SERVICE INSTRUCTIONS

FILMOSONIC® MAGNETIC SOUND SUPER 8MM PROJECTOR

MODELS

1731 A&B
1733 A&B
1742 A&B
1744 A&B
1745 A&B

BELL & HOWELL

GENERAL SERVICE DEPT.
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CHICAGO, ILLINOIS 60645

PART NO. 73588-

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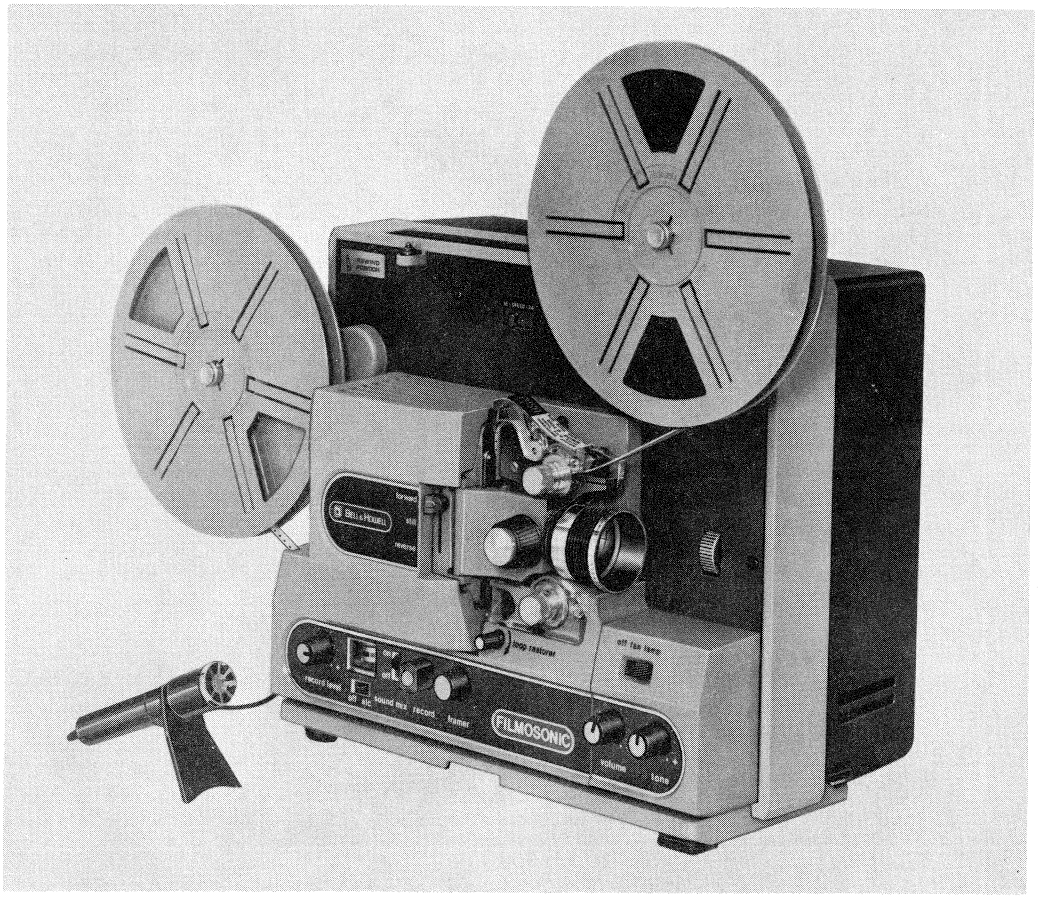


Design 1744 Super-8 Magnetic Sound Projector

FEATURE DESCRIPTION LIST

General Description	Automatic threading magnetic sound Super-8 movie projector with forward-still-reverse projection
Operating Voltage	120 volts, 60Hz
Projection Speeds	18 and 24 frames-per-second
Projection Lamp	Type DJL, 120 volt, 160 watt
Projection Lenses	See Parts Catalog Introduction
Sound System	Built-in speaker (8 ohm) and solid-state amplifier (3 watt for 1731/1733/1742; 5 watt for 1744/1745)
Signal/Noise Ratio	21db min. (1731/1733); 25db min. (all other models)
Wow and Flutter	0.5% RMS (weighted) maximum
Input Sensitivity (N/A for 1731/1733):	
Microphone Input	0.2 mv
Auxiliary Input	100 mv
Tone Control Range (1744/1745)	10 db minimum

Introduction

GENERAL.

This Service Manual has been prepared to aid the serviceman in the maintenance, repair and adjustment of Bell & Howell Model 1731, 1733, 1742, 1744 and 1745 "Filmosonic" Magnetic Sound Super-8 Movie Projectors. Statistical data for these units will be found in the Feature Description List on the preceding page.

Replacement parts for the projectors are illustrated and listed in the Parts Catalog section at the rear of the Service Manual. A letter coding system is used to designate those parts which are applicable to a specific projector model or models. This system is explained in the Parts Catalog introduction section.

DESCRIPTION.

All Models. Basically, all of the projector models covered by this manual are similar in design and construction. All are equipped with the automatic film threading feature and can be operated at a selected projection speed of 18 or 24 frames per second. Although designed to show and play super-8 magnetic sound movies, silent super-8 movies also can be shown. The Forward-Reverse-Still projection feature allows the user to back up the film to reshow a scene or to stop on a single frame if desired. A safety shutter automatically drops in position between the projection lamp and film aperture during "still" projection, and the sound system is disconnected when the projector is operating in "reverse." An 8-ohm speaker is built into the rear cover of the projector and the volume is adjustable by means of the Volume control on the front operating panel.

The Model 1731 is actually a Model 1733 less the front cover; therefore, all repair data specified for the Model 1733 will apply to the Model 1731. Models 1731, 1733 and 1742 are equipped with a 3-watt, solid-state amplifier; Model 1744 and 1745 with a 5-watt, solid-state amplifier. An external speaker jack is provided for plugging in an 8-ohm external speaker for sound at the screen during a showing or a headphone set for listening in private. The built-in speaker is automatically disconnected when an external device is plugged into the jack.

"A" Models Versus "B" Models. Each of the projector models is designated as "A" or "B" (1731A, 1731B, 1733A, 1733B, etc.). The only major difference in the "B" models from their "A" model counterparts is the addition of the autothread knob and lever components shown in the inset of Parts Catalog Figure 4. This addition has necessitated a change in the upper sprocket assembly and loopformer components. Except for these differences, the "B" versions are identical in all respects to the "A" versions. In the parts listings, therefore, parts coded "A" in the Usable on Code column will apply to 1731A and B and the 1733A and B. Parts coded "B" will apply to the 1742A and B. Since there are no electrical differences between "A" and "B" models, the wiring diagrams at the rear of the Parts Catalog will apply to both the "A" and "B" versions.

Models 1742, 1744 and 1745 Only. These models are more sophisticated than the 1731 and 1733 in that they are designed for magnetic sound recording. The projector circuitry allows the user to record voice, music, or both onto unrecorded sound tracks, or to mix in voice or music onto pre-recorded tracks by means of a special circuit with variable mixing control. Recording inputs are automatically adjusted for optimum sound quality. A monitoring feature permits the recording to be heard through the built-in speaker while it is actually being recorded.

Models 1744 and 1745 Only. In addition to the above, the Design 1744 and 1745 projectors are provided with the manual recording control feature. With the ALC (automatic level control) switch in the "off" position, the recording level can be adjusted manually for fine input control. A separate VU meter provides a visual indication of the sound input level whether recording with ALC or manually. A separate "Tone" control permits the adjustment of treble for the most pleasing sound playback. In addition to color, these two models differ as follows:

(1) Only the Model 1744 is provided with a receptacle mounted on the rear cover for plugging in a room lamp (100 watts maximum). The circuitry is designed so that the room lamp will go out when the projector switch is placed in the "lamp" position.

(2) The Model 1745 projector is provided with two additional jacks which are mounted at the rear of the projector main frame. These are standard 1/4-inch jacks for microphone input and 8-ohm external speaker use.

SPECIAL MAINTENANCE PRECAUTIONS.

The removal and installation of parts is relatively simple and, for the most part, can be accomplished with the tools normally available in all Bell & Howell service stations. Where special tools and gages are required (Figure A), their use is clearly noted in the instructions. Before proceeding with repairs, perform the general test procedures (Final Test section) to verify the customer complaint and refer to the Trouble Shooting chart for possible causes and remedies for the problem.

When repairing equipment, be sure that the work surface is clean. As parts are removed, group them in an orderly fashion to avoid confusion during reassembly. Loosely assemble attaching parts (screws, nuts, etc.) to the removed part or tapped casting to prevent their loss.

Be sure to clean all reusable parts thoroughly before reassembly. Remove dirt and old lubricant from gears, gear studs, etc. by washing them in a pan of non-flammable solvent. Wipe the motor, the transformer and the castings with a dry, lint-free cloth. Remove film emulsion from film path components (sprockets, guide rollers, aperture plate, etc.) with a cloth moistened with alcohol. If necessary, use a tooth pick or an orange stick to loosen hardened emulsion, especially between the sprocket teeth. Do not use a knife or other metal tool to scrape emulsion from film path components. Refer to separate instructions following for cleaning the magnetic head and capstan.

During reassembly, be sure to lubricate parts as noted in the instructions. If possible, use only the recommended Bell & Howell lubricants. However, if these are not available, use the best possible grade of ball bearing grease and instrument oil available from local commerical outlets. Do not overlubricate. Grease should be applied with a brush and care should be exercised to avoid getting grease on the drive belt, pulleys and drive rollers.

Upon completion of reassembly, perform the general inspections and operating tests outlined in the Final Test section to make certain that all repairs have been made and the projector is functioning properly.

TAPE HEAD AND CAPSTAN MAINTENANCE.

To insure maximum performance from the magnetic sound system, the tape heads and capstan should be cleaned whenever deposits of oxide and dust are observed. The accumulation of dust and oxide from magnetic tape can rapidly reduce the efficiency of these parts and quickly decrease the normal life of the heads. When this occurs, the sound will become distorted and the volume may decrease.

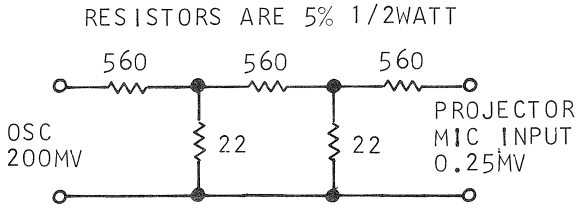
Cleaning Procedure. Although there is easier access to the capstan and heads with the film track assembly removed from the projector, these parts are accessible through openings in the film track when the snap-on cover (item 14, Figure 1) is removed. Do not use abrasives or metal tools for cleaning purposes. Use a Q-tip moistened with a good quality head cleaning fluid or isopropyl alcohol. Clean the capstan by holding the cotton swab against it while operating the projector or turning the flywheel manually. Hardened oxide particles should be removed with a round wooden toothpick followed by another cleaning with the cotton swab.

Demagnetizing Procedure. Demagnetize the head and capstan with a commercial head demagnetizer. With the projector "off," bring the tip of the demagnetizer close to, but not in contact with the face of the head. Withdraw the demagnetizer slowly away from the head several inches before turning it off. Repeat the procedure with the capstan.

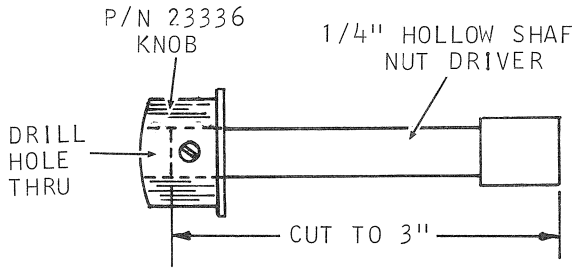
TOOLS NOT ILLUSTRATED

B&H Part No.	Description
TFR-1742-NX1	Blank Film (20 feet)
TFR-1744-NX5	Final Test Film (music/target/signal)
TFR-1744-NX6	Azimuth and Signal (Noise Test Film)
S-015642-143-NX2	Shim Gage (0.023 inch) - Adjust sprocket clearance
S-015642-143-NX3	Shim Gage (0.015 inch) - Sprocket clearance "GO"
S-015642-143-NX4	Shim Gage (0.025 inch) - Sprocket clearance "NO-GO"
S-015642-143-NX6	Shim Gage (0.037 inch) - Adjust sprocket clearance
S-015642-184-FX1	Special Bristol Wrench - Adjust sprocket clearance
Dale #RH-25	25 watt, 8-ohm (1%) non-inductive load
------	AC-VTVM, 10mv to 10V scale (-60db to +20db) Hewlett-Packard, Heath kit or comparable
GCE Tool #8606	Oscillator Adjusting Tool (G.C. Electronics)
B&H #STK-11165	Bias Adjusting Reversible Screwdriver
LP-8	Chatillon Push-Pull Scale (Master Gage Co., 1150 W. Grand Ave., Chicago, Illinois 60622)
------	Depth Micrometer (1 inch)
B&H #STK-11655	Connector Pin Removal Tool (See Figure D)

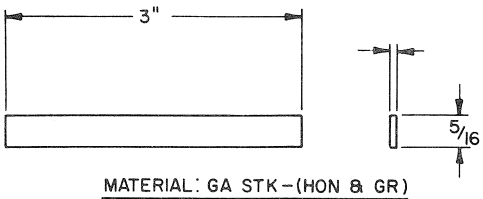
TOOLS WHICH CAN BE SHOP-MADE



MIC INPUT ATTENUATOR



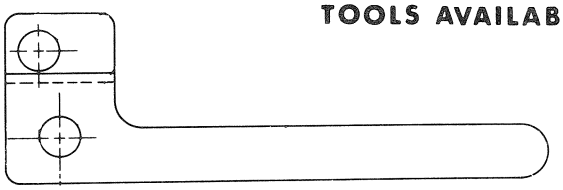
AZIMUTH ADJUSTING WRENCH



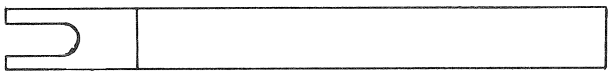
MATERIAL: GA STK-(HON & GR)

LENS CARRIER SETTING GAGE

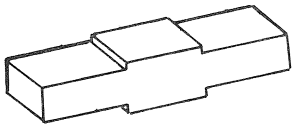
TOOLS AVAILABLE FROM BELL & HOWELL



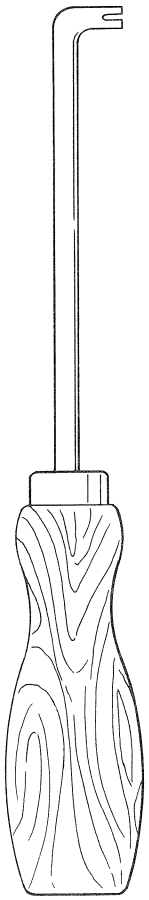
SHUTTLE TOOTH CENTERING GAGE NO. S-012600-15-FX1



DRIVE PINION CLEARANCE GAGE NO. SD-253-105-F1



SHUTTLE HEIGHT GAGE G9991-N1



SHUTTLE BENDING TOOL NO. SER-356-1-FX1

Figure A. Special Service Tools

Disassembly Procedure

1. GENERAL INSTRUCTIONS.

a. Be sure to disconnect the projector line cord before preceeding with repair. Remove the projection lamp (item 3, Figure 1) from the lamp socket and the projection lens from the lens carrier. Wrap both items in tissue paper and set them aside to protect them from possible damage.

b. The disassembly procedure set forth in these instructions completely dismantles the projector down to the bare main plate and main frame, with illustrated parts indexed and illustrated in the suggested sequence of disassembly. Obviously, the repairman must use his own judgement in eliminating those steps which do not affect his particular repair problem.

c. To prevent the loss or mix-up of attaching hardware, such items (screws, nuts, etc.) should be loosely assembled to the removed part or to the tapped castings from which they are removed.

d. Electrical parts which are mechanically secured to the projector are illustrated in Figure 2 of the Parts Catalog. If any of these electrical items should require replacement, refer to the appropriate wiring diagram (Figures 13 through 16) for wiring connections to the item and unsolder or disconnect leads as necessary.

e. Replacement of amplifier components should be limited to the items listed in Figure 2 (items 2A through 2K). All amplifiers are shown schematically in Figures 9 through 12. If troubles are traced to the amplifier, replace the complete assembly rather than attempting circuit board repairs. If the amplifier is to be replaced (Models 1742 and 1744 only), refer to paragraph 10 to determine if the replacement requires edge connector modification.

f. When removing riveted parts for replacement, drill out the old rivet with a drill equal to, or slightly smaller than the diameter of the rivet being removed. Be sure to blow away all drill chips with compressed air.

2. REMOVING FIGURE 1 PARTS. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Remove the front cover assembly (1), from the projector by depressing the latch (1G) and swinging the bottom of the cover outward; then disengaging the cover from the two locator pins at the top of the main frame. The adhesive-backed nameplate (1C) must be removed from the front cover to gain access to the rivets that secure the film trimmer (1K) and microphone holder (1N).

NOTE: In some earlier production models, the film trimmer was mounted in the front cover as shown. In all current models, the film trimmer is mounted on the top of the control box (item 2-26). Trimmer parts are available for both versions.

b. Pull the lamphouse assembly (2) straight out to disengage it from the main plate. Do not twist or wriggle the projection lamp (3) while removing it. Pull it straight out from its socket.

c. To remove the rear cover assembly (7), proceed as follows: Tip the projector to expose the underside of the base and remove two screws (4). With the projector upright, remove the two screws (5) located at either end of the jack bracket and the two screws (6) in the upper area of the line cord bracket. Pull the rear cover assembly (7) away from the projector to the limit of the line cord. There is enough slack in the line cord to permit removal of the speaker (9). Disconnect the two leadwires from the speaker terminals. Remove the four Keps nuts (8) and lift the speaker (9) and speaker gasket (10) from the mounting posts of the back cover. If the line cord (13) is to be replaced, trace its black leads to the securing leadwire nuts. Unscrew these nuts, disassemble the strain relief bushing (12) from the rear cover, and remove the line cord. For the Model 1745, be sure to remove the screw (12A) and lockwasher (12B) that secure the ground wire to the frame.

d. The film track cover assembly (14) snaps in place on the film track. The two snap-in prongs are located at the far left end of the cover and just to the right of the loop restorer knob. The acrylic sprocket cover (14B) is secured to the film track cover with two screws (14A).

NOTE: The current sprocket cover P/N 450552 (item 14B) has a larger sprocket clearance hole than the earlier version, but is usable on all early and current models. If you are repairing an early model projector and such repairs include the replacement of a damaged film track, it will also be necessary to install the current sprocket cover. (See Note below Figure 8 parts list).

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

NOTE: The following procedures make no specific mention of leadwire disconnections. Refer to the appropriate wiring diagram (Figures 13 through 16) and disconnect only those leadwires necessary to free the part being replaced. Most of the connections to the amplifiers is by means of push-on connectors. Where unsoldering is necessary, be careful not to allow solder to drip onto other electrical parts.

a. Disconnect the edge connector (1) from the rear edge of the amplifier assembly (2). The amplifier is not screw-mounted, but snaps down onto five plastic stand-offs (3) and (4) assembled to the base. Carefully disengage the amplifier assembly from these stand-offs and lift the assembly from the projector.

NOTE: Do not attempt amplifier repair and parts replacement beyond those listed beneath the amplifier (items 2A through 2K). A small quantity of early Model 1742 and 1744 projectors were equipped with a modified amplifier assembly. These early units can be identified by the presence of a red dot on the edge connector and the record play switch and by the part number 19701A imprinted on the foil side of the circuit board. (Current circuit boards are imprinted with the number 19701C). If you are replacing one of the early amplifier assemblies, refer to paragraph 10 for edge connector wiring modifications which must be made to accommodate the current amplifiers.

b. Remove two screws (5) and lockwashers (6) that secure the transformer mounting bracket (7) to tapped posts of the main frame, and lift out the assembled bracket and transformer. Remove two screws (8) and disassemble the transformer assembly (9) from the mounting bracket.

c. Loosen the setscrew in the blower fan and slide the fan to the left and up against the drive motor. Remove two screws (10) and carefully lift out the motor fan grille (11). Be sure to save the flat washer (12) located between the lower mounting foot of the grille and the tapped boss of the main frame.

d. Remove the screw (13) that secures the terminal lug of the grounding lead assembly (14) to the motor subplate. The other end of the lead is attached to the lamp socket and need not be removed. Remove three screws (15) and lock washers (16) and lift the complete motor and subplate assembly (17) from the projector. If further disassembly of this group is required, refer to paragraph 8 and Figure 7. The hex spacer (19) is secured to the main plate by a screw (18) inserted from the opposite side and located just below the rear edge of the lamp baffle.

e. Remove the screw (20) located just to the right of the lower sprocket assembly and disassemble the roller (21) and washer (22) from the screw. Loosen screw (23A) enough to permit the T-bar (23B) to be lifted from the film track slot. From the rear side of the main plate, remove the five screws (23) that attach the film track assembly (24). Two screws are located at the extreme ends of the film track and the fifth screw is located behind the flywheel. Carefully pull the film track away from the main plate as far as the leadwires will allow and without putting a strain on connections. If the Off-Fan-Lamp switch (30) is to be replaced, free its black and blue leads from the leadwire nuts and disconnect the brown lead from the lamp socket terminal. This will permit the film track to be withdrawn far enough to remove the two screws (25) which attach the control box assembly (26), thus exposing the Off-Fan-Lamp switch screws (29).

NOTE: No special instructions are necessary for the replacement of switches and controls mounted to the film track assembly. Simply disconnect or unsolder leads as necessary and remove the mounting parts as indicated. Note that the record level control (32), the sound-on-sound switch (34) and the record knob (44) and lamp (45) are used only on Models 1742, 1744 and 1745 projectors, and that the VU meter (37), Off/ALC switch (39) and separate Tone Control (41) are used only on the Models 1744 and 1745 projectors. For further breakdown of the film track and roller assembly, refer to paragraph 9 and Figure 8.

f. If the film trimmer (26F) is damaged, drill out the two rivets (26C) and disassemble the film trimmer parts from the top of the control box. In earlier projectors, the film trimmer was mounted to the inside wall of the front cover (see Figure 1).

g. Remove the push-on nut (42) and the record activator spring (43) from the shaft end of the record control knob (44) and withdraw the knob from the main plate. Remove the flat washer (43A) and spring (43B) from the control knob shaft. Grasp the base of the record lamp (45) and, while pressing against the front of the lamp, disassemble it from the control knob.

h. Remove the screw (46) and clamp (47) that secure the humbuck coil to the bottom of the main plate. Two screws (48) secure the head assembly (49) to the main plate. One is located just above and slightly to the right of the framer shaft; the other just above the right (front) end of the humbuck coil clamp (47). Remove these two screws only and carefully lift out the head and coil assembly while disengaging the head retracting lever from the lower bent end of the retracting rod (item 16, Figure 4). Do not attempt further disassembly of the head other than possible replacement of the tension spring (49A). If tests (paragraph 29) indicate thatthe head and coil assembly are faulty, the complete head and coil assembly must be replaced.

i. The muting switch assembly (53) is secured to the drive roller bracket with a screw (50), lock washer (51) and flat washer (52). The lamp socket assembly (56) is secured to the main plate with two screws (54), one of which also serves to attach the screen (55). The room lamp receptacle (57) is used only in Model 1744 projectors.

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

a. Loosen the two setscrews (1) in the hub of the flywheel assembly (2). Disassemble the flywheel (2) and assorted washers (3), (4) and (5) from the end of the capstan shaft (6). Carefully withdraw the capstan shaft (6) and disassemble the two ball bearings (7) from the capstan bushings. Refer to paragraph 7 and Figure 6 for replacement of capstan bushings and clamps.

b. Each reel arm cover (9) and (10) is secured to its support (39) and (40) with two screws (8). Remove the screws and lift off the covers taking care not to lose the torque spring (9A) located in the supply arm cover only. Remove the spindle screw (11) and disassemble the spacer (12), washers (13), spur gear (14), tension washer (15) and the spindle assembly (16) from each cover.

c. Lift the three spur gears (17) and (18) from the gear posts of the supply arm support (39). Lift spur gears (17) and (19) from take-up arm support (40).

d. Loosen the setscrew (20) and disassemble the spur gear (21) and the supply gear and shaft assembly (22) from the supply arm bearing (38). Loosen the setscrew (23) and disassemble the spur gear (24) and the take-up gear and shaft assembly (25) from the take-up arm bearing (38).

e. Remove the four retaining rings (26) and disassemble the two small spur gears (27) and two large spur gears (28) from the gear posts of the mounting plate assembly (33). Remove the retaining ring (29) and disassemble the large spur gear (30) from the upper stud of the lever that is assembled behind the upper sprocket gear.

f. Remove the screw (31) that attaches the gear mounting plate (33) to the main plate. Removal of the two large retaining rings (32) will now permit the disassembly of all remaining Figure 3 parts from the main plate. Be careful not to lose the two steel balls (37) and mark the cam washers (35) and (36) in such a way that they can be identified as "supply" or "take-up" at reassembly.

5. REMOVAL OF FIGURE 4 PARTS. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

CAUTION: The current lower sprocket assembly (10) can be identified by the presence of a setscrew located in the recessed O.D. just forward of the sprocket teeth. When withdrawing the sprocket from the main plate bearing, be sure to remove the washers (11) as well. Then wrap a piece of tape around the shaft to hold these washers against the sprocket flange and prevent the adjusting pin from dropping out.

a. Before removing the sprocket gears, note carefully the manner in which the retaining springs (1) and ratchets (3) are installed. Remove the retaining springs (1), the lower sprocket washer (2) and spring ratchets (3) and disassemble the washers and gears (4 through 8) from the upper and lower sprocket shafts. The lower sprocket assembly (10) can be withdrawn from its bearing in the mechanism plate without difficulty. However, the upper loopformer (13) must be removed before the upper sprocket assembly (10) can be withdrawn. This is accomplished by removing the pin-type screw (12), which will also free the flanged roller (14) and the washer located between the loopformer and the loopformer bracket (19).

b. To differentiate between early and current sprocket assemblies (9) and (10), measure the O.D. of the knurled ratchet knob, For earlier sprockets, the knob will measure slightly greater than 1/2-inch; for the current knob, slightly greater than 5/8-inch. Both styles are available for replacement. Guard actuater components (10B through 10E) can be disassembled from the current sprocket by removing retaining ring (10A). However, be careful not to disturb the tape you wrapped about the sprocket shaft to hold washers (11) in place.

c. Lift the head activating rod (16) from the stud protruding through the elongated hole at the top of the mechanism plate. Remove the drive roller (17) from the roller stud of the upper loopformer bracket (19). The bracket is secured to the mechanism plate with screw (18) and washers (18A).

d. Swing open the lens carrier assembly (32) and disassemble the pressure plate (20), retaining spring (21) and mask (22) from the lens carrier pins. The focus knob cover (23) is connected in place and must be pried from position with a knife blade to expose the screw (24). Remove the screw (24) and disassemble the washer (25), focus knob (26) and second washer (27) from the end of the eccentric shaft (28). Withdraw the eccentric shaft from inside the lens barrel of the lens carrier and disassemble the spring (29) and O-ring (30) from the shaft. If the lens carrier (32) is to be replaced, pry out the two hinge pins (31) with a knife blade.

e. Remove the two screws (33) that secure the film guide rail (34) to the aperture plate. Disassemble the side tension spring (35) and the side tension arm (36) from the aperture plate pin. Remove two screws (37) that secure the film deflector (37A) and aperture plate (38) to the mechanism plate.

f. Check for the presence of the tension spring (39) which should be hooked between the top of the upper latch lever and a hole in the main frame. The latch lever is the one whose stud protrudes through the elongated hole at the top of the mechanism plate. If the lens carrier catch (41) is broken or has lost its tension, the rivets (40) must be drilled out in order to replace it. The setscrew (42) is used to adjust the lens carrier horizontal alignment and should not be disturbed.

g. "B" Models Only. Remove the trimplate (45) and drill out rivet (46). Disassemble washer (47), knob assembly (48) and bushing (49) from the main-plate. Do not remove nut (50) unless torsion spring (51) is in need of replacement.

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

a. The spring loading bracket assembly (3) is secured to the roller mounting bracket assembly (5) with two screws (1) and washers (2), and need not be removed unless either of these brackets is to be replaced. Remove the retaining ring (4) from the roller mounting bracket pivot shaft and lift the bracket assembly (5) from the projector. Remove the drive belt (6) and disassemble the torsion spring (7) from the bracket pivot shaft.

b. If the outer drive roller (12) is to be replaced, the sleeve (8) must be removed from the roller shaft. Each of the rollers (11) and (12) is secured with a retaining ring (9) and a flat washer (10) is located at each end of the rollers.

c. Loosen the screw (13) and withdraw the Forward-Reverse knob (14) from the front end of the safety shutter actuating lever. From the recess in the mechanism casting behind the aperture plate, remove the retaining ring (15) that secures the lock lever to a pin at the lower front of the safety shutter. The lower end of the lock lever engages a square hole in the record cam (item 20, Figure 6). In the same casting recess, loosen the screw (18) that secures the upper front corner of the safety shutter to the mechanism casting. Now remove the pivot screw (17) and carefully disassemble the safety shutter assembly (19) from the projector.

d. Remove two screws (20) and disassemble shutter plate (21), shutter (22) and disc (23) from the end of the main shaft.

e. Rotate the manual knob (43) while observing the action of the up-and-down cam (36). The cam shoes (29C) must fit snugly on the outer rim of the cam, but not so tightly as to cause a binding condition as the manual knob is turned. If the cam shoe fit is too tight or too loose, the cam shoes must be replaced. Shuttle assembly removal is as follows: Remove the screw (24) which is inserted through the long cast arm of the mechanism and into the tapped hole of the shuttle pivot bracket (31). Remove the hex nut (25), cable clamp (26) and lock washer (27) from the end of the pivot stud (28) and remove the stud. Rotate the up-and-down cam (36) to its horizontal position and carefully lift the shuttle assembly (29) from the projector. Inspect the felt wick (29B) and its retaining spring (29A) to determine their condition. If the earlier inspection indicated that the cam shoes (29C) were in need of replacement, the staking points must be carefully filed down to free the old cam shoes. Remove the hex nut (30) and disassemble the pivot bracket (31), spacer (32), shuttle stud (33) and spring tension washer (35) from the shuttle. The setscrews (34) need not be removed from the shuttle stud.

f. Remove the up-and-down cam (36) from the end of the main shaft (44). Loosen the two setscrews (37) and disassemble the in-and-out cam (38) and thrust washer (39) from the main shaft. Loosen the setscrews (40) and (42) in the worm gear (41) and manual knob (43) respectively. Remove the retaining ring (46) from the main shaft (44) and slide the shaft toward the rear of the main plate until the manual knob can be removed. Then withdraw the shaft toward the front of the main plate, removing the worm gear and the friction washer (45) as they are freed.

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

a. (Early Models). Remove the screw (1), disengaging the hooked end of the spring (2) from the belt shifter bracket. Loosen the setscrews (3) in the speed shift knob (4) and withdraw the belt shifter (5), catching the springs (6), collar (7) and knob (4) as they are freed. The collar (7) need not be removed from the shifter.

b. (Current Models). Loosen the screw (1) in the belt shifter knob. Loosen the setscrews (3) in the belt shifter collars (4) and withdraw the belt shifter (6), catching the collars and the springs (5) as they are released. Lift the knob (7) from the belt shifter bracket and the main plate.

c. Remove the hex nuts (9) and screws (10) and disassemble the capstan bushings (11) and bushing clamps (12) from the main frame.

d. Remove retaining ring (13) and depress tilt lock bracket (16) so that the tilt post assembly (14) and spring (14B) can be withdrawn from the projector main frame. Note the manner in which spring (15) is assembled before disengaging the spring ends. Remove the two screws (17) and disassemble the tilt brackets (16) and (18) from the main frame.

e. Remove retaining ring (19) and lift record cam (20) from the main frame. Unscrew framer shaft (21) from the bushing in the main frame. Press front cover locator pins (22) and grommets (23) from the cast ears at the top of the main frame.

f. If the handle (26) is to be replaced, use a small bladed screw driver or pointed instrument to pry the speed clip (24) from one of the handle retainers (25). Disassemble the retainer from the end of the metal handle strap. Grasp the retainer at the opposite end and pull the metal strap from the rubber grip and the main frame.

g. Four screws (27), one at each side and two at the top, and three screws (28) across the bottom secure the main plate (29) to the main frame (30). The rubber feet (30C) are secured to the main frame with two rivets (30A) and (30B).

8. DISASSEMBLING THE MOTOR AND SUBPLATE ASSEMBLY (Figure 7). Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Remove the screws (1) and lock washers (2) and disassemble the subplate (3) from the motor assembly (12). Disassemble the eyelets (4) and grommets (5) from the subplate.

NOTE: On some earlier models, a sleeve spacer was inserted into each grommet with a flat washer on each side. This was an interim production measure and is an acceptable method of assembly. Be careful not to lose the washers and sleeves.

b. Remove the Keps nuts (6) that secure the support brackets (7) to the motor. Reassemble the nuts to the screws to prevent their loss.

c. Loosen the setscrews (8) and (10) and disassemble the fan (9) and pulley (11) and washer (11A) from the motor shaft.

9. DISASSEMBLING THE FILM TRACK ASSEMBLY (Figure 8). Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Remove the retaining rings (1) and disassemble the bowed washers (2) and roller halves (3) and (4) from their mounting pins.

b. Remove the push-on nut (5) and bowed washer (6) and disassemble the framer knob assembly (7) and washer (8) from the film track.

c. Before removing the loop restorer spring (10) note the manner in which the spring ends are engaged. Carefully pry the loop restorer knob (9) from the shaft end of the lever (11) and remove the spring (10). Press the shaft of the lever from the film track.

d. Remove the screw (12) and flat washer (13) and disassemble the sprocket guard (14) from the film track. Remove screw (16) and film deflector (17).

NOTE: An earlier version of the film track did not include the sprocket guard (14) or film deflector (17). This earlier film track is no longer available and if damaged, must be replaced by the current design. In addition, it will also be necessary to replace the early acrylic sprocket cover (item 1-14B) with the current version (P/N 450552), which is milled to provide clearance for the head of screw (item 8-16).

10. SPECIAL AMPLIFIER REPLACEMENT INSTRUCTIONS. As indicated earlier, replacement of amplifier components should be limited to items 2A through 2K in the Figure 2 parts list. If circuit board components are found to be defective, the complete amplifier assembly must be replaced. A limited quantity of the earliest Model 1742 and 1744 projectors were equipped with a modified amplifier assembly which is not interchangeable with the current design. Since only the current version will be available for replacement, the installation of a current amplifier in one of the earlier projectors will

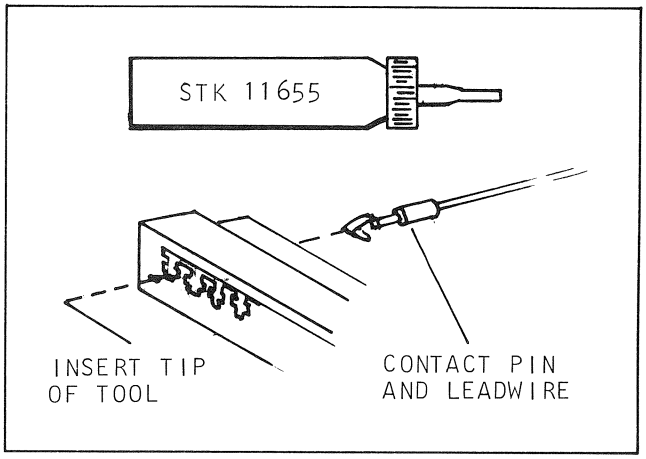


Figure B. Contact Pin Removal Tool STK11655

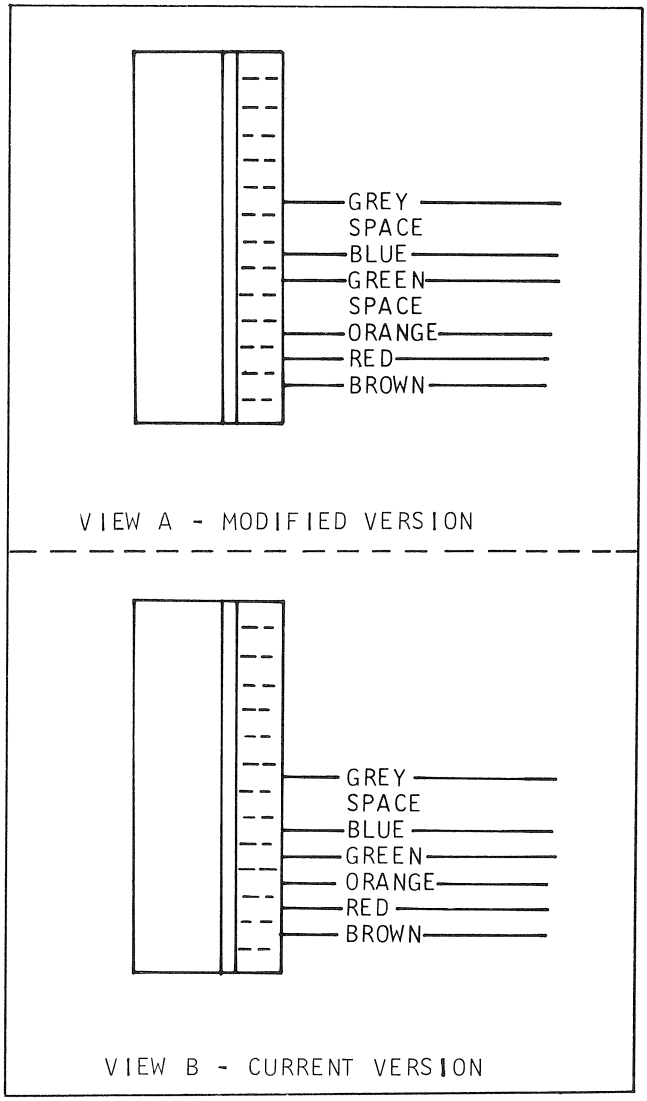


Figure C. Modified and Current Edge Connector Wiring for Design 1742

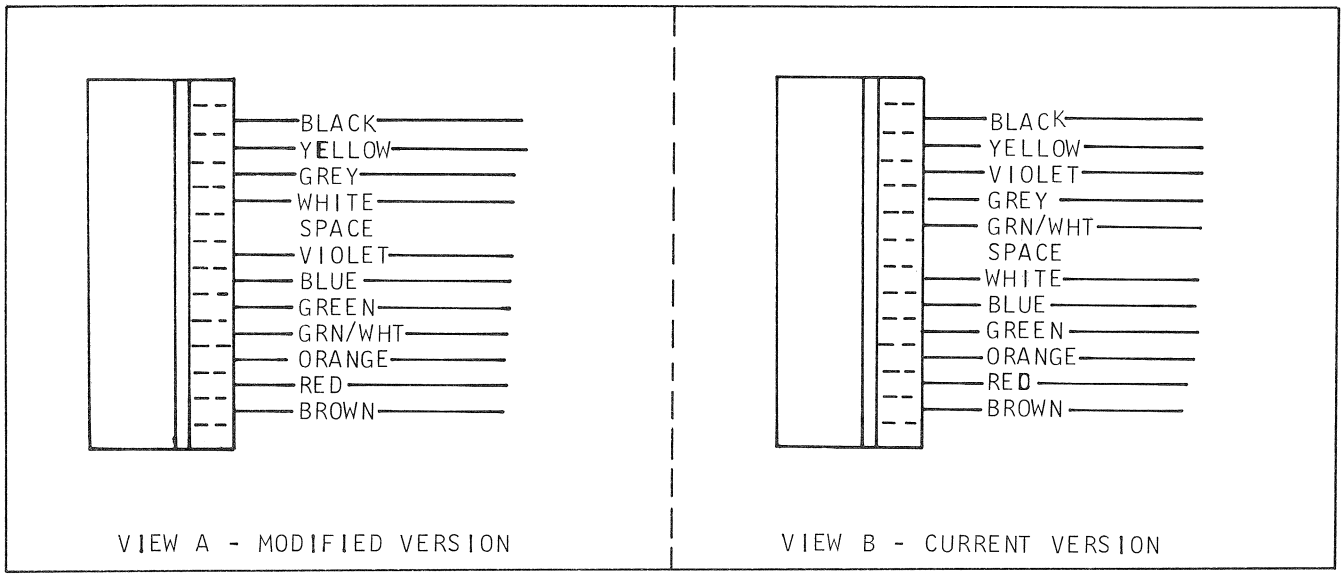


Figure D. Modified and Current Edge Connector Wiring for Design 1744

require re-routing of the wiring to the edge connector. The earlier "modified" amplifier can be identified by the part number 19701A stamped on the foil side of the circuit board (current boards are stamped 19701C). In addition, you will find a red dot (1742) or white dot (1744) on the edge connector and on the record/play switch.

a. After installing the current amplifier, use the contact pin removal tool STK11655 (Figure B) to press the contact pins from the edge connector. The flat end of the tool is inserted into the bottom channel of the pin opening until the spring leaf of the pin is lifted to clear the step in the channel.

b. Refer to Figure C (Model 1742) or Figure D (Model 1744) for the re-routing of wires to the edge connector. Make certain that the contact pins are fully seated. When the rewiring has been accomplished, be sure to remove the dot (red or white) from the edge connector to show that the current amplifier has been installed and the edge connector modification made.

Reassembly Procedure

11. GENERAL INSTRUCTIONS.

a. Before reassembling parts, be sure to clean them thoroughly. Specific cleaning instructions will be found in the Introduction section of this manual.

b. Wherever possible, riveting or staking operations should be performed first, before other parts are assembled to the main plate or main frame. Be sure that the main plate or main frame is resting squarely and firmly on a support block during the riveting operation.

c. When rewiring electrical components, use a pencil type soldering gun and solder all connections carefully. Avoid cold-soldered joints and be careful that solder does not drip onto other electrical components and cause short circuits. Avoid the direct application of solder gun heat to adjacent components by using a heat sink. Refer to the appropriate schematic diagram (Figures 9 through 12) for connections between the amplifier and jacks. Overall projector wiring connections are shown in Figures 13 through 16.

d. When replacing nameplates and labels, be sure that the area to which they are to be assembled is cleaned with solvent. For those which are already adhesive-backed, remove the paper backing and activate with trichloroethylene and allow it to become tacky. Carefully place the nameplate or label squarely in position and smooth it down with a clean, dry cloth. Wipe away excess adhesive with a cloth dampened in solvent. Where adhesive is to be applied, use 3M Company Type EC-847 adhesive (B&H Spec. 327) unless otherwise specified.

e. During reassembly, lubricate parts as directed in the following instructions, using the specified lubricant. Always lubricate sparingly and be especially careful not to get grease or oil on the drive belt and its pulley and rollers. Wipe away excess lubricant with a lint-free cloth.

12. REASSEMBLING THE FILM TRACK ASSEMBLY (Figure 8). Reassemble parts as outlined in the following paragraphs, noting any special precautions.

NOTE: An earlier version of the film track assembly did not include the sprocket guard (14) or the film deflector (17) and is no longer available. Refer to NOTE A, Figure 8.

a. Assemble film deflector (17) into the milled recess below and to the right of the sprocket hole and secure with screw (16). Assemble sprocket guard (14) into the milled recess to the left of the sprocket and install screw (12) and washer (13).

b. Note that the end of the loop restorer lever shaft (11) is split. Compress the end of the shaft while inserting it into the hole in the film track (15); then press it all the way through the hole. Assemble the U-shaped tang of the spring (10) into the hole in the triangular-shaped flange of the loop restorer knob (9). Match the coils of the spring and the flat of the "D" hole in the knob with the flat on the restorer lever shaft and press the knob part way onto the shaft. Engage the free tang of the spring with the small hole above the lever shaft while pressing the knob fully into place. Rotate the knob to check the spring return action.

c. Assemble the washer (8) to the hub of the framer knob assembly (7) and insert the hub through the hole in the film track. Assemble the bowed washer (6), bowed surface in, to the hub of the framer knob and secure all parts with the push-on nut (5).

d. Lightly grease the three roller posts of the film track with Dow-Corning #33 grease (B&H Item 3356), and assemble the three pairs of rollers (3) and (4) to the posts. Assemble a bowed washer (2), bowed surface out, to each post and secure parts with the push-on retaining rings (1). Check all rollers to be sure that they spin freely.

13. REASSEMBLING THE MOTOR AND SUBPLATE (Figure 7). Reassemble parts as outlined in the following paragraphs, noting any special precautions.

a. Assemble the flat washer (11A) and motor pulley assembly (11) to the longer shaft of the motor (12) with the ball cage of the pulley toward the motor. Install the pulley setscrews (10), tightening it just enough to hold.

b. Assemble the motor fan (9) to the opposite end of the motor shaft, fan hub away from motor. Install the fan setscrew (8) tightening it just enough to hold.

c. Assemble a support bracket (7) to each side of the motor, mounting the brackets on the extending threaded ends of motor belt mounting screws and with the bent mounting flanges of the support brackets pointing in toward one another. Secure the brackets by installing the Keps nuts (6) finger tight.

d. Assemble the grommets (5) into the motor subplate (3) and press two eyelets (4) onto each grommet, and secure the subplate to the motor bracket with four screws (1) and lock washers (2), tightening the screws securely. Secure the mounting flanges of the support brackets (7) to

the subplate with the four remaining screws (1) and lock washers (2) and tighten the screws; then tighten the Keps nuts (6) securely. Refer to paragraph 18, step j, for motor/subplate installation.

14. REASSEMBLING FIGURE 6 PARTS. Reassemble parts as outlined in the following paragraphs, noting any special precautions.

a. If either rubber foot (30C) was replaced, secure the new foot to the base of the main frame (30) with the appropriate rivet (30A) or (30B). Lift the main plate (29) up into position on the main frame with mounting holes aligned and install the seven screws (27) and (28) finger tight. Securely tighten the three screws (28) across the bottom of the main plate first; then the four screws (27) at the top and sides.

b. If the carrying handle (26) was replaced, assemble the new handle to the main frame as follows. Remove the steel insert strip from the ribbed handle. Squeeze a handle retainer (25) together and assemble it into the rectangular opening at the end of the insert strip with the "U" shaped portion of the retainer facing the center of the strip. Compress and assemble a speed clip (24) into the recess in the retainer to spread the retainer and thus prevent it from disengaging from the rectangular opening in the insert strip. From inside the main frame, insert the opposite end of the strip up through the handle slot in the top of the main frame. As the strip immerges, assemble the handle grip, ribbed side up, to the strip. Insert the end of the strip down through the opposite handle slot in the main frame and assemble the remaining retainer (25) and speed clip (24) to the insert strip in the same manner as described above.

c. Assemble the grommets (23) to the cast ears of the top of the main frame, with the profile of the grommet matching the profile of the ear. Insert a locator pin (22) into each grommet.

d. Insert the framer shaft (21) into the threaded framer bushing of the main plate and thread it into the bushing until the end of the shaft extends at the rear of the main plate. Assemble the record cam (20) to the framer bushing, with the squared edge of the cam to the left. Secure the cam with the retaining ring (19).

e. Secure the tilt bracket (18) to the main frame with the two screws (17), tightening the screws securely. Hook one end of the spring (15) into the small hole in the tilt lock bracket (16); then insert the tab of the tilt lock bracket (16) into the rectangular opening in tilt bracket (18) and hook the free end of the spring into the small hole near the top of the bracket (18). If replaced, assemble rubber feet (14A) to the tilt post assembly (14). The curved edge of the tilt post cross plate must face toward the front of the main frame. Assemble the spring (14B) to the tilt post. Compress the lock bracket (16) so that the square post holes in both brackets are aligned and insert the tilt post up through both brackets. Secure the tilt post with the retaining ring (13).

f. Preassemble the clamps (12) to the two capstan bushings (11), engaging each clamp with the slot in its bushing and with the tip of the clamp toward the short end of the bushing. Assemble these parts to the main plate, seating the small diameter of each bushing in the hole in the main plate. Insert the screws (10) through the clamps and main plate from the front side and install and tighten the two hex nuts (9). Be sure the clamps are snugly against the bushings.

g. (Early Models). Hold the speed shaft knob (4) within the rectangular opening in the main plate and insert the long straight leg of the belt shifter (5) through the knob and the right (rearmost) ear of the speed shift bracket. Assemble a spring (6), the collar (7) and a second spring (6) on the leg of the belt shifter before inserting the leg through the left ear of the bracket. Tighten the knob setscrews (3) just enough to hold the knob and shifter parts in place. The belt shifter must be aligned after the motor and drive pulley are installed (paragraph 13). Assemble the loop end of the spring (2) over the threaded end of the screw (1) and thread the screw into the tapped hole in the collar (7). Engage the hook end of the spring into the small hole in the upper surface of the speed shift bracket.

h. (Current Models). Assemble the screw (1), washers (1A) and (1B) and square nut (2) loosely to the speed shaft knob (7). Hold the knob in position within the shaft bracket ears and against the main plate while inserting the long straight leg of the belt shifter (6). Tighten the screw (1) just enough so that the leg cannot slip out of the notch in the knob. Assemble a collar (4) and then a spring (5) to the shifter leg as it passes between the two ears to the left of the knob. Then assemble the reaming spring (5) and collar to the shifter leg. Tighten setscrews (3) just to secure all parts until adjustment is made (paragraph 13). Refer to NOTE A, Figure 6, for updating belt shifter system.

15. REASSEMBLING FIGURE 5 PARTS. Reassemble parts as outlined in the following paragraphs, noting any special precautions.

a. Apply a light film of oil to the length of the main shaft (44) which is longest from retaining ring groove to end. Hold the manual knob (43) in position within the rectangular opening in the main plate and insert the oiled end of the shaft through the knob. Assemble the friction washer (45) to the shaft and continue inserting the shaft into and through the bearing in the short cast ear of the mechanism plate. Hold the worm gear (41) in position between the two cast ears, gear hub toward the right, and insert the shaft through the worm gear and the bearing in the long cast ear. Assemble the retaining ring (46) into the ring groove of the main shaft so that the washer (45) is between the retaining ring and the short cast arm. Tap the knob end of the shaft so that the washer (45) is seated against the cast arm. Temporarily tighten the worm gear setscrew (40) and knob setscrew (42).

b. Assemble the thrust washer (39) onto the main shaft and up against the long cast ear. Assemble the in-and-out cam (38), gear-toothed end first, to the shaft and up against the washer. Press the knob end of the shaft toward the right to take out all end play in the shaft and secure the in-out cam with two setscrews (37) dipped in shellac. Wipe the excess shellac from the cam with a lint-free cloth dampened with solvent.

c. Insert a 0.015 inch shim between the front face of the manual knob (43) and the edge of the rectangular opening in the main plate. Hold the knob against the shim and secure it to the main shaft with the setscrew (42) dipped in shellac. Wipe away the excess shellac with a lint-free cloth dampened with solvent. Turn the manual knob to check for freeness. If binding occurs, hold a wooden block against the knob end of the shaft and tap lightly with a rubber mallet to free it up.

d. Insert the worm gear clearance gage (Figure A) between the worm gear and the bearing in the short cast arm. Hold the worm gear against the gage and secure it with the setscrew (40) dipped in shellac. Wipe away excess shellac with a lint-free cloth dampened with solvent.

e. Assemble the up-and-down cam (36) to the main shaft with the flat surface toward the in-and-out cam and the holes in both cams aligned. Assemble the setscrew (34) into the threaded hole in the head of the shuttle stud (33) and screw it down as far as it will go without bottoming. Lightly grease both sides of the tension washer (35) and assemble it to the stud, bowed surface toward the stud head. Insert the stud through the stud hole in the shuttle (29) and assemble the spacer (32) and pivot bracket (31) to the stud. Install and tighten the hex Sems nut (30) to secure all parts. On the stud head side of the shuttle, carefully raise the leg of the captive shuttle tension spring just enough so that it can be rested on top of the setscrew (34).

f. Engage the slotted end of the felt wick (29B) with the tang of the shuttle as shown in Figure E. Insert the tip of the retaining spring (29A) into the small vertical slot at the opposite end of the wick and "roll" the spring and wick downward until the spring can be snapped in place over the retaining tang. Lightly grease the shuttle notches where the cam shoes (29C) are to be assembled. Note (Figure E) that the cam shoe surfaces are slightly bowed and these bowed surfaces must face as shown in Figure E. Turn the framer shaft so that the slotted end protrudes as far as possible at the rear of the main plate. Carefully assemble the shuttle to the projector, guiding the key hole slot of the shuttle framer lever onto the framer stud and, at the same time, turning the manual knob so that the narrowest width of the up-and-down cam (36) will be between the shuttle cam shoes. Make sure that the shuttle wick and spring are clear of the cam. Align the front lower hole of the pivot bracket (31) with the outermost hole in the long cast arm and insert the threaded end of the pivot

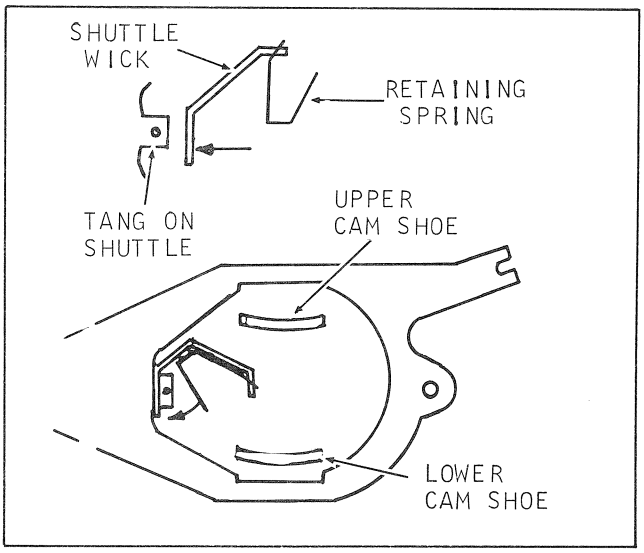


Figure E. Assembling the Shuttle Cam Shoes and Wick

stud (28) through the bracket and cast arm. Assemble the lock washer (27) and cable clamp (26) to the threaded end of the stud and install and tighten the hex nut (25). Assemble the screw (24) through the other hole in the cast arm and into the tapped hole in the pivot bracket and tighten just enough to hold securely.

g. Assemble the mylar disc (23) to the main shaft, with the burr side toward the up-and-down cam. Assemble the shutter (22), open side out, and shutter plate (21) to the main shaft. Line up the screw holes in the cams, disc, shutter and plate and install the two screws (20). Turn and hold the manual knob in a counterclockwise direction while tightening the two screws securely. Check the fit of the cam shoes by rotating the manual knob counterclockwise. The knob should turn smoothly but should require slightly more pressure when the high cam rise is in contact with the cam shoe.

h. Apply a speck of grease (B&H Spec. 1956) to each detent of the safety shutter T-lever (Figure F). Assemble the safety shutter to the projector, guiding the actuating tang of the T-lever through the forward-still-reverse slot in the mechanism casting and seating the pivot point of the shutter assembly on the shoulder of the pivot stud (28). Turn the pivot screw (17) finger tight into the pivot stud and secure. the front end of the shutter to the tapped boss inside the mechanism casting (see Figure F). Secure the forward-reverse knob (14) to the end of the T-lever with the screw (13), dipped in shellac, and move the lever through all three positions to check for freeness and visually check the centering of the perforated heat filter with the aperture opening. Adjust centering by loosening the front screw (18) and shifting the shutter up or down slightly; then hold securely while tightening both screws (17) and (18). Inside the mechanism casting, assemble the lock lever (16) to

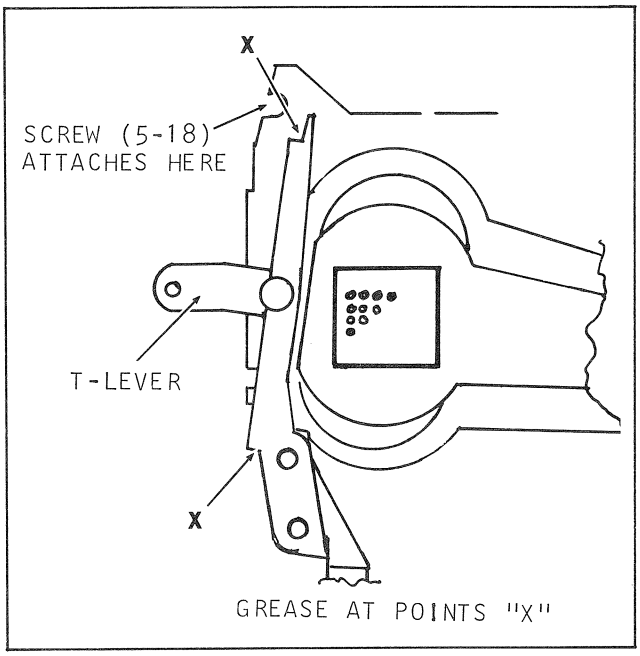


Figure F. Lubricating Safety Shutter Detents

the post and pin at the lower front corner of the safety shutter pivot lever while inserting the lower leg of the lock lever through the square hole in the record cam (item 20, Figure 6). Secure upper end of the lock lever with retaining ring (15).

i. Wipe both roller shafts of the mounting bracket assembly (5) with a cloth or sponge strip dampened with oil (B&H Spec. 1987). With a hypodermic needle, put one drop of the same oil in the journal of the longest stud, taking care not to get any oil on the area where the sleeve (8) is to be installed. Assemble a washer (10) to each of the roller shafts; then assemble drive roller (outer) assembly (12) to the shorter shaft and reverse drive roller (inner) assembly (11) to the longer shaft. Assemble a second washer (10) to each shaft and secure the parts with retaining rings (9). Slip sleeve (8) over the end of the longer shaft so that the sleeve protrudes slightly over the end of the shaft. Shrink the sleeve onto the shaft by carefully applying heat with a heat gun.

j. Assemble torsion spring (7) around the shoulder of the roller mounting bracket pivot stud. The spring leg with the sharpest bend should be closest to the surface of the bracket (5). Wipe the stud with a cloth or sponge saturated with oil (B&H Spec. 1543). Loop drive belt (6) around the two guide rollers and hold the belt away from the lubricated stud while inserting the stud into the pivot bushing of the safety shutter. Pivot the mounting bracket assembly (5), as necessary, to guide the inner roller (11) inside the rim of shutter (22). Secure the end of the bracket stud with retaining ring (4) and loop the drive belt over the U-shaped end of the belt shifter. Spread the legs of torsion spring (7) in opposite directions and hook them above and below the projection actuating ears of the safety shutter.

k. Note the prong-shaped fingers of the safety shutter protruding out of the opening near the top of the roller mounting bracket (5). When spring loading bracket assembly (3) is assembled to the roller mounting bracket, these fingers must be inserted between the spring-loaded shoes of the loading bracket. Assemble spring loading bracket to the pulley mounting bracket as noted above and line up the mounting holes. Secure bracket with two screws (1) and washers (2).

16. REASSEMBLING FIGURE 4 PARTS. Reassemble parts as outlined in the folliwing paragraphs, noting any special precautions.

NOTE: All "B" models are equipped with the auto-thread lever and knob components shown in the inset of Figure 4. Reassemble as shown, inserting 0.002-inch shim stock between the knob (48) and mainplate before securing the rivet (46). Make sure the knob moves smoothly.

a. If the lamp baffle (44) or lens carrier catch (41) were replaced, support the main plate solidly while securing the replacement part with the specified rivets (43) or (40), respectively. Check for the presence of focus adjusting setscrew (42). The point of this setscrew should protrude through the mechanism casting just to the left of the upper lens carrier catch rivet (40). Check to make certain that the upper sprocket shift lever spring (39) is present and properly connected. The actuating pin of the shift lever protrudes through an elongated slot near the top of the mechanism casting. One end of the spring (39) hooks into a small hole at the top of the shift lever; the other end through a hole in the main plate toward the front of the projector.

b. Place the aperture plate (38) on the work bench with the stud up and away from you. Assemble the side tension arm (36) onto the stud with the prongs down, engaging the prongs in the aperture plate slots. Assemble the side tension spring (35) to the stud, with the spring loop toward you and the spring ends entering the holes in the tension arm. Engage the loop form of the spring with the groove in the stud and press the spring in until it seats. The side tension arm should exert a tension of 2-1/2 inch-ounces minimum to 3 inch-ounces maximum. Check the tension by pressing the tension arm away from the stud to the limit of its travel and slowly releasing the arm against the stem of a fixed tension gage. It may be necessary to remove and adjust the side tension spring as shown in Figure G until proper tension is obtained. Rotate the manual knob until the shuttle teeth are in the fully retracted position. Loosely assemble the aperture plate to the mechanism casting with the two screws (37). In current models, the lower screw (37) also attaches the flag-type film deflector (37A). The back vertical edge of the aperture plate must be flush against the surface of the casting. Carefully line up the aperture openings and tighten the two screws securely. Assemble the guide rail (34) loosely to the aperture plate with the two screws (33). Hold the guide rail vertical and, while pressing the rail to the left so that both ears are against the sides of the aperture plate slots, tighten the two screws securely.

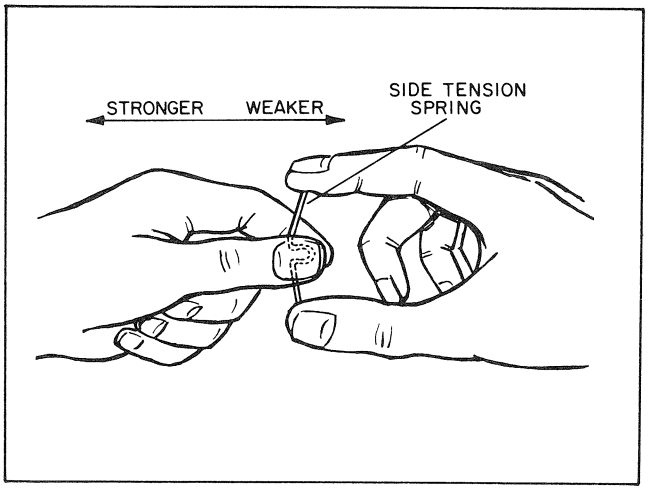


Figure G. Adjusting the Side Tension Spring

NOTE: Before proceeding with the reassembly, refer to paragraph 23 for shuttle adjustments.

c. If the lens carrier (32) was replaced, hold the new carrier between the ears of the mechanism casting with mounting holes aligned and press the hinge pins (31) firmly in place. Lubricate the rubber O-ring (30) with grease (B&H Spec. 1856) and assemble the ring over the end of the eccentric shaft (28), seating it in the ring groove. Apply a speck of grease (B&H Spec. 1956) to the pin end of the eccentric shaft. Assemble the spring (29) to the shaft and assemble the shaft to the lens carrier from inside the lens barrel. Compress the spring while assembling the washer (27), focus knob (26) and a second washer (25) to the protruding end of the shaft and secure all parts with the screw (24) dipped in Loctite or shellac. Check to make certain that the focus knob turns freely. Apply a bead of adhesive (B&H Spec. 935) around the inside lip of the focus knob cover (23) just in from the edge. Assemble the cover over the raised rib of the focus knob, pressing down and rotating the cover to assure proper adhesion. Remove excess adhesive with a cloth dampened with solvent.

d. Hold the pressure plate mask (22) in one hand with the bends at the ends ot the two tabs facing up and the notched tab at the top. Assemble the pressure plate spring (21) to the mask, spring legs up, engaging the ears of the spring with the small rectangular holes in the mask tabs. Note that one bent ear of the pressure plate (20) has a square hole which is slotted. This ear must engage the slotted tab of the mask (22) when the pressure plate is assembled to the mask and spring. Apply a very light film of silicone grease (Dow-Corning #33) to the small cast ears at the top and bottom rear of the lens carrier. Assemble the pressure plate group to the pins at the rear of the lens carrier with the slotted ends of the mask and plate at the top. Compress the mask and spring while engaging the upper ear of the pressure plate over the cast ear at the top of the lens carrier; then snap the lower ear of the pressure plate over the lower cast ear of the carrier.

e. With the lens carrier open, assemble the head retracting rod (16) to the protruding pin of the loop former shift lever at the top of the mechanism casting. The loop should face to the left and the bent lower end should face out away from the main plate. Assemble the upper sprocket assembly (9) into the cavity of the loop former bracket assembly (19). Assemble the roller (17) on the pin of the loopformer bracket. Assemble the upper loopformer (13) to the bracket, thereby trapping the roller and sprocket. Hold the flanged roller (14) between the ears of the loopformer with the flanged end facing out, and install the screw (12). The screw must pass through the outer ear of the loopformer, the flanged roller, the inner ear of the loopformer, the washer (15) and the ear of the loopformer bracket, in that order. Assemble a friction washer (11) over the end of the sprocket shaft and down against the rear flange of the sprocket. Insert the screw (18) with washer (18A) through the hole in the loopformer bracket to complete the preassembly of loopformer parts. Lightly oil (B&H Spec. 1543) the end of the sprocket shaft and lift the assembly up into position, guiding the sprocket shaft through the bearing in the mechanism casting. The protruding pin of the loopformer shift lever must engage the hole in the upper loopformer. Carefully start both screws (12) and (18); then tighten them both securely.

NOTE: If the projector being repaired is one of the earlier models, it will not include the sprocket parts referenced in step f. On current sprockets, the washers (11) will be assembled to the shaft and retained against the sprocket flange with tape to keep the sprocket adjusting pin from falling out. Just before installing the lower sprocket (step g), remove this tape and clean the shaft with alcohol to remove tape residue.

f. Assemble the bowed washer (10E), bowed surface up, to the rear hub of the sprocket (10). Lightly grease both sides of the guard actuator (10C) with B&H Spec. 1956 grease. Assemble the flat washer (10D) and then the guard actuator (10C), with the curved edge of the actuator arm down and the dimple of the actuator facing the rear end of the sprocket shaft. Install the flat washer (10B) and secure all parts with the retaining ring (10A).

g. Hold lower sprocket (10) with shaft end up and remove tape holding washers (11) against the sprocket adjusting pin. Remove tape residue with alcohol. Oil end of the sprocket shaft and insert the shaft through the lower bearing. Be sure arm of guard actuator (10D) is in the position shown in Figure 4 inset. At the rear of the mainplate, assemble the gear and pin assembly (8) to the lower sprocket shaft with the pin facing out. Assemble the gear (5A) to lower sprocket shaft, engaging it with the pin on gear assembly (8). Assemble the washer (4A) to the shaft and then install the spring ratchet (3) with its V-formed ends in to engage the ratchet teeth of the gear (5A). Assemble friction washer (2) and the retaining spring (1) to the end of the shaft, engaging the short leg of the spring with

the slot in the shaft and turning the spring clockwise while pressing it fully in place. Check ratchet torque of the lower sprocket in both directions by hooking the end of a push-pull torque gage in the sprocket teeth. The sprocket must turn in either direction at 2.5 inch-pounds of torque, but must not turn at 1.5 inch-pounds. Torque can be adjusted by hand-forming the V ends of the spring ratchet (3).

h. Apply a light film of oil (B&H Spec. 1543) to the projections on gears (5) and (7). The gear (7) must be installed with its three projections facing out and the lever assembly (6) with its large opening encircling the three projections. Then assemble the outer gear (5) with its projections in to engage the projections of the inner gear (7). Install the spring ratchet (3) and the retaining spring (1), following the same procedure outlined in step f. Check the ratchet torque of the upper sprocket in both directions. The sprocket must turn in either direction at 30 inch-ounces, but must not turn at 16.5 inch-ounces. Torque can be adjusted by hand-forming the V ends of the ratchet (3).

17. REASSEMBLING FIGURE 3 PARTS. Reassemble parts as outlined in the following paragraphs, noting any special precautions.

a. Lightly grease (B&H Spec. 1956) both support assemblies (39) and (40) around the bearing hole bosses. Assemble the reel arm bearings (38) into the bearing holes from the unpainted side of the supports. Assemble the arms and bearings to the projector main plate. Place a speck of grease in the small through holes on opposite sides of the protruding bearings and place a steel ball (37) in each of these holes. Carefully assemble the cam washers (35) and (36) to the bearings with the prongs of the washers toward the top of the main frame and the detent holes locating over the steel balls (37). Assemble the conical tension springs (34) to the bearings, small diameter first, with the inner end of the spring pointing toward the top of the main plate. Assemble the gear mounting plate (33) to both bearings, pressing down to compress the springs until the retaining rings (32) can be installed. Secure the gear mounting plate to the main plate with the screw (31). Lightly grease (B&H Spec. 1956) each bearing face on the arm support side and move supports to the closed (down) position.

b. Lightly grease (B&H Spec. 1956) the stud of the lever assembly installed on the upper sprocket shaft. Pivot the lever so that the gear (30) can be assembled to the stud, and secure the gear with the retaining ring (29). Lightly grease all gear studs of the gear mounting plate (33). Assemble the gears (27) and (28) to the studs and secure them with the retaining rings. The two large gears (28) and the rearmost small gear (27) must be in mesh.

c. Lightly oil (B&H Spec. 1543) the shaft of the take-up gear and shaft assembly (25) and insert it through the take-up bearing from the arm support side. Assemble the spur gear (24) hub facing out, to the take-up gear shaft, meshing it with the small gear (27). Insert a 0.005 inch feeler gage between the gear (24) and the bearing (38) and apply pressure with the thumb and fingers to hold the shim in place while tightening the setscrew (23). Lubricate and assemble the supply gear and shaft assembly (22) and its spur gear (21) in the same manner.

d. Lightly grease (B&H Spec. 1956) the gear studs of both arm supports as well as the area around the base of those studs. All gears (17), (18) and (19) are to be installed with their hubs in toward the supports. After gears are installed and properly meshed, lightly grease the gear teeth with the same grease used on the studs.

e. Lightly oil (B&H Spec. 1543) of each reel spindle assembly (16). Assemble a spindle assembly (16) into each of the reel arm covers (9) and (10) and apply a light brushing of grease (B&H Spec. 1956) around the inner bearing area where the spindle shaft emerges. Assemble the tension washer (15), bowed surface down, and the flat washer (13) to the spindle shaft. Lightly grease both faces of the spur gear (14) and assemble the gear, a second washer (13), and the spacer (12) to the spindle shaft. Secure all parts with the screw (11), tightening the screw so that the spindle rotates freely and has a noticeable amount of end play. Assemble the take-up arm cover (10) to its support, meshing the spindle gear (14) with the adjacent support gear and seating the cover on the shoulder of the support gear studs. Install and tighten the two cover screws (8). Place the torque spring (9A), bulge up, into the bottom recess of the supply arm cover (9) and assemble the cover to the supply arm support, meshing the spindle gear (14) with the adjacent studs. Install and tighten the cover screws (8). Instructions for checking and adjusting reel arm torque will be found in paragraph 21.

f. Assemble a bearing (7) into the capstan bearing holder on the front side of the main plate. Insert the shaft of the capstan assembly (6) through the bearing. Assemble the second bearing (7) over the capstan shaft and seat it in the rear bearing holder. Then, in order, assemble washer (5), wave washer (3), steel washer (4), a second wave washer (3) and the flywheel assembly (2) to the capstan shaft. Turn the projector face down so that the capstan is resting on a wooden block. Then, while pressing down gently on the flywheel to seat the washer, tighten the flywheel setscrews (1) securely.

g. Lightly speck all gear teeth of the entire gear train with grease (B&H Spec. 1956). Rotate the manual knob and reel spindles to distribute the grease and, at the same time, to check the freeness of the gear train.

18. REASSEMBLING FIGURE 2 PARTS. Reassemble parts as outlined in the following paragraphs, noting any special precautions.

NOTE: The room lamp receptacle (57) and label (58) are furnished only on Design 1744 projectors. Refer to Figure 15 for receptacle wiring connections.

a. Hold the lamp socket (56) in position against the rear of the main plate and, from the front side of the main plate, install the screw (54) closest to the mechanism casting. Hold the screen (55) in position over the opening in the main plate with the short leg of the screen (lower front corner) behind the lip of the main plate opening and the long leg of the screen resting against the main plate with the top left (rear) square opening aligned over the second socket screw mounting hole. Tighten both screws (54) finger tight. After the projector has been assembled and wiring connections made, the lamp socket must be aligned as instructed in paragraph 22.

b. Locate the muting switch (53) against the drive roller side of the shuttle pivot bracket, with the switch pin inserted through the locating hole in the pivot bracket. Assemble the lockwasher (51) to the screw (50) and insert the screw through the elongated hole in the bracket and into the tapped hole in the switch body. Place the Forward-Still reverse lever in down (Reverse) position and pivot the muting switch until the switch blade closest to the main plate is bearing lightly against the rubber sleeve at the end of the drive roller shaft and the contacts of the short outer blade and curved blade are "making." Hold the switch firmly in this position while tightening the screw. In the Still and Forward positions, the contacts of the short inner blade and curved blade must be "making." Refer to paragraph 27 for muting switch adjustments.

c. The humbuck coil and head assembly (49) must be handled very carefully. With the Forward/Reverse knob in the Forward position and the "Record" knob pulled out (Design 1742, 1744 and 1745), pick up the assembly and twist the coil about four times to wrap the wire leads together. Dress the ground lead over the top hole in the head block and position the head against the main plate while guiding the small hole at the end of the head retracting lever onto the bent lower end of the retracting rod (16, Figure 4). Align the head mounting holes with those in the main plate and install the two screws (48). Hold the head with a counterclockwise pressure while tightening the screws. The left-hand screw should also secure the grounding lug. Assemble the screw (46) through the hole in the coil clamp (47). Place the ball of the coil in the socket hole of the main plate with the coil to the right. Assemble the clamp to the main plate with its prongs over the coil ball and tighten the screw (46). Guide the shielded leads from the head around the right and under the humbuck coil through the lower rectangular hole in the main plate. Check to make sure that the grounding lead is clear of the record cam and does not rest against the head mounting plate. Refer to paragraphs 28 and 29 for head and coil adjustments.

d. Design 1742/1744/1745 Only. Insert the leads of the "Record" lamp (45) into and through the opening in the end of the record knob (44), drawing the leads out through the slot in the side of the knob which is adjacent to the flat on the knob locking flange. Make sure the leads are not pinched, and continue drawing them through until the lamp is fully seated in the knob. Assemble the spring (43B) and washer (43A) to the shaft of the record control knob (44). Hold the record knob so that the leadwires and the flat of the knob locking flange are at the left and assemble the knob through the bushing in the main plate. Assemble the record actuator spring (43) over the pin at the end of the knob so that the U-form of the spring is down and facing away from the back of the main plate and the tabs of the spring rest on the flat of the record knob. Install the push-on nut (42), pressing it in until it seats.

e. Design 1744/1745 Only. Refer to the appropriate wiring diagram Figure 15 or 16 and make the proper wiring connections to the VU meter (37), the Off/ALC switch (39) and the Tone control (41). The Tone control (41) assembles into the right-hand mounting hole of the control box (26) and is secured with the nut and washer supplied with the control. Press the knob (40) onto the shaft of the control. Assemble the Off/ALC switch (39) into its opening in the film track assembly (24) and secure it with the two screws (38). Assemble the VU meter (37) into its opening in the film track assembly and secure it with the two screws (36) and hex nuts (35). Refer to paragraph 32 for VU meter adjustment.

f. Design 1742/1744/1745 Only. Refer to the appropriate wiring diagram Figure 14, 15 or 16 and make the proper wiring connections to the record level control (32) and the sound-on-sound switch (34). Assemble the record level control (32) into the far left-hand hole in the film track assembly (24) and secure it with the nut and washer supplied with the control. Assemble the switch (34) into its opening in the film track assembly and secure it with the two screws (33). Assemble the knob (31) to the record level control shaft.

NOTE: The following steps apply to all projectors.

g. Assemble the insulating sleeve (30A) and the shield (30B) to the leadwires before connecting the leads to the Off/Fan/Lamp switch (30C). See the appropriate wiring diagram (Figures 13 through 16) for proper leadwire connections. Then snap the shield in place on the switch body. Assemble the switch (30) to the film track assembly (24) and secure it with the two screws (29). Make the proper wiring connections to the Volume control (28) and secure it to the control box (26) with the nut and washer supplied. Assemble the knob (27) to the control shaft.

h. In earlier models, film trimmer parts were mounted inside the front cover (see Figure 1). In all current projectors, the trimmer parts are mounted

on top of the control box assembly (26). If removed, reassemble these parts (26C through 26H) to the control box, orienting the parts as shown in Figure 2. Be sure that the rivet heads are firmly seated on a block during the riveting operation.

i. Assemble the control box assembly (26) to the film track assembly (24) with the two screws (25). Lift the film track/control box assembly up into position against the projector main plate, guiding the leadwires through the main plate in the following manner: insert the leads from the volume or volume/tone control through the lower right-hand construction hole; insert the on-off switch leads through the right-hand elongated construction hole; insert the amplifier connector through the round construction hole below the take-up arm. Assemble the film track against the main plate, being careful not to scratch the film track around the sprocket. Guide the wire leads so they do not interfere and check to be certain that the loop restorer moves freely on the loop of the track. Loosely assemble the five hex head screws (23) from rear of main plate and into the track as follows: (1) behind the flywheel; (2) upper right-hand; (3) lower right-hand; (4) lower left-hand; (5) upper left-hand, also securing insulated wire clamp. Assemble the roller (21) and washer (22) to the pivot screw (20), large roller diameter against screwhead, and loosely assemble the screw to the track. In current models loosely install the T-bar (23B) behind loop restorer hole with the screw (23A).

NOTE: None of the above screws are to be tightened until the film track is properly aligned. Before continuing with the reassembly, refer to paragraph 26 for film track adjustment procedure.

j. If removed, secure the hex spacer (19) to the main plate with the screw (18) inserted through the hole just below the rear lip of the lamp baffle. Check to make certain that two metal eyelets are in position in each of the motor subplate grommets. Lift the motor and subplate assembly (17) up into position against the main plate and secure this assembly to the spacer (19) and two tapped mounting posts with the three screws (15) and lock washers (16). Secure the grounding lead (14) to the motor subplate with the screw (13). The other end of the grounding lead attaches to the lamp socket plate with a second screw (13). Loosen the motor fan setscrew and press the fan against the motor to provide clearance for the grille (11). Lightly grease (B&H Spec. 1956) the lower grille mounting post of the main frame and place a washer (12) on this post. Assemble the grille to the posts, open face toward the fan. Install and tighten the two screws (10). Adjust pulley end play to 0.015 inch (±0.005).

k. Assemble the transformer (9) to the transformer mounting bracket (7) with the two screws (8). Be sure the transformer leads are out, away from the main plate. Lift the transformer and bracket up into position against the projector main frame posts and secure with the two screws (5) and lock washers (6). Screws should be dipped in shellac or Loctite before installation.

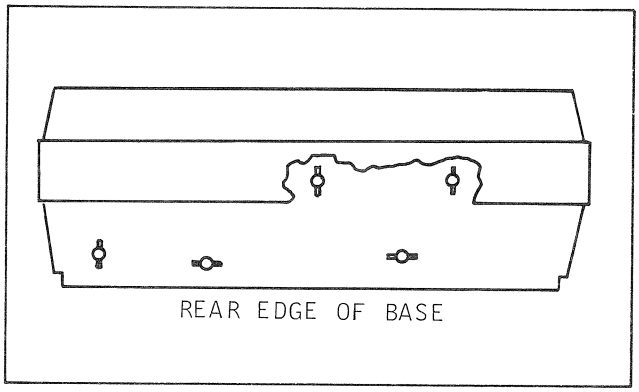


Figure H. Installing Amplifier Stand-Offs

NOTE: A small number of earlier Model 1742 and 1744 projectors were equipped with modified amplifiers which required slightly different wiring connections to the edge connector. Before installing the amplifier, refer to paragraph 10 for the manner in which you can identify modified amplifiers and the procedures to be followed for rewiring edge connectors to match current amplifiers.

l. Assemble the five plastic stand-offs (3) and (4) into their openings in the base, using the pattern shown in Figure H. Carefully guide the amplifier assembly (2) into position over the stand-offs and carefully press down until all stand-offs snap in place. Make all wiring connections to the amplifier as shown in the appropriate diagram (Figures 13 through 16).

m. Recheck all wiring connections and plug the edge connector (1) in at the rear edge of the amplifier board.

19. REASSEMBLING FIGURE 1 PARTS. Reassemble parts as outlined in the following paragraphs, noting any special precautions.

a. Before installing labels and nameplates, clean the area to which these items will be assembled with naphtha. For items (1A), (1B) and (14C), simply peel off the paper backing and assemble squarely in the designated area. Smooth down with a clean cloth to assure good adhesion. For items (1C) (2A), (15) and (18), the adhesive backing must first be activated by brushing it with solvent or trichloroethylene. When adhesive is tacky, assemble the label or nameplate squarely in the designated area, smoothing it down with a clean cloth.

b. Assemble the sprocket cover (14B) to the film track cover (14) with the two screws (14A). Lift the film track cover up into position against the film track and press firmly to snap the cover in place.

c. Insert the stripped ends of the line cord (13) through the rear cover assembly (7) from the outside, the stripped ends extending ten inches beyond the inside surface of the cover. Assemble the strain relief bushing (12) into the D-hole in the cover to hold the line cord in place.

d. Assemble the speaker gasket (10) over the four rear cover studs. Assemble the speaker (9) to the four studs, with the speaker terminals toward the bottom of the cover. Assemble a washer (11) to each stud and secure all parts with the four Keps nuts (8). Move the bottom edge of the rear cover close enough to the projector so that the leadwire connections can be made to the speaker terminals and the line cord stripped ends appropriately joined with other leads and secured with wire nuts (see appropriate wiring diagram, Figures 13 through 16).

NOTE: Before installing the covers to the projector, perform all of the checks and adjustments outlined in paragraphs 20 through the end of this section, as well as the electrical and sound tests in the Final Test section. When you are satisfied that the projector meets all performance standards, the covers can be assembled as follows.

e. Lift the rear cover assembly (7) up into position on the projector main frame while watching to be sure that the harnessed leadwires do not interfere with flywheel rotation. When the rear cover is fully seated against the main frame, insert the two screws (6) through the holes near the top of the cord storage bracket well and turn them finger tight into the tapped holes in the speed shift bracket. Insert the two screws (5) through the rear cover and turn them finger tight into the tapped holes at the ends of the jack bracket mounted on the amplifier. Carefully tip the projector to expose the bottom of the main frame, and insert the two screws (4) through the holes in the main frame and into the tapped holes in the bottom lip of the rear cover. Tighten these two screws securely; then place the projector in an upright position and tighten screws (5) and (6).

f. Align the locating ridge on the center terminal post of the projection lamp (3) with the corresponding notch in the lamp socket and press the lamp firmly and squarely in place until seated. Do not wiggle or twist the lamp, as this can distort the contact pins. Remove fingerprints from the lamp with a clean cloth. Assemble the lamphouse assembly (2) to the projector, with the open side over the edge of the cast mechanism plate and the V-end of the spring latch engaging the rectangular opening to the left of the lamp. Press against the lamphouse until it snaps into place.

NOTE: In all current models, the film trimmer parts are mounted on the control box (see Figure 2), rather than inside the front cover.

g. If replaced, assemble the new microphone holder (1N) to the inside of the front cover. Insert the rivets (1L) through the cover and holder from the front end and assemble a washer (1M) to each rivet before riveting. If the film cutter parts (1J) and (1K) were replaced, orient the new parts as shown in Figure 1 when assembling them to the inside of the front cover. Secure film cutter parts with the two rivets (1H). If the cover latch parts (1E) through (1G) were replaced, orient the new parts as shown in Figure 1 and secure them to the bottom flange of the front cover with the rivet (1D).

h. Lift the assembled front cover (1) up into place, engaging the locator pins at the top of the main frame with the two holes in the upper flange of the cover. Press the bottom of the cover in until the latch snaps in place.

20. FINAL INSPECTIONS.

a. Open the film carrier and rotate the manual knob while watching the movement of the shuttle teeth with a magnifying glass. The shuttle teeth should travel in the center of the slot and must not contact the edges of the slot at any point. Refer to paragraph 23 for shuttle adjustments.

b. With the projector grounded, plug the line cord into a 110 to 120 volt outlet. With the main switch in the "Fan" position and the projector running in "Forward," apply naphtha to the drive belt and belt pulleys with a brush to remove any grease or oil from these parts; then blow dry with compressed air. Check to make certain that the greasing of the gear train has not been overlooked. If it has, apply grease (B&H Spec. 1956) to gear teeth with a brush prior to cleaning the belt and pulleys, running the projector to distribute the grease evenly.

c. Swing open the lens carrier and move the main switch to the "Lamp" position. With the projector running in "Forward," observe the action of the safety shutter as the lever is moved to the "Still" position. The light should dim noticeably to indicate that the perforated shutter has dropped in place between the lamp and the aperture. Repeat by moving the lever to "Reverse" and back to "Still." Repeat the entire procedure, this time observing the response of the drive rollers and sprockets. In both forward and reverse operation, the mechanism must begin to drive before the safety shutter clears the aperture opening. If necessary, adjust safety shutter operation as instructed in paragraph 25.

d. Close the lens carrier and check to make certain that there is no play in the carrier. If necessary, bend the fingers of the lens carrier catch (item 14, Figure 4) with a pliers to eliminate play. Be careful not to break the catch.

e. Check to make certain that all leadwire connections are secure by tugging gently on the leadwire near its connections point. Be sure that all leadwires are dressed out of the way of moving parts.

f. Make final projector adjustments as outlined in the Adjustments section, following. Then perform the tests in the Final Test section to verify projector operation and performance.

Adjustments

NOTE: Unless directed otherwise in the specific adjustment instructions, always make certain that the Forward-Reverse lever is shifted to the "Still" position when the projector is not running.

21. CHECKING SPINDLE TORQUE.

a. A modified 8-mm film reel (View A, Figure J) is required for checking spindle torque. Torque measurements are to be taken with a Chatillion "LP8 push-pull scale, available from Master Gage Co., 1150 W. Grand Ave., Chicago, Illinois 60622. The scale must be held vertically directly above the screw in the reel for a proper torque reading.

b. With the projector grounded and the line cord plugged into the 110 to 120 volts a-c outlet, swing both reel arms up to the operating position. Install the modified film reel on the take-up (rear) spindle and place the projector switch in the "Fan" position. Engage the scale with the string loop and, holding the scale as shown in View A, press the Forward-Reverse lever up to the "Forward" position. Proper torque (at the point where the spindle and film reel do not turn) should be 4.0 to 4.5-inch-ounces. Torque can be adjusted by tightening (to increase) or loosening (to decrease) the screw at the back of the reel arm support (View B).

c. Place Forward-Reverse lever in "still" (center) position and transfer the modified film reel to the feed (front) spindle. Note that the screw in the film reel must now be at position A. Engage the scale with the string loop and, holding the scale vertically, press the Forward-Reverse lever down to the "Reverse" position. Proper torque (at this point where the spindle and film reel do not turn) should be 3.5 to 4.0-inch-ounces. Torque can be adjusted by tightening (to increase) or loosening (to decrease) the screw at the back of the reel arm support (View B).

22. LAMP SOCKET ALIGNMENT. As illustrated in Figure K, the lamp socket is secured with two screws. The screw to the rear of the lamp socket is inserted through an oversized hole in the main

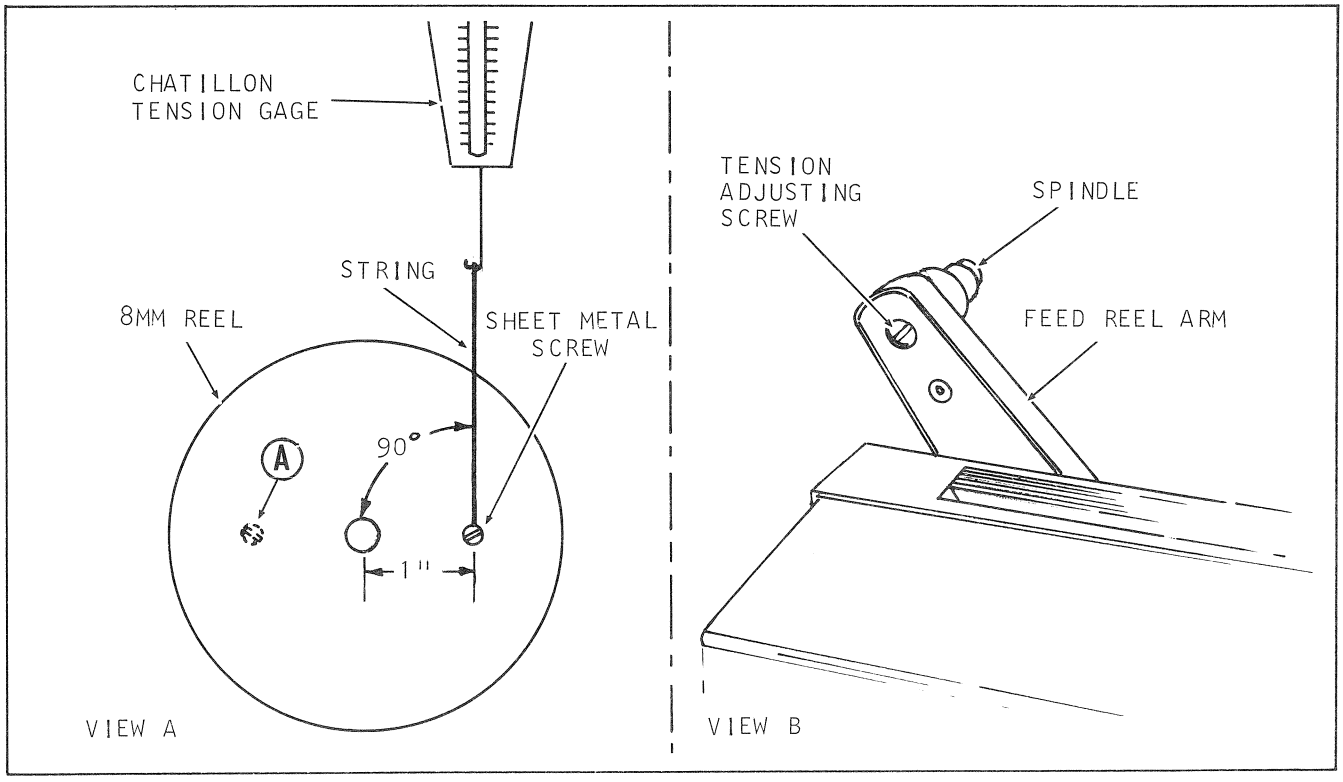


Figure J. Checking and Adjusting Reel Spindle Torque

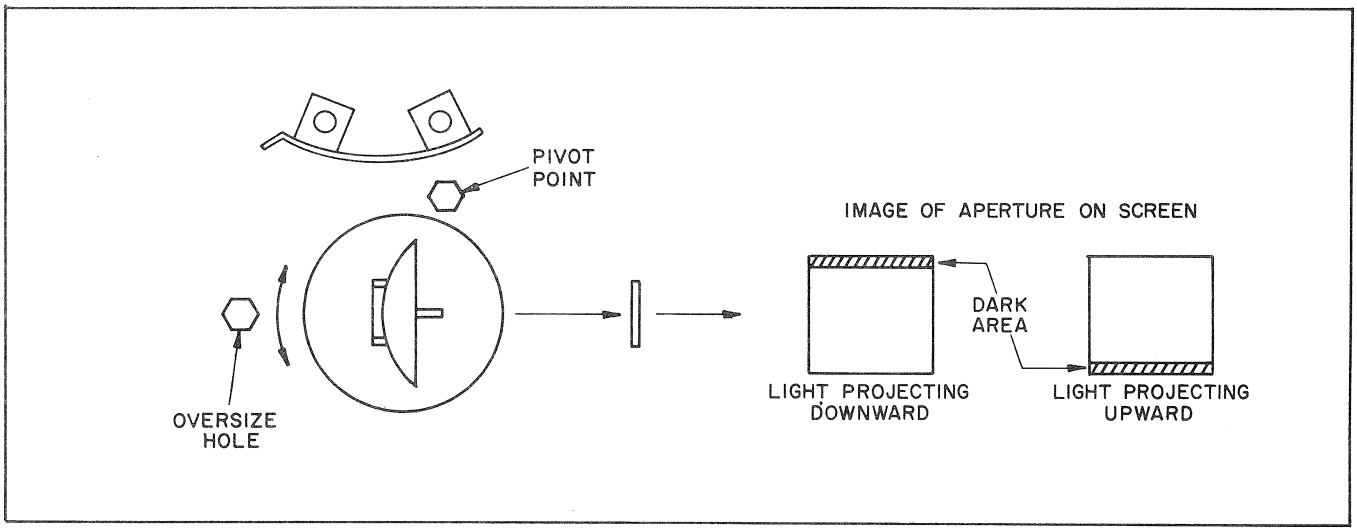


Figure K. Lamp Socket Adjustment

plate; thus when both screws are loosened slightly, the socket can be rotated to obtain full and even light through the aperture opening.

a. Rotate the manual knob until the shutter clears the aperture opening. Install the projection lamp, alining the key on the lamp base with the key slot in the socket and pressing down firmly on top of the lamp until it is seated.

b. Install the projection lens and switch on the projector. Focus the lens until the image of the aperture is sharp on the screen and note whether a dark area is evident at the top or bottom of the image.

c. If dark area was noted, switch off the projector and loosen the lamp socket screws just enough to permit the lamp socket to be rotated. A dark area at the top of the aperture image indicates that light is projecting at a slightly downward angle. With the blade end of a screwdriver, apply a slight amount of pressure against the top edge of the rear socket screw, thereby rotating the lamp socket slightly counterclockwise.

d. If the dark area appeared at the bottom of the aperture image, it indicates that the light is projecting at a slightly upward angle. In that case, apply pressure to the bottom edge of the rear socket screw, rotating the lamp socket clockwise.

e. It may be necessary to repeat the adjustment several times, switching on the lamp between adjustments to check the image. When the aperture image appears fully and evenly lighted, tighten both lamp socket screws securely, watching the image to make certain that the socket does not move out of alignment. Then switch off the projector and install the lamphouse.

23. SHUTTLE TOOTH ADJUSTMENT. The shuttle protrusion adjustment requires the use of the shuttle height gage G9991-N1 and shuttle bending tool SER-356-1-FX1. The shuttle centering adjustment requires the use of the shuttle tooth centering gage S-012600-15-FX1. These tools are shown in Figure A.

Checking and Adjusting Shuttle Tooth Protrusion.

a. Carefully place the projector on the fan end with the lens pointing up. Rotate the framer knob to the extreme counterclockwise position, place the Forward-Reverse lever in "Forward" position, and swing open the lens carrier.

b. Place the "Reg/Super 8" side of the shuttle height gage on the aperture plate so that the "GO" step (0.040 inch) is over the shuttle tooth slot and rotate the manual advance knob counterclockwise to cycle the shuttle teeth. The teeth should not strike the gage.

c. Reverse the gage so that the "NO-GO" step (0.028 inch) is over the shuttle tooth slot and once again rotate the manual advance knob. The teeth must catch against the "NO-GO" step.

d. If the shuttle teeth strike the "GO" step of the gage, they are protruding too far. If the teeth pass beneath the "NO-GO" step, they are not protruding far enough. Be sure to check that the teeth are protruding an equal amount.

e. To adjust the shuttle tooth protrusion, remove the lamphouse and lamp and rotate the manual knob until the shutter is "open" and the shuttle teeth are at the center of the downstroke. Insert the shuttle bending tool through the opening in casting, just forward of the lamp socket, and engage the slot of the tool with the shuttle tooth arm. Note, in Figure L, that the bending tool should engage the arm on the annealed (shiny) area. To increase the height of the shuttle teeth above the aperture plate surface, move the handle of the tool away from the projector main plate; to decrease height, move handle toward

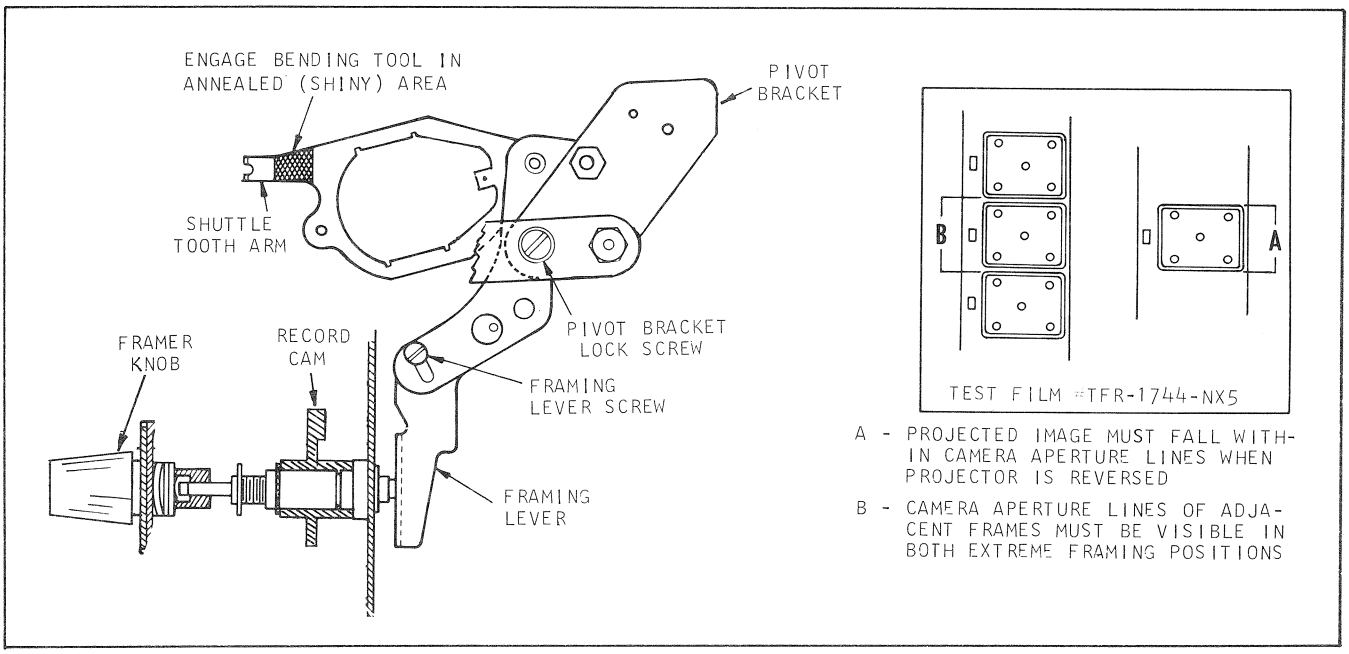


Figure L. Adjusting the Shuttle

the main plate. If shuttle teeth are protruding unevenly (one tooth protruding more than the other), the bending tool can be raised or lowered, thereby twisting the shuttle tooth arm slightly.

CAUTION: The shuttle tooth arm must be bent carefully, and in small amounts, checking between each bending operation until shuttle tooth height is properly established. Use extreme care when bending so as not to distort aperture plate components or damage the shuttle teeth.

Checking and Adjusting Shuttle Tooth Centering.

a. With the framer knob still in extreme counterclockwise position and the lens facing up, place a strip of film in the film channel. Rotate the manual advance knob until the shuttle teeth are at the top of the stroke and just starting to extend through the film.

b. The shuttle teeth should be approximately in the center of the film perforation. At no time should either side of the tooth ride against the radius at the corner of a perforation.

c. Slightly loosen the pivot bracket screw (Figure L) and very lightly tap the top of the pivot bracket to center the teeth. Then retighten the screw.

d. Rotate the manual knob to bring the shuttle teeth to the bottom of the stroke and check centering as in step b. Continue to advance shuttle to the top of the stroke and re-check centering. If necessary, repeat steps c and d until centering is achieved.

24. PICTURE FRAMING ADJUSTMENT. The framing mechanism must be adjusted to permit maximum picture framing in either direction.

a. Thread the projector with TFR-1744-NX5 test film and run the projector in the forward direction.

b. Rotate the framer knob to extreme clockwise position and then to extreme counterclockwise position. The camera frame line of adjacent frames must be visible as noted in Figure L when framing knob is at extreme positions.

c. To adjust picture framing, loosen the framing lever screw at the knee of the shuttle framing lever and shift the shuttle bracket arm up or down, as necessary, to center the frame in the aperture. Tighten the screw securely without disturbing the position of the bracket arm, and recheck picture framing.

25. SAFETY SHUTTER ADJUSTMENT. The rubber drive rollers which drive the shutter pulley must make contact and begin driving the mechanism (in forward and in reverse) before the safety shutter clears the aperture opening. With the back cover removed and the projector line cord connected to the power source, switch on the projector. This test is to be made without film.

a. Operate the projector, first in the forward direction and then in the reverse direction. Watch the safety shutter carefully as the lever is moved from the "Still" position to either of the operating positions.

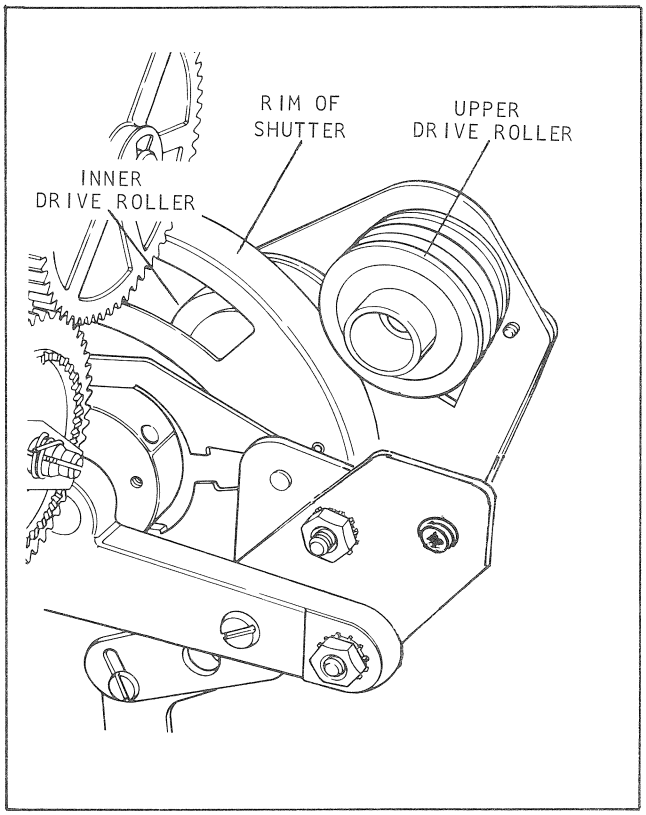


Figure M. Safety Shutter Adjustment

b. Proper operation of the safety shutter is controlled by the clearance between the upper drive roller and the rim of the shutter (Figure M). The nominal clearance is 0.062 ± 0.015 inch. If, when operating in reverse, the safety shutter tends to clear the aperture opening before the shutter begins to revolve, this clearance should be increased toward the high (0.077 inch) tolerance limit. If, when operating in forward, the safety shutter clears the aperture opening too soon, the clearance should be reduced toward the lower (0.047 inch) tolerance limit.

c. To adjust, place the lever in the "Still" (center) position and loosen the two screws which attach the spring loading bracket to the pulley mounting bracket. Insert shim stock of the desired thickness (to increase or decrease nominal clearance of 0.062 inch) between upper drive roller and rim of shutter. While maintaining a light pressure on the roller, tighten the two loading bracket screws securely.

d. Retest safety shutter operation and readjust if necessary, by changing the thickness of the shim stock inserted between roller and shutter rim.

26. POSITIONING THE FILM TRACK. The method for properly positioning the film track is different for current projectors (Serial No. 6001001 and up) then for the earlier style of film track. The earlier version does not include a sprocket guard (14, Figure 8) or the film deflector (17, Figure 8).

a. Early Track Positioning Procedure. All mounting screws (refer to paragraph 18, step i) must be loose before beginning the adjustment procedure.

(1) Rotate the lower sprocket by means of the manual advance knob until any two sprocket teeth straddle the 12 o'clock position as shown in Figure N, View A.

(2) Carefully insert the 0.023-inch shim gage (S-015642-143-NX2) at the 12 o'clock position and the 0.037 inch gage (S-015642-143-NX6) at the 9 o'clock position.

(3) While pressing the film track down and to the right so that the track sprocket hole is in firm contact with both shim gages, securely tighten the guide roller screw to the right of the sprocket.

(4) Through an access hole in the flywheel, tighten the hex head screw that secures the track to the main plate. From the back side of the mainplate, tighten the remaining four track attaching screws in the following order: upper and lower screws at front of track, in that order; upper and lower screws at rear of track, in that order.

(5) Guide the sleeved leads from the main on-off switch up behind the mainplate and secure them with the insulated cable clamp.

(6) Recheck sprocket to film track clearance at the 12 o'clock position with the 0.015-inch GO gage (S-015642-143-NX3) and the 0.025-inch NO GO gage (S-015642-143-NX4).

b. Current Track Positioning and Sprocket Adjustment. As directed in the lower sprocket reassembly procedure, the arm of the guard actuator must be positioned as shown in the inset of Parts Catalog Figure 4. Unless this is done, the guard will not pivot and the film may disengage from the sprocket teeth in forward operation. Install the track as follows.

(1) Rotate the lower sprocket by means of the manual advance knob until the sprocket setscrew is at the 3 o'clock position (see Figure N, View B).

(2) As directed in the film track installation procedure, all track mounting screws were left loose. Hold the track firmly against the mainplate to prevent it from shifting position and tighten the roller screw first. This is the "pilot" screw and will set the position for the track. Now insert the "T-bar" (2-24B) down through the track slot to the left of the sprocket, its legs straddling the screw (2-24A) in the mainplate, and tighten the screw securely. Finally, tighten all five screws at the rear of the mainplate in the same order as for the earlier track, step a(4), above.

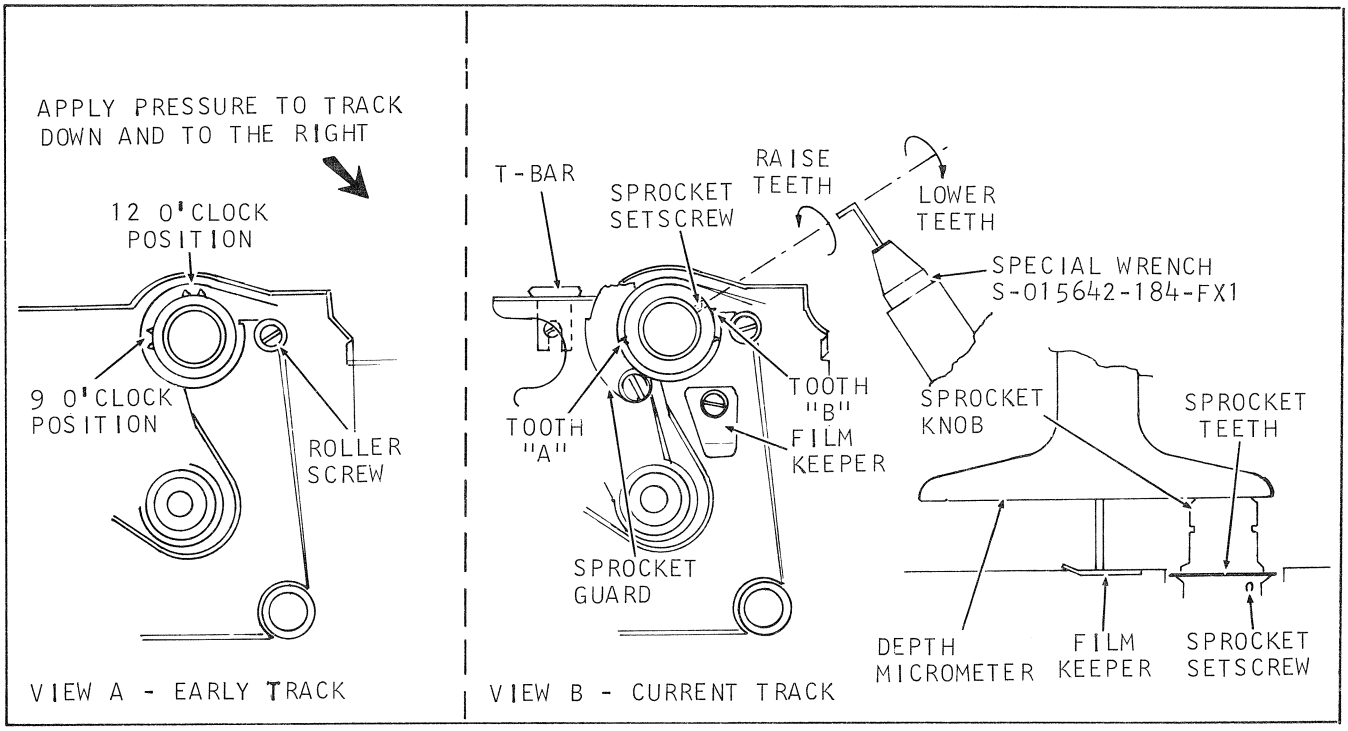


Figure N. Positioning the Film Track

(3) Position the 1-inch depth micrometer on top of the sprocket knob as shown in Figure N, View B, and measure down to the top surface of the film keeper. Note the reading.

(4) Measure the depth to sprocket teeth "A" and "B" and record readings. The readings to the sprocket teeth should be 0.039-inch (±0.003-inch) greater (lower) than the reading to the film keeper.

(5) To adjust sprocket height, insert the special Bristol wrench (S-015642-184-FX1) into the sprocket setscrew. If the difference in readings is more than 0.042-inch, move the wrench handle up toward the lens (CW) to increase sprocket tooth height. If the difference is less than 0.036-inch, move the wrench handle down away from the lens (CCW) to lower sprocket tooth height. After each small adjustment, recheck per steps (3) and (4) until the proper height is obtained.

NOTE: Once sprocket height has been properly adjusted, it need not be regaged unless the sprocket is removed. Film track removal will not affect the adjustment.

27. ADJUSTING THE MUTING SWITCH. The reverse muting switch is mounted to the shuttle pivot bracket (see inset of Figure 2, item 53). An ohmmeter is required for making the adjustment.

a. With the ohmmeter set at the X1 scale, attach the ohmmeter leads to the muting switch lead terminals on the circuit board (see Figures 13 through 16).

b. Place the Forward-Reverse lever in the "Still" position. Loosen the switch screw (50, Figure 2) and adjust the switch so that the ohmmeter reads "open" and hold switch securely while retightening the screw.

c. Place the Forward-Reverse lever in the "Reverse" position and the ohmmeter should read "short." The ohmmeter must read "open" in the still and forward positions and "short" in the reverse position.

NOTE: All of the following electrical tests and adjustments are to be made at 120 volts and with test equipment connected as follows: Plug the projector line cord into a variac set at 120 volts. Connect the plug of the 8-ohm non-inductive speaker load (see tool list in Introduction) to the external speaker jack at the rear of the projector, and connect the AC-VTVM across the 8-ohm load.

28. SETTING AZIMUTH, FREQUENCY RESPONSE AND SIGNAL TO NOISE RATIO.

a. Thread the projector with the azimuth test film (TFR-1744-NX6) and start the projector. When the 400Hz-10db signal passes the head, the meter needle will move to the right. Turn the volume control to set the reading on the DB scale at 4.9 volts (-4db) for Designs 1733 and 1742 and 6.3 volts (-2db) for Designs 1744 and 1745).

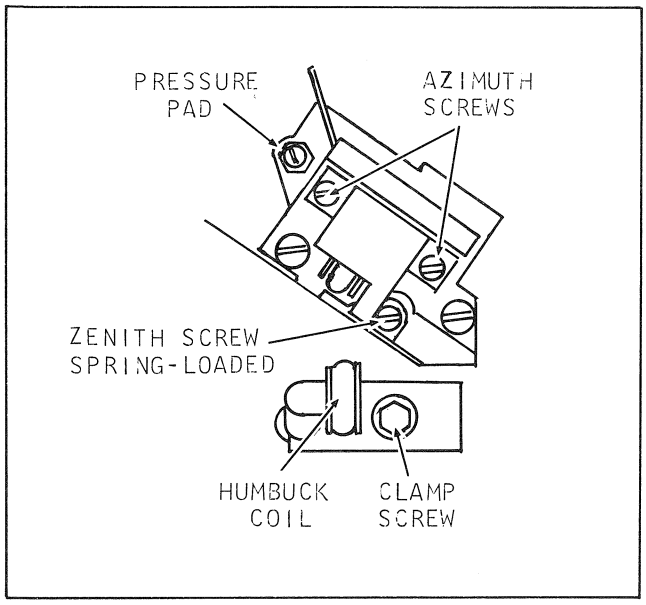


Figure P. Head and Humbuck Coil Adjustment

b. Engage the pressure pad and its screw (Figure P) with the special azimuth adjusting wrench and screwdriver (Figure A). As the 5000Hz signal passes the head, adjust the pressure pad to obtain the highest possible reading on the DB scale.

c. The two azimuth screws (Figure P) must be adjusted simultaneously, always turning the two sleeved screwdrivers in directions opposite each other. Adjust the azimuth screws to obtain the highest possible reading on the DB scale.

d. Adjust the Zenith screw (Figure P) to peak the reading as high as possible.

e. When the last signal (400Hz at 0db) passes the head, readjust the volume control for 4.9 volts (1733 and 1742) or 6.3 volts (1744 and 1745) and let the test film run out.

29. HUMBUCK COIL ADJUSTMENT.

a. Using a 3/16-inch nut driver loosen the screw in the humbuck coil clamp (Figure P) just enough to allow the coil to be moved with light pressure.

b. Move the coil until the meter needle deflects as far as possible to the left; then detent the meter range knob counterclockwise. Continue moving the coil and detenting the range knob (each detent represents 10db) until, with the 4.9 volt (1733 and 1742) or 6.3 volt (1744 and 1745) reference point, the lowest db reading is obtained.

c. Carefully retighten the clamp screw; then check to make sure that the coil has not moved. Place the Forward-Reverse lever in the "Reverse" position and check cam and humbuck coil clearance.

30. RECORD BIAS ADJUSTMENT.

NOTE: Amplifier P.C. boards are pre-adjusted at the factory but may require final adjustment in the projector. This adjustment is not required on Model 1733.

a. Connect a shielded test lead to the jacks on the AC voltmeter and the two clips to resistor R30 on the amplifier P.C. board (Figure Q).

b. Set the meter range knob to 0.01 (10 millivolts) on the meter and make certain the variac is set at 120 volts.

c. With the Record Level knob turned fully clockwise, push in and hold the Record knob. With the projector operating in forward, note the reading on the meter.

d. Flip the Sound Mix switch to "ON" and again note the reading on the meter.

e. Insert the oscillator adjusting tool (see Tool List in Introduction) into oscillator coil T1 (Figure Q). Alternately flip the Sound Mix switch on and off, adjusting the coil until the meter readings are approximately 4db apart between the on and off positions. The readings must be greater than 0.55 millivolts in either switch position.

f. If the reading does not register above 0.55 millivolts, place a drop of alcohol on the tuning slug of Coil L3 (Figure Q). Carefully adjust L3

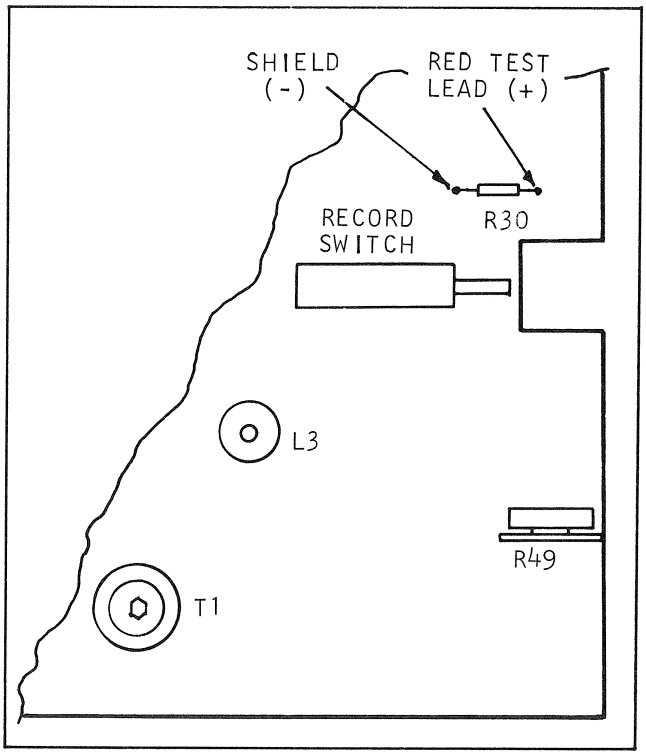


Figure Q. Adjustment Components on P.C. Board

with the reversible screwdriver (STK-11165) for maximum output on the meter. If L3 cannot be adjusted for geater than 0.55 millivolts, check the head for an open or shorted condition and replace head if necessary.

g. Recheck for 4db separation of Sound Mix switch positions per step e, preceding.

31. DC BIAS ADJUSTMENT-INTEGRATED CIRCUIT.

NOTE: DC bias is preadjusted at the factory but may require further adjustment in the projector. This adjustment is not required for the Model 1733.

a. Position the Tone control (Model 1744 and 1745 only) to maximum clockwise position and flip the ALC switch to "ON."

b. Insert a 3 millivolt (1000Hz) signal into the mic jack and adjust the Volume control until the output signal (across the 8-ohm load) begins to show distortion. Distortion should be approximately equal on both peaks.

c. If distortion is not equal, adjust Potentiometer R28 (located at the left end of P.C. board when facing rear of projector) to obtain equal distortion of peaks.

32. VU METER ADJUSTMENT (Models 1744 and 1745 Only).

a. Disconnect the output cables from the speaker and auxiliary jacks. With the variac set at 120 volts, press and hold the Record knob in (note that light glows) and place the Forward-Reverse lever in forward.

b. Place the Sound Mix switch in the "OFF" position and the ALC switch "ON."

c. Connect the oscillator through the input attenuator (Figure A) into the MIC INPUT jack. With the input signal at 400Hz at 0.25mv, the meter indicator should be between black and red sections (±1/16 inch).

d. If the indicator does not swing to the proper position, adjust Potentiometer R49 (Figure Q) until the meter positions properly.

e. Check for a sticky meter by placing the ALC switch in the "OFF" position and rotating the Record Level knob from one extreme to the other. The meter indicator should move correspondingly.

Final Test

33. GENERAL INSTRUCTIONS.

This section contains specific tests to be performed to insure that the projector is in proper working order. Tests will also serve to indicate the possible trouble or malfunction in the projector so that time can be saved in trouble shooting and servicing. Note that the projector is to be operated only from a 120 volt ac 60 cycle power source.

NOTE: When not actually operating the projector, place the Foward-Reverse lever in the "Still" position. Do not operate the projector with the rear cover removed. Inadequate cooling will cause burn damage around the aperture.

34. GENERAL INSPECTION PROCEDURE.

a. Visually inspect the projector for missing parts. Pick up the projector, turn it over, and shake it to make sure that no loose parts are inside.

b. Check attaching screws and nuts for tightness, and tighten if necessary.

c. Tilt the projector on its back end (lens facing up) and switch on the lamp. Look through the two vent slots to see that wires are not rubbing on the flywheel.

d. Pull on the ends of the sprocket shafts to check for end play. Sprockets must be under spring tension and springs must not be loose.

e. Open and close the lens carrier to make certain that it latches securely in place. If necessary, bend the fingers of lens carrier catch (37, Figure 4) to increase the tension.

f. Check the manual knob shaft for a slight amount of end play. Rotate manual knob to check the fit of the cam shoes. Cam shoes should fit snugly but without binding, and proper fit is obtained by selecting the appropriate combination of shoes.

35. PROJECTOR SPEED.

The forward projector speeds are 18 ± 1 frame per second (1080 ± 60 rpm) and 24 ± 1 frames per second (1440 ± 60 rpm). Reverse speeds are the same except that the tolerance at both speeds is ± 2 frames per second (± 120 rpm). If speeds are considerably below those specified, check to see if the belt is badly stretched or if there is grease or oil on the belt or pulley grooves. Replace the stretched belt or clean belt and pulleys with isopropyl alcohol.

NOTE: Unless otherwise specified, all of the following tests are to be performed with a controlled input voltage of 120 volts AC (variac) and at a projector speed of 18 fps.

36. POWER OUTPUT TEST.

a. Make sure that the end of the final test film (TFR-1744-NX5) is properly trimmed and thread the film into the projector. Start the projector in forward and hold the Autothread lever down until the film takes up on the take-up reel. Stop the projector.

b. Attach the plug of the 8-ohm non-inductive load to the external speaker jack and connect the AC voltmeter across the 8-ohm load.

c. Set the voltmeter on the 10-volt scale and (on 1744 and 1745 only) set the Tone control at the maximum clockwise position. Start the projector in forward.

d. While the first signal of the test tape (400Hz at 0db) is playing, adjust the Volume control for a power output level of 4.9 volts (1733 and 1742) or 6.3 volts (1744 and 1745) on the voltmeter. Continue with the Playback Test, following.

37. PLAYBACK TEST (PROJECTOR SPEAKER).

a. Disconnect the "load" plug from the external speaker jack. While the music is playing, listen for good sound quality. Check Volume control operation and (on 1744 and 1745 models) Tone control operation.

b. Place the operating lever in the "Still" position and then, briefly, in the "Reverse" position. There should be no sound in the speaker in these positions. Continue with paragraph 38, following.

38. FOCUS, FRAMING AND LOOP RESTORER TESTS.

a. While the target is being projected, focus the lens and, when applicable, check lens zooming operation.

b. Check framing operation. With the framing knob it should be possible to de-frame the projected picture two frame index lines above and below the regular framing line.

c. The dry splice (two feet in on the target film) must transport through the aperture without losing the loop.

d. Four feet in on the test film, three perforations have been removed. After the film losses, it should be possible to reset the loop with the loop restorer.

e. The wet splices of the test film should transport without losing the loop. Continue with paragraph 39, following.

39. SIGNAL-TO-NOISE TEST.

a. At the end of the target section of the film, reconnect the "load" plug to the external speaker jack.

b. While the last signal (400Hz at 0db) on the film is playing, readjust the Volume control for the power output level of 4.9 volts (1733 and 1742) or 6.3 volts (1744 and 1745). Set the Tone control (1744 and 1745 only) fully clockwise.

c. When the film runs out, reduce the voltmeter range from 10 volt to 1 volt (one detent). The maximum reading on the DB scale of the voltmeter should be -5db.

40. RECORD-PLAYBACK (All Models Except 1733).

a. Load the blank test film (TFR-1742-NX1) through the projector until film is taking up smoothly on the take-up reel.

b. Set the Sound Mix switch at "Off" and the Volume control to 1/4 volume or lower. On 1744 and 1745 models, set the ALC switch "On" and the Tone control at mid-position.

c. Plug a microphone into the "MIC" jack and record for approximately 20 seconds (five feet). Stop the projector.

d. Disconnect the microphone and rewind approximately two feet of film (eight seconds). Record for approximately two seconds and stop the projector.

e. Run the projector in forward and in "Play" mode until the end of recorded section and stop the projector. Connect a music source to the Aux. Input jack.

f. On 1744 and 1745 models only, set the ALC switch to "Off" and press and hold the Record button while adjusting the Record Level knob so the VU meter deflects into the red area only on high notes or loudest sounds.

g. While holding the Record button in, run the projector forward and record music until the film trailer passes the record head. Rewind seven to eight feet of film (approximately 30 seconds) and stop the projector.

h. Reconnect the microphone to the "MIC" jack and move the Sound Mix switch to "On." Start the projector in forward and, while recording voice, adjust the Record level up and down through the end of the film. Rewind the film.

i. Reload the film and start the projector. While the "voice" section (step c) is playing, check for good sound quality and clearness of recorded speech. In the middle of the "voice" section, a blank should be observed (erase test).

j. While the "music" section is playing (step g) listen for sound distortion, speaker rattle and (1744, 1745 only) tone control operation. While the projector is in still or reverse, there should be no sound in the speaker.

k. During the "sound-on-sound" section (step h), listen for differences in the music and the voice recorded over it.

l. Let the film run out and rewind the film. Place the projector operating lever in the "Still" position, the Volume control at mid-position, the Record Level knob fully counterclockwise and the Sound Mix switch "Off." On 1744 and 1745 projectors, set the Tone control at mid-position and switch the ALC switch to "On."

Trouble Shooting

TROUBLE	PROBABLE CAUSE	REMEDY
	MECHANICAL TROUBLES	
Projector inoperative with switch in the FAN or LAMP position	1. No electrical power.	1. Check power source and line cord.
	2. Loose motor pulley.	2. Tighten pulley setscrew (10, Figure 7).
	3. Broken drive belt.	3. Replace belt (6, Figure 5).
	4. Defective on-off switch (30, Figure 2) or wiring.	4. Check switch and circuitry.
Picture flicker	1. Drive roller assemblies not adjusted properly.	1. Readjust as instructed in paragraph 25.
	2. Defective motor pulley.	2. Replace pulley (11, Figure 7).
	3. Dirt, wear or binding in gearing.	3. Clean and repair or adjust gearing as instructed in re-assembly instructions.
Film scratches	1. Excessively dirty film channel parts (rollers, guides, etc.).	1. Clean projector thoroughly.
	2. Worn aperture plate (38, Figure 4) or pressure plate (20, Figure 4).	2. Replace parts if worn or marred.
	3. Worn or damaged aperture plate film guide rail (34, Figure 4).	3. Replace aperture plate guide rail.
Jumpy picture	1. Loss of film loop due to damaged film.	1. Inspect and splice as required.
	2. Green film.	2. Run film through projector two or three times to age the film.
	3. Shuttle teeth worn.	3. Replace shuttle assembly (29, Figure 5).
	4. Misaligned shuttle tooth.	4. Adjust and align shuttle as instructed in paragraph 23.
	5. Grooves worn in aperture plate film guide rail.	5. Replace aperture plate (38, Figure 4).
	6. Upper and/or lower loopformer binding.	6. Free up binding loopformer.

TROUBLE	PROBABLE CAUSE	REMEDY
	MECHANICAL TROUBLES (CONT'D)	
Autothreading not operating properly	1. Loopformers binding.	1. Free up loopformers.
	2. Safety shutter binding.	2. Free up safety shutter.
Film spills	1. Insufficient tension on feed spindle.	1. Adjust feed spindle torque (paragraph 21).
Fails to take-up or rewind	1. Defective drive belt.	1. Replace belt (6, Figure 5).
	2. Worn rim on drive roller.	2. Replace worn roller (11 or 12, Figure 5).
	3. Drive rollers not adjusted properly.	3. Readjust as instructed in paragraph 25.
	4. Defective reel spindles.	4. Replace spindles.
Film jams below aperture plate	1. Chute from head to bottom of aperture plate causing loop restorer arm to interfere.	1. Bend chute toward aperture plate with screwdriver until restorer arm is out of the way.
Film jams at lower sprocket	1. Film track improperly adjusted.	1. Adjust film track (paragraph 26).
Noisy	1. Loose attaching parts.	1. Tighten as necessary.
	2. Gearing dry.	2. Lubricate as necessary.
Dim projected pictures	1. Projector lamp dirty.	1. Clean projector lamp.
	2. Wrong lamp used.	2. Use Type DJL, 120V, 160V lamp only.
	3. Lamp socket out of alignment.	3. Align lamp socket as instructed in paragraph 22.
Pictures not framing	1. Framing lever out-of-adjustment.	1. Adjust framing (paragraph 24).
Motor (and picture) speed too slow	1. Drive belt oily or dirty.	1. Clean belt with isopropyl alcohol.
	2. Motor and/or pulleys not aligned.	2. Visually align motor pulley with drive rollers.
	3. Gears not meshed properly.	3. Adjust for minimum backlash.
	4. Rubber drive rollers improperly adjusted.	4. Adjust rollers (paragraph 25).

TROUBLE	PROBABLE CAUSE	REMEDY
	SOUND TROUBLES	
No sound in Forward; has sound in Still and Reverse	1. Muting switch out-of-adjustment or faulty.	1. Adjust (paragraph 21) or replace muting switch (53, Figure 2).
No sound in any operating position	1. Disconnected speaker leadwires.	1. Reconnect speaker leads.
	2. Faulty magnetic head or head leads disconnected.	2. Check wiring; check head for shorted or open condition and replace if faulty.
	3. Faulty P.C. board.	3. Replace P.C. board.
Sound distorted in Record/ Playback (all models except 1733)	1. Humbuck coil out-of-adjustment.	1. Adjust humbuck coil (paragraph 29).
	2. Head dirty or out-of-adjustment.	2. Adjust head (paragraph 28).
	3. Improper record bias adjustment.	3. Adjust record bias (paragraph 30) if sound is distorted unevenly, adjust DC bias (paragraph 31).
	4. (1744/1745 Only) VU meter out-of-adjustment.	4. Adjust VU meter (paragraph 32).
No record bias output (all models except 1733)	1. Faulty P.C. board.	1. Replace P.C. board.
Cannot adjust for bias current (all models except 1733)	1. Open or shorted head.	1. Replace faulty head.
	2. Faulty P.C. board.	2. Replace P.C board.
No bias output on one side of Sound Mix switch (all models except 1733)	1. Leadwires shorted at switch terminals.	1. Reposition leadwires.
Cannot record (all models except 1733)	1. Missing or bent record activator spring (43, Figure 2).	1. Straighten or replace activator spring.
	2. Open or shorted head.	2. Replace magnetic head.
	3. Faulty P.C. board.	3. Replace P.C. board.

PARTS CATALOG

FILMOSONIC® MAGNETIC SOUND SUPER 8MM PROJECTOR

MODELS

1731 A&B
1733 A&B
1742 A&B
1744 A&B
1745 A&B

BELL & HOWELL

GENERAL SERVICE DEPT.
7100 McCORMICK ROAD
CHICAGO, ILLINOIS 60645

PART NO. 73588-1

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Replacement Parts

The following pages illustrate and list, by part number and description all replacement parts for Bell & Howell Filmosonic Magnetic Sound Super-8 Projectors, Models 1731/1733/1742/1744/1745. All parts are listed in a suggested order of disassembly. When ordering replacement parts, be sure to check the Usable on Code column to make certain that the part in question is applicable to the model being repaired. If the Usable on Code column is blank, the listed part or parts are applicable to all models. Following is the coding system used to identify the specific models. Note that the code letters are applicable to both the "A" and "B" versions of each model unless otherwise specified.

CODE	MODELS
A	1731/1733A and B
B	1742A and B
C	1744A and B

ACCESSORIES

External Speaker	P/N 19760
Lenses (All but 1745):	
Standard, 1-m f/1.6	P/N 022701
Zoom, 20-32mm f/1.5	P/N 021295
Lenses (1745 Only):	
Standard, 1-m f/1.6	P/N 022701
Zoom, 20-32mm f/1.5	P/N 021258
Microphone	P/N 19737
Take-Up Reel (All but 1745)	P/N 046535
Take-Up Reel (1745 Only)	P/N 046533

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		PROJECTOR COVERS		
1-1	016344	COVER ASSEMBLY, Front, complete (not used on Model 1731)	1	A
-1	016345	COVER ASSEMBLY, Front, complete	1	B
-1	016346	COVER ASSEMBLY, Front, complete	1	C
-1	046240	COVER ASSEMBLY, Front, complete	1	D
-1A	450347	. LABEL, Operating instructions (adhesive backed)	1	A
-1A	450346	. LABEL, Operating instructions (adhesive backed)	1	B
-1A	49999	. LABEL, Operating instructions (adhesive backed)	1	CD
-1B	450392	. LABEL, Film trimmer (adhesive backed) (NOTE A)	1	
-1C	49803	. NAMEPLATE, Front cover (adhesive backed)	1	A
-1C	49821	. NAMEPLATE, Front cover (adhesive backed)	1	BCD
-1D	46182	. RIVET, Semi tubular, 0.099 inch O.D.	1	
-1E	49922	. SPACER, Latch	1	
-1F	49921	. SPRING, Latch	1	
-1G	45821	. LATCH, Front cover	1	
-1H	46987	. RIVET, Semi tubular, 0.099 inch O.D. (NOTE A)	2	
-1J	49495	. GUIDE, Film trimmer (NOTE A)	1	
-1K	40497	. TRIMMER, Film (NOTE A)	1	
-1L	765333	. RIVET, Semi tubular, 0.099 inch O.D.	2	BCD
-1M	40829	. WASHER, Flat	2	BCD
-1N	49408	. HOLDER, Microphone	1	BCD
-1P	19690	. WASHER, Flat	1	
-1Q	No Number	. COVER, Front (replace cover assembly, complete)	NP	

FIG. & INDEX NO.	PART NO.	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		PROJECTOR COVERS (CONT'D)		
1-2	016341	LAMPHOUSE ASSEMBLY, Complete	1	A
-2	016342	LAMPHOUSE ASSEMBLY, Complete	1	BC
-2	046241	LAMPHOUSE ASSEMBLY, Complete	1	D
-2A	49802	. NAMEPLATE, Lamphouse (adhesive backed)	1	A
-2A	49820	. NAMEPLATE, Lamphouse (adhesive backed)	1	BCD
-3	40591	LAMP, Projection, Type DJL	1	
-4	766221	SCREW, Hex washer head, 6-32 by 3/8 inch	2	
-5	49426	SCREW, Hex washer head tapping, 6-20 by 1/4 inch	2	
-6	766221	SCREW, Hex washer head, 6-32 by 3/8 inch	2	
-7	016348	COVER ASSEMBLY, Rear, complete	1	AB
-7	016349	COVER ASSEMBLY, Rear, complete	1	C
-7	046245	COVER ASSEMBLY, Rear, complete	1	D
-8	49425	NUT, Keps	4	
-9	450507	SPEAKER, 8-ohm, 3-watt	1	AB
-9	450508	SPEAKER, 8-ohm, 5-watt	1	CD
-10	49464	GASKET, Speaker	1	
-11	49919	WASHER	4	CD
-12	22464	BUSHING, Strain relief	1	ABC
-12	450337	BUSHING, Strain relief	1	D
-12A	30809	SCREW, Hex washer head, 6-32 by 3/8 inch	1	D
-12B	700735	LOCKWASHER, External tooth	1	D
-13	49915	LINE CORD	1	ABC
-13	046114	LINE CORD ASSEMBLY	1	D
-14	016368	COVER ASSEMBLY, Film track	1	A
-14	016367	COVER ASSEMBLY, Film track	1	B
-14	016366	COVER ASSEMBLY, Film track	1	C
-14	046244	COVER ASSEMBLY, Film track	1	D
-14A	700345	. SCREW, Hex head tapping, 6-20 by 1/4 inch	2	
-14B	450552	. COVER, Sprocket, acrylic (see NOTE A, Figure 8)	1	
-14C	49800	. NAMEPLATE, Controls (adhesive backed)	1	A
-14C	49824	. NAMEPLATE, Controls (adhesive backed)	1	B
-14C	49825	. NAMEPLATE, Controls (adhesive backed)	1	CD
-14D	450341	LABEL, Film track cover (adhesive backed)	1	
-14E	450503	RED DOT (Adhesive backed)	2	
-15	450511	LABEL, 18/24 Speed (adhesive backed)	1	
-16	450338	LABEL, Rewind Position (adhesive backed)	1	
-17	39225	LABEL, Lamp type (adhesive backed)	1	
-18	49499	NAMEPLATE, Design No. (adhesive backed)	1	
-19	450339	LABEL, Film trim (adhesive backed)	1	
-20	450344	LABEL, Elevation adjust (adhesive backed)	1	
-21	30810	SCREW, Hex washer head, 6-32 by 1/2 inch	2	
-22	26906	NUT, Hex Sems, 6-32	2	
-23	19622	REEL HOLDER	1	
-24	19628	HEAT BAFFLE	1	
-25	450661	BRACKET, Rear cover	1	ABC

NOTE A: In earlier 1733, 1742 and 1744 models, trimmers were mounted inside the front cover as shown. In all current models, the film cutter is mounted on the control box (item 26, Figure 2).

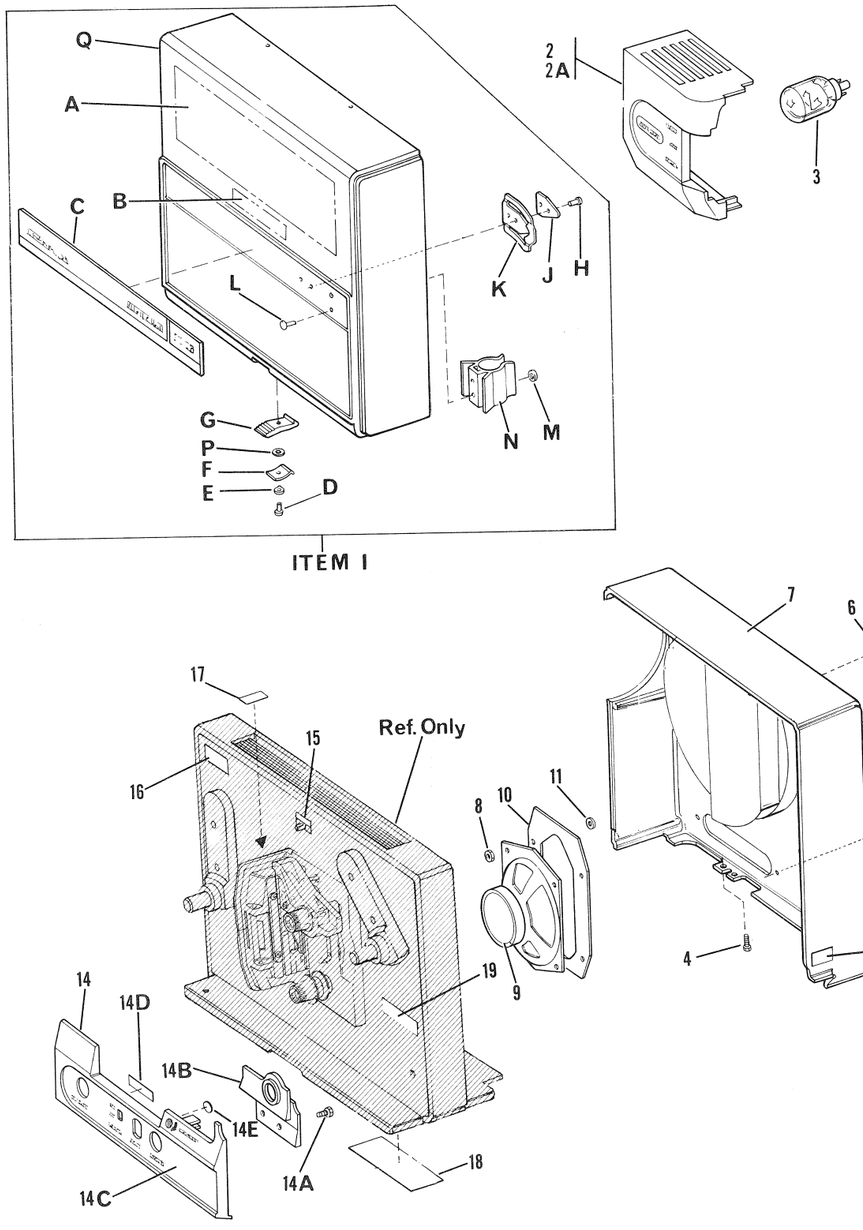


Figure 1. Projector Covers

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		ELECTRICAL PARTS		
2-1	45025	EDGE CONNECTOR	1	
-2	015634	AMPLIFIER ASSEMBLY (See Figure 9 for schematic diagram)	1	A
-2	015643	AMPLIFIER ASSEMBLY (See Figure 10 for schematic diagram)	1	B
-2	015645	AMPLIFIER ASSEMBLY (See Figure 11 for schematic diagram)	1	C
-2	046112	AMPLIFIER ASSEMBLY (See Figure 12 for schematic diagram)	1	D
-2A	49474	. JACK, Mini, SPKR (J5)	1	
-2B	19740	. JACK, Standard, AUX OUT (J4)	1	CD
-2C	49474	. JACK, Mini, MIC IN (J1)	1	BCD
-2D	19740	. JACK, Standard, AUX IN (J3)	1	BCD
-2E	19794	. NAMEPLATE, Jack (adhesive backed)	1	A
-2E	19795	. NAMEPLATE, Jack (adhesive backed)	1	B
-2E	19796	. NAMEPLATE, Jack (adhesive backed)	1	CD
-2F	43878	. JACK, Standard, MIC IN (J2)	1	D
-2G	43878	. JACK, Standard, 8-OHM SPKR (J6)	1	D
-2H	45112	. WASHER, Insulating	4	D
-2J	24835	. RIVET, Semi-tubular	1	D
-2K	450345	. NAMEPLATE, Jack	1	D
-3	49901	STAND-OFF, Plastic	3	
-4	49901	STAND-OFF, Plastic	2	
-5	30810	SCREW, Hex washer head, 6-32 by 1/2 inch	2	
-6	700735	LOCKWASHER	2	
-7	19791	BRACKET, Transformer mounting	1	
-8	30815	SCREW, Hex washer head, 8-32 by 3/8 inch	2	
-9	015613	TRANSFORMER ASSEMBLY, Power	1	AB
-9	015612	TRANSFORMER ASSEMBLY, Power	1	CD
-9A	49957	. SLEEVE, Insulating	1	
-9B	88845	. FUSE, Slo-blo, 1/2-amp	1	
-10	30809	SCREW, Hex washer head, 6-32 by 3/8 inch	2	
-11	19645	GRILLE, Motor fan	1	ABC
-11	450322	GRILLE, Motor fan	1	D
-12	49497	WASHER, Flat	1	
-13	30807	SCREW, Hex washer head, 6-32 by 1/4 inch	2	
-14	015970	LEAD ASSEMBLY, Grounding	1	
-15	30811	SCREW, Hex washer head, 6-32 by 5/8 inch	3	
-16	700735	LOCKWASHER, External tooth	3	
-17	No Number	MOTOR AND SUBPLATE ASSEMBLY (See Figure 7 for parts).	NP	
-18	45721	SCREW, Hex washer head, 6-32 by 3/8 inch	1	
-19	19672	SPACER, Hex, motor subplate	1	
-20	19688	SCREW, Guide roller	1	
-21	39249	ROLLER, Film guide	1	
-22	19690	WASHER, Flat	1	
-23	46124	SCREW, Hex head, self tapping, 6-20	5	
-23A	700105	SCREW, Slotted binding head, 5-40 by 3/16 inch	1	
-23B	450517	T-BAR, Track retaining	1	
-24	046288	FILM TRACK ASSEMBLY (See Figure 8 for parts)	1	ABC
-24	046290	FILM TRACK ASSEMBLY (See Figure 8 for parts)	1	D
-25	46124	SCREW, Hex head, self tapping, 6-20	2	
-26	016396	CONTROL BOX ASSEMBLY (NOTE A)	1	A
-26	016397	CONTROL BOX ASSEMBLY (NOTE A)	1	B
-26	046115	CONTROL BOX ASSEMBLY (NOTE A)	1	C
-26	046243	CONTROL BOX ASSEMBLY	1	D
-26A	49801	. NAMEPLATE, Control box (adhesive backed)	1	A
-26A	49822	. NAMEPLATE, Control box (adhesive backed)	1	B
-26A	49823	. NAMEPLATE, Control box (adhesive backed)	1	CD

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		ELECTRICAL PARTS (CONT'D)		
2-26B	450343	. LABEL, Film trimmer	1	
-26C	46598	. RIVET, Semi-tubular	2	
-26D	29539	. WASHER, Flat	2	
-26E	49495	. GUIDE, Film trimmer	1	
-26F	450349	. TRIMMER, Film	1	
-26G	450350	. SHIM, Film trimmer	1	
-26H	46599	. SPACER, Film trimmer	1	
-26J	No Number	. BOX, Control (replace control box assembly)	NP	
-27	016330	KNOB ASSEMBLY, Volume control	1	
-28	015606	CONTROL ASSEMBLY, Volume (includes mounting parts)	1	AB
-28	015605	CONTROL ASSEMBLY, Volume (includes mounting parts)	1	CD
-29	46448	SCREW, Phillips flat head, 6-32	2	
-30	015607	SWITCH ASSEMBLY, Off/Fan/Lamp (pre-wired)	1	ABD
-30	015966	SWITCH ASSEMBLY, Off/Fan/Lamp (pre-wired)	1	C
-30A	39182	. SLEEVE, Insulating	1	
-30B	45874	. SHIELD, Switch	1	
-30C	19763	. SWITCH, Off/Fun/Lamp (unwired)	1	
-31	016330	KNOB ASSEMBLY, Record level	1	BCD
-32	19743	CONTROL ASSEMBLY, Record level (includes mounting parts)	1	B
-32	49912	CONTROL ASSEMBLY, Record level (includes mounting parts)	1	CD
-33	36226	SCREW, Slotted flat head, special	2	BCD
-34	19742	SWITCH, Sound-on-Sound	1	BCD
-35	32048	NUT, Hex	2	CD
-36	36919	SCREW, Flat head, 2-56 by 1/4 inch	2	CD
-37	19738	VU METER	1	CD
-38	36226	SCREW, Slotted flat head, special	2	CD
-39	19741	SWITCH, Off/ALC	1	CD
-40	016330	KNOB ASSEMBLY, Tone control	1	CD
-41	015605	CONTROL ASSEMBLY, Tone (includes mounting parts)	1	CD
-42	49487	NUT, Push-on	1	BCD
-43	450650	SPRING, Record activator	1	BCD
-43A	49956	WASHER, Flat (current models)	1	
-43B	450500	SPRING, Compression (current models)	1	
-44	19649	CONTROL KNOB, Record	1	BCD
-45	015610	LAMP AND LEAD ASSEMBLY, Record	1	BCD
-46	30805	SCREW, Hex washer head, 4-40 by 3/8 inch	1	
-47	19793	CLAMP, Humbuck coil	1	
-48	36838	SCREW, Slotted pan head, 4-40 by 3/8 inch	2	
-49	015973	HUMBUCK COIL AND HEAD BLOCK ASSEMBLY	1	A
-49	015974	HUMBUCK COIL AND HEAD BLOCK ASSEMBLY	1	BCD
-49A	49442	. SPRING, Tension	1	
-50	766174	SCREW, Slotted hex head, 4-24	1	
-51	49291	LOCKWASHER	1	
-52	30613	WASHER, Flat (discontinued on current models)	1	
-53	016399	SWITCH AND PIN ASSEMBLY, Muting	1	
-54	30809	SCREW, Hex washer head, 6-32 by 3/8 inch	2	
-55	49849	SCREEN, Vent opening	1	
-56	010270	SOCKET ASSEMBLY, Lamp	1	
-57	45917	RECEPTACLE, Room lamp	1	C
-58	45898	LABEL, Receptacle (adhesive backed)	1	C

NOTE A: In early 1733, 1742 and 1744 models, the film trimmer was mounted inside the front cover (see Figure 1). In all current models, the film trimmer is mounted on the control box. Only the current control box will be available for replacement.

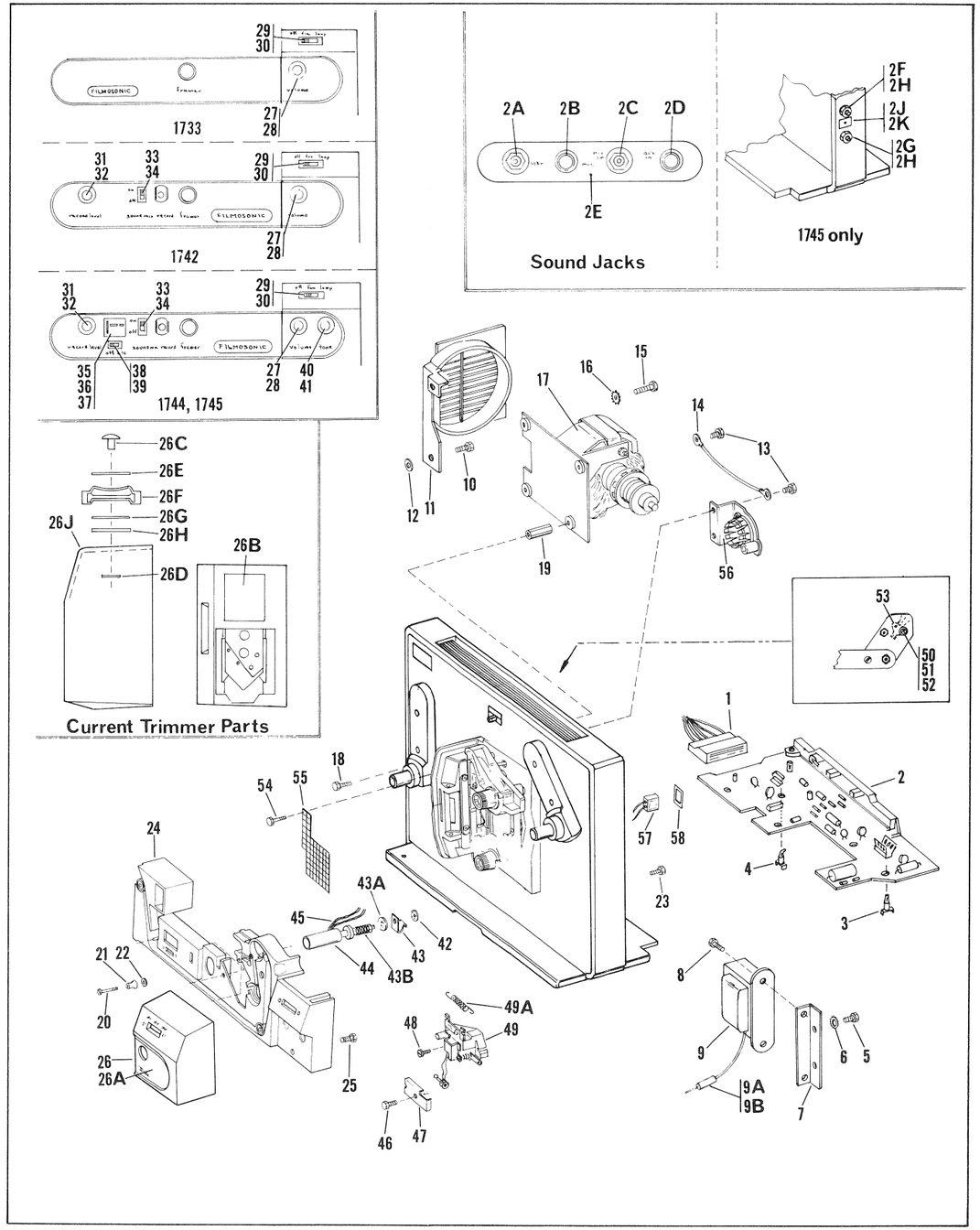


Figure 2. Electrical Parts

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		FLYWHEEL, REEL ARMS AND GEARS		
3-1	706811	SETSCREW, Fluted socket cup pt, 8-32 by 3/16 inch	2	
-2	016335	FLYWHEEL ASSEMBLY	1	
-3	31649	WASHER, Wave-type tension	2	
-4	44486	WASHER, Flat	1	
-5	31650	WASHER, Flat	1	
-6	015624	SHAFT ASSEMBLY, Capstan	1	
-7	40267	BEARING, Ball	2	
-8	700105	SCREW, Slotted binding head, 5-40 by 3/16 inch	4	
-9	015627	COVER ASSEMBLY, Supply arm	1	ABC
-9	046108	COVER ASSEMBLY, Supply arm	1	D
-9A	32979	SPRING, Torque, supply arm	1	
-10	015628	COVER ASSEMBLY, Take-up arm	1	ABC
-10	046109	COVER ASSEMBLY, Take-up arm	1	D
-11	32861	SCREW, Spindle	2	
-12	29726	SPACER, Spindle shaft	2	
-13	35580	WASHER, Flat	4	
-14	35579	GEAR, Spur	2	
-15	29724	WASHER, Spring tension	2	
-16	010374	SPINDLE ASSEMBLY, Film reel	2	
-17	29707	GEAR, Spur	4	
-18	39049	GEAR, Spur (supply arm)	1	
-19	29706	GEAR, Spur (take-up arm)	1	
-20	29192	SETSCREW, Fluted socket cup pt, 4-40 by 1/8 inch	1	
-21	39060	GEAR, Spur	1	
-22	010189	GEAR AND SHAFT ASSEMBLY, Supply	1	
-23	29192	SETSCREW, Fluted socket cup pt, 4-40 by 1/8 inch	1	
-24	39056	GEAR, Spur	1	
-25	010190	GEAR AND SHAFT ASSEMBLY, Take-up	1	
-26	21736	RING, Retaining, 0.207 inch ID	4	
-27	29706	GEAR, Spur, small	2	
-28	34718	GEAR, Spur, large	2	
-29	21736	RING, Retaining, 0.207 inch ID	1	
-30	45462	GEAR, Spur	1	
-31	80147	SCREW, Phillips binding head, 5-40 by 3/16 inch	1	
-32	29744	RING, Retaining, 0.562 inch ID	2	
-33	016338	GEAR MOUNTING PLATE ASSEMBLY	1	
-34	39099	SPRING, Reel arm tension	2	
-35	49826	CAM WASHER, Supply arm	1	
-36	19665	CAM WASHER, Take-up arm	1	
-37	1261	BALL, Steel	2	
-38	34705	BEARING, Reel arm	2	
-39	012605	SUPPORT ASSEMBLY, Supply arm	1	
-40	012402	SUPPORT ASSEMBLY, Take-up arm	1	

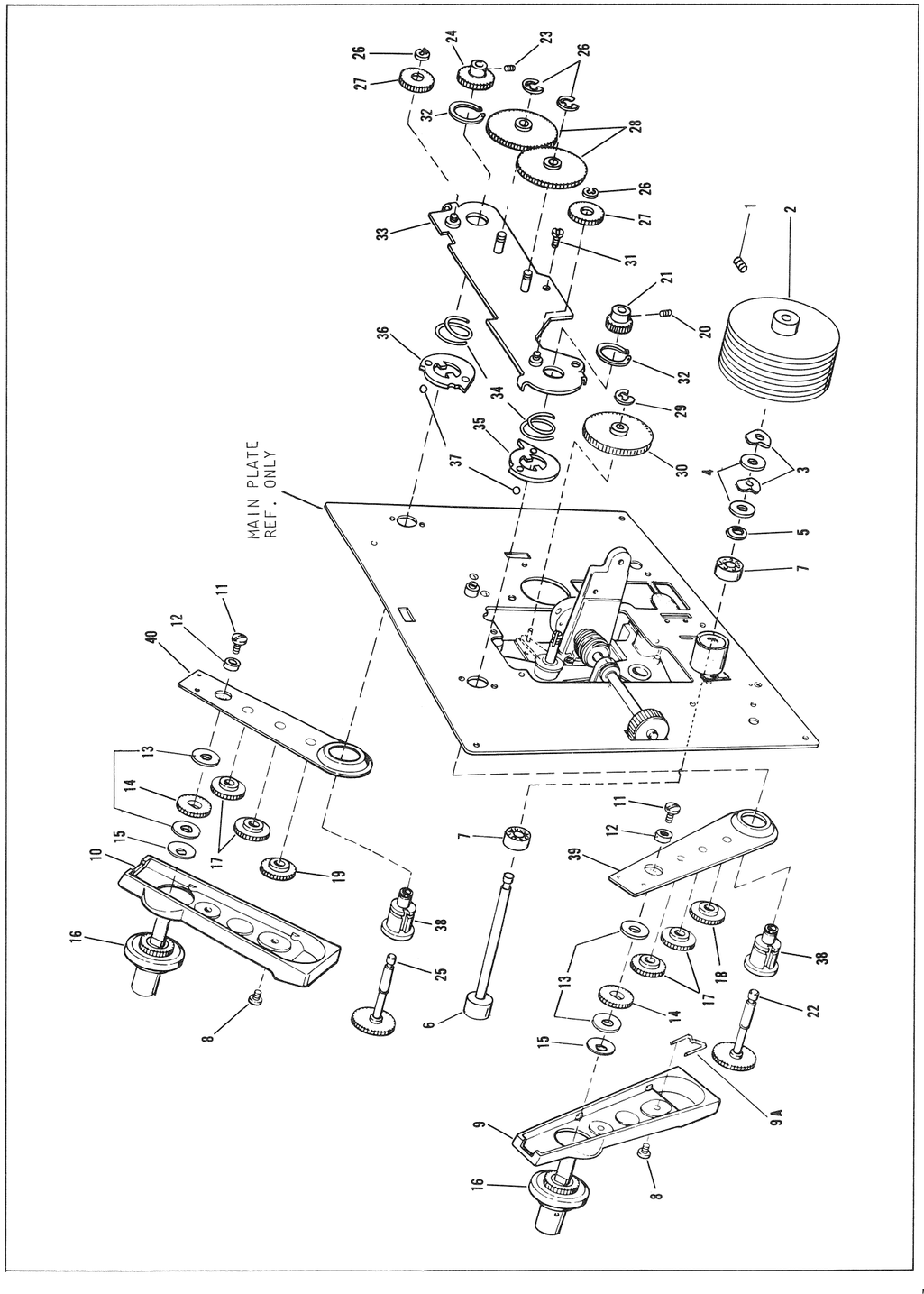


Figure 3. Reel Arms and Gears

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		LOOPFORMERS, SPROCKETS AND GEARS		
4-1	35181	SPRING, Gear retaining	2	
-2	35186	WASHER, Friction (lower sprocket)	1	
-3	35184	RATCHET, Spring	2	
-4	35186	WASHER, Spacer (upper sprocket)	1	
-4A	30667	WASHER, Spacer (lower sprocket)	1	
-5	35177	GEAR, Upper sprocket, outer	1	
-5A	19641	GEAR, Lower sprocket, outer	1	
-6	011459	LEVER AND STUD ASSEMBLY	1	
-7	43868	GEAR, Upper sprocket, inner	1	
-8	015615	GEAR AND PIN ASSEMBLY, Lower sprocket, inner	1	
-9	046214	SPROCKET ASSEMBLY, Upper (early models - 1/2 inch diameter knobs)	1	
-9	016336	SPROCKET ASSEMBLY, Upper (current "A" models - 5/8 inch diameter knobs)	1	
-9	046405	SPROCKET ASSEMBLY, Upper (all "B" models)	1	
-9A	26085	WASHER, Friction	1	
-10	046213	SPROCKET ASSEMBLY, Lower (early models - 1/2 inch diameter knobs)	1	
-10	046291	SPROCKET ASSEMBLY, Lower (current models - 5/8 inch diameter knobs)	1	
-10A	29744	RING, Retaining, external, 0.562 inch ID	1	
-10B	450566	WASHER, Flat	1	
-10C	450356	ACTUATOR, Guard	1	
-10D	450361	WASHER, Flat	1	
-10E	450538	WASHER, Bowed	1	
-11	26085	WASHER, Friction	2	
-12	30612	SCREW, Pin-type	1	
-13	39015	LOOPFORMER, Upper (all "A" models)	1	
-13	450558	LOOPFORMER, Upper (all "B" models)	1	
-13A	450340	LABEL, "PUSH" (Adhesive backed)	1	ABC
-13B	450600	SPRING, Tension (all "B" models)	1	
-13C	450614	LEVER (all "B" models)	1	
-14	39237	ROLLER, Flanged	1	
-15	30613	WASHER, Flat	1	
-16	19643	ROD, Head retracting	1	
-17	30625	ROLLER, Guide	1	
-18	39383	SCREW, Slotted pan head, 5-40 by 1 inch	1	
-18A	450518	WASHER, Flat	1	
-19	016334	BRACKET ASSEMBLY, Upper loopformer (all "A" models)	1	
-19	046404	BRACKET ASSEMBLY, Upper loopformer (all "B" models)	1	
-20	450375	PLATE, Pressure	1	
-21	39795	SPRING, Retaining	1	
-22	39797	MASK, Pressure plate	1	
-23	39114	COVER, Focus knob (cement in place)	1	
-24	36947	SCREW, Slotted pan head, 3-48 by 3/16 inch	1	
-25	34784	WASHER, Flat	1	
-26	39113	KNOB, Focus	1	
-27	39121	WASHER, Flat	1	
-28	014227	SHAFT ASSEMBLY, Eccentric	1	

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		LOOPFORMERS, SPROCKETS AND GEARS (CONT'D)		
4-29	39097	SPRING, Tension	1	
-30	39230	O-RING, Rubber	1	
-31	39127	PIN, Hinge, lens carrier	2	
-32	016333	CARRIER ASSEMBLY, Lens (grey)	1	ABC
-32	046242	CARRIER ASSEMBLY, Lens (black)	1	D
-33	30621	SCREW, Slotted truss head, 3-48 by 3/16 inch	2	
-34	39796	RAIL, Film guide	1	
-35	28067	SPRING, Side tension	1	
-36	30639	ARM, Side tension	1	
-37	30620	SCREW, Slotted truss head, 3-48 by 1/8 inch	2	
-37A	450561	DEFLECTOR, Film (current models)	1	
-38	010346	PLATE ASSEMBLY, Aperture	1	
-39	37961	SPRING, Tension	1	
-40	26642	RIVET, Tubular, 0.089 inch diameter	2	
-41	30615	CATCH, Lens carrier	1	
-42	39254	SETSCREW, Fluted socket oval pt, 6-32 by 1/4 inch (Nyloc)	1	
-43	19025	RIVET, Tubular, 0.123 inch diameter	2	
-44	32478	BAFFLE, Lamp	1	
-45	450604	TRIMPLATE, Autothread knob ("B" models only)	1	
-46	46296	RIVET, Semi-tubular ("B" models only)	1	
-47	450599	WASHER, Flat ("B" models only)	1	
-48	046403	KNOB ASSEMBLY, Autothread ("B" models only)	1	
-49	450595	BUSHING, Shoulder ("B" models only)	1	
-50	450601	NUT, Lock ("B" models only)	1	
-51	450602	SPRING, Forsion ("B" models only)	1	
-52	450603	TRIMPLATE, Autothread knob ("B" models only)	1	

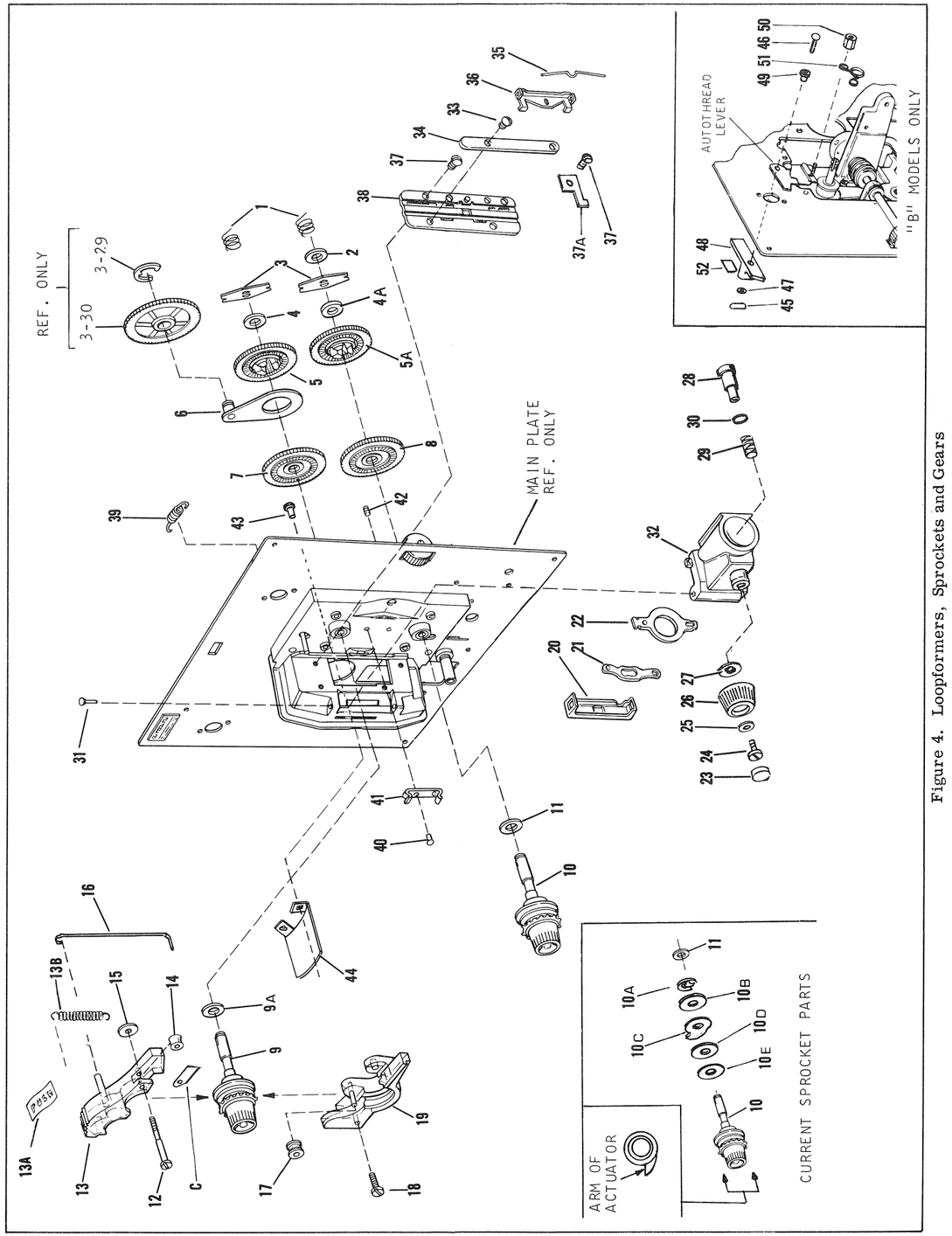


Figure 4. Loopformers, Sprockets and Gears

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		SHUTTER, SHUTTLE AND DRIVE MECHANISM		
5-1	41317	SCREW, Strike, 4-40 hex washer head	2	
-2	34784	WASHER, Flat	2	
-3	016339	BRACKET ASSEMBLY, Spring loading	1	
-4	25715	RING, Retaining, Type E, 0.145 inch ID	1	
-5	015630	BRACKET ASSEMBLY, Roller mounting	1	
-6	(Note A)	BELT, Drive	1	
-7	19673	SPRING, Torsion	1	
-8	49471	SLEEVE, Pulley shaft	1	
-9	27322	RING, Retaining, special	2	
-10	32172	WASHER, Flat	4	
-11	015972	ROLLER ASSEMBLY, Drive, inner	1	
-12	015622	ROLLER ASSEMBLY, Drive, outer	1	
-13	32926	SCREW, Fillister head, 2-56 by 1/4 inch	1	
-14	19652	KNOB, Forward-Reverse	1	
-15	17676	RING, Retaining, external Type E, 0.156 inch ID	1	
-16	19639	LEVER, Lock	1	
-17	39264	SCREW, Pivot	1	
-18	34656	SCREW, Round head Sems, 6-32 by 1/4 inch	1	
-19	016343	SHUTTER ASSEMBLY, Safety	1	
-20	49439	SCREW, Shoulder, 3-48	2	
-21	29175	PLATE, Shutter	1	
-22	19631	SHUTTER	1	
-23	19691	DISC, Mylar	1	
-24	36842	SCREW, Slotted pan head, 6-32 by 3/8 inch	1	
-25	26906	NUT, Hex Sems	1	
-26	31585	CLAMP, Cable	1	
-26A	766324	SLEEVE	1	
-27	700735	LOCKWASHER, External tooth	1	
-28	39010	STUD, Fire shutter pivot	1	
-29	016340	SHUTTLE ASSEMBLY, Complete	1	
-29A	19644	. SPRING, Wick retaining	1	
-29B	450669	. WICK, Felt	1	
-29C	(NOTE B)	. CAM SHOE	2	
-30	26906	NUT, Hex Sems	1	
-31	19799	BRACKET, Shuttle pivot	1	
-32	19787	SPACER, Shuttle	1	
-33	49416	STUD, Shuttle	1	
-34	29192	SETSCREW, Shuttle tension adjusting	1	
-35	39027	WASHER, Spring tension	1	
-36	19606	CAM, Up-and-down	1	
-37	12498	SETSCREEW, Fluted socket cup pt, 6-32 by 1/8 inch	2	
-38	43167	CAM, In-and-out	1	
-39	26085	WASHER, Thrust	1	
-40	12498	SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	1	
-41	49811	WORM GEAR	1	
-42	80591	SETSCREW, Fluted socket cup pt, 6-32 by 3/16 inch	1	
-43	39140	KNOB, Manual	1	
-44	43183	SHAFT, Main	1	
-45	30667	WASHER, Friction	1	
-46	26131	RING, Retaining, crescent, 0.219 inch ID	1	

NOTE A: If the projector motor is mounted on a black nickel subplate, use drive belt P/N 19624; if motor is mounted on plain nickel subplate, use drive belt P/N 49900.

NOTE B: Always use a white cam shoe (P/N 19618) in the upper position; then select either a white cam shoe or a black cam shoe (P/N 33712) to obtain the proper fit on the pull-down cam. Shuttle and cam operation must be neither too loose nor too tight.

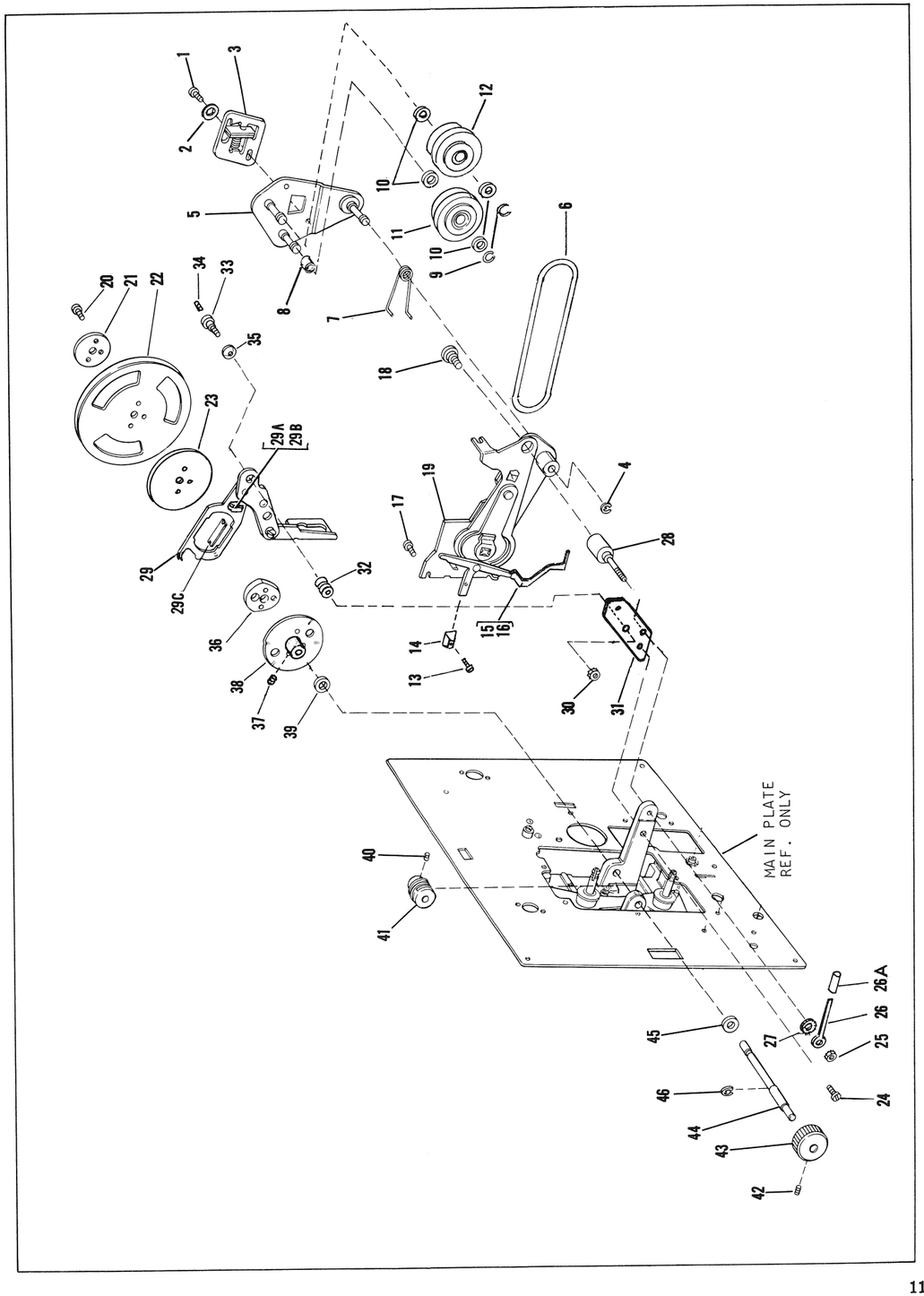


Figure 5. Shutter, Shuttle and Drive Mechanism

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MAIN PLATE AND MAIN FRAME ASSEMBLIES		
		EARLY BELT SHIFTER PARTS (NOTE A)		
6-1	36838	SCREW, Slotted pan head, 4-40 by 3/8 inch	1	
-2	765965	SPRING, Belt shifter tension	1	
-3	36767	SETSCREW, Fluted socket cup pt, 6-32 by 1/2 inch	2	
-4	No Number	KNOB, Speed shaft	NP	
-5	No Number	SHIFTER, Belt	NP	
-6	49492	SPRING, Belt shifter return	2	
-7	40479	COLLAR, Belt shifter	1	
-8	49955	RETAINER, Belt	1	
		CURRENT BELT SHIFTER PARTS (NOTE A)		
6-1	450514	SCREW, Hex washer head, 8-32 by 5/8 inch	1	
-1A	39121	WASHER, Flat	1	
-1B	9517	LOCKWASHER, External tooth	1	
-2	450363	NUT, Square	1	
-3	29192	SETSCREW, Fluted socket cup pt, 4-40 by 1/8 inch	2	
-4	40479	COLLAR, Belt shifter	2	
-5	49492	SPRING, Belt shifter return	2	
-6	450512	SHIFTER, Belt	1	
-7	046237	KNOB ASSY, Belt shifter (includes items 1, 1A, 1B and 2)	1	
-8	49955	RETAINER, Belt	1	
-9	766183	NUT, Hex	2	
-10	36844	SCREW, Pan head, 6-32 by 5/8 inch	2	
-11	49924	BUSHING, Capstan	2	
-12	19623	CLAMP, Capstan bushing	2	
-13	21736	RING, Retaining, Type E, 0.207 inch ID	1	
-14	015279	TILT POST ASSEMBLY	1	
-14A	45560	. FOOT, Rubber	2	
-14B	46799	. SPRING, Tilt post return (current models)	1	
-15	46095	SPRING, Tilt lock bracket	1	
-16	46018	BRACKET, Tilt lock	1	
-17	30809	SCREW, Hex washer head, 6-32 by 3/8 inch	2	
-18	19627	BRACKET, Tilt post	1	
-19	81833	RING, Retaining, external, 0.312 inch ID	1	
-20	19621	CAM, Record	1	A
-20	450502	CAM, Record	1	BCD
-21	49402	SHAFT, Framer	1	
-22	49828	PIN, Locator, front cover	2	
-23	45847	GROMMET, Locator pin	2	
-24	46006	CLIP, Speed	2	
-25	45839	RETAINER, Handle	2	
-26	46133	HANDLE, Carrying	1	
-27	49490	SCREW, Hex head, special	4	
-28	706679	SCREW, Hex head tapping, 6-32 by 3/8 inch	3	
-29	No Number	PLATE ASSEMBLY, Main/mechanism	NP	
-30	016332	MAIN FRAME ASSEMBLY	1	ABC
-30	046246	MAIN FRAME ASSEMBLY	1	D
-30A	32652	. RIVET, Semi-tubular, 0.123 inch diameter	1	
-30B	39776	. RIVET, Semi-tubular, 0.123 inch diameter	1	
-30C	45561	. FOOT, Rubber	2	

NOTE A: If it should be necessary to replace the early style belt shifter knob (item 6-4) or belt shifter (item 6-5), it is recommended that the current belt shifter parts be installed in their entirety.

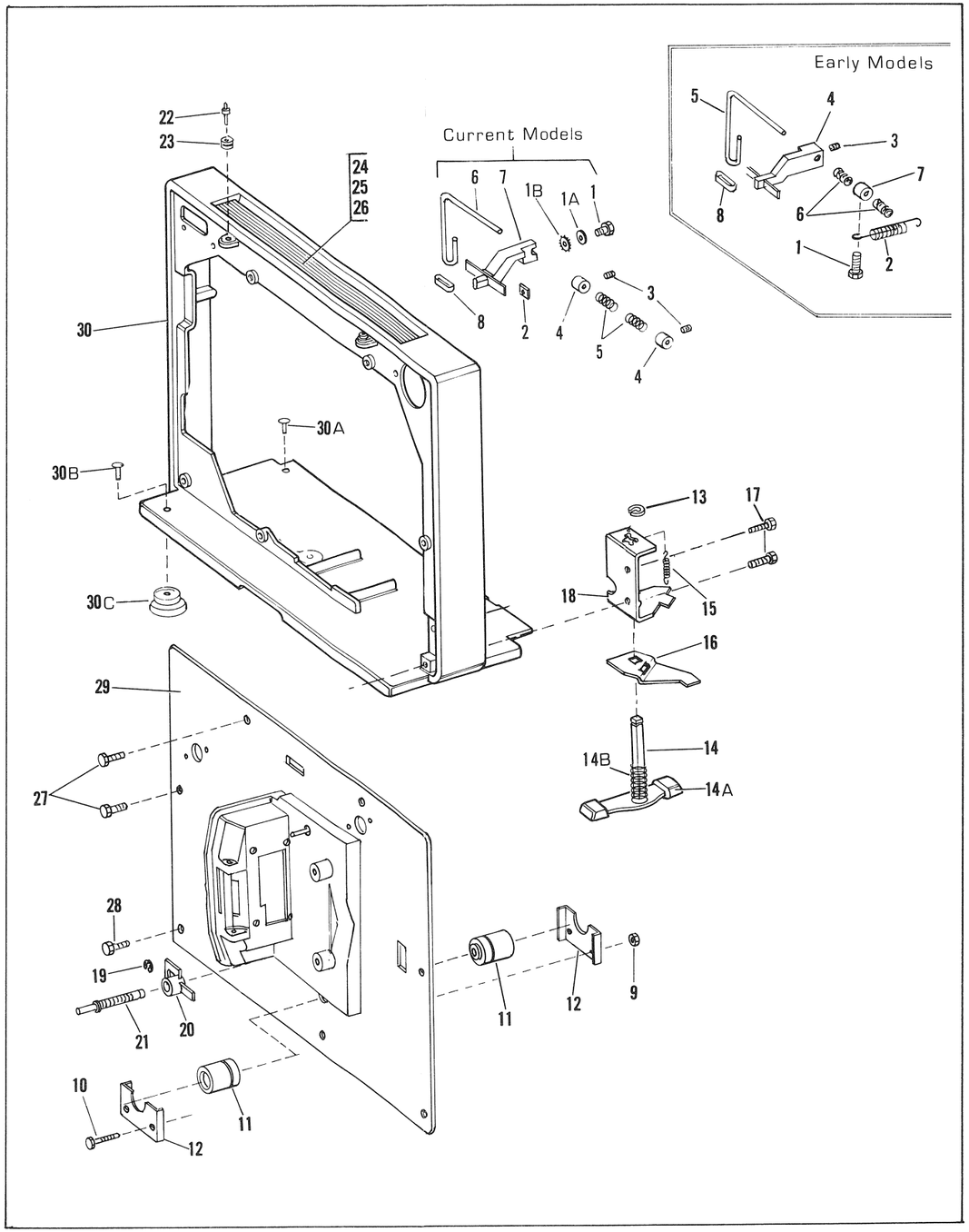


Figure 6. Main Plate and Main Frame Assemblies

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		MOTOR AND SUBPLATE ASSEMBLY		
7-	No Number	MOTOR AND SUBPLATE ASSEMBLY	REF	
-1	30815	. SCREW, Hex washer head, 8-32 by 3/8 inch	8	
-2	15563	. LOCKWASHER, Split, No. 8	8	
-3	(NOTE A)	. SUBPLATE, Motor	1	
-4	49917	. EYELET	6	
-5	49414	. GROMMET, Rubber	3	
-6	35164	. NUT, Keps	2	
-7	49902	. BRACKET, Motor support	2	
-8	706811	. SETSCREW, Fluted socket cup pt, 8-32 by 3/16 inch	1	
-9	450367	. FAN, Motor	1	
-10	706811	. SETSCREW, Fluted socket cup pt, 8-32 by 3/16 inch	1	
-11	015623	. PULLEY ASSEMBLY, Motor	1	
-11A	82809	. WASHER, Flat	1	
-12	015616	. MOTOR ASSEMBLY, Drive	1	

NOTE A: Black nickel subplate P/N 49838 and plain nickel subplate P/N 19788 are interchangeable; however, drive belt P/N 19624 must be used with the black subplate, whereas belt P/N 49900 must be used with the plain nickel subplate.

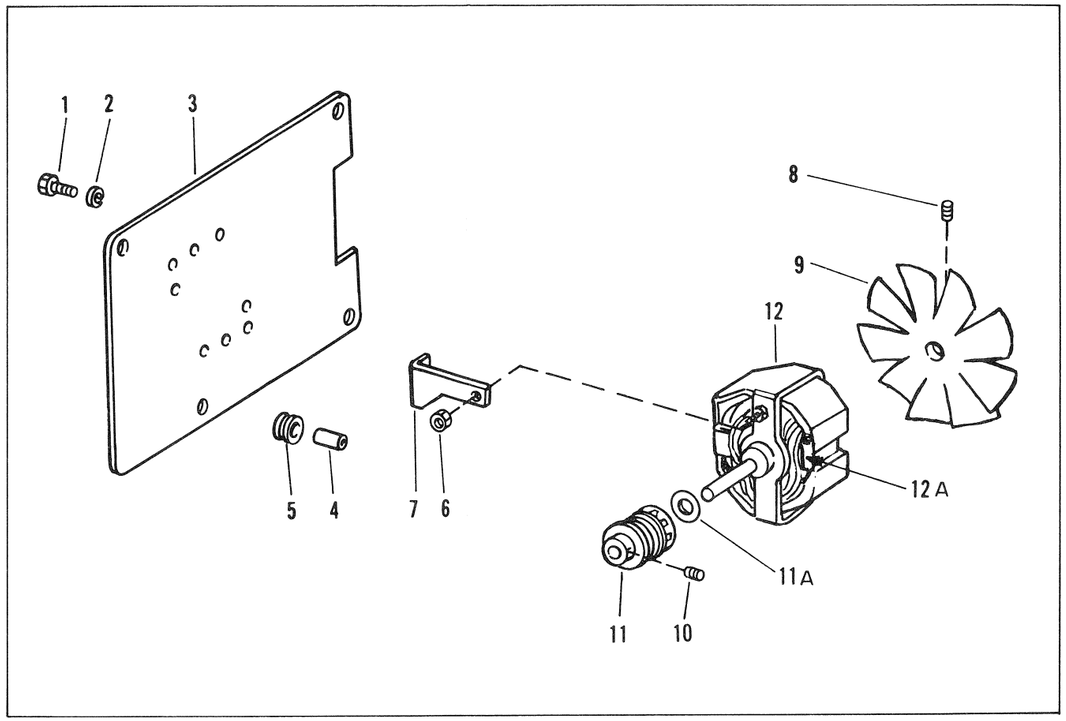


Figure 7. Motor and Subplate Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		FILM TRACK ASSEMBLY (NOTE A)		
8-	No Number	FILM TRACK ASSEMBLY, Complete (early models)	NP	
8-	046290	FILM TRACK ASSEMBLY, Complete (current models)	REF	
-1	46147	. RING, Retaining, push-on	3	
-2	46146	. WASHER, Bowed	3	
-3	46990	. ROLLER HALF, Film, hubbed	3	
-4	46989	. ROLLER HALF, Film, recessed	3	
-5	43543	. NUT, Push-on	1	
-6	35349	. WASHER, Bowed	1	
-7	016331	. KNOB ASSEMBLY, Framer	1	
-8	42967	. WASHER, Flat	1	
-9	49959	. KNOB, Loop restorer	1	
-10	450520	. SPRING, Loop restorer	1	
-11	450553	. LEVER, Loop restorer	1	
-12	19682	. SCREW, Sprocket guard	1	
-13	19690	. WASHER, Flat	1	
-14	450551	. GUARD, Sprocket	1	
-15	No Number	. TRACK, Film (replace complete track assembly)	NP	
-16	19682	SCREW, Film delfector (current models)	1	
-17	450557	DEFLECTOR, Film (current models)	1	
-18	450517	T-BAR, Track retaining (see item 2-23B)	REF	

NOTE A: Earlier film track assemblies, which did not include the sprocket guard (item 14) or film deflector (item 17), are no longer available. If it is necessary to replace the acrylic cover (item 1-14B), the lower sprocket assembly (item 4-10) and/or the film track of an earlier model, replace these items with the current parts for projector compatability. The items involved are the complete track assembly P/N 046290, items 8-16, 8-17 and 8-18, the current lower sprocket (item 4-10) and the new acrylic cover (item 1-14B).

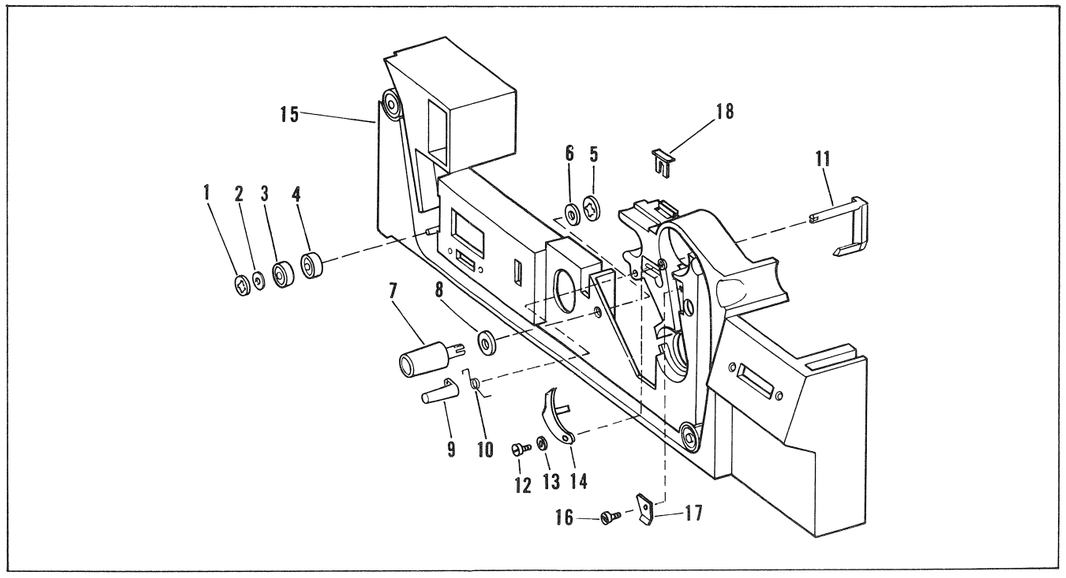


Figure 8. Film Track Assembly

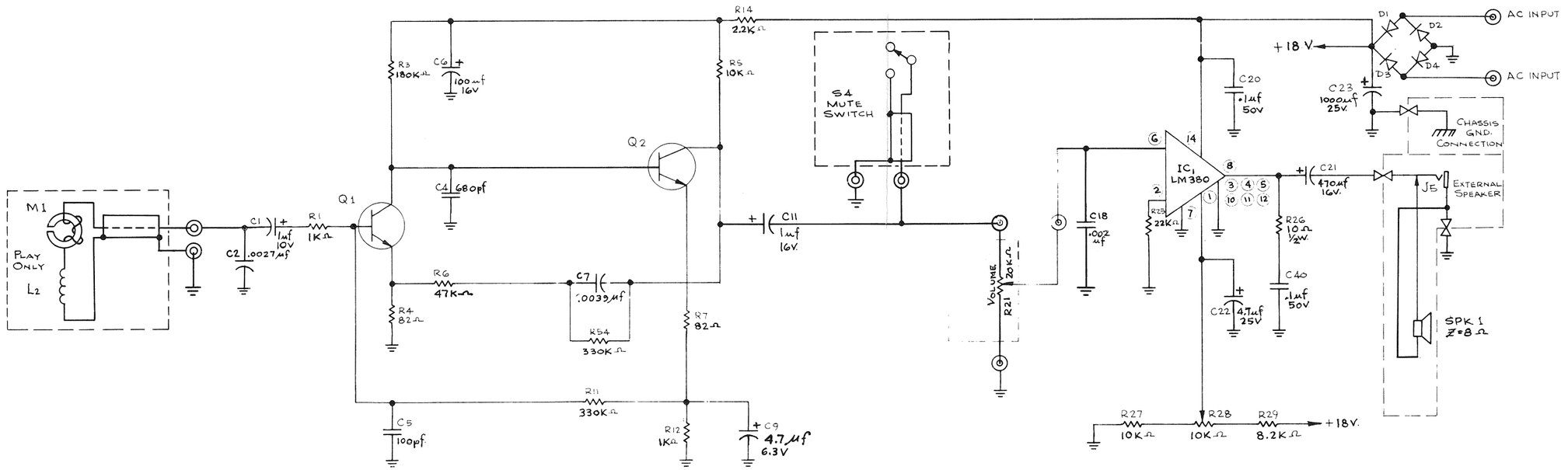


Figure 9. Amplifier Assembly P/N 015634
(Design 1731 and 1733)

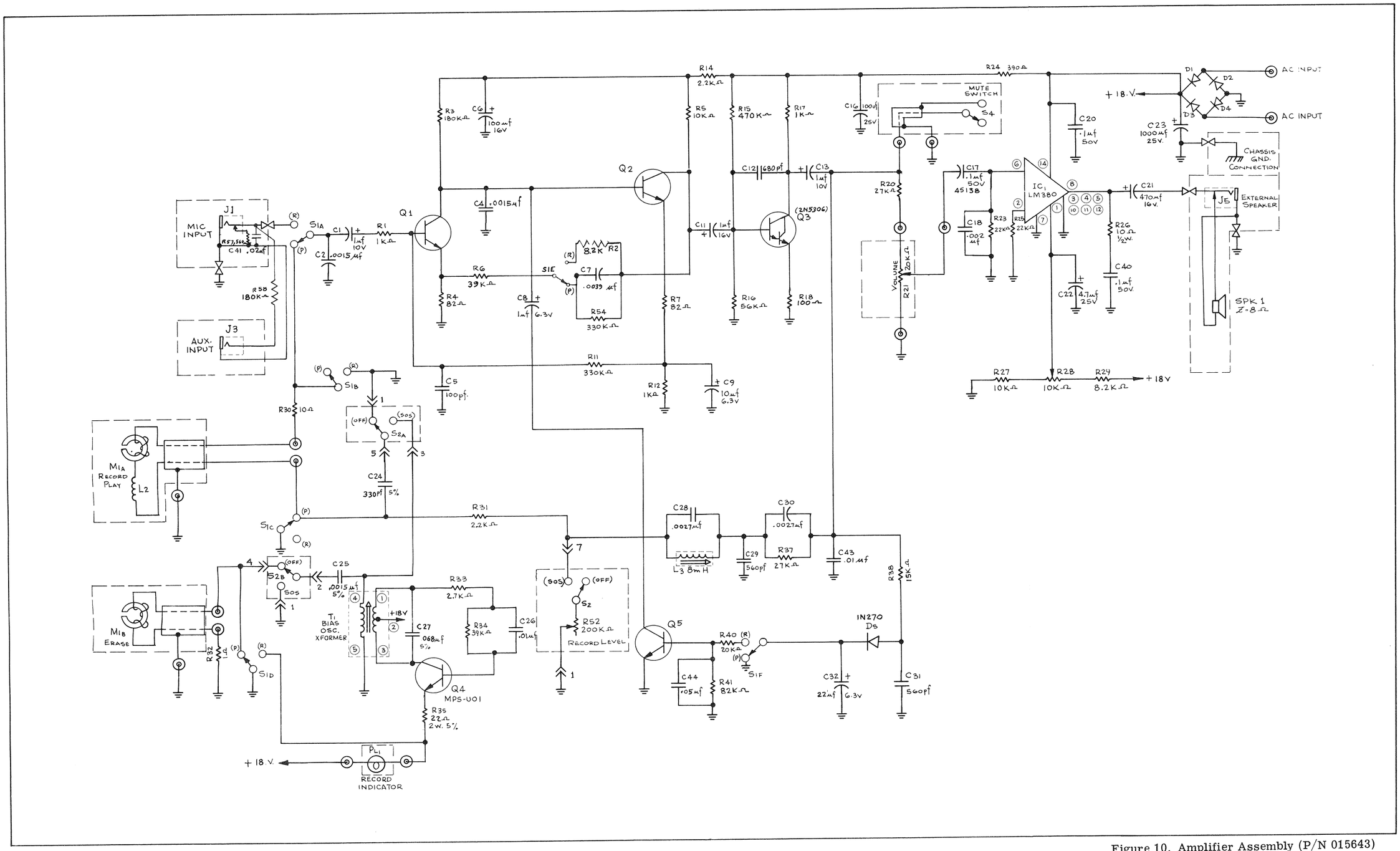


Figure 10. Amplifier Assembly (P/N 015643)
(Design 1742 Only)

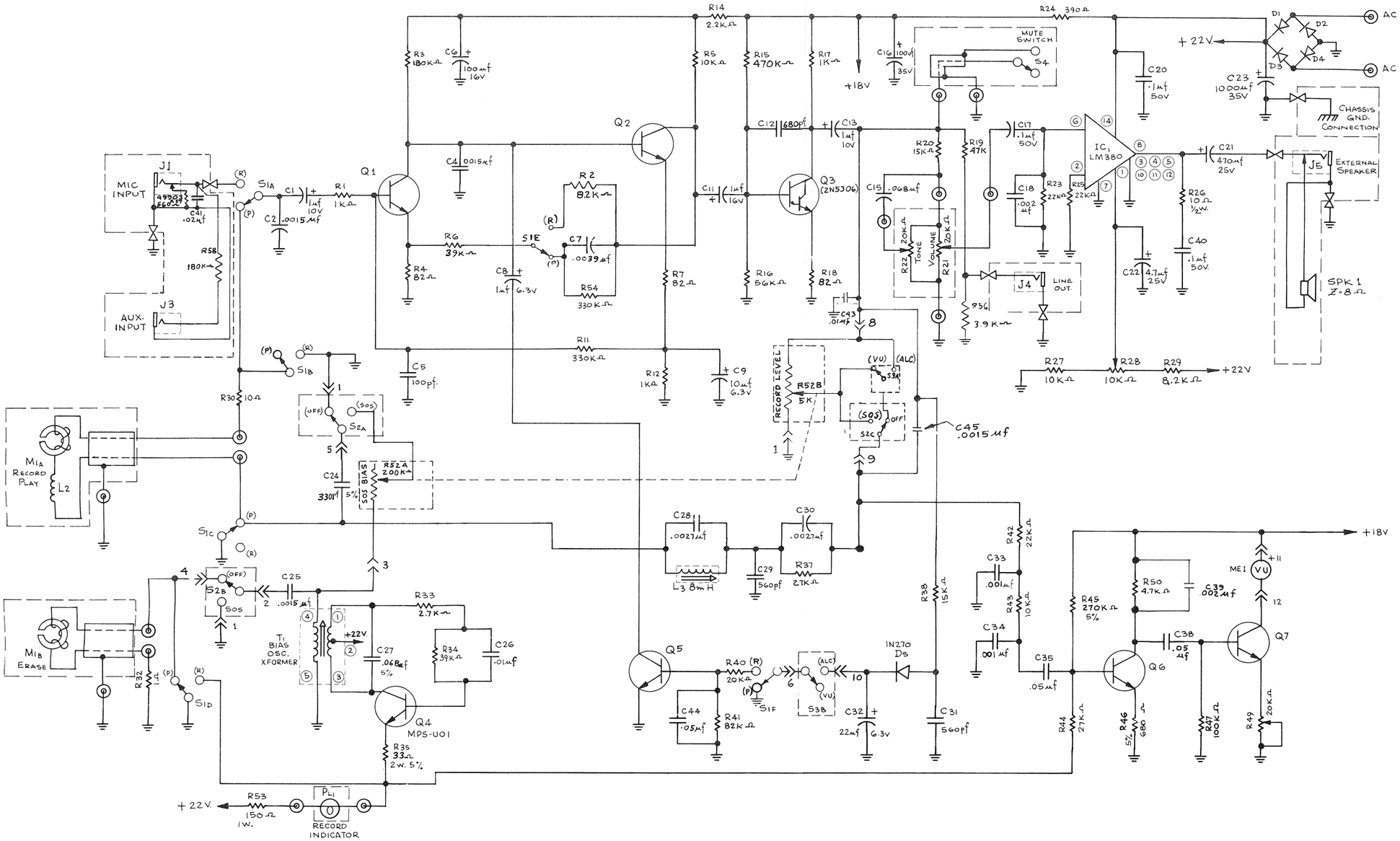


Figure 11. Amplifier Assembly (P/N 015645)
(Design 1744 Only)

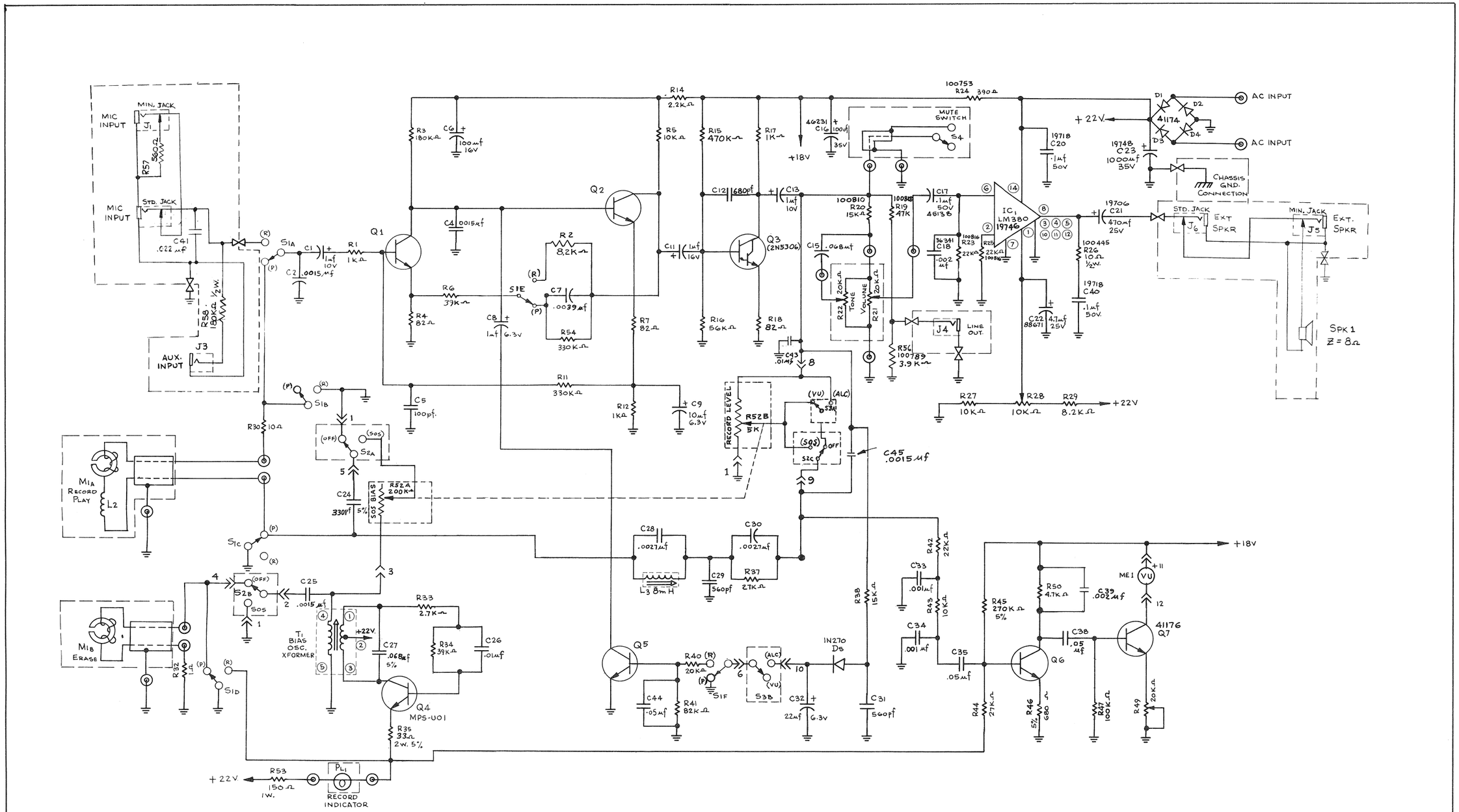


Figure 12. Amplifier Assembly (P/N 046112)
(Design 1745 Only)

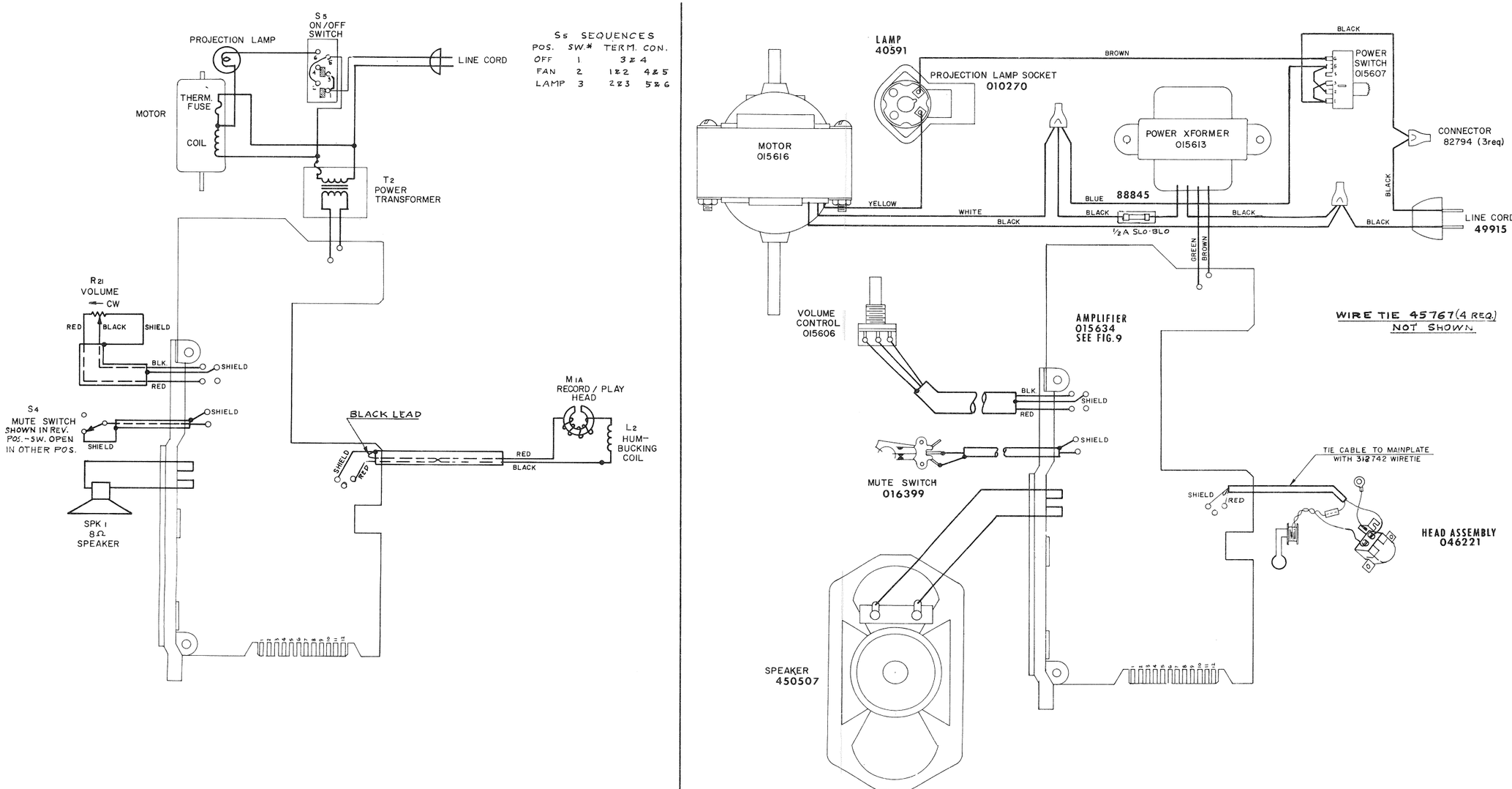
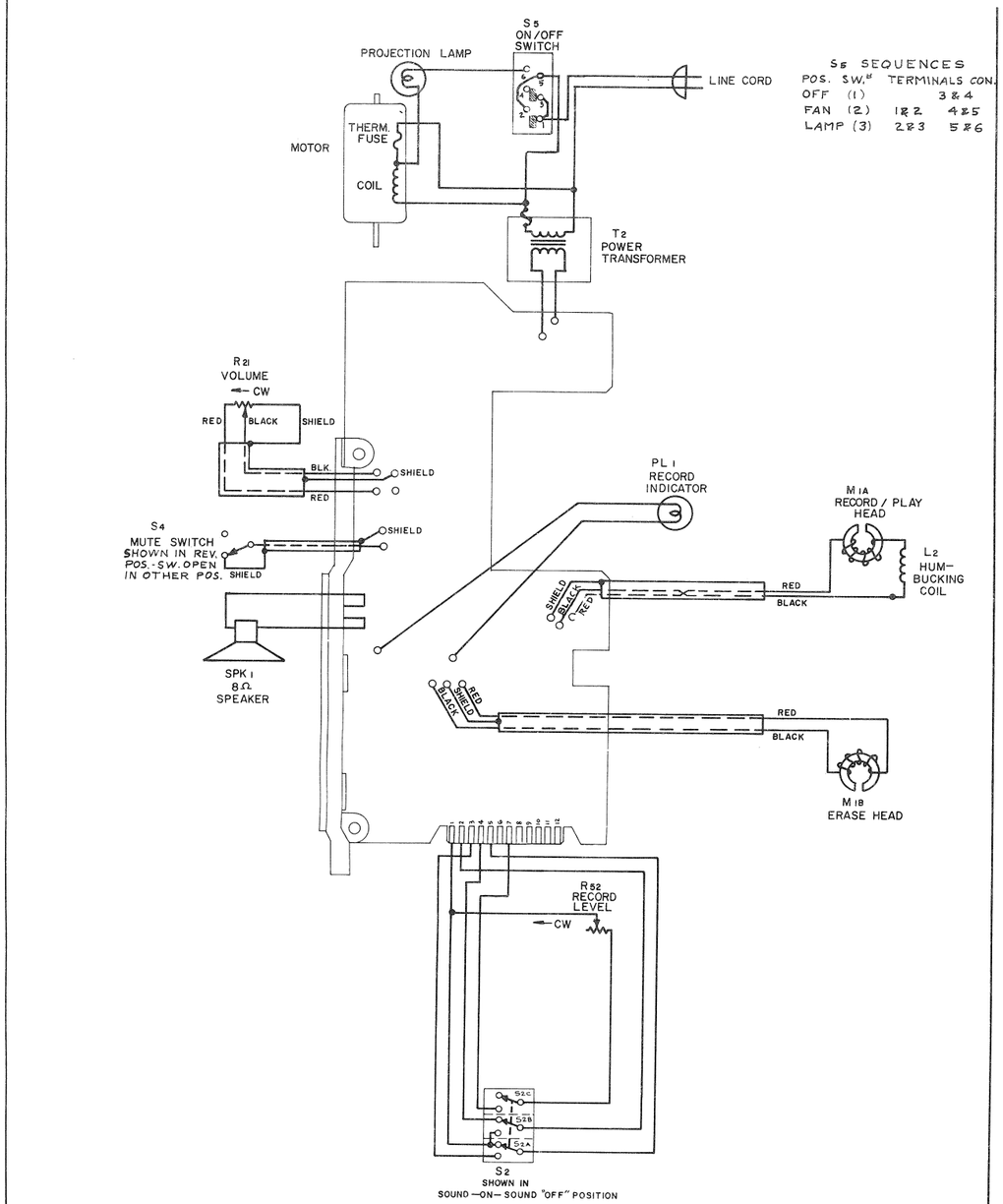


Figure 13. Design 1731/1733 Wiring Diagrams



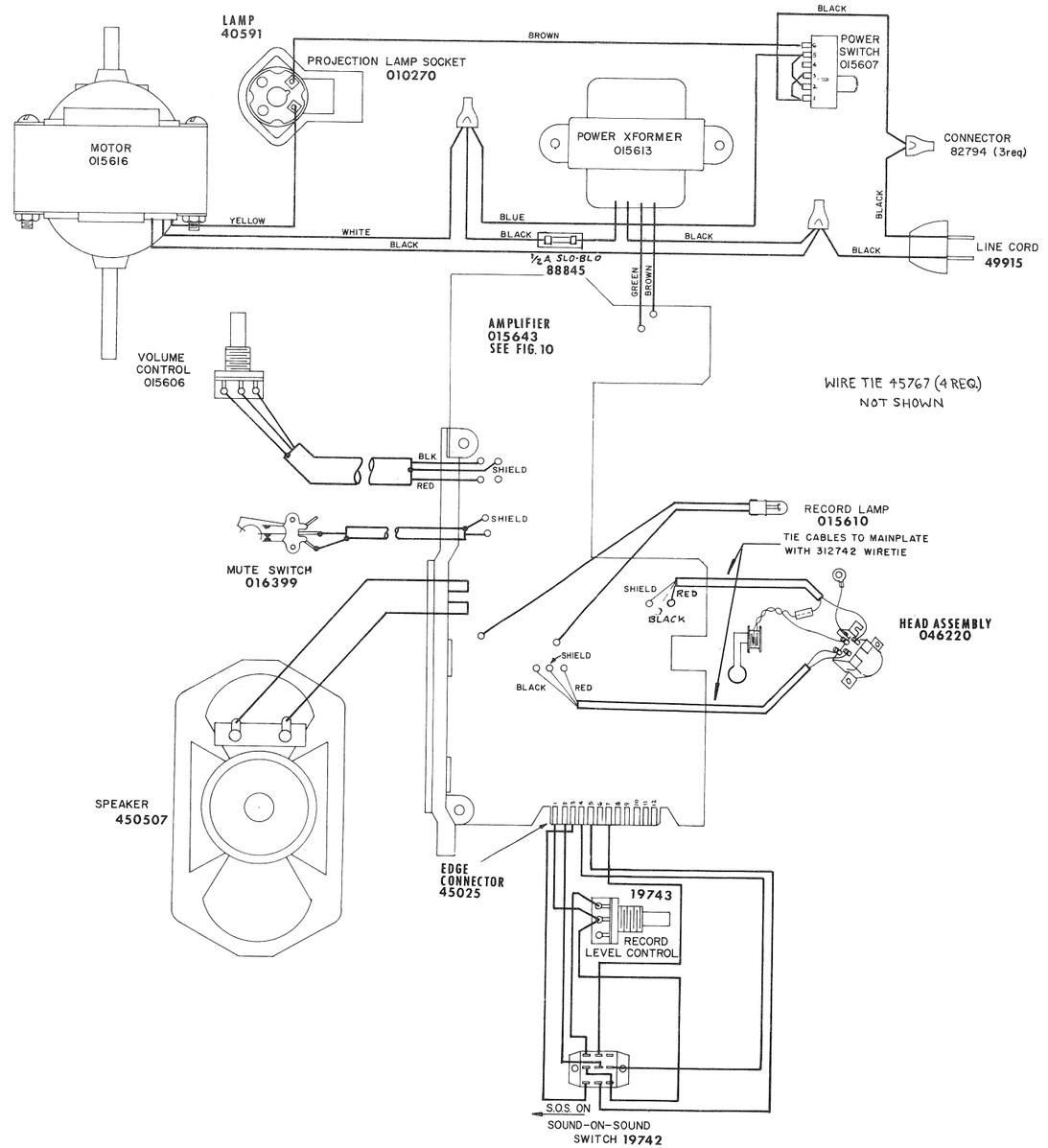
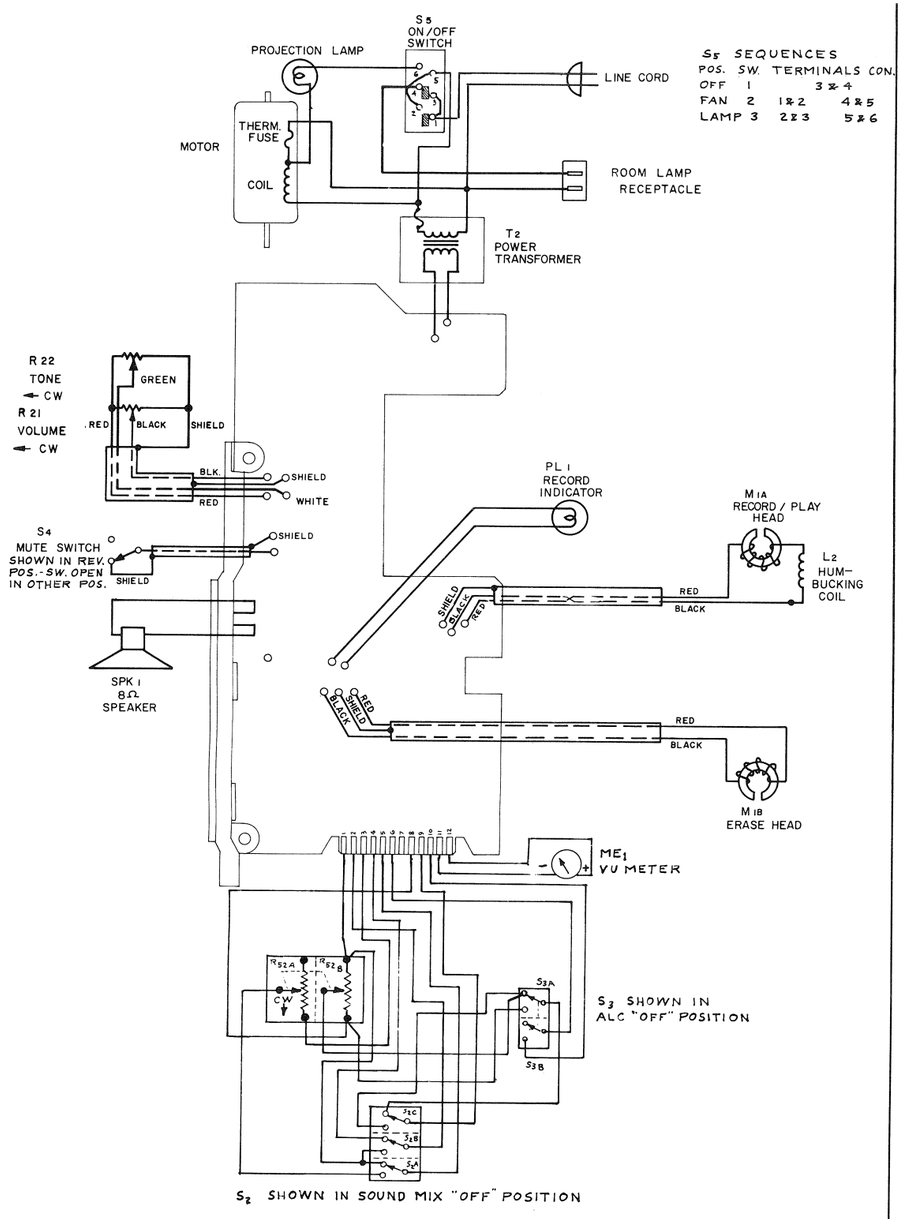


Figure 14. Design 1742 Projector Wiring Diagrams



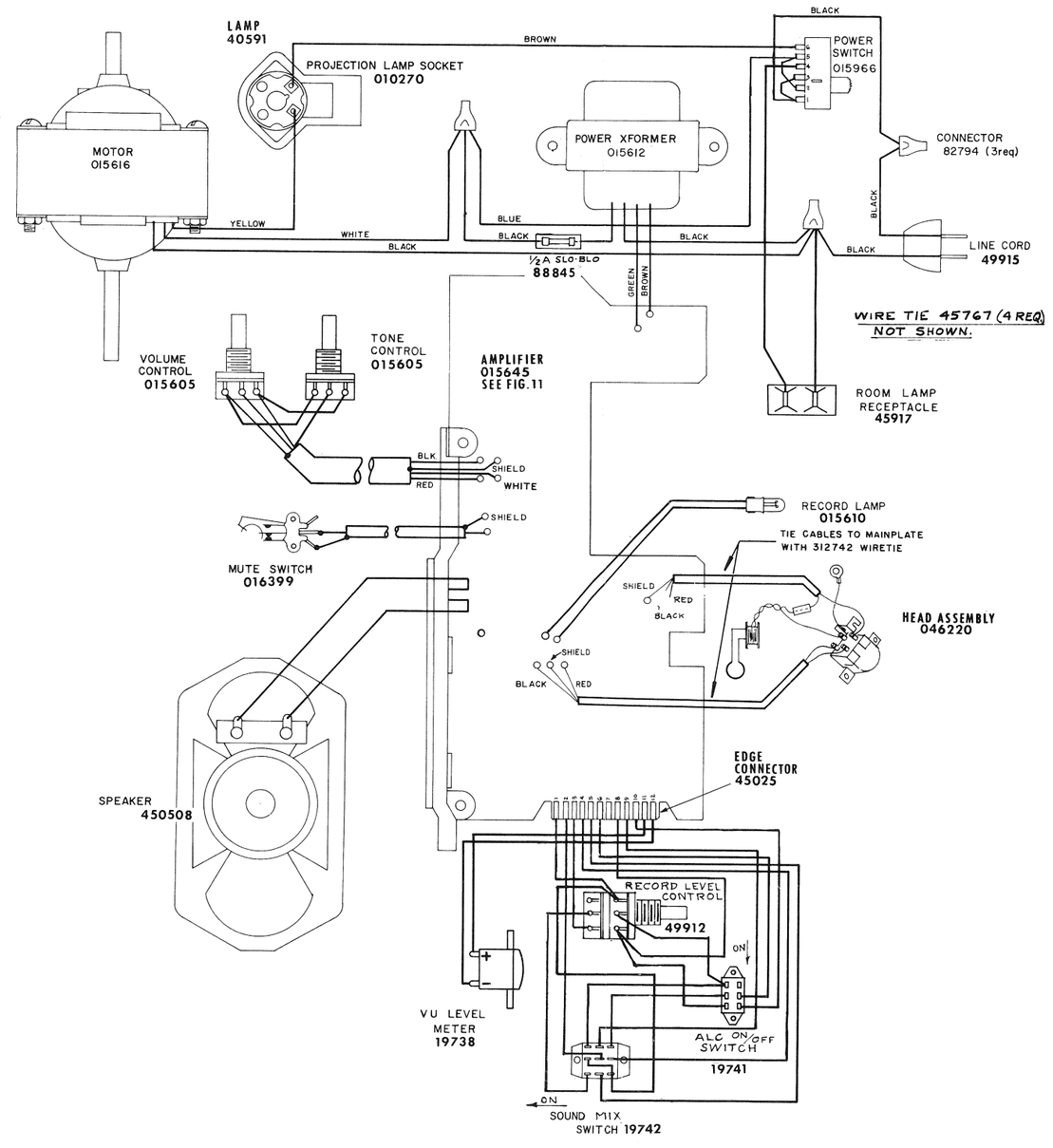
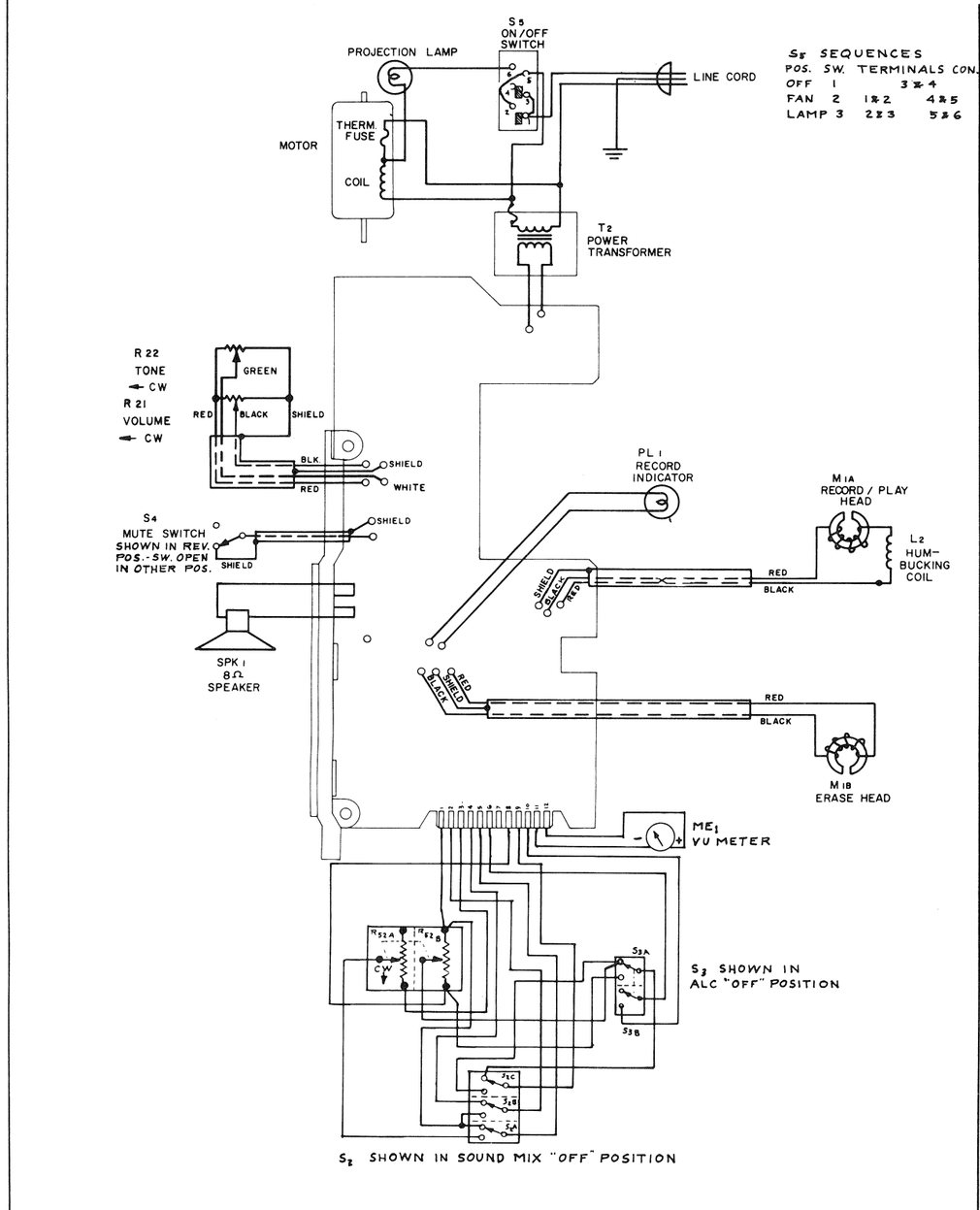


Figure 15. Design 1744 Projector Wiring Diagrams



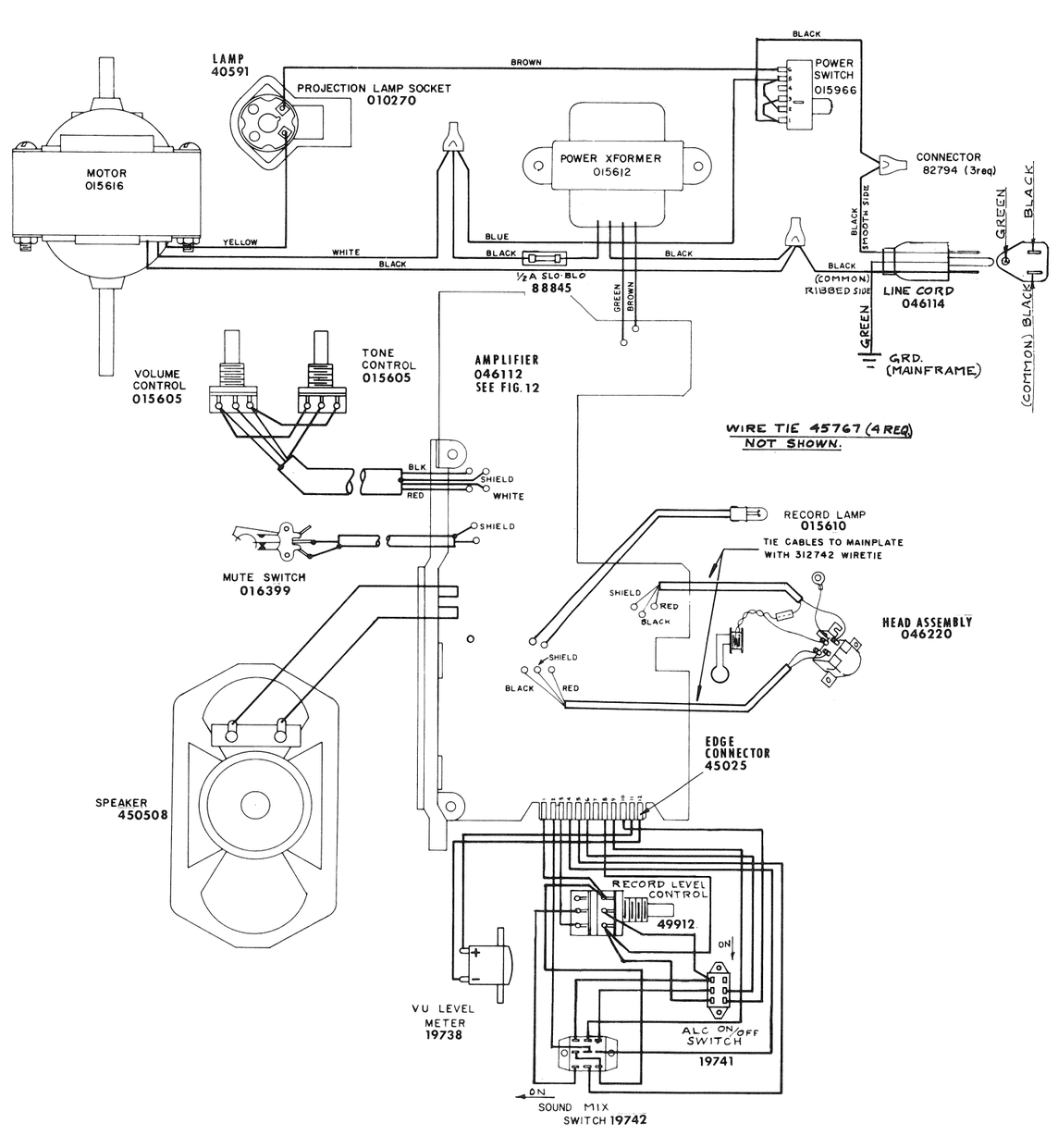


Figure 16. Design 1745 Projector Wiring Diagrams

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450347	1-1A
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