SERVICE INSTRUCTIONS

AUTOLOAD®
FILMOSOUND® 16mm PROJECTOR
(AUTOMATIC THREADING)

MODELS:

1585A, ML

1590A, B

1592A, B, C, H, BH

BELL & HOWELL

GENERAL SERVICE DEPT.
7100 McCORMICK ROAD
CHICAGO, ILLINOIS 60645

PART NO. 73583

PRINTED IN U.S.A.

REVISED
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RECOMMENDED SPARE PARTS LIST FOR

AUTOLOAD® FILMOSOUND® 16MM PROJECTOR MODEL 1592C

REFERENCE: SERVICE MANUAL NO. 73583 (REVISED JANUARY 1977)

THE FOLLOWING IS A RECOMMENDED SPARE PARTS LIST FOR REPAIR OF 50 PROJECTORS.

PART NO.	DESCRIPTION	QTY
17639	Ring, Retaining	12
21736	Ring, Retaining	12
24047	Belt, Take-up	12
30166	Screw, Binding head	24
30811	Screw, Hex washer head	12
31011	Bearing	6
31135	Spring	12
31237	Washer, Nylon	12
31239	Gear, Spur	12
31241	Clip, Retaining	12
31245	Ring, Retaining	12
31557	Shuttle	5
31561	Foot, Rubber	5
33385	Gear, Spur.	6
34766	Bar, Tilt	1
34878	Washer	12
34884	Lamp, Exciter	12
34889	Screw, Binding head	12
35814	Guard, Sprocket	5
35830	Spring	12
35846	Guide, Upper arm	3
35850	Guide, Lower arm	3
36013	Wiper, Felt	12
36014	Wick, Cam	12
36015	Spring	12
36018	Spring, Leaf	12
36038	Spring	12
36047	Follower, Cam	12
36064	Rail, Film guide	3
36065	Shaft, Cam	2
36083	Ring, Retaining	12
36769	Setscrew	24
36771	Setscrew	24
36999	Guard, Sprocket.	3
37293	Rail, Film tension	3
37302	Pawl, Locking	3
37302	Shaft, Locking pawl	2
41307	Cam, Pull down	3
44312	Key, Gear retaining	12
44370	Gear, Spur	3
44371	Gear, Spur	3

PART NO.	DESCRIPTION	QTY
44459	Belt, Drive	6
45682	Cover, Rear arm	2
45692	Capacitor, Start.	3
47431	Lamp, Projector (EKS-EMM).	12
49532	Shaft, Rear reel arm	3
49696	Cover, Front arm.	2
49945	Switch, Rotary	2
308638	Fuse	6
707073	Knob, Control	2
707110	Gear	3
707112	Gear, Clutch	3
707211	Spring, Tension	6
707281	Capacitor	2
707747	Speaker	2
708246	Screw, Hex washer head	12
765777	Ring, Retaining	12
99828	Ring, Retaining	12
09712	Bearing Assembly, Support.	2
09807	Knob, Tilt	2
09828	Contact Assembly, Exciter lamp	2
011214	Shaft and Link Assembly	2
011221	Lever and Pivot Assembly	2
011235	Bearing and Arm Assembly.	2
011236	In-Out Bracket Assembly	2
012132	Plate Assembly, Aperture	1
012133	Plate Assembly, Kick.	2
012134	Hub and Bracket Assembly	2
013946	Sprocket Assembly	2
014536	Sprocket Assembly, Upper	2
014558	Solenoid Assembly	1
014573	Switch Assembly, Animated	2
014575	Lampholder Assembly	2
014947	Gear and Bearing Assembly.	3
014949	Clutch Assembly, Take-up	3
015569	Photocell and Lite Pipe Assembly	1
015573	Motor Assembly.	1
015919	Clutch Assembly, Rewind.	3
016394	Clutch and Bearing Assembly.	3
016495	Motor	1
016530	P.C.B. Amplifier Assembly	2

FACTORY SERVICE RECEIVING ADDRESSES

CHICAGO

*Bell & Howell Company
General Service Department
2200 Brummel Place
Evanston, Illinois 60202
Area Code: 312-273-5820

NEW YORK

Bell & Howell Company
General Service Department
200 Smith Street
E. Farmingdale, L.I., New York 11735
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Bell & Howell Company
General Service Department
623 Rodier Drive
Glendale, California 91201
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*For parts orders and service information.

DALLAS

Bell & Howell Company
General Service Department
433 Regal Road
Dallas, Texas 75207
Area Code: 214-631-2550

ATLANTA

Bell & Howell Company
General Service Department
4801 Fulton Industrial Building
Atlanta, Georgia 30336
Area Code: 404-696-1162

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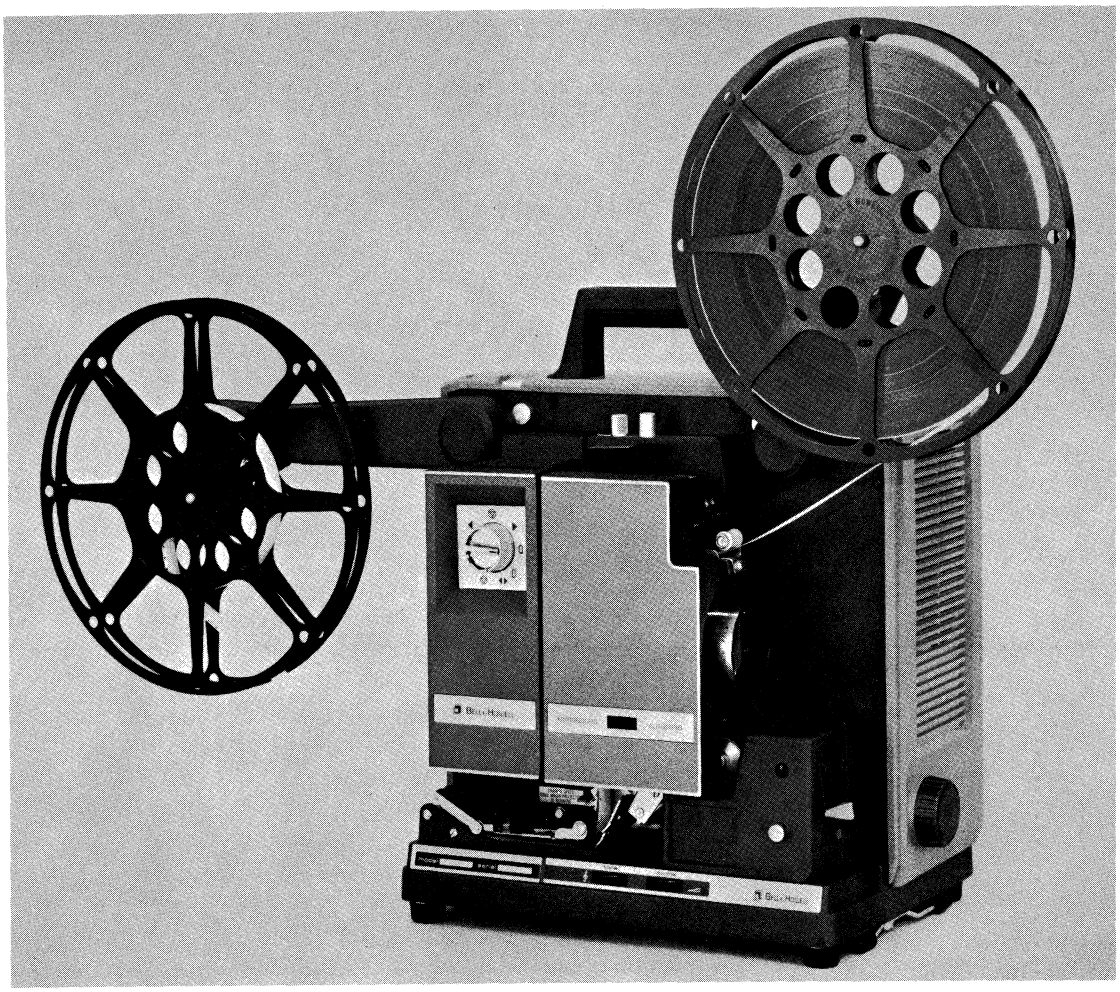


Design 1592 Autoload Filmosound Projector

FEATURE DESCRIPTION LIST

Operating Voltage (Domestic) 120VAC, 60Hz
Operating Voltage (Export) 120VAC, 50/60Hz

Film Threading . . . . . Fully automatic

Projector Control:
Models 1585 and 1590 . . . . . Forward and reverse projection only
Model 1592 . . . . . Forward, reverse and still projection with "Directamotion" control

Projection Lens (Standard) 2-inch f/1.4

Projection Lamp:
Models 1585 and 1592 . . . . . 25 hour, 250 watt P/N 47431
Model 1590 . . . . . 25 hour, 250 watt P/N 44223

Exciter Lamp . . . . . 4-volt Type BAK P/N 34884

Amplifier . . . . . Solid state with integrated circuit; output, 10 watts RMS

Total Power Consumption . . . . . 350 watts

Introduction

GENERAL.

This Service Manual has been prepared to assist in the repair and adjustment of Bell & Howell Autoload Filmosound Projectors, Design 1585, 1590 and 1592. Design specifications are listed in the Feature Description List on the preceding page. An illustrated Parts Catalog is included at the rear of the manual to identify replacement parts and to aid the serviceman in the disassembly and reassembly of the projector. Parts differences between models are indicated by the use of code letters in the "Usable on Code" column of the parts lists, with the coding system explained on page 2 of the Parts Catalog.

DESCRIPTION.

Nine projectors are covered in this Service Manual; 1585A, 1585ML, 1590A, 1590B, 1592A, 1592B, 1592H, 1592BH and 1592C. All of these projectors are mechanically similar except that the 1592 models are additionally equipped with the "still" picture control and animation feature (see following paragraph). The 1585A, 1585ML, 1590A, 1592A and 1592H models are most easily identified by their metal "snap-on" lamphouse (item 13, Parts Catalog Figure 1). The remaining models are equipped with a hinged plastic lamphouse (item 16, Parts Catalog Figure 1). Models 1592H and 1592BH are export models and are wired for 50/60Hz operation.

Only the 1592 models are equipped with the "still" picture control and animation feature. The step-by-step motion is accomplished by placing the "Run-Still" control knob in the "Still" position and the "Motor-Lamp" switch in either the "Forward-Lamp" or "Reverse-Lamp" position; then depressing the animation lever at the top of the mechanism housing. The film will advance frame by frame each time the lever is depressed and released. If the lever is held down, the frames will continue to advance in sequence (for the animation effect) until the lever is released.

These Filmosound projectors are completely gear driven, with shifting from forward to rewind accomplished by means of a rocker plate/idler gear arrangement. The autoload system consists of a series of guides, loopformers and rollers which, when the system is in the "load" position (closed), will guide the film through the threading path to the film take-up reel. When the system is in the "open" position, the guides and rollers clear the film path.

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

SPECIAL MAINTENANCE PRECAUTIONS.

NOTE: Special information regarding the newest Filmosound Autoload Projector (1592C) will be found on page 2A of these service instructions.

The removal and installation of most projector parts can be accomplished with tools normally available in photo equipment repair shops. A pencil-type soldering gun should be available for electrical repairs, and the Bristol wrenches listed in the following chart will also be required. Special tools and gages necessary for projector alignments and adjustments are illustrated and listed in Figure A and its accompanying chart.

BRISTOL SETSCREW WRENCHES REQUIRED FOR MAINTENANCE

Setscrew Size	No. of Flutes	B&H Part No.	
		Handle	Wrench
No. 4-40	6	G1271-F1	G1271-X2
No. 6-32	6	STK3852-B	STK3863-B
No. 8-32	6	G165-F1	G165-X2

NOTE: Wrench G165-F3 is needed to tighten setscrew in tool handles.

CLEANING.

All film path areas must be kept free from emulsion build-up, or film jamming will take place during the automatic threading operation. Use Toluol, and/or an orange stick to remove emulsion from the film path areas, being careful not to scratch the surfaces. Pay particular attention to the film path parts of the soundhead cover and soundhead.

Do not use trichloroethylene solvents to clean plastic parts. Use a naphtha base cleaning fluid and be sure that grease is NOT wiped off critical areas of lubrication. Do not use solvents on these critical areas, especially in the auto-threading linkage, since lubrication is applied during assembly and it would be difficult to replace without disassembling the linkage. Use a soft lint free cloth when necessary to remove any accumulation of dust or film chips.

During periodic maintenance of the projector, the transport mechanism should be removed and thoroughly cleaned. Brush or blow out all large

particles of dirt. Wash all moving parts except "Olite" bearings with any good petroleum solvent. Wash "Olite" bearings and the pull-down cams with naphtha. Wash the cam oilers in naphtha, and replace if not thoroughly cleaned by washing. Discard and replace the cam wiper and cam wiper wick. As soon as parts have been washed and dried, coat with a light film of the specified lubricant.

LUBRICATION.

The following Lubrication Chart lists those items which are to be lubricated during reassembly. Lubricants specified can be ordered from Bell & Howell by part number. Be careful not to over-lubricate. A drop or two of oil and a light film of grease (applied with a brush, if possible) will be adequate. Wipe away excess lubricant with a lint-free cloth.

Felt pads and wicks should be placed in a shallow pan of the specified grease or oil and allowed to stand until saturated. Permit the excess lubricant to drain away before installing these felt parts.

DRIVE BELT REPLACEMENT

Because of the compactness of design of these projectors, the drive belt is not easily accessible for replacement. To avoid extensive disassembly at the rear of the projector, the following procedure is recommended. Refer to Parts Catalog Figure 2.

a. Remove the rear cover (item 7, Figure 1) to expose the drive belt and associated components. Manually run the drive belt off of the large mechanism pulley and pull the free end of the belt from the belt shifter loop.

b. Remove the tie strips from around the wiring at both ends of the motor.

c. Loosen the screws in both motor bracket straps (28, Figure 3) and lift off the straps and stabilizer bracket (29) as a group.

d. Raise the motor just enough to permit the belt to be passed beneath the motor toward the transformer. Be very careful not to lift the motor so high as to damage the blower fan at the end of the motor shaft.

e. Disconnect the push-on connectors which connect the motor leads to the starting capacitor (item 7C, Figure 2) and remove the crimp-type solderless connector which joins the grey-yellow motor lead to the three white leads. The belt can now be removed from the projector.

f. Install the new belt by reversing the above order of removal. Replace the crimp-type solderless connector with a screw-on type connector and, when securing the motor with the motor bracket straps, make sure that the motor grounding strap (left end of motor) bears on the motor mounting bracket (28, Figure 3).

LUBRICATION CHART

Parts to be Lubricated	Lubricant
Machined surfaces (non-bearing) of all castings	Oil (P/N 070003)
Sprocket shafts (17 and 19, Figure 10)	Oil (P/N 08963)
Framer shaft (26, Figure 12) and bearing face of worm gear (24, Figure 13)	Oil (P/N 04978)
Felt oil pads in cams, and sliding parts (friction surfaces) not otherwise specified	Oil (P/N 070032)
The following items are to be greased sparingly:	
Teeth of all nylon gears	Grease (P/N 070034)
Friction surface of lamp release ring (18, Figure 9)	
Reel arm lock butttons (30, Figure 4)	
Tilt rack and pinions (Figure 6)	

Parts to be Lubricated	Lubricant
The following items are to be greased sparingly:	
Meshing gears in reel arms (Figures 7 and 8)	Grease (P/N 070034)
Loop restorer shaft (58, Figure 11)	
Self-centering assembly (63, Figure 11)	
Cam wiper and wick (14 and 15, Figure 12)	
Shuttle link bearings (17A, Figure 12)	
In-out cam and cam follower (21A, Figure 12)	
Mechanism housing (31, Figure 13); film guide pivot posts, sprocket shaft bearings and camshaft bearings	
Pinion teeth of focus knob 5M, Figure 10)	

SPECIAL INFORMATION

FOR

MODEL 1592C

GENERAL.

The Model 1592C is the newest of the Filmosound Autoload Projectors. It incorporates all of the features of the projectors in the 1592 series and, in addition, includes the newest design features and more efficient and trouble-free operation.

Electrical repairs have been simplified by the use of quick disconnects between the wiring harness and the major electrical components. Wiring connections for the Model 1592C are shown in Figures 17 and 17A of the Parts Catalog.

To improve film rewind consistency, a new reverse take-up clutch system has been incorporated into the Model 1592C. These new parts are shown in the center inset of Parts Catalog Figure 4, and instructions for their installation are covered in a following paragraph.

A second design improvement is the addition of an Autoload stop assembly (P/N 015762). The stop assembly is screw-mounted to the projector base directly in front of the autoload threading arm, P/N 48939 (Parts Catalog Figure 11, item 4). This stop, when properly installed, will prevent jamming of the Autoload system which sometimes results from placing excessive force on the Autoload threading arm while setting the system. Instructions for installing and adjusting the stop assembly are covered in a following paragraph.

NOTE: The Autoload stop feature can be incorporated into all 1500-series projectors. Instructions for this modification are contained in Branch Service & Repair Bulletin #240.

INSTALLING REVERSE CLUTCH PARTS (Parts Catalog Figure 4).

a. Assemble the gear retaining key (20) into the slot of the front reel arm shaft. Assemble the rewind gear (19B) to the shaft so that the square recess in the inner face of the gear overlaps the key. Lightly grease (B&H Spec. 1945) the entire length of the protruding end of the rewind gear.

b. Note the two pin-like bosses on one face of the clutch gear (19A). These bosses must face out (away from the mainplate) when the clutch gear is installed on the shaft. Press the clutch gear back to mate with the rewind gear.

c. Hold the bearing assembly (18A) so that the torsion spring is toward the clutch gear. The left leg (or uppermost leg, as the case may be) must be positioned between the two bosses of the clutch gear when the bearing assembly is installed. Press the bearing assembly back until its recess fits over the hub of the clutch gear. Assemble the retaining ring (15) into the groove in the end of the front reel arm shaft.

INSTALLING AND ADJUSTING THE AUTOLOAD STOP ASSEMBLY. A 3/16-inch nut driver with an overall length of 11 inches or more is required in order to clear the mechanism when installing the stop assembly mounting screw. The index numbers in the following paragraphs are keyed to Parts Catalog Figure 11.

a. Unlock the Autoload system by pressing the Autoload lever assembly (11) to the left. Open the lens carriage.

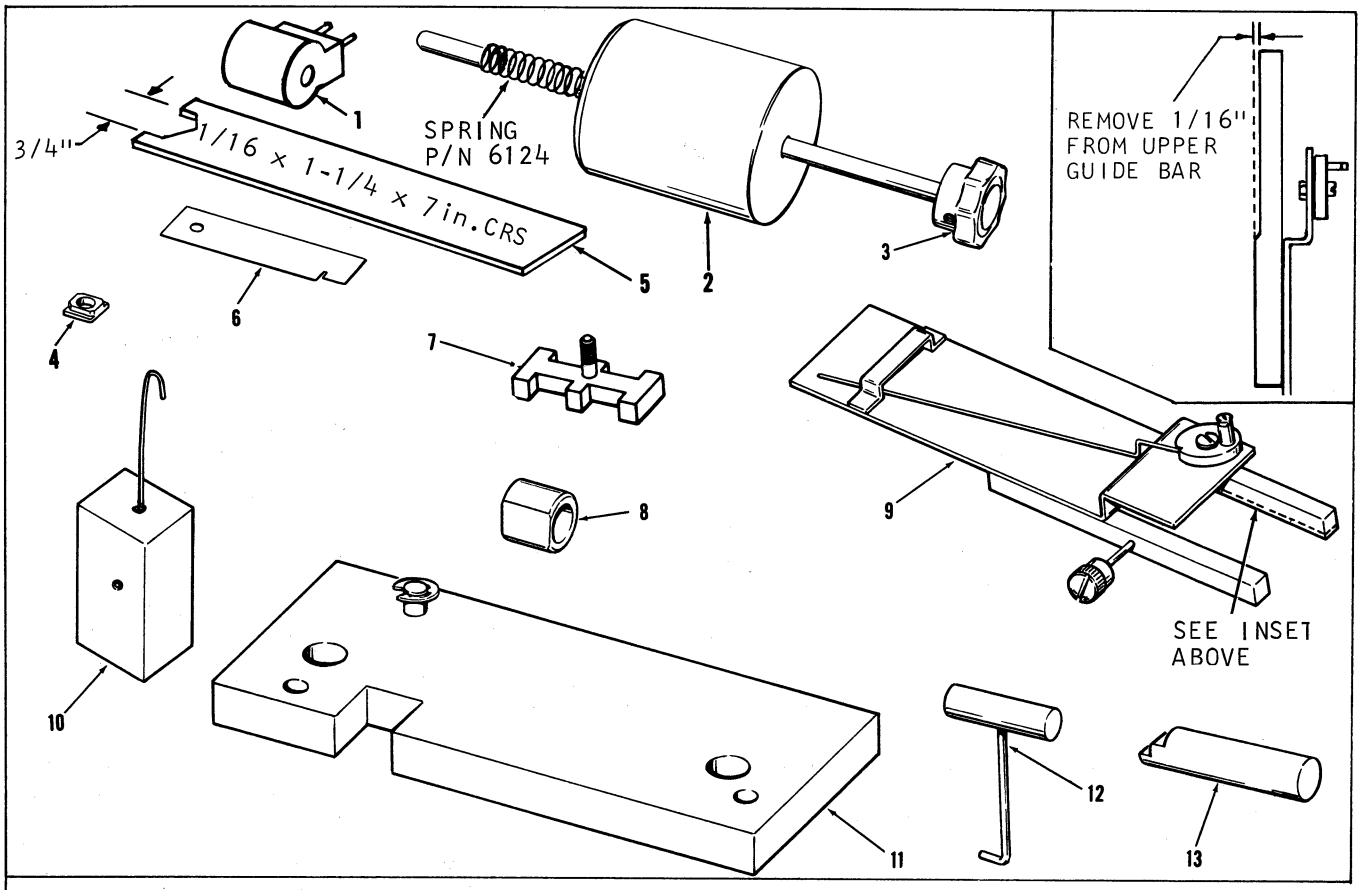
b. Position the stop assembly over the hole and boss below the threading arm (4) and install, but do not tighten, the lever stop screw (P/N 49986).

c. Engage and lock the Autoload system by pressing the threading arm (4) to the right until it is in the locked position; then rotate the stop assembly until the stop pin is touching the right side of the threading arm.

d. Insert a No. 68 drill (0.031 inch) between the threading arm and the stop pin. Hold the arm so that it cannot move to the left and position the stop assembly so that the pin is contacting the drill.

e. Hold the stop assembly firmly to retain this position, and release the Autoload system. Tighten the stop screw, taking care not to move the stop assembly from its adjusted position.

f. Lock and unlock the system several times to make certain that it locks each time. If the system fails to lock consistently, recheck the spacing with the No. 68 drill. Readjust spacing if necessary.



INDEX NO.	TOOL NO.	TOOL NAME	USE
1	SER-1552-1-N1	Lamp Plug	Alignment of optical system (Figure E)
2	SER-550-2-N1	Lens Plug	
3	SER-550-2-N2	Alignment Rod	
4	SER-550-2-N3	Aperture Plug	
5	Make in Shop	Torque Wrench	Adjust rewind torque (check torque with Chatillon #LP-72 (0 to 72 oz.) push-pull scale, Master Gauge Co., Chicago 60622)
6	SER-550-5-N2	Stroke Gage	Measure shuttle stroke (Figure F)
7	S-09701-35N2	Shuttle Height Gage	Check shuttle protrusion (Figure G)
8	SER-552-2-N1	Restorer Positioning Tool	Adjusting the loop restorer (Figure R)
9	SER-552-4-N1	Shuttle Tension Gage	Adjusting shuttle tension (Figure H)
10	SER-552-4-N2	Weight for Shuttle Tension Gage	Adjusting shuttle tension (Figure H)
11	SER-552-1-N1	Timing and Alignment Plate	Timing the sprockets (Figure R)
12	SER-552-5-N1	Soundhead Locating Gage	Positioning the soundhead (Figure M)
13	SER-550-8-N1	Alignment Tool	Aligning sound drum and photocell (Figure L)
	SER-550-5-N1	Shuttle Stroke Target	Measuring shuttle stroke (Figure J)

Figure A. Special Service Tools

Disassembly Procedure

1. GENERAL PRECAUTIONS.

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

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

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

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

2. REMOVAL OF COVERS (Figure 1). Remove the parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Unlatch and remove the front cover assembly (1). If latches are to be replaced, the rivets (1B) must be carefully drilled out.

NOTE: All projectors beginning with Serial No. 5290001 are equipped with the current front cover assembly and top cover assembly (item 9) which feature the new latching components. The current cover assemblies are not interchangeable with the earlier covers.

b. The rear cover (7) is secured by seven screws (6) and (6A), three along the bottom edge and two at each side. Use a thin-wall socket wrench to remove these screws, grinding it down if necessary, so that it can fully engage the screw heads.

c. Remove two screws (8) near the top of the mainplate to free the top cover assembly (9). Remove the four screws (9A) and disassemble the carrying handle (9B) and brackets (9C) from the cover. Note the difference in latching parts (9D through 9F) between early and current models.

d. 1590A, 1592A and 1592H Models Only. Swing open the mechanism cover assembly (11). Press down on the spring (11D) and lift straight up to remove the cover. The cover latch (11B), hinge bar (11C) and spring (11D) are secured to the cover with screws (11A).

e. 1585A, 1585ML, 1590A, 1592A and 1592 Models Only. Remove the lamphouse assembly (13) by pulling it straight out from the projector mainplate. If the latch (13D) is to be replaced, the rivet (13A) must be drilled out.

f. 1590B 1592B and 1592BH Models Only. Remove the three screws (15) that secure the lamphouse assembly (16) to the mainplate. The air deflector (17) is also secured by the lower screw. Note the manner in which the lower end of the Still/Run lever (1592B and 1592BH models only) engages the pin on the crank lever (item 11E, Figure 2). No special instructions are necessary for disassembling the lamphouse components.

3. REMOVAL OF END CAPS AND LAMP (Figure 2). Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Loosen the setscrew (1) and disassemble the tilt knob assembly (2) from the tilt shaft.

b. Replacement of the speaker (6B), starting capacitor (7C) and receptacle (7F) can be accomplished without disassembling the end caps (6) and (7) from the projector. However, if the end caps are damaged and in need of replacement, proceed as follows: Tilt the projector so that the four screws (3) and one spacer (3A) which secure the end caps (6) and (7) to the base can be removed. Then set the projector upright and remove the remaining four screws (4) which are inserted through the front side of the mainplate. Be careful not to lose the speed nuts (5) assembled to the mounting bosses of the end caps.

c. Note that 1585A, 1585ML and 1590A projectors are equipped with a single control knob (11), whereas the 1592A and 1592H models require two knobs (11A) and (11B). The 1590B, 1592B and 1592BH models use a single knob (11C) for "Fwd-Rev-Lamp" control plus a crank lever (11E) to provide for the "Still/Run" control operation.

d. To remove the projection lamp (12), press down the lamp retaining spring and pull the lamp straight out from its socket. Do not rock or twist the lamp during removal, or the lamp pins may be damaged. The lamp shield (14) and lampholder (15) are secured to the mainplate with two screws (13).

4. REMOVAL OF ELECTRICAL PARTS (Figure 3). Before removing electrical components, note the manner in which the leadwires are routed and tied. The pictorial wiring diagrams at the rear of the Parts Catalog will assist in the proper reconnection of leadwires.

a. 1585 and 1592 Models Only. If only the power transformer (4) is to be replaced, remove the two hex nuts (1), screws (2) and lockwashers (3) at the upper ends of the brackets (7) and (8). Export models also require spacers (3A) which are located between the right-hand bracket (8) and the transformer. If the lamp transformer (10E) is to be replaced, the entire transformer group (items 1 through 10) must be removed from the base. In order to gain access to the two screws (9A), the amplifier cover (item 16, Figure 6) must also be removed.

b. 1590A and 1590B Models Only. These projectors are equipped with only a power transformer (14) which is secured to the base with four screws (13). The mounting brackets (14C) and (14D) can be replaced by drilling out the rivets (14A). However, if the transformer itself is faulty, replace the complete transformer and bracket assembly (14).

c. The drive motor and blower components must be removed as a unit to permit belt replacement or motor and blower repairs. This is accomplished by removing the four motor mounting screws (15) and the four blower housing screws (16). If the drive belt (23) is in need of replacement, it can be cut with a sharp knife. If the belt is in good condition, slip it edgewise down between the mechanism pulley and the casting. Lift the assembled motor and blower from the base. Remove three screws (17) and disassemble the fan housing (19) from the housing cover (22). Loosen the setscrew (20) and disassemble the fan and hub assembly (21) and cover (22) from the motor shaft.

d. Loosen the screws in the top ears of the motor clamps (28) and disassemble the clamps and mounting brackets (30) from the motor end bells. Note the difference in motor clamp brackets (29) as used in earlier models and in the more current designs, as well as the addition of the coil-like thermal fuse (29A).

e. 1592 Models Only. Remove the two screws (33) and disassemble the animation switch and bracket assembly (34) and rotary switch and bracket assembly (35) from the projector mainplate. Disassemble as necessary, for repair or parts replacement.

f. 1585 and 1590 Models Only. Remove the two screws (36) which secure the switch bracket (37) to the mainplate and disassemble the nut (38), lockwasher (38A) and rotary switch (39) from the bracket. Remove the screw (40) and the fuseholder (41).

NOTE: The switch bracket (37) has been discontinued on 1585A and 1590 models, with the rotary switch (39) mounted directly against the mainplate.

g. 1592 Models Only. The solenoid (48A) can be removed by loosening the setscrew (42) in the lower collar (43) and withdrawing the collar from the solenoid actuating rod; then removing the three screws (44) which are inserted through the rubber bushings (46). Be careful not to lose the three spacer washers (45) located behind the solenoid mounting plate (48B). Remove the two screws (47) and separate the solenoid (48A) from the plate (48B).

5. REMOVAL OF GEARS, REEL ARMS AND SOUNDHEAD (Figure 4). Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. To remove the rear reel arm assembly (29) for repair or replacement, disassemble the retaining ring (1), washer (3), spur gear (4) and a second retaining ring (1) from the end of the reel arm shaft. Note the manner in which the reel arm disc (27) is positioned before disassembling the screws (26) and disc (27) from the mainplate; then carefully withdraw the reel arm assembly, catching the lock button (30) and spring (31) as they pop free.

NOTE: The only difference between the early and current rear reel arm assembly is the discontinuance of the 1000-foot reel (horizontal) detent position from the current design. This change affects the arm and bearing assembly (item 32, Figure 8).

b. To remove the front reel arm assembly (28) for repair or replacement, disassemble the gear and clutch parts (15) through (20) from the end of the reel arm shaft. Note the manner in which the reel arm disc (27) is positioned before disassembling the screws (26) and disc (27) from the mainplate. Carefully withdraw the reel arm assembly, catching the lock button (30) and spring (31) as they pop free.

c. To remove the soundhead assembly (40) for repair or replacement, it first is necessary to remove the amplifier cover (item 16, Figure 6) so that the soundhead leads can be unsoldered from the edge connector terminals (refer to appropriate wiring diagram). Assuming that the transformer assembly has already been removed (paragraph 4), refer to Figure 4 and disassemble the retaining ring (32), flywheel (35) and washers (33) and (34) from the end of the sound drum shaft. Then remove three screws (36) and washers (37) and carefully lift the soundhead assembly from the mainplate.

d. No special instructions are required for removal of the drive gearing in Figure 4 except to note in which direction the gear hubs are facing. Inspect all gears for chipped or broken teeth and replace if necessary. Clean and re-lubricate all reusable gears.

6. REMOVAL OF RUN-STILL LINKAGE AND MECHANISM ASSEMBLY (Figure 5). Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

NOTE: The disassembly procedures in steps a through d, following apply only to the 1592 model projectors. Steps e and f apply to all models.

a. Loosen the setscrews (1) in the collars (2); then disengage the lower end of the still-run rod (4) from the pivoting link assembly (18) and disassemble the rod, collars and spring (3) from the stop pawl.

b. Loosen the setscrew (5) and remove the collar (6) and spring (7) from the lower end of the fire shutter rod. Disengage the upper end of the rod from the fire shutter and remove the rod (8).

c. Remove the retaining rings (9) and disassemble the still-run arm (10) and switch shaft tube (11) from the mainplate.

d. Remove the two shoulder screws (12) and lift the sliding link assembly (13) and the two spacers (14) from the mainplate. Remove the pivot screw (15) and disassemble the pivoting link assembly (18), spacer (19), torsion spring (20) and flat washer (21) from the mainplate.

e. Remove two retaining rings (22) and lift out the torsion spring (23). Remove the shoulder studs (24), belt shifter bracket (25) and the spacers (26).

f. Hold the mechanism assembly (29) securely while removing the four screws (27) and the idler gear adjustment bracket (28). Carefully withdraw the mechanism assembly from the mainplate.

7. REMOVAL OF BASE COMPONENTS (Figure 6). Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Remove the retaining ring (1) from the inner end of the shaft to which the roller (8) is mounted and disengage that end of the snubber spring. Disassemble the retaining ring (2), flat washer (3) and spring (4) from the top of the spring post (6).

b. Remove the adapter shaft (7) and lift out the film guide roller (8). Remove the screw (9) and lift the sliding film guide assembly (10) from the flanges on the base. Disassemble, if necessary, for replacement of damaged parts.

c. To expose the amplifier assembly (20) and edge connector assembly (18), remove the five screws (15) amd the cover (16). Remove the four screws (17) and (19) and lift out both assemblies. When separating the edge connector from the amplifier pull them straight apart without wriggling or twisting them and thus distorting the pins. Note the spacers (21) located beneath the amplifier.

d. Remove the four screws (22) and the cover (23) to expose the volume and tone control assembly (25). Four screws (24) secure the control assembly into the base.

e. Remove the screw (26) and lockwasher (27) and disassemble the tilt bar (28) from the lower end of the tilt gear rack (39). Remove two screws (37) and disassemble the adapter (38) and gear rack (39) from the base. Remove the retaining ring (40) and lift out the tilt gearshaft (41) and spring tension washer (42). Drive out the spring pin (43) and lift out the tilt worm gear (44).

8. DISASSEMBLING THE FRONT REEL ARM (Figure 7). Disassemble the front reel arm in the following manner, noting any special precautions.

a. Remove the two screws (1) and lift the reel arm cover (2) from the front arm (22). Note the shim washers (3) located between the cover and reel arm mounting bosses.

b. Remove the screw (4) and disassemble the feed spindle assembly (5) and shim washer (6) from the front reel arm. If spindle parts are damaged, remove the retaining ring (5A), loosen the setscrews (5B) and remove the gear (5C) and washer (5D) from the spindle (5E).

c. Remove the retaining ring (7) from the spring post in the reel arm to free the end of the torsion spring (10). Loosen the setscrews (8) and (8A) and lift the gear (9) and torsion spring (10) from the reel arm shaft (14). If damaged, disassemble the plastic sleeve (9A) from the gear hub.

d. Remove the two retaining rings (11) and disassemble the reel arm shaft (14) and washers (12) and (13) from the reel arm.

e. Remove the retaining ring (15) and withdraw the upper spur gear (16) from the gearshaft (20). Remove the two gear retaining clips (17), the washer (18) and the lower spur gear (19) and slide the gearshaft (20) from the bearing posts of the reel arm. Inspect the nylon bearings (21) and, if damaged, press them from the bearing posts.

9. DISASSEMBLING THE REAR REEL ARM (Figure 8). Disassemble the rear reel arm in the following manner, noting any special precautions.

a. Remove the two screws (1) and lift the reel arm cover (2) from the rear arm (32). Note the shim washers (3) located between the cover and the reel arm mounting bosses.

b. Press the take-up arm against the reel arm casting and slip the take-up belt (4) from the pulleys. Release the take-up arm slowly and catch the tension spring (5) as it drops free. Remove the screw (6) and disassemble the take-up spindle and pulley assembly (7) and shim washer (8) from the take-up arm. The take-up arm and rear reel arm are replaceable only as an assembly (32).

c. Remove the retaining ring (10) and large flat washer (11) from the end of the gearshaft (16). Remove the rubber sleeve (12) from the hub of the gear (14). Loosen the gear setscrew (13) and disassemble the gear (14), the shim washer (15) and the gearshaft (16) from the reel arm.

d. Remove the retaining ring (17) from the spring post in the reel arm to free the end of the torsion spring (18) and lift the torsion spring from the hub of the upper face gear (27).

e. Remove the retaining ring (19) and slide the upper spur gear (20) toward the upper face gear (27) until the upper gear retaining clip (21) can be removed. Move the gearshaft (24) down until the upper spur gear (20) and washer (23) can be removed. Remove the lower gear retaining clip (21) and lower spur gear (22), and slide the gearshaft (24) from the bearing posts of the reel arm. Inspect the nylon bearings (25) and, if damaged, press them from the bearing posts.

f. Loosen the setscrew (26) and lift the upper face gear (27) from the reel arm shaft (31). Remove the two retaining rings (28) and disassemble the reel arm shaft (31) and washers (29) and (30) from the reel arm.

10. DISASSEMBLING THE EXCITER LAMP COVER AND SOUNDHEAD (Figure 9). Disassemble the exciter lamp cover and soundhead assembly in the following manner, noting any special precautions.

a. Inspect exciter lamp cover parts (1 through 7) and disassemble only as necessary for replacement.

b. Make a careful note of leadwire connections before disconnecting or unsoldering leads during disassembly of the soundhead. Remove the exciter lamp (8), wipe off fingerprints, and wrap the lamp in tissue paper.

c. Do not loosen the clamping screw (10) or disturb the lateral position of the optical slit assembly (11) unless it has been determined that the optical slit is in need of replacement or adjustment.

d. Unhook and remove the stabilizer arm spring (12). Remove the retaining ring (13) and disassemble the roller adjusting screw (14) and complete stabilizer arm assembly (15) from the soundhead casting. Remove the two screws (15A) and washers (15B) and disassemble the rollers (15C) and (15D) from the stabilizer arm roller shafts. The removal of screws (15E) will free the torsion spring (15G) and stabilizer arms (15F), (15H) and (15J).

e. Remove two screws (16) and disassemble the lamp contact assembly (17) and lamp release ring (18) from the soundhead casting.

f. Loosen the setscrew (19) which bears against the light pipe and photocell retainer (22). Then remove the two screws (20), and carefully withdraw the sound drum assembly (21), retainer (22) and photocell assembly (23) as a group from the soundhead casting. Wrap the sound drum and photocell in tissue paper to protect them from damage. Do not remove the edge guide screw (24).

g. To remove the stabilizer tension adjuster, remove the retaining ring (25) from the adjuster (27), and unscrew the adjuster from the tapped hole in the spring retainer (28). Be careful not to lose the friction washer (26) located at the lower end of the adjuster.

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

a. To remove the lens carrier assembly (5), pry out the hinge pins (1) and (2) with a wire cutter or similar tool and lift the lens carrier from the mechanism. Note that the spring washer (3) is used with the upper pin and the flat washer (4) with the lower pin. To disassemble the lens carrier, remove the two screws (5A) and remove the pressure plate (5B), bushings (5C) and (5D), springs (5E) and pressure plate lever (5F). The adjustment plate (5H) need not be removed. Pry up the nameplate (5J) with a knife blade. Remove two screws (5K) and disassemble the spring (5L) and the knob and pinion assembly (5M) from the lens carrier (5N).

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

c. Loosen two setscrews (11) in each sprocket gear (12) and (13) and remove the gears and spring tension washers (14) from the sprocket shafts. Remove two screws (15) and the upper sprocket guard assembly (16), and withdraw the upper sprocket assembly (17) and its thrust washer (18) from the mechanism housing. Disassemble the lower sprocket assembly (19), flange (20) and thrust washer (21) from the mechanism housing.

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

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

f. 1592 Models Only. Loosen the setscrew (34) and disassemble the animation switch lever assembly (35) and switch lever crank (37) from the mechanism housing. Note: in Models 1585 and 1590, the crank opening in the housing is sealed with a plug (38).

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

a. Remove the three screws (1) and flanged rollers (2). Note the manner in which the torsion spring (5) is installed. Remove the retaining ring (3) and withdraw the threading arm (4) and torsion spring (5) from the mounting posts of the guard mounting plates.

b. Note the manner in which the legs of the torsion spring (14) are engaged. Remove the screw (6), idler roller (7), roller stud (8), locking lever eccentric (9), torsion spring (10) and autothread lever assembly (11).

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

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

e. Loosen the locking screw (27) and disassemble the threading lever assembly (28) from the rear shaft end of the loopformer (31). Remove the retaining ring (30) and withdraw the upper loopformer assembly (31). Remove the connecting link and stud assembly (35).

f. The hex head screw (36) is used to adjust the lens carrier and should not be disturbed. Do not remove the lens carrier catch (38) unless damaged and in need of replacement.

g. Remove two screws (40) and the upper guard mounting plate assembly (41). Note the manner in which the legs of the torsion spring (44) are engaged. Loosen two setscrews (42) and disassemble the shaft and link assembly (43), torsion spring (44), flat washer (45) and the loopformer and lock pawl assembly (46) from the mechanism housing. Do not disassemble the loopformer and lock pawl assembly unless parts are damaged and obviously in need of replacement.

h. Remove the screw (49) and flat washer (50) and disengage and remove the tension spring (51). Remove the screw (52) and flat washer (53) and lift out the cam follower and support assembly (54). Do not disassemble unless parts are damaged and in need of replacement. Loosen the hex head locking screw (55) and disassemble the arm assembly (56), flat washer (57) and the lever and shaft assembly (58) from the mechanism housing.

i. Remove the two screws (60), lock washers (61) and flat washers (62) which secure the self-centering assembly (63) to the mechanism housing. The self-centering device is furnished only as an assembly.

j. Remove screws (64) and the aperture plate assembly (65). Refer to paragraph 15 for aperture plate disassembly instructions.

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

a. Loosen the two setscrews (1) and withdraw the mechanism pulley (2) from the end of the camshaft. Remove four screws (3) and lift off the support bracket (4), used on 1585 and 1590 models, or the fire shutter assembly (4), used on 1592 model projectors. Disassemble the fire shutter only if parts are damaged and in need of replacement.

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

c. Unless obviously in need of replacement, do not disassemble the ball and stud assemblies (12) or the shuttle link bearing (17A) from the shuttle arms (17). Inspect the pull-down cam follower (17B) for wear. The cam follower is staked in place in the recess of the shuttle arm and can be reversed or turned end-for-end if badly worn. Unhook the extension spring (13) from the end of each shuttle arm and remove the felt wiper (14) and shuttle arms. The cam wiper wick (15) is inserted within the coils of the spring (13). If the wiper and wick appear especially dirty, discard them.

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

e. Pull out the stop pin (25) and unscrew the framer knob and shaft (26) from the mechanism housing. Remove the screw (27), the in-out spring (28) and the shuttle retractor pin (29).

f. 1592 Models Only. Remove the two retaining rings (30) and disassemble the stop pawl shaft (31) and stop pawl (32). Remove the screws (33) and (35) and disassemble the bearing bracket (34) and stop

pawl shaft bracket (36) from the mechanism housing. Inspect the grommets (37) and, if damaged, press them from the bracket (36).

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

a. 1592 Models Only. Remove the round nut (1) and washer (2) and disassemble the shuttle adjustment bracket (3) from the animated clutch bracket assembly. Remove the screws (4) and (5) and lock washers (6) and lift the animated clutch bracket assembly (7) from the mechanism housing. If the bracket assembly parts are in need of replacement, proceed as follows. Remove the three retaining rings (7B) and slide the shaft (7C) from the clutch mounting bracket (7L), removing the slide bumper (7D), washer (7E), spring (7F) and clutch slide bar assembly (7G) from the shaft as it is withdrawn. Remove the screw (7H) and washer (7J) to free the strike (7K) from the clutch slide bar.

b. 1585 and 1590 Models Only. Remove the two retaining rings (8) and (28), the two screws (9) and the bearing loading spring (10). Loosen the setscrews (11) and (24A) in the loop restorer cam (27) and worm gear (24) and press the camshaft (30) to the left until the bearing (12) is forced from its seat in the housing. Then press the camshaft to the right to force the large bearing (29) from its seat. Remove the worm gear and loop restorer cam as the camshaft is withdrawn from the housing.

c. 1592 Models Only. Remove the large retaining ring (8), the two screws (9) and the bearing loading spring (10). Loosen the setscrew (11) in the loop restorer cam (27) and press the camshaft (30) to the left until the bearing (12) is forced from the mechanism housing. Pull the bearing from the camshaft. Remove retaining rings (16) and (28) from the camshaft and press the camshaft to the right to force the large bearing (29) from its seat. Remove the clutch, gear and cam parts (13) through (27) as the camshaft is withdrawn. Make a note of the manner in which the torsion spring (14) is assembled. Inspect worm gear parts (24A through 24D) and, if damaged, disassemble for replacement.

15. DISASSEMBLING THE APERTURE PLATE (Figure 14). Disassemble the aperture plate by removing parts, as necessary, in their indexed order of disassembly. Be very careful not to scratch or nick the rails or aperture plate with the screwdriver when removing screws.

16. TESTING AND REPAIRING THE AMPLIFIER ASSEMBLY (Figure 15). Amplifier circuit board repairs are not recommended except as an emergency measure and then only if qualified electronics personnel and test equipment are available. If a faulty condition is traced to the amplifier, replace the complete assembly. Using standard electronic shop test equipment and techniques, check the amplifier assembly and its components for continuity and for shorts and open circuits. Refer to the appropriate wiring diagram for voltages and ratings of components and for test points. Defective solder-secured parts can be replaced by cutting the leads as close as possible to the body of the part or by unsoldering the leads from their terminal points. When unsoldering, it is advisable to use a heat sink to avoid the direct application of heat to adjacent components. When replacing parts, note the following special precautions.

a. Each of the three transistors (4) and (5) are furnished with a special lock washer (3) and a mica washer (3A). The lock washer is to be installed beneath the head of the screw (1) with its teeth against the flat washer (2). Apply thermal compound (Bell & Howell Spec. 28-7-001) to both sides of the mica washer and install this washer between the transistor and the metal heat sink bracket. The metal collector plate of the transistor must be toward the heat sink.

b. The integrated circuit (30) must be installed with its polarity mark or notch toward the edge of the board indicated by the dashed arrow drawn on the top of the circuit in Figure 15. This arrow is not imprinted on the integrated circuit.

Reassembly Procedure

17. GENERAL REASSEMBLY INSTRUCTIONS.

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

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

c. When installing electrical components, refer to the appropriate wiring diagram at the rear of the Parts Catalog for the proper connection of leadwires. When resoldering components to the amplifier assembly (Figure 15), use a heat sink to avoid the direct application of heat to adjacent components on the board. Refer to paragraph 16 for special instructions regarding circuit board component replacement.

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

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

18. REASSEMBLING THE APERTURE PLATE (Figure 14).

a. Assemble the film guide (9) to the aperture plate (10) with the screw (8). The right end of the film guide should be square with the edge of the aperture plate.

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

c. Attach the film guide rail (2) to the aperture plate with the two screws (1), tightening the screws securely. Refer to paragraph 20, step d, for installation instructions.

19. REASSEMBLING THE MECHANISM (Figure 13). Reassemble Figure 13 parts as outlined in the following paragraphs.

NOTE: When reassembling 1592 model projectors use only steps a through g following. When reassembling 1585 and 1590 model projectors, refer to steps h and j only.

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

the longer screw (5) and install the washer (2) and the round nut (1), tightening the nut finger tight.

b. Lightly grease both bearing openings in the cast arms of the mechanism housing. Press the ball bearing (12) into its bearing opening until fully seated. Assemble the large bearing (29) to the camshaft (30) until the bearing is seated against the shoulder of the shaft. Install the retaining ring (28) to the camshaft with the bowed surface of the ring facing away from the ball bearing.

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

d. Insert the end of the camshaft (30), with ball bearing (29) assembled, through the bearing hole in the right-hand cast arm of the mechanism housing. To the shaft, assemble the loop restorer cam (27), shim washer (26) and the assembled worm gear group. Assemble the torsion spring (14) over the hub of the driven clutch (15), spreading the legs of the spring so that they straddle the bent ear at the top of the clutch. Insert the hub of the driver clutch (13) through the hub of the driven clutch, spreading the legs of the torsion spring still further until one of the lugs of the driver clutch is also straddled by the spring legs. Install the washer (17) and the assembled clutches on the camshaft. When installed, the bent ear of the driven clutch (15) must be parallel with the camshaft flat for the loop restorer cam (27).

e. Slide the camshaft all the way in place, inserting the end of the camshaft into bearing (12) while seating the large bearing (29) in the bearing hole of the cast arm. Assemble the two retaining rings (16) to the camshaft, one between washer (26) and loop restorer cam (27); the other between washer (17) and clutch (15). Clutch and loop restorer adjustments will be made after reassembly has been completed.

f. Fasten the bearing loading spring (10) to the cast arm of the mechanism housing with two screws (9). Assemble the large retaining ring (8) into the ring groove of the housing arm, with the bowed face of the ring against the bearing (29).

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

NOTE: Steps h through j, following apply only to the 1585 and 1590 model projectors.

h. Lightly grease both bearing openings in the cast arms of the mechanism housing. Press the ball bearing (12) into its bearing opening until fully seated. Assemble the large bearing (29) to the camshaft (30) until the bearing is seated against the shoulder of the shaft. Install the retaining ring (28) to the camshaft with the bowed surface of the ring facing away from the ball bearing.

i. Insert the long end of the camshaft through the bearing hole in the long cast arm of the mechanism housing. As the shaft end protrudes through the cast arm, assemble the loop restorer cam (27), shim washer (26) and worm gear (24) to the shaft. Continue sliding the shaft to the left, inserting the end of the shaft into the left-hand bearing (12) while seating the large bearing (29) in the bearing opening of the right-hand cast arm. Make certain that both bearings are fully seated; then install the bearing loading spring (10) to the left-hand cast arm with the two screws (9). Assemble the large retaining ring (8) into the inner ring groove in the right-hand bearing opening. The bowed surface of the ring must face the large bearing (29).

j. Insert a 0.190 inch feeler gage between the loop restorer cam and the cast arm of the mechanism housing. Hold the cam firmly against the feeler gage while tightening its setscrew (11) against the flat of the camshaft. Remove the feeler gage. Tighten the worm gear setscrew (24A) enough to hold until final adjustment can be made.

20. REASSEMBLING THE MECHANISM (Figure 12). Reassemble Figure 12 parts as outlined in the following paragraphs.

a. Assemble the shuttle retractor pin (29) and in-out spring (28) and insert the rounded end of the pin into the hole in the long cast arm, just to the right of the camshaft. Secure the loop end of the spring to the casting with the screw (27).

b. Screw the framer knob and shaft (26) down into the mechanism housing. Orient the stop pin (25) so that the flat side of the pin is parallel with and facing the framer shaft, and press the pin in place. Screw the bearing support (24) all the way up into the staked nut of the shuttle arm plate assembly (23). Engage the fork-like end of the shuttle arm plate framing arm with the cut-out at the lower end of the framer shaft, and fasten the plate to the cast arm of the mechanism housing with the two screws (22).

c. Loosely assemble the in-out cam (20) to the cam bracket assembly (21) so that the nylon face of the cam follower (21A) rides against the polished surface of the cam (indicated by the dash arrow in

Figure 12). Install this assembled group over the end of the camshaft and secure the cam bracket assembly to the cast arm of the mechanism housing with the two screws (19).

d. At this point, refer to Figure 11 and install the assembled aperture plate (65) with screws (64). Then return to Figure 12 and continue with reassembly as follows.

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

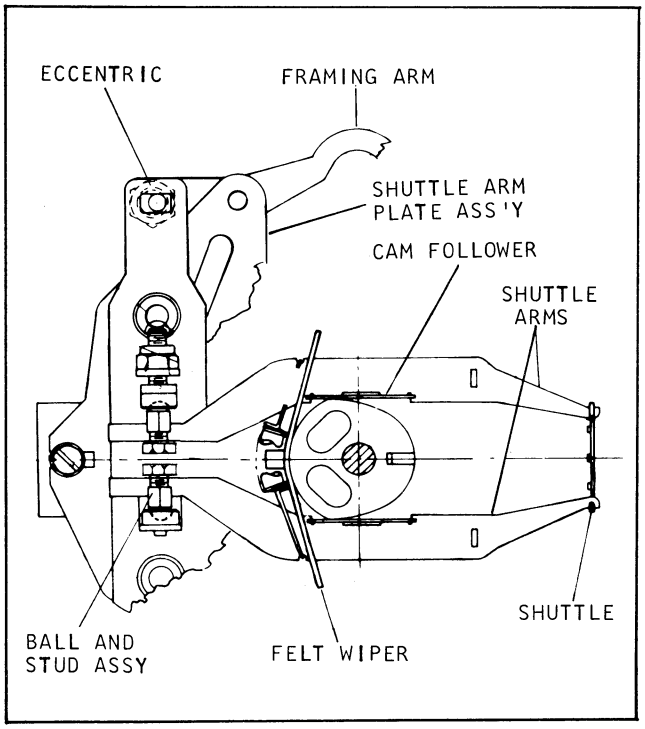


Figure B. Shuttle and Shuttle Arms Assembled

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

g. 1592 Models Only. Assemble the grommets (37) into the bracket (36). Assemble a retaining ring (30) into the groove nearest the end of the stop pawl shaft (31) and insert the opposite end of the shaft through the shaft hole in the bearing bracket (34) and both ears of the stop pawl (32). Loosely attach the bearing bracket to the cast arm of the mechanism housing with two screws (33). Assemble bracket (36) to the opposite end of the shaft and fasten the bracket to the mechanism housing with screws (35). Tighten screws (33) and (35) securely. Assemble the second retaining ring (30) into the groove of the shaft so that the right-hand ear of the stop pawl is held against the bearing bracket (34).

NOTE: Only the 1592 model projectors are equipped with the fire shutter assembly (4). On 1585 and 1590 model projectors, a support bracket is installed in place of the fire shutter.

h. Insert the rounded end of the heat baffle (6) up under the shutter and secure the baffle with the two screws (5). Fasten the bracket or fire shutter assembly (4) to the mechanism housing with four screws (3) and washers (3A). Install the pulley (2) on the end of the camshaft, and tighten the pulley setscrews (1) down on the flats of the shaft.

21. REASSEMBLING THE MECHANISM (Figure 11). Reassemble Figure 11 parts as outlined in the following paragraphs.

a. Attach the self centering assembly (63) to the mechanism housing with the two screws (60), lock washers (61) and flat washers (62). Assemble the lever and shaft assembly (58) to the mechanism housing and install the washer (57) and arm assembly (56) on the end of the shaft. The fork-like finger of the arm assembly must engage the pin of the self centering assembly between the two large washers. Insert a 0.0015-inch feeler gage between the washer (57) and the machined boss of the housing. Grip the shaft (58) and arm (56) to hold the feeler gage while

tightening the hex head screw (55); then remove the feeler gage. Assemble the retaining ring (59) to the shaft assembly (58).

NOTE: The shaft assembly (58), when installed, must be positioned approximately as shown in Figure 11, with the notched area in its upper edge positioned beneath the lower sprocket shaft bearing of the mechanism housing.

b. Assemble the cam follower parts (54A) through (54F) as shown in Figure 11. Attach this assembled group to the arm assembly (56) with the screw (52) and washer (53). Tighten the screw just enough to hold the follower group. Hook one end of the spring (51) around the end of the lever shaft (58) and secure the other end to the mechanism housing with the screw (49) and washer (50).

c. Assemble the film escape mechanism components (46A) through (46G) in the following manner. Assemble the hub assembly (46F) to the locking pawl (46E) with the screw (46D). Insert the shaft (46B) through one ear of the upper loopformer assembly (46G) and install the spring (46C) and the assembled hub and pawl on the shaft. Then engage the end of the shaft with the second ear of the loopformer. Assemble the retaining rings (46A) to the shaft, with the center ring between the spring (46C) and hub assembly (46F). Hook one end of the spring over the outer ear of the loopformer and hook the other end behind the upper finger of the hub assembly (46F). The spring should tend to rotate the hub and locking pawl in a clockwise direction.

d. Install the torsion spring (44), short leg first, on the shaft of the shaft and link assembly (43) and insert the shaft through the bearing in the mechanism housing. Hook the long leg of the spring beneath the tapped mounting boss in the upper left-hand corner of the mechanism housing. Hook the short, bent end of the spring behind the left edge of the link. Assemble the washer (45) and the film escape mechanism parts (step c, above) to the protruding end of the shaft (43) and temporarily tighten the setscrews (42).

e. Attach the upper sprocket guard mounting plate (41) to the mechanism housing with two screws (40), the upper screw being inserted through the half-moon slot in the upper loopformer (46G).

f. Attach the lens carrier catch (38) and its flat washer (39) to the mechanism housing with the screw (37). Turn the hex head lens stop screw (36) into the tapped hole in the housing until only one thread is visible. It may be necessary to adjust the catch and stop screw at final assembly to insure proper operation of the lens carrier.

g. Assemble the shuttle retractor (34) to the link and stud assembly (35) with the screw (32), lock washer (33) and flat washer (33A). Assemble the upper loopformer assembly (31) to the upper end of the connecting link (35) and install the retaining ring (30). Slip the pin end of the threading lever (28) up behind the link (43), engaging the pin with the rectangular slot in the link. Insert the shaft of the loopformer assembly through the mounting plate (41) and mechanism housing, and into the hub of the threading lever (28). Tighten the hex head locking screw (27) securely. Attach the leaf spring (26) to the upper loopform with two screws (25).

h. Assemble the small hole in the film guide (24) over the pin in the lower sprocket guard mounting plate (21) and hold the film guide in place while inserting the shaft of the toggle lever assembly (23) through the guard plate. The forked end of the toggle lever must straddle the film guide mounting pin. Secure the toggle lever to the mounting plate with the retaining ring (22). Engage the remaining forked end of the toggle lever with the pin at the lower end of the connecting link (35) and secure the lower mounting plate (21) to the mechanism housing with the two screws (20). The film guide (24) must be lifted slightly during this operation so that its large pivot hole slides over the sprocket shaft bearing in the housing.

i. Assemble one large washer (18) and the lower film guide (19) over the lower sprocket bearing, at the same time inserting the pin at the lower end of the connecting link (35) through the hole in the arm of the film guide (19). Install the second large washer (18) and secure these parts with the retaining ring (17).

j. Fasten the back-up bracket (16) to the mounting plate (21) with the screw (15). Assemble the loopform (13) and the torsion spring (14) onto the lower pin of the connecting link (35) and install the retaining ring (12). The legs of the spring must bear against the underside of the loopform in such a manner that they will force the loopform to pivot clockwise around the connecting link pin.

k. Assemble the film guide (11E) to the autothread lever (11F) with the screw (11D), tightening the screw finger-tight. Assemble the roller (11C) and film guide (11B) to the shaft of the autothread lever and secure with the screw (11A).

l. Assemble the autothread lever (11) and eccentric (9) to the mounting plate (21) with the threaded stud (8). The loopform (13) must be pivoted counterclockwise and held in that position while installing these parts. Again hold the loopform (13) in the counterclockwise rotation while securing the idler roller (7) to the stud (8) with the screw (6). Release the loopform (13). Assemble the torsion spring (10), short leg first, to the eccentric (9). Hook the short leg of the spring into the hole in the mechanism housing above and to the left of the eccentric (9). Hook the long leg of the spring in the V-like notch along the left edge of the lever (11).

m. Assemble the torsion spring (5) and threading arm (4) to the stud in the lower right-hand corner of the mounting plate (21). Engage the legs of the spring

so that they tend to pivot the threading arm clockwise. Install the retaining ring (3) to secure the arm to the stud.

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

22. REASSEMBLING THE LENS CARRIER (Figure 10). Reassemble the lens carrier assembly as outlined in the following paragraphs.

a. Lightly grease the gear teeth of the pinion assembly (5M), the pinion slots of the carrier (5N) and the notches of the pinion spring (5L).

b. Assemble the spring (5L) into the two grooves of the pinion assembly (5M) and assemble the pinion into the grooves of the carrier (5N). Fasten the spring securely with the two screws (5K). Check to make certain that the knob rotates smoothly.

c. Place the pressure plate (5B) on the work surface, polished surface down and the forked end of the plate to the left. Assemble the pressure plate lever (5F) to the pressure plate with the small extrusion of the lever fitted into the corresponding hole in the pressure plate. Assemble the bushings (5C) and (5D) into the springs (5E) and assemble these parts and the adjustment plate (5H) to the pressure plate, with the shorter bushing located at the lever (5F). Install and tighten the two screws (5A).

d. Slip the adjustment plate, with pressure plate assembled, into place within the lens carrier and loosely install the two screws (5G). Insert the lens plug (Figure A) into the lens bore of the carrier with the rectangular boss of the plug fitted into the opening in the pressure plate. Tighten screws (5G) securely and withdraw the lens plug.

e. Clean the nameplate area of the lens carrier with a cloth dampened with solvent. Remove the backing from the nameplate (5J) and activate the adhesive as instructed in paragraph 17, step c. Assemble the nameplate to the lens carrier and wipe away excess adhesive with a soft cloth dampened with solvent.

23. REASSEMBLING THE MECHANISM (Figure 10). Reassemble Figure 10 parts as outlined in the following paragraphs.

a. Rotate and hold the lower loopform (13, Figure 11) fully counterclockwise and assemble the filter exit guide (32, Figure 10) to the mechanism housing with the screw (31).

b. Assemble the sprocket guards (27) and (28), rollers (29) and torsion springs (30) to the tapped mounting posts of the guard mounting plates. The rollers must be assembled as shown in the inset of Figure 10. The inner bent end of each spring is inserted into small spring holes in the mounting plates adjacent to the tapped posts. The outer bent end of each spring hooks over the outer edge of each sprocket guard (27) and (28). The springs should tend to rotate the free (unmounted) end of the sprocket guard toward the sprocket bearings in the mechanism housing. Secure the sprocket guards to their mounting post with the screws (25) and the shim washers (26).

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

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

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

f. Assemble the sprocket guard parts (16A) through (16D). Slip the assembled sprocket guard (16) up into position beneath the upper sprocket and secure the guard with two screws inserted from the rear of the mechanism housing. Assemble a spring tension washer (14) and the upper sprocket gear (12) to the sprocket shaft. Align either setscrew (11) with the flat on the sprocket shaft and carefully mesh the sprocket gear with the worm gear. Tighten both setscrews (11) securely. The sprocket and gear must turn freely, but with a minimum of end play.

g. Fasten the hood (10) to the mechanism housing with the two screws (9). Press down and hold the upper loopformer (31, Figure 11) while assembling the actuating lever (7, Figure 10) to the lever shaft. Install the retaining ring (6).

h. Hold the assembled lens carrier (5) between the hinge bosses of the mechanism housing. Insert the flat washer (4) on top of the lower hinge boss and the spring tension washer (3) beneath the upper hinge boss. Press the hinge pins (1) and (2) into place to hold the lens carrier. Adjust the lens carrier catch (38, Figure 11) so that it holds the lens carrier firmly against the stop screw (36, Figure 11) in the closed position; yet permits the carrier to be opened easily.

i. All critical adjustments are to be made during the final assembly of the projector and are covered in the Adjustments section of this service manual.

24. REASSEMBLING THE SOUNDHEAD AND EXCITER LAMP COVER (Figure 9). Reassemble the soundhead and lamp cover parts as outlined in the following paragraphs.

a. If exciter lamp mounting pin parts (31) through (31C) were replaced, assemble the spring (31C) and bushing (31B) into the opening in the casting and insert the mounting pin (31A), forcing the end of the pin carefully through the bushing.

b. Fasten the terminal (30) to the soundhead casting with the screw (29). The free end of the terminal should be approximately at the 5 o'clock position. Loosely assemble the optical slit locking screw (10), the setscrew (19) and the edge guide screw (24) to the soundhead casting. Leave approximately three threads of the guide screw exposed.

c. Apply ahesive (B&H Spec. 1761-34) to the end four threads of the roller adjusting screw (14) and assemble the screw to the soundhead, leaving approximately two threads exposed.

d. Assemble the light pipe and photocell assembly (23) and light pipe retainer (22) to the sound drum and shaft assembly (21) and insert the sound drum shaft carefully through the opening in the soundhead casting. Hold the sound drum while tightening the setscrew (19) against the retainer (22) just enough to hold all parts in place. Install the two screws (20), turning them down in the tapped holes in the sound drum housing.

e. Lightly oil the roller shafts of stabilizer arms (15H) and (15J). Assemble the lower stabilizer arm (15H) over the short shaft end of the upper stabilizer arm (15J). Assemble the torsion spring (15G), straight leg first, over the tapped hub of the lower stabilizer arm (15H). Assemble the stabilizer arm (15F) to the tapped hubs of the upper and lower arms and install the two screws (15E). Hook the bent end of the spring (15G) through the small hole near the end of stabilizer arm (15F). Wind the straight leg of the spring one full turn clockwise and hook it behind the small post in the lower arm (15H). Assemble the rollers (15C) and (15D) to their respective roller studs. Roller (15D) must be installed with its narrow flange nearest the shoulder of the stud. Secure both rollers with the screws (15A) and washers (15B). Insert the shaft of the upper stabilizer arm carefully through the soundhead casting and the adjusting screw (14) and install the retaining ring (13). Position the retaining ring for 0.0005 to 0.005 inch end play of the stabilizer arm shaft. See Figure C for stabilizer and installation.

f. Lightly grease both surfaces of the lamp release ring (18) and assemble the release ring and the lamp contact assembly (17) to the soundhead casting with the two screws (16).

g. Insert the optical slit assembly (11) into its opening in the soundhead casting and tighten screw (10) just enough to hold the slit in place.

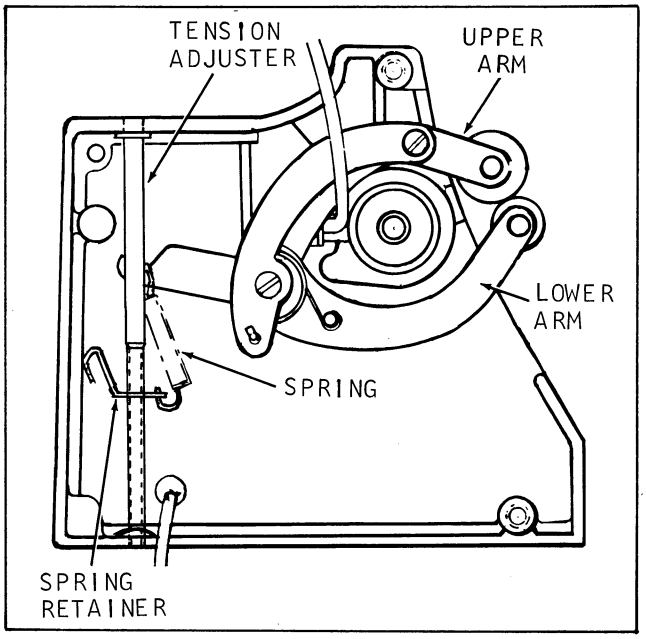


Figure C. Stabilizer Arms Installed on Suundhead

h. Insert the small end of the stabilizer tension adjuster (27) through the hole in the top of the soundhead casting. Assemble the spring retainer (28) to the adjuster, threading it approximately midway in the threaded area. Before inserting pin end of adjuster into the small hole at the bottom of the casting, assemble the friction washer (26), bowed face up, to the end of the adjuster. Assemble the retaining ring (25) into the groove at the upper end of the adjuster. Hook the tension spring (12) between the end of the lower stabilizer arm (15H) and the hole in the spring retainer (28). Install the exciter lamp (8). Refer to paragraph 40 for soundhead adjustments.

i. Reassemble the exciter lamp cover as follows. Remove the cloth backing from the light shield (6) and assemble the light shield to the left-hand inside upper wall of the lamp cover (7) so that it is flush with the outer edge of the cover. Remove any excess or overlap with a sharp knife or razor blade. Assemble the cover screw (2) to the cover and install the retaining ring (1). Press the hole plug (5) into the hole in the cover. Position the film guide (4) over the tapped holes in the cover with the flange of the guide wrapped around the front of the cover, and loosely install the screws (3). Insert a 0.020-inch spacer between the guide flange and the cover, press the flange against the spacer, and tighten the screws (3) securely. Remove the spacer.

25. REASSEMBLING THE REAR REEL ARM ASSEMBLY (Figure 8). Reassemble the rear reel arm as outlined in the following paragraphs.

a. Apply one drop of oil to the unflanged end of the bearing in the rear reel arm (32). Assemble one retaining ring (28) to the rear reel arm shaft (31) in the groove nearest the two narrow flats on the shaft. Assemble the thrust washer (30) over the long end of the

shaft and down against the retaining ring. Insert the shaft through the reel arm bearing and install the spacer washer (29) and the second retaining ring (28). Assemble the face gear (27) to the reel arm shaft (31), gear teeth facing up, and tighten setscrew (26) against flat of shaft.

b. Assemble the nylon bearings (25) into the cast bearing arms of the rear reel arm, engaging the key tabs of the bearings with the cross-slots of the bearing holes. Assemble the lower gear (22) to that end of the gear shaft (24) where the flats are nearest the end. The gear face with the square recess must face away from the cast bearing boss. Install the gear retaining clip (21). Insert the gear shaft through both nylon bearings (25). Assemble the washer (23) and gear retaining clip (21) to the end of the gear shaft. Install the upper gear (20), square recess facing inward to engage clip (21), and assemble the grip ring (19) to the end of the shaft. Insert a 0.010 inch feeler gage between the upper gear (20) and washer (23) and press the grip ring (19) in against the gear. Remove feeler gage.

c. Assemble the rubber sleeve (12) to the hub of the face gear (14). The sleeve must rest down against the shoulder of the gear. Insert the small diameter end of gear shaft (16) up through the hole in the lower end of the reel arm. Hold the shaft in place and assemble the washer (15), the face gear (14) and the large washer (11) to the gear shaft. Secure these parts with the retaining ring (10).

d. Install the setscrew (13) into the tapped hole in the reel arm casting near the lower end of gear shaft (16). Do not tighten the setscrew. Move the gear shaft (16) to engage the teeth of the face gear (14) with the lower spur gear (22) and tighten the setscrew (13). Rotate the face gear in both directions to check backlash. There should be approximately 0.005 to 0.018 inch backlash around the total gear circumference. If necessary, loosen the setscrew (13) and remesh gear teeth until proper backlash is obtained; then tighten setscrew securely.

e. Apply a light film of grease to all gear teeth and to the hub of the upper face gear (27). Assemble the torsion spring (18) to the hub of face gear (27) with the loop of the spring over the casting boss near upper spur gear (20). Secure the spring loop to the boss with the retaining ring (17). Rotate the upper face gear in both directions to make certain that the retaining ring does not restrict movement of the spring loop on the boss. Reposition retaining ring if necessary.

f. Apply one drop of oil to the mouth of the bearing in the take-up arm assembly. Assemble the washer (8) to the shaft of the take-up spindle (7) and insert the shaft through the take-up arm bearing. Install and tighten the screw (6). Assemble the take-up arm to the mounting pin in the reel arm. Assemble the take-up belt (4) around the spindle pulley and the rubber sleeve of the lower face gear. See Figure D. Insert the tension spring (5) into the recess in the take-up arm and compress the spring

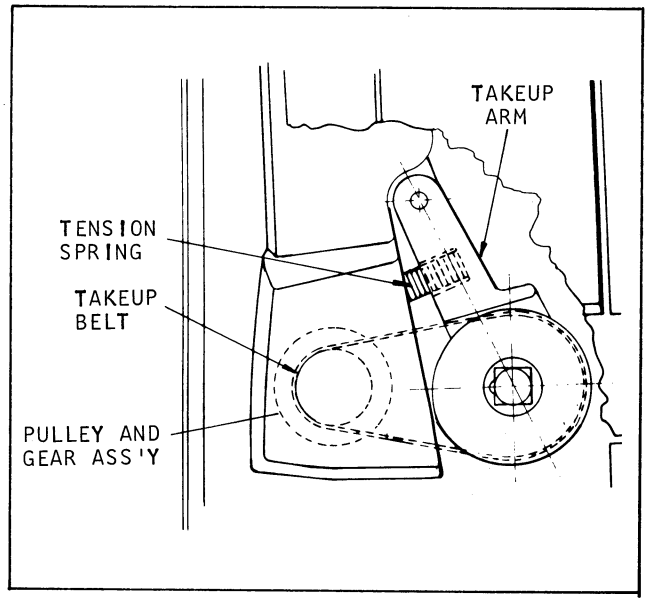


Figure D. Take-Up Arm Assembled

with a piece of shim stock while assembling the reel arm cover (2) to the reel arm. Be sure to place a shim washer (3) on each of the reel arm mounting bosses before lowering the cover in place. Install and tighten the two screws (1).

26. REASSEMBLING THE FRONT REEL ARM ASSEMBLY (Figure 7). Reassemble the front reel arm as outlined in the following paragraphs.

a. Assemble the washer (5D) and then the face gear (5C) down against the shoulder of the feed spindle (5E). Install but do not tighten the two setscrews (5B). Assemble the retaining ring (5A) to the groove in the spindle shaft.

b. Place the reel arm (22) on the bench with the lower (spindle) end of the arm at your left. Assemble the nylon bearings (21) into the cast bearing bosses of the reel arm, engaging the key tabs of the bearings with the cross slots in the bearing bosses. Insert the gear shaft (20) through the nylon bearings from right to left, make sure that the end with the flats furthest from the tip of the shaft is at the right (upper end of the reel arm). Assemble the lower spur gear (19) to the left end of the shaft. The gear face with the square recess must face away from the cast bearing boss. Install the gear retaining clip (17) to the flats of the gear shaft. Assemble the washer (18) and the second gear retaining clip to upper end of the gear shaft (20). Assemble the upper spur gear (16) to the shaft, with the square recess of the gear engaging the retaining clip. Install the grip ring (15) on the end of the shaft. Insert a 0.010-inch feeler gage between the upper spur gear (16) and washer (18), and press the grip ring in against the gear. Remove the feeler gage.

c. Assemble the retaining ring (11) into the ring groove nearest the two flats of reel arm shaft (14). Assemble the washer (12) onto the shaft and down

against the retaining ring. Place a drop of oil at the unflanged end of the reel arm upper bearing. Insert the long end of the shaft (14) through the upper bearing and install the spacer washer (13) and the second retaining ring (11). Make certain that the setscrews (8) and (8A) are not protruding into the shaft hole of the face gear (9) and that the sleeve (9A) is in place on the hub of the gear. Apply a light coat of grease to the gear teeth. Assemble the torsion spring (10) to the hub of the gear with the loop end of the spring furthest from the gear teeth. Assemble the face gear to the reel arm shaft while engaging the loop end of the spring over the spring boss of the reel arm. Secure the loop with the retaining ring (7) and tighten the gear setscrew (8) securely. The retaining ring (7) must not be so tight as to restrict movement of the spring loop when the face gear is rotated.

d. Apply one drop of oil at the flanged end of the reel arm lower bearing. Assemble the washer (6) onto the shaft of the feed spindle assembly (5), and insert the shaft down through the reel arm bearing. Install and tighten the screw (4) securely.

e. Rotate face gears (5C) and (9) in both directions to check backlash. There should be approximately 0.005-to 0.018 inch backlash around the total circumference of each gear. By the trial and error method, loosen the gear setscrews (5B) or (8) and reposition the engagement of face gears with spur gears until proper backlash is obtained. Then tighten setscrews securely.

f. Place a shim washer (3) on each of the reel arm mounting bosses and carefully assemble the cover (2) to the reel arm. Install and tighten the two screws (1).

27. REASSEMBLING THE BASE COMPONENTS (Figure 6). Reassemble Figure 6 parts as outlined in the following paragraphs.

a. Lightly grease the teeth of the worm gear (44), tilt gearshaft (41) and gear rack (39). Assemble spring washer (42) to the tilt gearshaft (41), bowed surface toward the worm gear. Insert the shaft through the hole in the base and secure it with the retaining ring (40). Fasten the tilt adapter (38) loosely to the base with the screw (37). Assemble the gear rack (39) and worm gear (44) into the base, holding the worm gear between the two formed ears of the base with all gear teeth (worm gear, gearshaft and tilt rack) engaged. Secure the worm gear with a new spring pin (43). Position the tilt adapter (38) so that the gear rack does not bind in the rectangular cut-out and tighten the screw (37) securely.

b. Assemble the rubber feet (31) and flat washer (32) to the base with the four screws (30). Assemble the tilt bar (28) to the lower end of the gear rack (39) with the screw (26) and lock washer (27). The short leg of the tilt bar must be toward the front (operating side) of the base. New rubber feet (29) are cemented to the tilt bar.

c. Assemble the volume and tone control assembly (25) into the base and secure with the four screws (24). Check to make certain that the control knobs are not binding in the cut-outs of the base before tightening the four screws. Do not install the cover (23) until all wiring connections and adjustments have been made.

d. Assemble the edge connector (18) to the amplifier (20) and position these components within the base. The two spacers (21) are positioned between the amplifier and base at the end furthest from the tilt bar. Loosely assemble the two amplifier screws (19); then install the two edge connector screws (17) and tighten all screws securely. Do not install the cover (16) until all wiring connections and adjustments have been made.

e. Turn the base right side up and, if the mainplate (35) had been removed for any reason, assemble the mainplate to the uprights of the base with the four screws (34).

NOTE: At this point, refer to Figure 5 and carefully assemble the complete mechanism assembly (29) to the mainplate with the four screws (27), the upper two screws also serving to attach the idler gear adjustment bracket (28). Then refer to Figure 6 for balance of reassembly as follows.

f. Assemble a roller (10C) and the adapter (10B) to the shaft at the squared end of the film guide bracket (10D). Assemble the second roller (10C) to the shaft at the rounded end of the film guide bracket and install both retaining rings (10A). Engage the free end of the adapter (10B) with the guide rails of the film guide which is assembled to the lower rear corner of the mechanism assembly (see Figure 11, item 11B). Lower the rear end of the film guide assembly (10) so that the ears of the adapter (10B) are between the cast ears of the base. Hold the guide roller (8), large diameter facing out, between the ears while installing the adapter shaft (7) through the cast ears and roller. Install the screw (9) to secure the assembly.

g. Assemble the snubber spring post (6) to the base with the screw (5). Hook one end of the snubber spring (4) around the groove in the shaft behind the guide roller of the mechanism assembly (see Figure 11, item 11C) and secure it with the retaining ring (1). Hook the other end of the spring to the spring post and secure with the washer (3) and retaining ring (2).

28. INSTALLING THE RUN-STILL LINKAGE (Figure 5). Reassemble Figure 5 parts as outlined in the following paragraphs.

a. All Models. Lightly grease the elongated slot and sliding contact surface of the belt shifter bracket assembly (25) and assemble the spacers (26) and bracket assembly (25) to the tapped bosses of the projector main plate with the two shoulder studs (24). Assemble one loop end of the torsion spring

(23) to the right-hand shoulder stud (24) and the other loop end to the bent ear of the bracket assembly just above the shoulder stud. Install the retaining rings (22) to retain the spring loops.

NOTE: Steps b through f, following, apply only to 1592 model projectors.

b. Assemble one loop of the torsion spring (20) over the shoulder stud of the pivoting link assembly (18). Assemble the large washer (21) down against the shoulder. Position the link assembly against the projector mainplate, with the end of the stud engaged in the rectangular opening just below the projection lamp socket area, add the other end on the tapped boss of the mainplate. Insert the spacer (19) between the link assembly and the tapped boss and install the pivot screw (15). Secure the shaft of the link (18) with the washer (17) and retaining ring (16).

c. Engage the remaining loop of the torsion spring (20) with the pin at the lower end of the sliding link assembly (13) while assembling the spacers (14) and sliding link to the projector mainplate. Install and tighten the two shoulder screws (12).

d. Assemble a retaining ring (9) into the ring groove closest to the slotted end of the switch shaft tube (11) and insert the short end of the tube through the mainplate from the front. Assemble the run-still arm assembly (10) over the protruding end of the tube (11), engaging the key lugs of the arm in the slot of the tube and the slot in the end of the arm with the staked pin at the upper end of the sliding link assembly (13). Install the second retaining ring (9) into the ring groove at the end of the tube (11).

e. Insert the long straight end of the fire shutter rod (8) down behind the pivoting link assembly (18) and through the hole in the bent ear of the link. Engage the upper end of the rod with the hole in the fire shutter filter arm. Assemble the spring (7) and collar (6), small diameter up to the lower end of the rod, and tighten the collar setscrew (5).

f. Assemble a collar (2), small diameter up, to the still-run rod (4). Insert the straight end of the still-run rod up through the hole in the tip of the stop pawl of the mechanism assembly. Hook the bent end of the rod through the hole in the long arm of the pivoting link assembly (18). Assemble the spring (3) and the second collar (2), small diameter down, to the upper end of the rod. Slide the lower collar up against the underside of the stop pawl and compress the spring slightly with the upper collar. Tighten both collar setscrews (1) securely.

29. INSTALLING THE SOUNDHEAD, REEL ARMS AND GEARS (Figure 4). Install Figure 4 parts as outlined in the following paragraphs.

a. Carefully assemble the soundhead assembly (40) to the projector mainplate. Be sure that all leadwires are pulled through behind the mainplate so as not to be pinched between the mainplate and the soundhead. Hold the soundhead while installing and tightening the three screws (36) and their washers (37). Refer to the appropriate wiring diagram at the rear of the Parts Catalog for proper wiring connections between soundhead and other projector parts.

b. Assemble the bowed washer (34) and the flywheel (35) to the sound drum shaft, with the bowed face of the washer against the flywheel. Install the flat washer (33) and retaining ring (32) on the end of the sound drum shaft. Spin the flywheel to make certain that the shaft rotates smoothly.

c. Insert a spring (31) and a reel arm lock button (30) into the opening to the right of the rear reel arm mounting hole in mainplate. Hold the button in with a piece of shim stock while assembling the rear reel arm (29) to the mainplate. Assemble the reel arm disc (27) over the shoulder of the reel arm, with the bent fingers of the disc pointing away from the mainplate. Align the screw holes in the disc with those in the reel arm and install and tighten the screws (26). Install the front reel arm assembly (28) in the same manner.

d. Assemble the spur gears (25C), hubs inward, to the gear studs of the rewind lever assembly (25D). Place a washer (25B) on the gear stud nearest the end of the lever, and secure the gears with the retaining rings (25A). Hook the bent end of the long leg of the spring (24) through the hole in the upper lip of the rewind lever (25D) and assemble the spring loop and the rewind lever to the gear stud of the mainplate (located near the upper left-hand corner of the cut-out for the mechanism assembly). Wind the short leg of the spring one full turn counterclockwise and hook the bent end behind the edge of the cut-out. Assemble the idler gear (23), hub inward, and the washer (22) to the protruding gear stud, meshing gear (23) with gears (25C). Install the retaining ring (21).

e. Assemble the gear retaining key (20) to the flats of the front reel arm shaft. Assemble the spur gear (19) to the shaft so that the square recess in the face of the gear engages the retaining key (20). Assemble the reverse take-up clutch assembly (18) to the shaft and install the washers (17) and (16) and retaining ring (15).

f. Assemble the gear (11B), long hub out, to the gear stud of the arm assembly (11C) and install the retaining ring (11A). Assemble the rewind clutch assembly (14) and flat washer (13) to the upper sprocket shaft and assemble the gear retaining key (12) to the flats of the shaft. Assemble the large hole in the idler arm over the inner shoulder of the spur gear (9) and install these parts and washer (10) on the upper sprocket shaft. Slide the gear (9) inward until the square recess in its face engages the key (12). The staked pin of the idler arm must be inserted into the triangular cut-out in the rewind lever (25D). Install the spring tension washer (7) bowed face out, and the grip ring (6).

g. Install the washers (5) and spur gears (4), hubs in, on their respective gear studs, and secure them with the retaining rings (1). Assemble the washer (3) and the spur gear (2) to the shaft and install the retaining ring (1).

h. Speck all gear teeth sparingly with grease. After the projector is completely assembled, grease can be distributed by running the projector briefly.

30. INSTALLING ELECTRICAL COMPONENTS (Figure 3). Install Figure 3 parts as outlined in the following paragraphs. Refer to the appropriate wiring diagram at the rear of the Parts Catalog for proper connection of leadwires between components.

a. 1592 Models Only. Place the solenoid assembly (48A) on the work surface with the rod pointing toward you and the tapped holes in the solenoid bracket facing up (leadwires at the right). Place the mounting plate (48B) over the tapped holes, with the leg containing the single mounting hole toward you and at the left. Install and tighten the two screws (47). Assemble the three rubber bushings (46), small diameter first, into the mounting holes of the mounting plate (48B). Install a collar (43), large diameter first, on the solenoid rod, pressing it up against the yoke while tightening its setscrew (42). Assemble this solenoid group to the support plate mounted on the long cast arm of the mechanism assembly, while guiding the solenoid rod down through the hole in the tongue of the stop pawl. Fasten the mounting plate (48B) to the mechanism support plate with the three screws (44), inserting the spacer washers (45) between the rubber bushings (46) and the mechanism support plate. Temporarily assemble the remaining collar (43) on the lower end of the solenoid rod (beneath the stop pawl) and tighten its setscrew.

b. 1585 and 1590 Models Only. Attach the fuseholder (41) with the screw (40). Assemble the switch (39) to the switch bracket (37) with the locking nut (38) and lockwasher (38A). Lift the bracket up into position against the mainplate while guiding the switch shaft through the mainplate and secure the bracket with the two screws (36).

NOTE: The switch bracket (37) was used only on early model projectors and has since been discontinued. On current models, the switch is mounted directly against the projector mainplate.

c. 1592 Models Only. Assemble the rotary switch (35C) to the bracket assembly (35D) with the locking nut (35A) and lockwasher (35B). Lift the assembled switch and bracket (35) up into position against the mainplate while guiding the switch shaft through the tube (item 11, Figure 5) already assembled to the mainplate. Engage the free end of the animation switch lever crank (item 37, Figure 10) into the hole at the top of the animation switch bracket (item 34, Figure 3) and secure both switch brackets (34) and (35) to the mainplate with two screws (33). Insert a 0.010 inch feeler gage between the animation switch lever (item 35, Figure 10) and the mechanism housing and hold the lever against the shim while pressing the crank grip ring (item 36, Figure 10) in against the mechanism housing. Remove the shim.

NOTE: Before reassembling motor components (step d, following), refer to Figure 3 for the differences between the early and current motor clamp brackets (29) and the inclusion of the thermal fuse assembly (29A) on all current models. Refer to the appropriate wiring diagram for the wiring connections to the fuse.

d. All Models. Assemble the motor mounting brackets (30) and motor bracket straps (28) with stabilizer bracket (29) to the motor end caps. When mounted to the projector base, the motor should be positioned so that the nameplate can be easily read. Install the motor pulley (27) on the motor shaft, small pulley diameter toward the motor. If the pulley was replaced, be sure to use the same color of pulley as the one which was removed. Position the pulley so that its inner face is approximately 1/4-inch from the rubber mounting ring of the motor and temporarily tighten the setscrews (26). Assemble the strain relief (24) to the jacket of the line cord (25) and assemble the strain relief into the center hole in the stabilizer bracket (29). Loop the drive belt (23) around the motor pulley and insert the end of the motor shaft through the blower fan housing cover (22). Assemble the blower fan (21) to the end of the motor shaft, with the fan hub containing the setscrews facing toward the motor. Position the fan on the shaft so that the end of the shaft is approximately 1/16-inch below the face of the outer fan hub and tighten the two setscrews (20). Assemble the fan housing (19) to the cover with the three screws (17). Manually rotate the motor pulley to make certain that the fan is not striking the cover or housing.

e. All Models. Lift the assembled motor and blower group into position on the projector base, threading the drive belt through the loop of the belt shifter bracket assembly (item 25, Figure 5). Guide the belt edgewise upward and around the large mechanism pulley. Align the motor and blower mounting holes with those in the base, and install and tighten the eight mounting screws (15) and (16). Refer to the appropriate wiring diagram at the end of the Parts Catalog section and make the necessary wiring connections.

f. 1590 Models Only. Assemble the power transformer assembly (14) to the projector base with the four screws (13). Refer to the appropriate wiring diagram at the end of the Parts Catalog section for proper wiring connections.

g. 1585 and 1592 Models Only. Assemble the brackets (10C) and (10D), mounting flanges facing inward, to the lamp transformer (10E) with the screws (10B) and hex nuts (10A). Make wiring connections to the transformer according to the appropriate wiring diagram. Position the transformer so that the mounting holes in the bracket are aligned

with those in the base. Install the two front screws (9); then tip the projector so that the two rear screws (9A) can be inserted up through the base. Tighten all screws. Assemble the brackets (7) and (8) to the top of the lamp transformer with the screws (6) and hex nuts (5). Make wiring connections to the power transformer (4) according to the appropriate wiring diagram. Secure the power transformer to the upper fingers of the brackets (7) and (8) with two screws (2) with lockwashers (3) and hex nuts (1). Note that two sleeve spacers (3A) are inserted between the bracket (8) and transformer on 1592H and 1592BH model projectors.

31. REASSEMBLING END CAPS AND LAMP COMPONENTS (Figure 2). Reassemble Figure 2 parts as outlined in the following paragraphs.

a. Pull the lamp leads through the access hole in the mainplate and connect them to the terminals of the lampholder (15). Secure the lampholder and the lamp shield (14) to the mainplate with the two screws (13), and pull excess lamp leads back behind the mainplate. Assemble the projection lamp (12) into the lamp socket and swing the lamp retaining spring up into place.

b. 1585A, 1585ML and 1590A model projectors are equipped with a single control knob (11) for the switch shaft, whereas the 1592A and 1592H model projectors require two knobs (11A) and (11B). 1590B, 1592B and 1592BH model projectors use a single control knob (11C) for "Fwd-Rev-Lamp" control plus a crank lever (11E) to provide for the "Still/Run" control.

c. Assemble the axuiliary speaker jack (9) and its insulating washer (10) to the rear end cap (7) with the hex locking nut (8). Reassemble the rear end cap components (7A) through (7H), noting that only the 1592 model projectors are equipped with the Directamotion remote control receptacle (7F). An adhesive-backed cover (7G) is installed over the receptacle opening in 1585 and 1590 model projectors. The starting capacitor (7C) is mounted with its terminals up and the top end of the capacitor approximately 1/8-inch above the top edge of the capacitor clamp (7B). Secure the clamp to the rear end cap with two screws (7A).

d. Assemble the speaker (6B) over the four molded pins of the front end cap (6C) and install the four grip-type retaining rings (6A). Speaker should be installed with the terminals at the top.

e. Make certain that all twelve speed nuts (5) are in place on the formed mounting ears of the two end caps. Position the front end cap assembly (6) on the base with mounting holes aligned and, from beneath the base, install the two base-to-end cap mounting screws (3) finger tight; then install two screws (4) through the mainplate and into the speed nuts on the front mounting ears of the end cap. Tighten all four screws securely. Install the rear end cap assembly (7) in the same manner.

f. Assemble the tilt knob (2) to the protruding end of the tilt shaft and tighten the setscrew (1) securely. Rotate the tilt knob to check the tilting mechanism.

g. Refer to the appropriate wiring diagram at the end of the Parts Catalog section for proper wiring connections.

32. REASSEMBLING LAMPHOUSE AND COVERS (Figure 1). No special instructions are necessary for the reassembly of the lamphouse or cover components. These items need not be installed until after all adjustments have been made (see the following section).

NOTE: The lamphouse assembly (16) for 1585ML, 1590B, 1592B and 1592BH model projectors is shown in an inset in Figure 1. This lamphouse is assembled to the projector mainplate with three screws (15), the lower screw also serving to attach the air deflector (17).

Adjustments

33. GENERAL INSTRUCTIONS.

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

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

WARNING

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

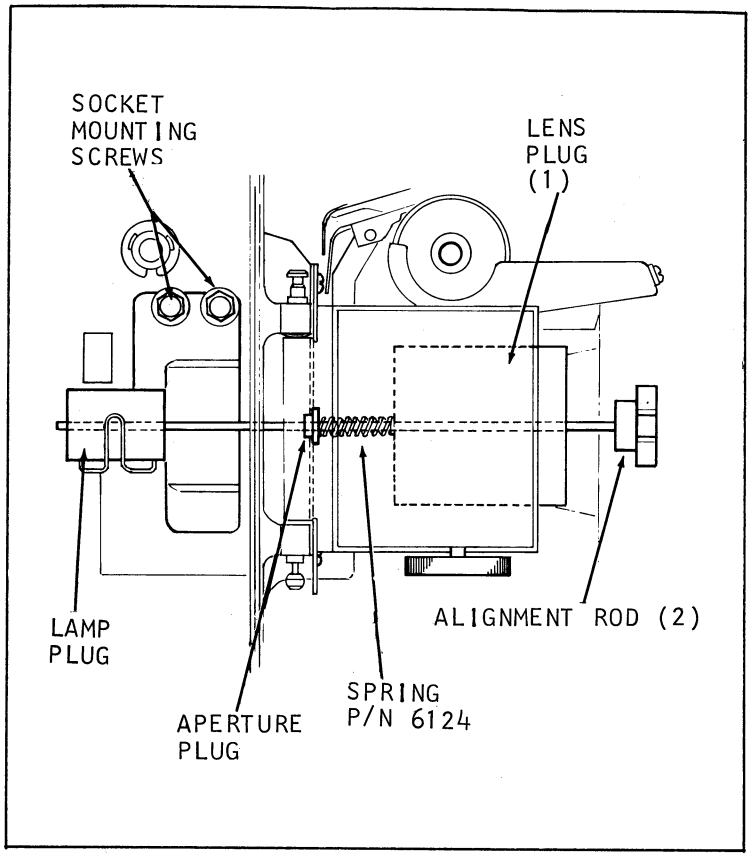


Figure E. Aligning the Optical System

34. OPTICAL ALIGNMENT.

It is important that these alignments be performed in the following listed sequence (steps a through d). All special tools and fixtures required for optical alignment are shown in Figure A. These items are shown installed in the projector in Figure E. Be sure to turn the mechanism manually until the shutter blade is clear of the aperture opening, before inserting alignment tools.

a. Aligning the Aperture Plate.

(1) Remove the projection lens from the lens carrier. Open the lamphouse and remove the projection lamp and the condensing lens assembly.

(2) Swing the lens carrier fully open and disassemble the pressure plate from the lens carrier.

(3) Loosen the two aperture plate mounting screws just enough to permit movement of the aperture plate, and insert the aperture plug (item 5, Figure A) into the aperture opening. Close the lens carrier.

(4) Insert the alignment rod (Figure E) through the lens plug until the rod end protrudes enough to install the spring (P/N 6124). Insert the lens plug into the lens barrel until the tip of the alignment rod engages the aperture plug previously installed. Tip the projector carefully onto its back (lens opening facing up). The alignment rod must slide freely through the aperture plug without binding. If necessary, shift the aperture plate slightly until free rod movement is obtained; then tighten aperture plate screws.

b. Aligning the Lamp Socket.

(1) Tip the projector back into its normal, upright position and reassemble the pressure plate to the lens carrier. Close the lens carrier.

(2) Loosen the two lampholder mounting screws just enough to permit movement of the lampholder. Insert lamp plug (1, Figure A) into lamp socket and secure the lamp spring. Slide alignment rod completely into place until tip of rod engages the hole in lamp plug. Shift socket as necessary until rod slides freely in the lamp plug hole. Then tighten the screws securely and remove all tools.

35. ADJUSTING THE INTERMITTENT MECHANISM.

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

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

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

(3) Link bearing missing from end of shuttle arm. Partial disassembly required to remove shuttle arm and replace link bearing (refer to Disassembly section).

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

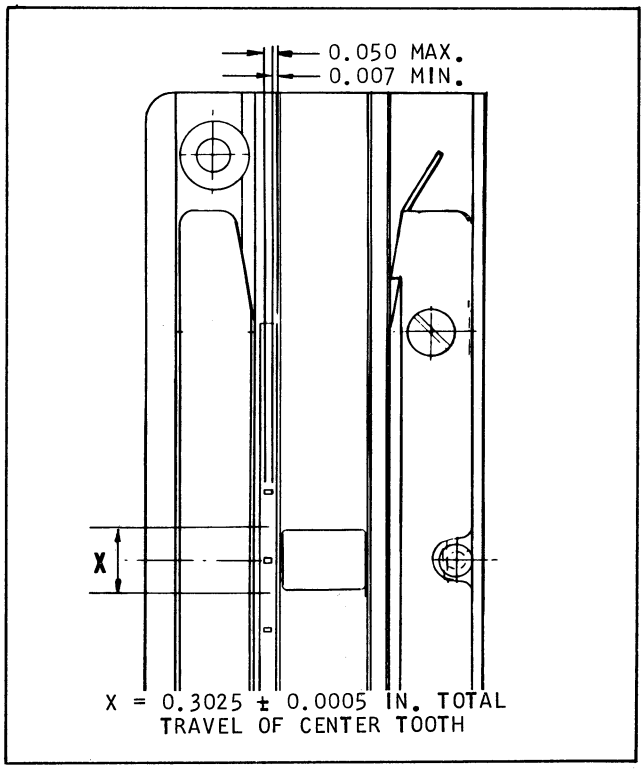


Figure F. Aperture Plate and Shuttle Tooth Clearance

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

NOTE: If the mechanism assembly is installed on the mainframe, it will be necessary to remove the lamphouse, the projection lamp and the lampholder before proceeding.

(1) Turn the mechanism drive pulley by hand until the access holes in the shutter and the fire shutter bracket are aligned as shown in Figure G.

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

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

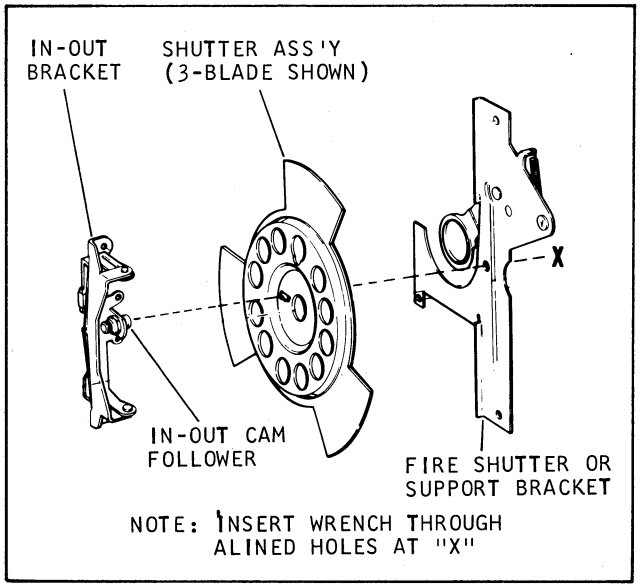


Figure G. Adjusting Shuttle Tooth Height

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

c. Checking Fit of Shuttle Arms to Pull-Down Cam (See Figure H). Remove rear cover and the projection lamp.

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

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

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

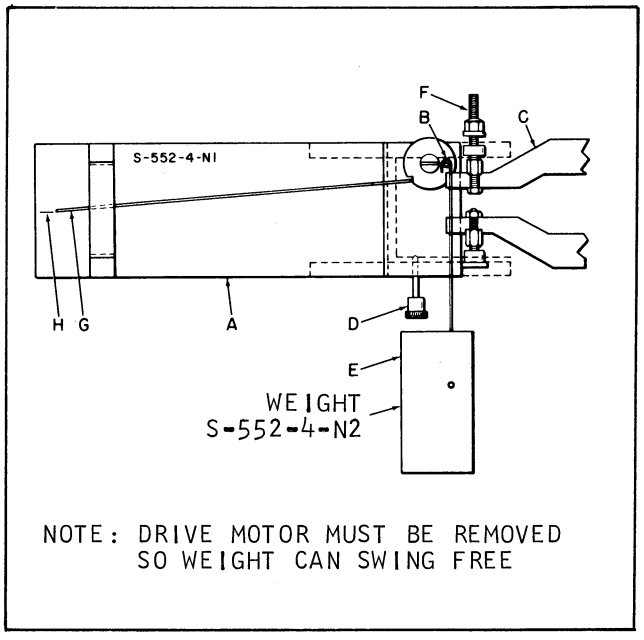


Figure H. Adjusting Fit of Shuttle Arms to Pull-Down Cam

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

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

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

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

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

(a) Remove pressure plate assembly from the lens carrier.

(b) Set the framer knob at the mid-point of its over-all travel.

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

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

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

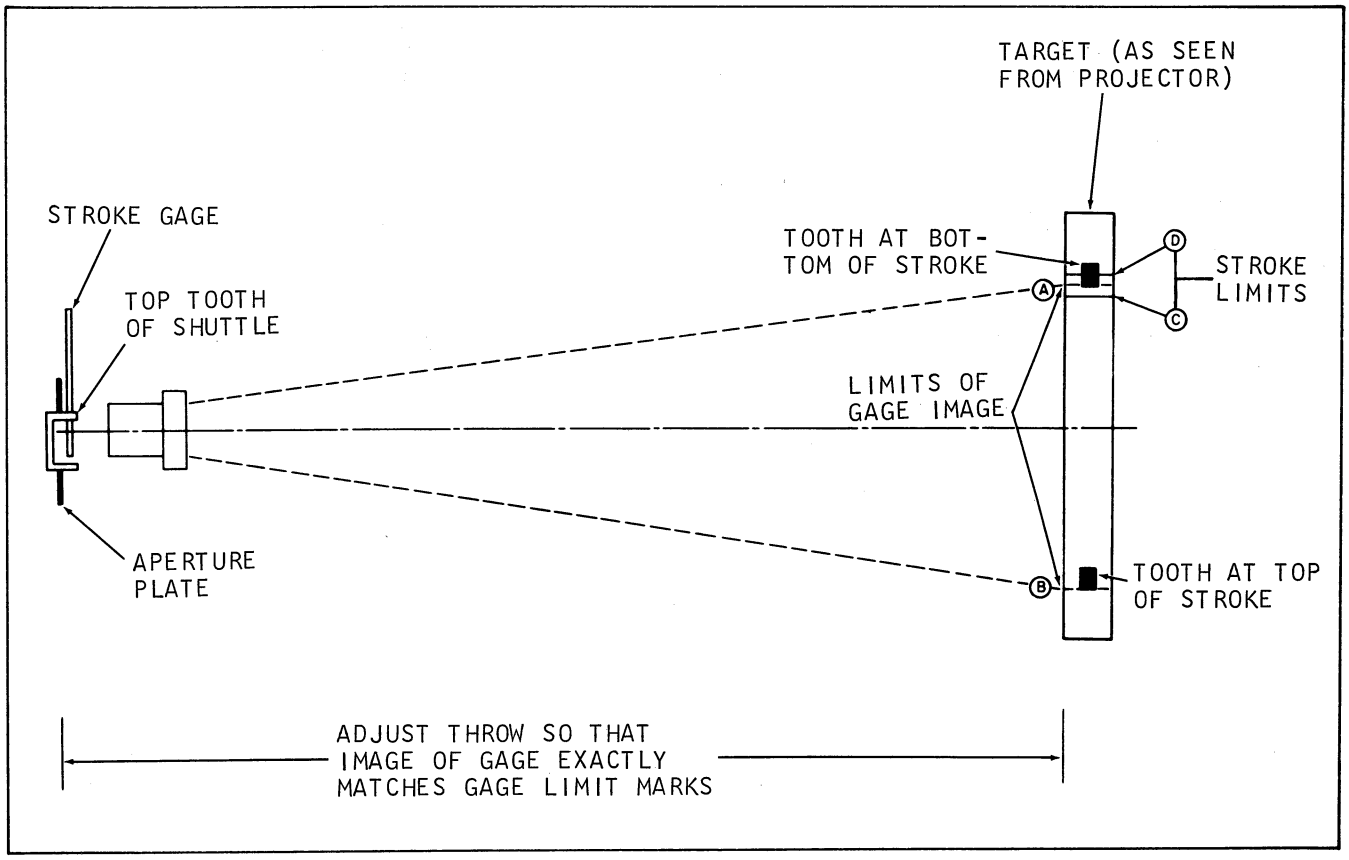


Figure J. Checking and Adjusting Shuttle Stroke with Target

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

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

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

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

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

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

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

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

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

36. LENS CARRIER ADJUSTMENT. Angular relationship between the lens carrier and the aperture plate is controlled by lens mount stop screw (item 36, Figure 11). Thread projector with roll title or target film having sharp images in corners and project a picture approximately 30 inches high onto a matte surface. The projector must be square with the screen. Focus the picture and compare resolution of the two sides of the image when viewed from a distance of approximately twice the width of the picture. If one side appears to be soft, refocus to sharpen that edge of the picture and note whether the lens is moved toward or away from the aperture. For example, if image at right-hand edge of screen is soft until lens is moved toward aperture, then lens stop screw is set too far forward and should be turned clockwise.

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

37. ADJUSTING THE ANIMATION CLUTCH (1592 Models Only).

a. Checking Stop Pawl to Trigger Clearance. Rotate the mechanism by hand until the finger of the trigger is adjacent to the inner bent ear of the stop pawl as shown in View A, Figure K. If the trigger fails to clear the stop pawl ear, adjust as follows. Loosen the bearing bracket screws (item 33, Figure 12) and shift the bearing bracket (item 34, Figure 12) up or down, as necessary, to obtain approximately 0.010 to 0.015-inch clearance between the stop pawl ear and the end of the trigger; then tighten the two screws securely.

b. Checking Shuttle Retraction. Turn the mechanism pulley by hand while pressing down on the clutch pawl at a point where the clutch rod passes through it. The ear of the clutch pawl should latch behind the trigger as shown in View B, Figure K. Note also the clearance required between the finger on the clutch yoke and the curved arm of the strike. Adjust as follows:

(1) Loosen the clutch strike screw (View B, Figure K) to permit the strike to be shifted. Insert a 0.015-inch feeler gage between the clutch yoke finger and the strike arm, and press and hold the strike against the feeler gage while retightening the strike screw. Remove the feeler gage.

(2) Refer to View C, Figure K. Loosen the round Allen nut slightly and shift the shuttle adjustment bracket slowly toward the shuttle (to the right) until the shuttle teeth are retracted below the level of the aperture plate rails. Retighten the Allen nut.

(3) Refer to View D, Figure K. Adjust the setscrew in or out to obtain a clearance of 0.094 inch between the left-hand ear of the clutch slide bar and the end of the setscrew.

(4) The shuttle interlock retainer is secured to the right end of the worm gear. Note, in View C, that the curved lip of this retainer must overlap the downward bent finger of the clutch slide bar. If necessary, bend this finger to obtain positive overlap as shown.

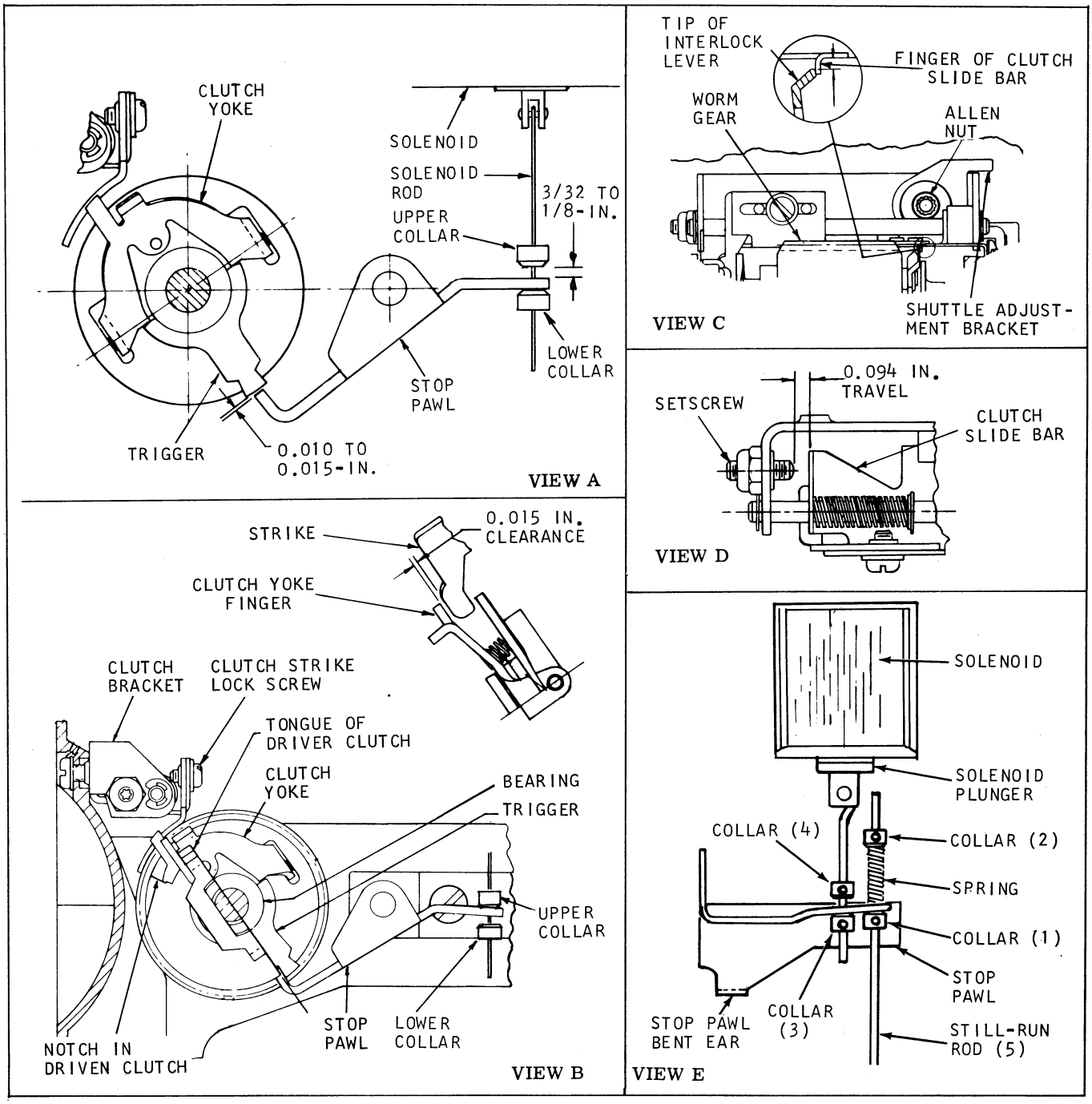


Figure K. Animation Clutch Adjustments

c. Adjusting Clutch Solenoid Linkage. Refer to Figure K for the following adjustment procedure. Rotate the mechanism by hand until the finger of the stop pawl is centered at the tip of the trigger as shown in Figure K, View A, and place Still-Run knob in "Run."

(1) Refer to Figure K, View E. Loosen setscrews in collars (1) and (2) and press lower collar (1) up against the underside of the stop pawl until a clearance of 0.010 to 0.015-inch is obtained between stop pawl finger and tip of trigger. Tighten collar (1) setscrew.

(2) With the tip of an appropriate spring gage, press down on upper collar (2) until gage indicates a spring pre-load of 5 ounces; then tighten upper collar setscrew.

(3) Loosen setscrews in collars (3) and (4). Use a suitable clamp to hold the solenoid plunger

up to its seat; then raise lower collar (3) until it just touches the stop pawl and tighten the collar setscrew. Position the upper collar (4) so that there is 1/16 to 1/8 inch clearance between collar and stop pawl and tighten upper collar setscrew.

d. Checking Still-Run Linkage. Refer to Figure K, View E in this section for the following adjustment procedure.

(1) Rotate the projector Still-Run knob to the Run position so that the still-run rod (5) moves downward in the limit of its travel.

(2) Rotate the mechanism knob and check to make certain that the ear of the stop pawl clears the trigger as shown in View A, Figure K.

(3) Operate the projector and switch from "Run" to "Still" position. The stop pawl is engaged with the trigger mechanically and is disengaged electrically (by the solenoid). If the preload tension of the spring (paragraph c, step 2, preceding) is set too low, the stop pawl may not engage the trigger properly and a chattering will result. If set too high, the solenoid may not be able to overcome spring tension to disengage the stop pawl from the trigger. Readjust spring tension until proper operation is obtained.

38. ADJUSTING THE FIRE SHUTTER (1592 Models Only). When the projector has been completely assembled, install the projection lamp and lens and run the projector "forward" with the lamp on. Turn the Still-Run knob to the Still position and focus the image of the aperture on the screen. Check for full pattern of the fire shutter disc on the screen (image must show perforations of disc throughout). Note that a bent ear on the fire shutter bracket limits the travel of the fire shutter filter arm. If unfiltered light appears at the top or bottom of the aperture image, it will be necessary to bend this stop ear so that the amount of filter arm travel is increased or decreased accordingly.

39. ADJUSTING THE REEL ARMS AND REWIND CLUTCH.

a. Front Reel Arm Adjustment (See Figure 7). Adjust end play of the shaft (14) to 0.008 inch ± 0.003 inch by positioning retaining ring (11) against an 0.008 inch shim. The backlash for both face gears should be between 0.005-inch (minimum) and 0.016-inch (maximum). Adjustment is made by loosening the face gear setscrews (5B), (8) and (8A) and repositioning the face gears (5C) and (9) as necessary.

b. Rear Reel Arm Adjustment (See Figure 8). Adjust end play of the shaft (31) to 0.008 inch ± 0.003 inch by positioning retaining ring (28) against an 0.008 inch shim. The backlash for both face gears should be between 0.005-inch (minimum) and 0.018-inch (maximum). The upper gear (27) is adjusted by loosening its setscrew (26) and repositioning the gear as necessary. The lower gear (14) is adjusted by loosening the setscrew (13) in the tapped hole of the arm and shifting the shaft (16) in and out as necessary.

c. Rewind Clutch Adjustment. The rewind clutch system must be adjusted to produce a supply spindle torque of 5-1/2 to 6 inch-ounces when the rewind button is pressed during operation. Install an empty reel on the supply spindle and wrap several turns of a ten-inch film strip around the reel hub. Hook a spring scale to the free end of the film strip. Turn on the projector, rotate the "Motor-Lamp" switch to "Reverse" and press and release the rewind button at the top of the mechanism housing. The spring scale must register between 2.5 and 4.5 in.-lbs. When the rewind clutch system begins to slip. Take-up torque is adjusted by means of the take-up clutch assembly (item 18, Figure 4). Grip the flats on the inner face of the clutch with a wrench while loosening or tightening the nut on the clutch hub. Rewind torque (also 2.5 to 4.5 in.-lbs.) is adjusted by means of the rewind clutch assembly (item 14, Figure 4). This clutch is installed with the adjusting nut facing inward toward the mainplate, and a special wrench (item 5, Figure A) must be used for the adjustment.

40. ADJUSTING THE SOUNDHEAD.

a. Soundhead Removal.

(1) Remove the projection lens from the lens carrier and wrap it in tissue or a soft cloth.

(2) Loosen the cover thumbscrew and remove the exciter lamp cover from the soundhead.

(3) Remove the rear cover (Figure 1) from the projector. Remove the assembled power transformer and lamp transformer (Figure 3) from the projector base, being careful not to place undue strain on the transformer leads. Remove the flywheel (35, Figure 4) from the sound drum shaft.

(4) Refer to the wiring diagram at the rear of the Parts Catalog section and disconnect or unsolder soundhead leadwires as necessary.

(5) With a sharp pencil or scribing tool, scribe a line on the projector main plate along the front edge of the soundhead casting. This will provide a reference mark for locating the soundhead during installation.

(6) Remove the three screws (36, Figure 4) and flat washers (37) and carefully withdraw the soundhead assemby from the projector main plate, disengaging the Volume control shaft from its opening in the soundhead housing.

b. Photocell Alignment (Figure 9).

(1) Loosen the setscrew (19) and the two housing screws (20). Remove the exciter lamp (8) and the optical slit (11).

(2) Insert the sound drum alignment tool into the optical slit opening as shown in Figure L.

(3) Press the sound drum in until its inner face just makes contact with the first step, or bearing surface, of the alignment tool, and maintain this contact while tightening the two screws (20) securely.

(4) Withdraw the alignment tool and, while looking into the optical slit mounting hole, shift the photocell until its forward tip is flush with the inner face of the sound drum. Maintain this position while tightening the setscrew (19).

c. Roller Tension Adjustment (Figure C). The roller arms are linked by a torsion spring and, therefore, will move as a pair. The counterbalance spring must be adjusted to offset the weight of the rollers and roller arms. Place the soundhead on a level surface and move the roller arms (as a set) to various positions. If the roller arms fail to remain in the set positions, engage the slotted head of the tension adjuster with a screwdriver and turn the adjuster clockwise or counterclockwise until proper counterbalance is obtained.

NOTE: The following adjustments must be made with the soundhead installed and the projector threaded with special test film.

d. Soundhead Installation.

(1) Carefully assemble the soundhead assembly to the projector mainplate, while inserting the Volume control shaft through the soundhead casting. Install and tighten the Volume control mounting nut.

(2) Install the three screws (36, Figure 4) with their washers (37) from the rear of the mainplate and tighten the screws finger tight. Shift the soundhead until the forward edge of the soundhead housing is aligned with the scribe or pencil mark on the mainplate and maintain this position while tightening the three screws securely.

(3) Refer to the appropriate wiring diagram at the rear of the Parts Catalog section and reconnect or resolder all soundhead leadwires.

(4) Assemble the bowed washer (34, Figure 4), flywheel (35) and flat washer (33) to the sound drum shaft and secure these parts with the retaining ring (32).

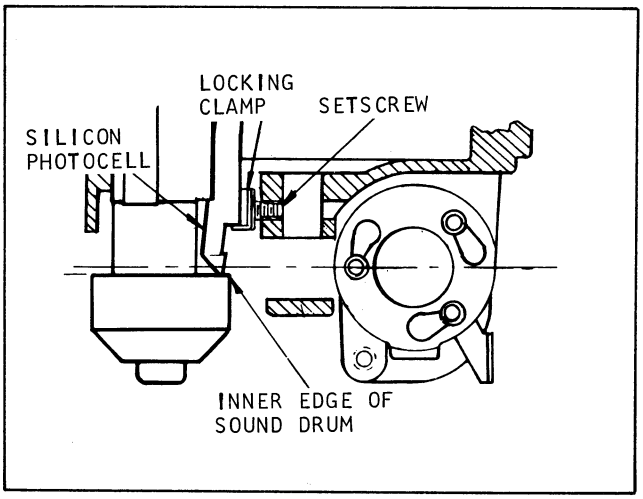


Figure L. Positioning the Sound Drum and Silicon Cell

(5) Reinstall the assembled power transformer and lamp transformer (Figure 3) to the projector base.

e. Optical Slit Adjustment (Figure 9).

(1) Insert the optical slit (11) into its opening in the soundhead. The adjusting hole in the barrel of the slit must be at top center.

(2) Insert a 0.050-inch feeler gage between the tip of the optical slit and the sound drum and press the optical slit in against the feeler gage. Hold in this position while tightening the locking screw (10) just enough to hold the slit in place.

(3) Thread the projector with 7000 CPS optical setting film and connect a 16-ohm, 10-watt load resistor and output meter to the speaker jack.

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

(4) Set the volume control at approximately 12 o'clock position and start projector. Move slit toward or away from film, as required, to obtain an output reading. Rotate the slit to obtain peak reading and simultaneously move in or out until maximum output is obtained. If film was threaded with emulsion toward the optical slit, move slit toward film until output drops 1-1/2 to 2 DB. If emulsion is toward sound drum, move slit away from film to obtain 1-1/2 to 2 DB drop in output. Tighten slit clamping screw (10) securely to lock the adjustment.

f. Buzz Track Adjustment (Figure 9). The lateral position of the film in the soundhead is controlled by the flanged roller (15C) and edge guide screw (24). Unless the adjustment has been disturbed, it is not probable that the edge guide screw (24) will require resetting. Thread the projector with buzz track film and adjust volume control to a suitable listening level. Turn adjusting screw (14) to move flanged roller laterally.

NOTE: There are two types of buzz track in use. On one, the track spacing exceeds the length of the scanning beam. This track can be positioned so that little or no signal is reproduced. On the other type of track, spacing is less than the length of the beam. This track should be positioned so that both tones are reproduced at approximately the same volume level. If, after adjustment of guide roller position, signal levels cannot be balanced (or eliminated on wide track), or level of tones fluctuates, adjust edge guide screw (24) to clear up the condition. If the edge guide screw is far out of adjustment, turn it clockwise until it clears the edge of film, adjust rollers and then set guide screw to stop weave of film.

g. Positioning the Soundhead.

(1) Lock the autoload system in the load position and loosen the three soundhead mounting screws (36, Figure 4) just enough to permit the soundhead to be shifted.

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

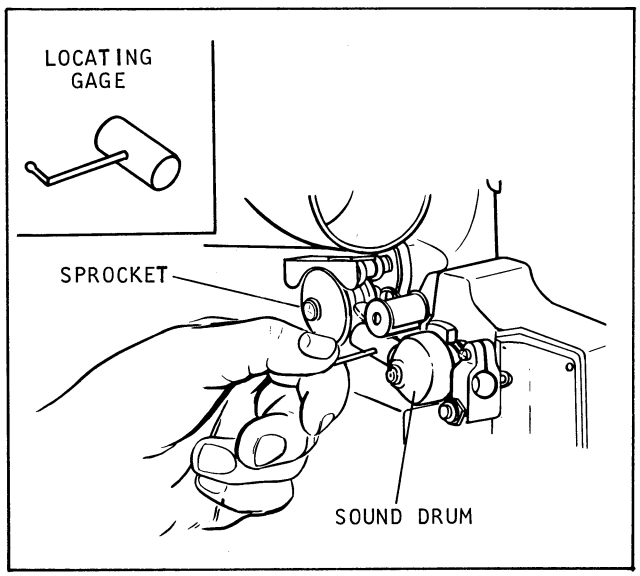


Figure M. Positioning the Soundhead

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

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

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

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

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

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

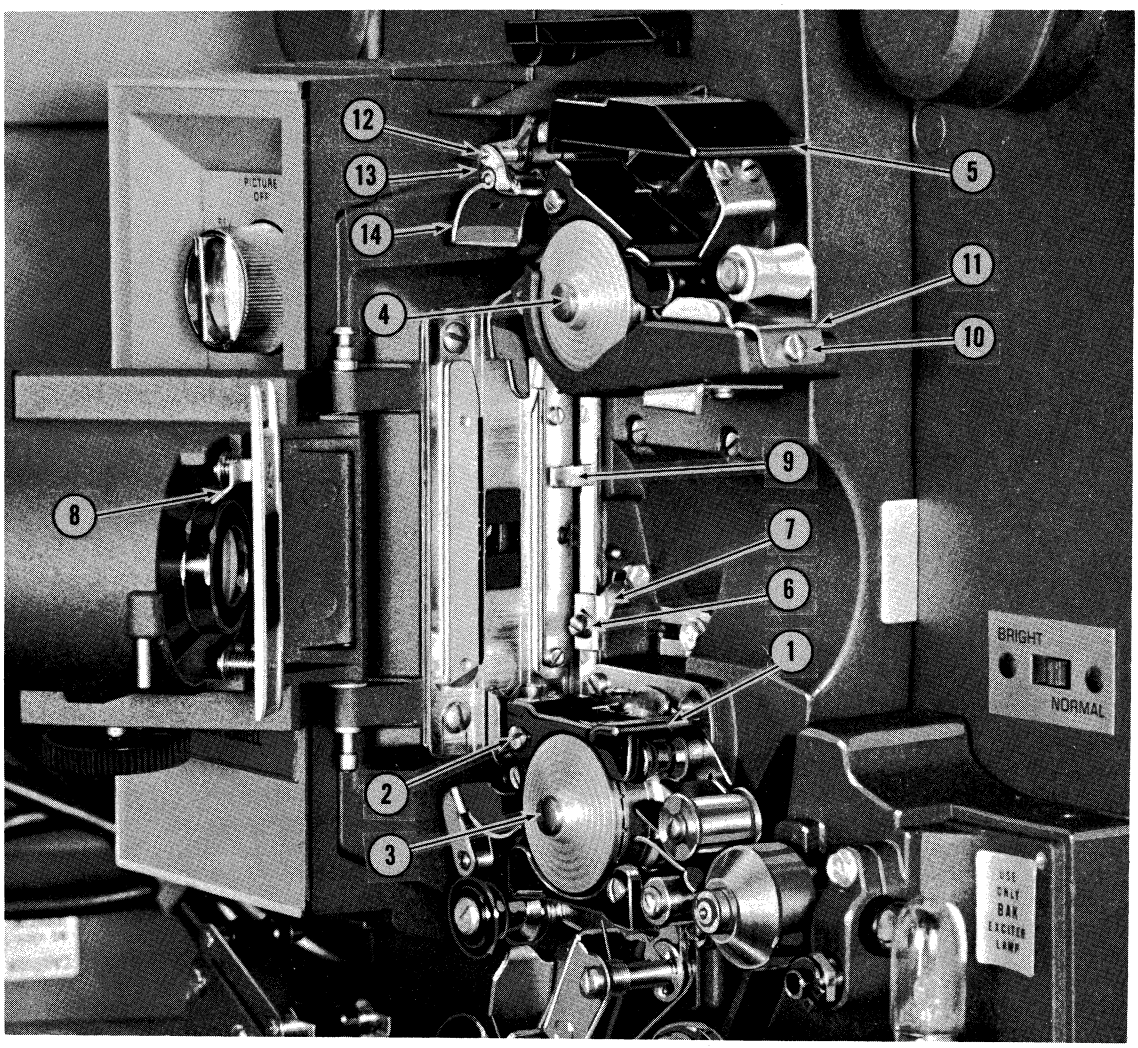
(4) Strobe Disc. Attached to sprocket by means of suction cup or rubber foot. For viewing with light from 60 Hz source, disc should have 70 dots for sound speed, 93 dots for silent speed. Count number of apparent revolutions of pattern for one minute. If pattern drifts in direction of rotation, add to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

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

b. Speeds at 120 Volts AC, 60 Hz.

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

(2) Silent Speed (18 FPS ± 5%)
Shutter - 1080 RPM ± 5%
Sprocket - 77.1 RPM ± 5%



1. Sprocket guard
2. Guard retaining screw
3. Lower sprocket hub
4. Upper sprocket hub
5. Actuating assembly
6. Shuttle retractor screw
7. Shuttle retractor
8. Pressure plate lift-off ear
9. Connecting link ear
10. Film guide screw
11. Film guide
12. Escape hub screw
13. Film escape hub
14. Loopformer

Figure N. Autoload System Adjustments — View I

42. AUTO-LOAD SYSTEM ADJUSTMENTS — GENERAL.

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

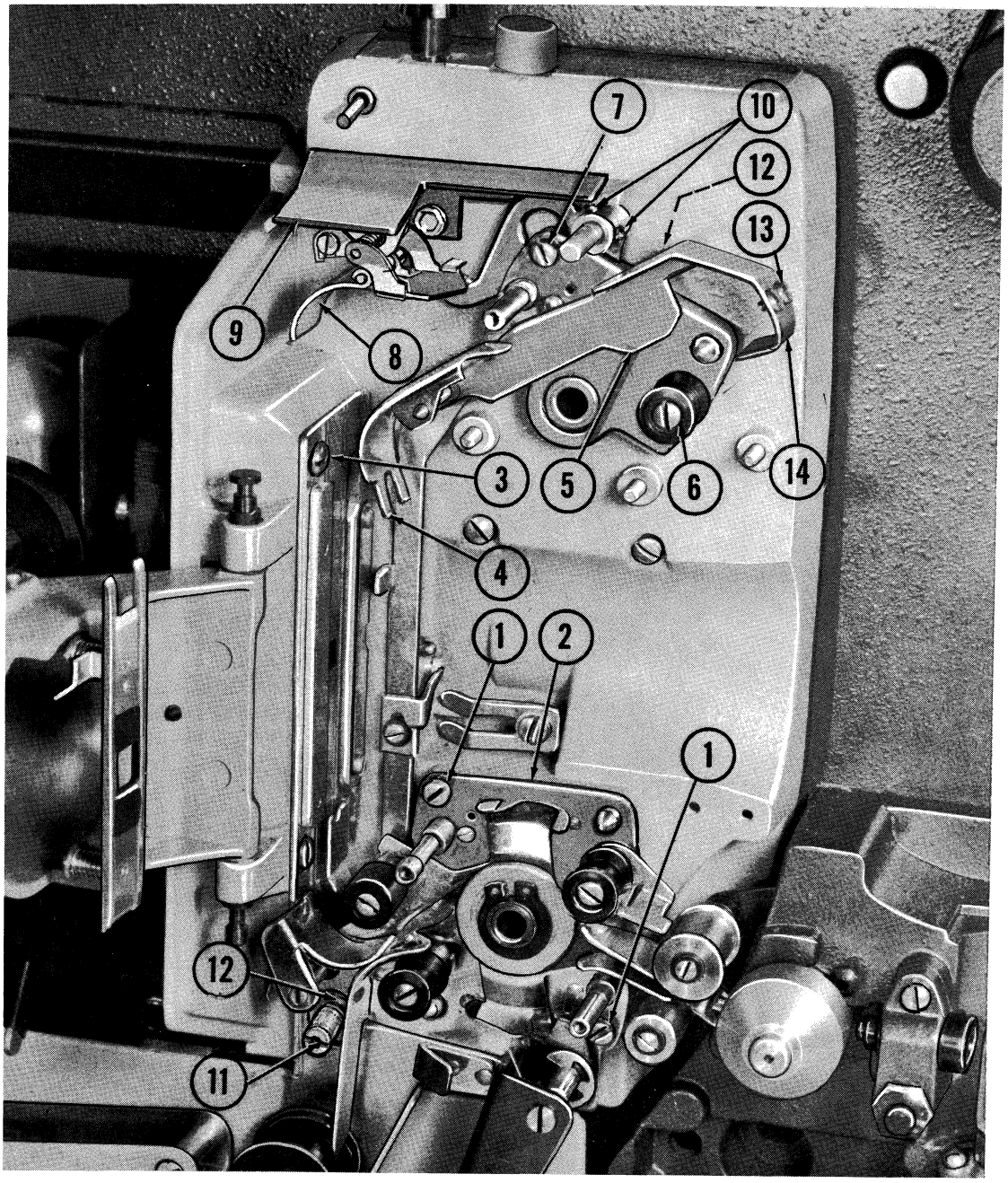
b. When the system is in the open position, the location of the guiding parts is not critical. Therefore, adjustments to assure proper location of the guiding parts are made with the system in the load position.

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

43. ADJUSTING THE LOADING GUIDES.

a. Swing open the lens carrier upper take-up sprocket guard (1, Figure N) and remove the retaining screw (2).

b. Place timing plate (SER-552-1-N1) over the sprocket hubs (3 and 4, Figure N). The timing plate locating pin should enter the counterbore from which screw (2) was removed. If the locating pin does not enter counterbore, loosen three sprocket guard plate



1. Guard plate attaching screw
2. Sprocket guard plate
3. Aperture plate screw
4. Lower loopform assembly
5. Heel of lower loopform
6. Entrance guide roller
7. Upper guard plate screws
8. Film escape kickplate
9. Hood
10. Kickplate setscrews
11. Eccentric pivot screw
12. Eccentric pivot
13. Leaf spring screw
14. Leaf spring

Figure P. Autoload System Adjustments — View II

attaching screws (1, Figure P) and rotate the lower guard plate (2) until pin enters hole. Then tighten the three screws securely.

c. Remove retaining ring that secures the actuating assembly (5, Figure N) and lock the auto-load system. Place a 0.015 inch feeler gage between the film support rails of the aperture plate and the rear surface of the lower loop form assembly (4, Figure P). This surface should touch the feeler gage just as the heel of the loop form (5, Figure P) strikes the shoulder on the mounting stud for the entrance guide roller (6, Figure P). To adjust, loosen two screws (7, Figure P) which attach the upper sprocket guard plate. Press

downward on front end of loop form assembly and rotate upper sprocket guard plate until heel of loop form strikes shoulder of stud and rear surface clears aperture rails by 0.015 inch. Then tighten screws (7, Figure P) securely.

NOTE: Depress and hold the lower loop form assembly (4, Figure P) and check, at rear of mechanism, to see that the pin in the threading lever clears the bottom of the elongated slot in the loop form shaft link by approximately 1/64 inch. (See Figure Q.) If necessary, loosen the hex head screw that secures the threading lever and rotate the lever to obtain the proper clearance; then retighten the hex head screw.

d. Check operation of the film escape mechanism by leaving the auto-thread system open. Manually advance the film and jam it in the upper channel. The film should fold and flow out through the kickplate in the loop former (14, Figure N). If the kickplate does not release, the arm of the hub assembly (13) is not striking the hood (9, Figure P) properly. The hood can be moved slightly and the hub assembly should be adjusted accordingly. When the auto-thread system is activated and the kickplate does not lock in position, loosen the screw (12, Figure N) holding the hub assembly to locking pawl and adjust the hub assembly until the tip of the bracket touches the upper curved surface of the loop former. This will lock kickplate in position.

e. Again depress the loop form assembly (4, Figure N) and check to make certain that there is 0.012 to 0.015 inch clearance between the top surface of the lower loop form (4, Figure N) and the bottom surface of the kickplate (8, Figure P). To adjust, remove the two screws which attach the hood (9). Loosen two setscrews (10) and rotate kickplate (8) to obtain desired clearance. Tighten setscrews and reinstall hood. Before tightening hood retaining screws, press hood toward rear of the projector.

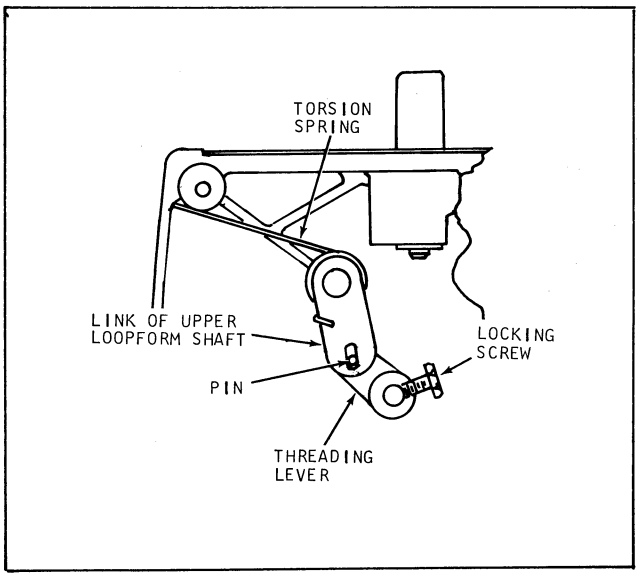


Figure Q. Threading Lever Clearance Adjustment

f. With the auto-load system locked and film gate open, check to make certain that the shuttle teeth do not protrude through the slot in the aperture plate. If shuttle teeth protrude, loosen screw (6, Figure N) and carefully raise the shuttle retractor (7) until teeth are retracted; then tighten screw (6) securely. CAUTION: The top end of the shuttle retractor must not strike the casting.

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

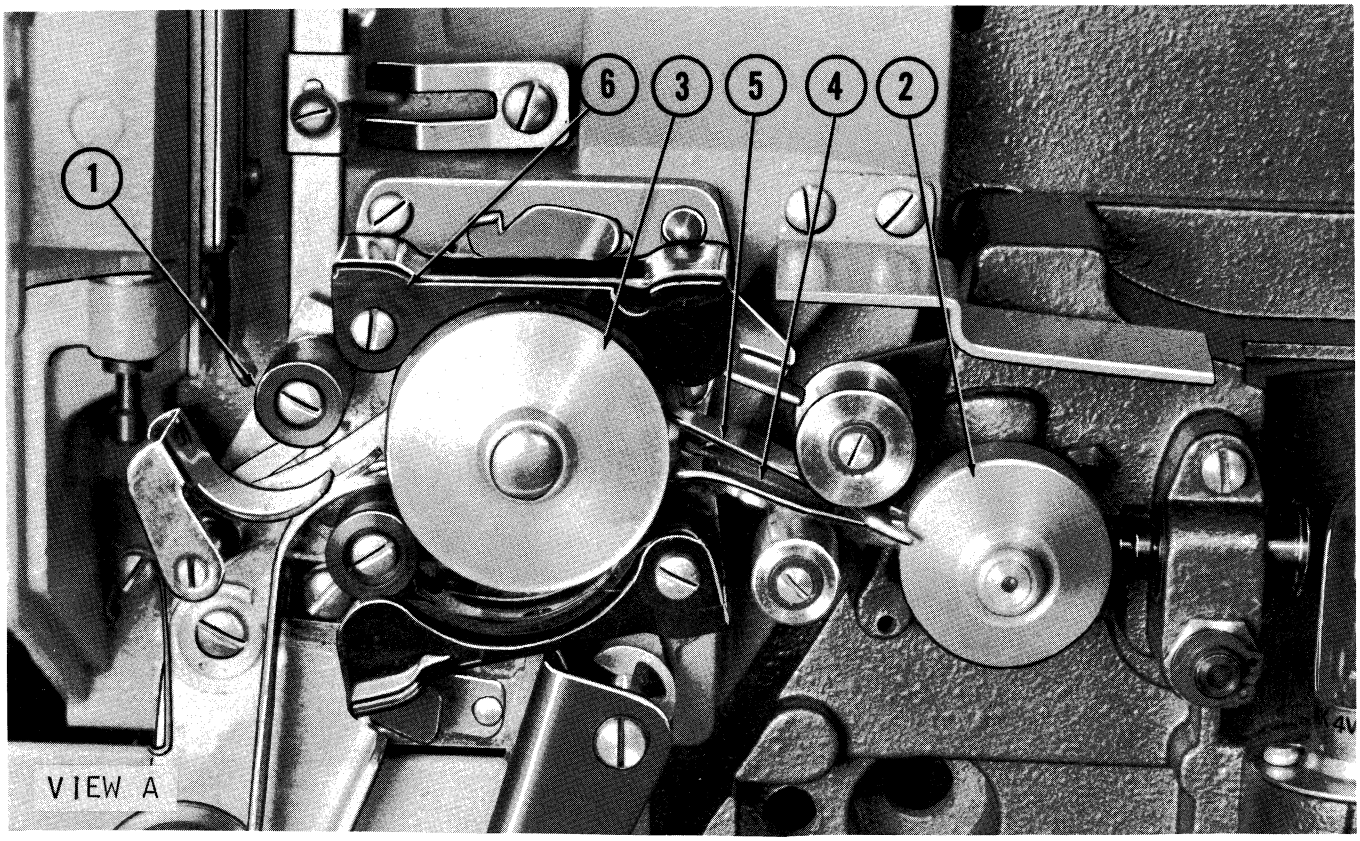
h. Loosen the screw (10, Figure N) and align the film guide (11) so that film will feed squarely to the sprocket; then retighten screw (10).

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

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

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

a. Slip the loop restorer position tool (Figure A) over the loop restorer roller (1, Figure R) with the flat on the tool facing the guide roller at the rear end of the upper sprocket shoe (6, Figure R). The flat of the tool should just touch the guide roller lightly. To adjust spacing between loop restorer roller and guide roller, loosen the mounting screws in the self-centering assembly (inset B, Figure R) and raise or lower that assembly until the proper spacing is obtained. Then tighten the mounting



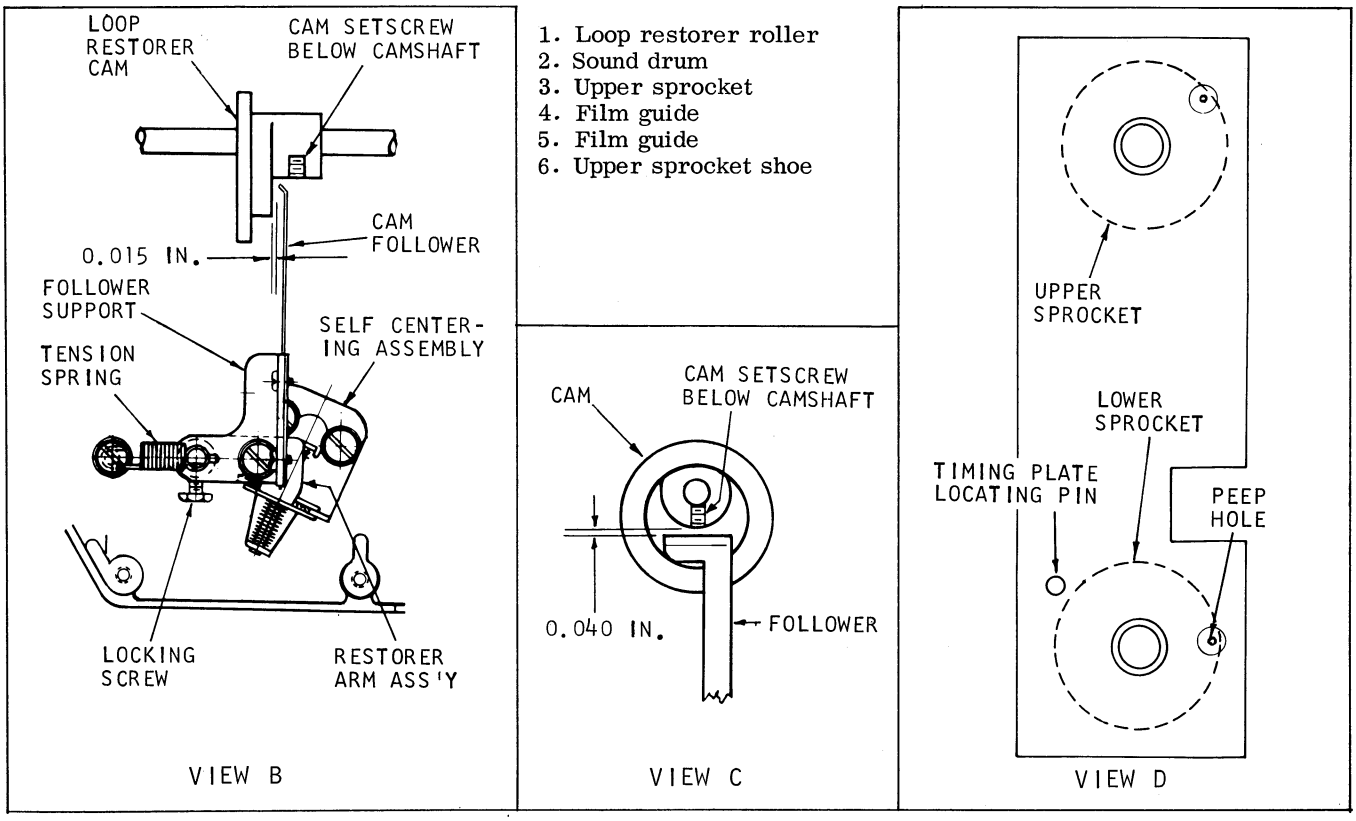


Figure R. Autoload System Adjustments — View III

screws securely. Be sure that the ear of the loop restorer arm is positioned between the two spring-loaded keeper plates of the self-centering assembly.

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

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

45. TIMING THE SPROCKETS.

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

b. Push upward on the underside of the worm gear and check to make certain that the tongue on the driver clutch bears against edge of notch in driven clutch (see Figure K, View B).

c. Open the film shoes and place the timing plate (item 11, Figure A) over the sprocket hubs (View D, Figure K). Dip the end of a straightened paper clip in red lacquer and insert it down through the peep holes to mark the face of each sprocket. Remove timing plate and place a light pencil mark on the face of each sprocket in line with the teeth nearest the red dot. If this pencil mark does not align with the red dot, the sprockets are out-of-time. Note the direction in which each sprocket must be rotated to bring the teeth back in line with the peep holes; then proceed as follows:

d. To retime the sprockets, the rear cover of the projector must be removed to expose the large sprocket gears at the rear of the mechanism assembly. Hold the sprocket gear stationary while loosening its setscrews; then, still holding the gear stationary, carefully rotate the sprocket and shaft assembly in the proper direction until the pencil alignment mark appears in the center of the timing plate peep hole. Tighten the gear setscrews securely without retaining the gear or the sprocket.

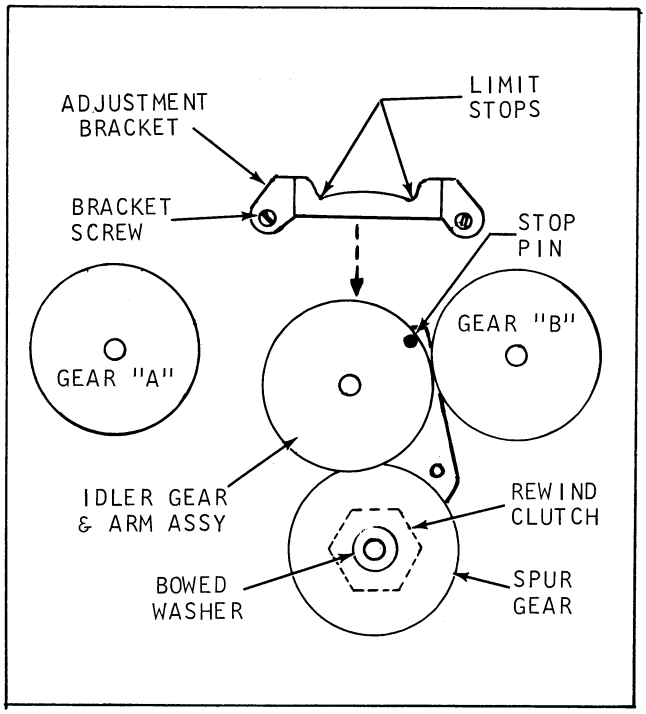


Figure S. Adjusting Gear Shift Tension and Backlash

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

47. GEAR SHIFT TENSION ADJUSTMENT. When shifting from forward to rewind, or vice versa, the idler gear arm (Figure S) should pivot smoothly to effect the engagement of the idler gear with gear "A" or gear "B." This can be checked by rotating the drive belt pulley manually, first in one direction and then the other. If the pivoting action seems hesitant, increase the tension on the arm assembly by pressing the retaining ring more firmly on the spur gear shaft until the bowed washer (Figure S) is flattened against the face of the gear.

48. IDLER GEAR BACKLASH ADJUSTMENT. In both the forward and rewind positions, there must be a perceptible amount of backlash between the idler gear and gears "A" and "B," Figure S. As the idler arm pivots, a stop pin protruding at the upper end of the arm rides the slightly curved rim of the adjustment bracket from one limit stop to the other. Check gear backlash at both limit stops. If there is no backlash at one stop and too much at the other, loosen the adjustment bracket screws and shift the bracket slightly to balance the backlash in both positions.

Trouble Shooting

49. MISCELLANEOUS TROUBLES AND REMEDIES.

TROUBLE	PROBABLE CAUSE	REMEDY
Nothing runs	1. Defective On-Off switch.	1. Replace switch.
	2. Damaged power cable.	2. Repair or replace cable.
	3. Loose connections.	3. Repair connections.
Motor hums but does not run	1. Starting circuit open or shorted.	1. Repair loose or transposed connections; replace defective capacitor and/or relay.
Motor runs but mechanism does not run	1. Damaged switch.	1. Replace switch.
	2. Transposed leads on main switch.	2. Connect leads to proper terminals.
	3. Drive belt broken or unhooked from pulley.	3. Replace or reinstall drive belt.
	4. Motor pulley loose on shaft.	4. Position pulley and tighten setscrews.
	5. Animation clutch spring broken (1592 Models Only).	5. Replace spring.
Rewind does not operate	1. Rewind clutch not engaging or clutch slipping.	1. Adjust (paragraph 39, step c).
Take-up does not operate	1. Take-up sprocket damaged.	1. Replace sprocket.
Feed spindle does not rotate	1. Dirt in reverse take-up clutch.	1. Clean clutch.
Gate will not lock	1. Latch spring set too close to lens mount stop.	1. Adjust latch spring.
	2. Pressure plate out-of-line.	2. Realign pressure plate.
Shuttle runs but sprockets do not revolve	1. Animation clutch spring broken or lost (1592 Models Only).	1. Replace spring.
Short lamp life	1. Line voltage in excess of lamp voltage.	1. Use lamp of correct voltage rating.
	2. Drive belt broken or disengaged.	2. Replace or re-engage belt.
	3. Dirt and lint clogging blower housing.	3. Clean.
Projector speed slow	1. Binding in the mechanism.	1. Free binding condition.
	2. Belt slipping.	2. Clean or replace belt.
Runs at speed between 18 and 24 FPS	1. Pulleys out-of-line.	1. Realign pulleys.
	2. Belt shifter bent.	2. Straighten belt shifter.
	3. Improper power line frequency.	3. Use proper voltage and frequency.

50. PICTURE TROUBLES AND REMEDIES.

TROUBLE	PROBABLE CAUSE	REMEDY
Film jump	1. Damaged film.	1. Repair or replace.
	2. Loose shuttle.	2. Adjust and tighten (paragraph 35, step c).
	3. Dirty film aperture.	3. Clean film aperture.
	4. Damaged or lost pressure plate spring.	4. Replace spring.
	5. Pressure plate misaligned.	5. Realign pressure plate.
	6. Incorrect shuttle stroke.	6. Adjust (paragraph 35, step d).
Double image	1. Incorrect shuttle stroke.	1. Adjust (paragraph 35, step d).
	2. Excessive shuttle protrusion.	2. Adjust (paragraph 35, step b).
Weave (due to faulty aperture plate)	1. Sticking edge guide.	1. Clean guide.
	2. Replace tension spring lost.	2. Replace spring.
	3. Fixed edge guide out of position.	3. Reposition guide.
Poor illumination	1. Optics out-of-line.	1. Realign (paragraph 34).
	2. Fire shutter sticking.	2. Check mechanical linkage ffor binding.
Poor focus	1. Dirty lens and/or aperture.	1. Clean lens and/or aperture.
	2. Warped film.	2. Recondition or replace film.
	3. Projector lens mount out-of-line.	3. Realign (paragraph 36).
	4. Pressure plate spring lost.	4. Replace spring.
	5. Bent pressure plate.	5. Replace pressure plate.
	6. Pressure plate out-of-line.	6. Realign pressure plate.
Frame line creeps	1. Framer eccentric loose.	1. Align and tighten (paragraph 35, step e).
Insufficient framing	1. Framer eccentric out of adjustment.	1. Adjust (paragraph 35, step e).
Trailer ghost	1. Shutter out-of-line.	1. Reassemble properly.

51. FILM TRANSPORT TROUBLES AND REMEDIES.

TROUBLE	PROBABLE CAUSE	REMEDY
Loss of loops	1. Damaged film.	1. Repair or replace film.
	2. Inadequate shuttle protrusion.	2. Adjust (paragraph 35, step b).
	3. Inadequate or excessive shuttle stroke.	3. Adjust (paragraph 35, step d).
	4. Pressure plate spring lost.	4. Replace spring.
	5. Pressure mounting plate screws loose.	5. Tighten mounting screws.
	6. Sprocket guards not closing.	6. Clean or adjust.
	7. Sprocket drive gear loose on shaft.	7. Retime (paragraph 45) and tighten setscrews.
	8. In-out bracket spring broken.	8. Replace spring.
Lower loop not restored	1. Loop restorer stroke too short.	1. Adjust (paragraph 44).
	2. Loop restorer does not engage restorer cam.	2. Adjust (paragraph 44).
Film rubs on loop restorer roller	1. Restorer arm out of position.	1. Reposition (paragraph 44).
	2. Loop restorer does not engage restorer cam.	2. Adjust (paragraph 44).
Excessive film slap	1. Damaged film.	1. Recondition or replace.
	2. Green film.	2. Age or buff film.
	3. Dirty pressure plate.	3. Clean pressure plate.
	4. Pressure plate rubbing on aperture plate guide rails.	4. Realign pressure plate.
	5. Incorrect shuttle stroke.	5. Adjust (paragraph 35, step d).
Animation clutch does not operate (1592 Models Only)	1. Open in animation clutch circuit.	1. Repair circuit.
	2. Solenoid plunger set too high or too low.	2. Adjust solenoid plunger (paragraph 37, step c).
	3. Stop pawl clearance excessive.	3. Adjust (paragraph 37, step a).
Animation clutch stops sprocket but shuttle pulls film (1592 Models Only)	1. Insufficient shuttle retraction.	1. Adjust (paragraph 37, step b).
Splices jam in sprocket shoes	1. Bad splices.	1. Replace splices.
	2. Emulsion build-up.	2. Clean film path components.

52. SOUND SYSTEM TROUBLES AND REMEDIES.

TROUBLE	PROBABLE CAUSE	REMEDY
Projector runs, no voltage at P.C. board	1. Loose connection.	1. Repair connection.
	2. Amplifier switch damaged.	2. Replace switch.
Projector runs, voltage at P.C. board, but exciter lamp does not light	1. Exciter lamp cable disconnected.	1. Connect cable.
	2. Wrong exciter lamp used.	2. Replace with correct lamp.
	3. Projector main switch open or leads disconnected.	3. Replace main switch or connect leads.
Voltage at P.C. board, exciter lamp lights, but no sound	1. Speaker jack disconnected or speaker jack switch open.	1. Connect leads. Repair or replace jack.
	2. Photocell cable disconnected or leads reversed.	2. Connect cable. Connect leads to proper terminals.
	3. Photocell out-of-line.	3. Realign (paragraph 40, step b).
	4. Dirt on end of photocell.	4. Clean photocell.
	5. Wrong exciter lamp used.	5. Replace with correct lamp.
Low volume	1. Trouble in printed circuit board.	1. Check out the circuit board.
	2. Wrong exciter lamp used.	2. Replace with correct lamp.
	3. Photocell out-of-line.	3. Realign (paragraph 40, step b).
	4. Dirt on photocell or slit.	4. Clean photocell and slit.
	5. Slit misaligned.	5. Realign (paragraph 40, step e).
	6. Buzz track misaligned.	6. Realign (paragraph 40, step f).
Distortion at all volume levels	1. Wrong exciter lamp used.	1. Replace with correct lamp.
	2. Trouble in printed circuit board.	2. Check out the circuit board.
Crackling noises	1. Broken ground lead to main frame.	1. Replace defective lead.
	2. Buzz track out-of-line.	2. Realign (paragraph 40, step f).
	3. Broken cable shield.	3. Repair shield or replace cable.
Wow or flutter	1. Soundhead stabilizer guide roller sticking.	1. Clean roller and roller shaft.
	2. Stabilizer guide roller spring broken, unhooked or lost.	2. Repair or replace spring.
	3. Film edge guide (soundhead) out-of-line.	3. Realign (paragraph 40, step f).
	4. Loose flywheel.	4. Tighten flywheel.
	5. Damaged sound drum bearing.	5. Replace sound drum.

52. SOUND SYSTEM TROUBLES AND REMEDIES (CONT'D).

TROUBLE	PROBABLE CAUSE	REMEDY
Wow or flutter (Cont'd)	6. Dirt causing guide roller arm pivot bearing to bind.	6. Clean and polish.
	7. Photocell or exciter cable rubbing against flywheel.	7. Reposition cables.
	8. Chips or dirt in take-up sprocket gear teeth.	8. Remove and clean sprocket gear.
	9. Loop restorer stroke is too short or restorer set too low.	9. Adjust (paragraph 44).
Clicking noises	1. Dirt on sound drum.	1. Clean sound drum.
	2. Broken ground lead to main frame.	2. Replace lead.
High frequencies fade (jumps focus)	1. Warped film.	1. Recondition or replace film.
	2. Film edge guide (soundhead) out-of-line.	2. Realign (paragraph 40, step f).
	3. Dirt on sound drum.	3. Clean sound drum.
Hum	1. Ground wiring.	1. Correct grounded condition.
	2. Trouble in printed circuit board.	2. Check out the circuit board.

53. TROUBLE SHOOTING AUTOLOAD SYSTEM.

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

b. Test Film. The autoload system has been designed to function properly with all films which can be described as being in projectable condition (see Operators Instructions for limits of shrinkage, curl, etc.). Generally, any film which functions properly in other Bell & Howell projectors (such as Designs 399, 542 and 552) can be used for testing the autoload system. Any film which does not thread properly should be inspected. The end of the leader must be properly trimmed and free from sharp bends. All sprocket holes in the first 18-inches of leader must be in good condition. Splices must be properly registered and in good condition. Sprocket holes restricted by cement or splicing tape must be cleared or the splice remade. The repairman is cautioned that it would be a waste of time to adjust or attempt to adjust the autoload system to autothread a film which is in such poor condition as to be incapable of being the source of an uninterrupted film presentation of acceptable quality.

c. Autoload Trouble Shooting Chart.

TROUBLE	PROBABLE CAUSE	REMEDY
Film cannot be inserted into feed sprocket	1. Obstruction below roller of channel (16C, Figure 10).	1. Remove obstruction.
	2. Roller channel (16C, Figure 10) bent or binding.	2. Straighten or replace assembly.
	3. Excessive pressure on leaf spring (26, Figure 11).	3. Adjust leaf spring (paragraph 43, step j).
Film will not pull between feed sprocket and sprocket shoe	1. Entrance guide (11, Figure N) misaligned.	1. Realign per paragraph 43, step h).
	2. Feed sprocket guard sticking.	2. Clean sprocket shoe pivot.
	3. Feed sprocket guard spring (30, Figure 10) broken.	3. Replace spring.
	4. Caked emulsion or burr on sprocket shoe film rails.	4. Clean; remove burr with crocus cloth.
Film comes out the side of top sprocket	1. Obstruction in sprocket guard.	1. Remove obstruction.
	2. Damaged sprocket guard.	2. Replace sprocket shoe.
	3. Sprocket guard and sprocket misaligned laterally.	3. Realign.
Film strikes top of aperture plate and begins to pile up	1. Upper loop former (8, Figure P) bent or out of adjustment.	1. Straighten or replace if bent; readjust per paragraph 43, step e.
	2. Lower loop former (4, Figure P) set too close to aperture plate.	2. Readjust per paragraph 43, step e..
Film butts into or goes under top end of aperture plate side tension rail or strikes fixed rail	1. Upper loop former (8, Figure P) bent causing sidewise deflection of film.	1. Straighten or replace if bent; readjust per paragraph 43, step e.
	2. Lower loopformer (4, Figure P) bent or out of adjustment.	2. Straighten or replace if bent; readjust per paragraph 43, step c.
Film butts against top of film pressure plate or passes over outside of pressure plate	1. Lower loop former (4, Figure P) out of adjustment.	1. Readjust per paragraph 43, step c.
	2. Pressure plate not lifting off of aperture plate when film gate is closed.	2. Bent parts need straightening (paragraph 43, step g) or replacing.
Film ejects between bottom of gate and top of take-up sprocket, or piles up in this area	1. Lower loopformer (13, Figure 11) bent or sticking.	1. Straighten, remove bind, or replace as necessary.
	2. Lower loop former spring (14, Figure 11) broken.	2. Replace spring.
	3. Loop restorer out of adjustment or restorer roller stud bent.	3. Readjust loop restorer (paragraph 44); replace damaged parts.
	4. Obstruction or burr in take-up sprocket upper guard.	4. Clean; remove burr with crocus cloth.
	5. Sprockets out of time.	5. Time sprockets per paragraph 45.

TROUBLE	PROBABLE CAUSE	REMEDY
Film not threading over take-up sprocket	1. Sprocket guard mounting plate (21, Figure 11) out of position.	1. Reposition per paragraph 43, step b).
	2. Obstruction in upper sprocket guard.	2. Remove obstruction.
	3. Sprocket guard spring (30, Figure 10) broken.	3. Replace spring.
	4. Take-up sprocket shaft loose in gear (13, Figure 10).	4. Retime sprockets (paragraph 45) and tighten setscrews (11, Figure 10).
Film piles up ahead of sound drum	1. Insufficient clearance between soundhead threading guides (4 and 5, Figure R).	1. Readjust all guides per paragraph 43.
	2. Back-up bracket (16, Figure 11) bent downward.	2. Straighten bracket.
	3. Exciter lamp cover loose.	3. Tighten cover retaining screw.
	4. Obstruction in gap between sound drum and exciter lamp cover.	4. Remove obstruction.
	5. Not enough clearance between sound drum and cover.	5. Check clearance per paragraph 46.
	6. Edge guide adjusting screw (24, Figure 9) out too far.	6. Adjust per paragraph 40, step f.
Film ejects ahead of lower take-up sprocket shoe or piles up in this area	1. Insufficient clearance between soundhead threading guides (4 and 5, Figure R).	1. Readjust all guides per paragraph 43.
	2. Soundhead loose or improperly positioned.	2. Reposition per paragraph 40, step g.
	3. Obstruction or burr in lower take-up sprocket guard.	3. Remove obstruction; remove burr with crocus cloth.
	4. Film guide (4, Figure 9) improperly positioned.	4. Reposition guide.
Film sticks in or is ejected from lower take-up sprocket guard	1. Obstruction or burr in lower take-up sprocket guard.	1. Remove obstruction; remove burr with crocus cloth.
	2. Sprocket guard sticking.	2. Clean sprocket guard pivot.
	3. Broken sprocket guard spring (30, Figure 10).	3. Replace spring.
	4. Sprocket guard and sprocket misaligned laterally.	4. Realign.
	5. Autothread lever (11, Figure 11) bent or improperly positioned.	5. Reposition or straighten lever.
Film piles up ahead of idler roller (11C, Figure 11) or is ejected from this area	1. Autothread lever (11F, Figure 11) bent or improperly positioned.	1. Reposition or straighten lever.
	2. Idler roller sticking or roller stud loose or bent.	2. Remedy sticking condition; replace autothread lever (11F, Figure 11).

TROUBLE	PROBABLE CAUSE	REMEDY
System will not lock	1. Autothread lever (11F, Figure 11) binding.	1. Repair or replace lever.
	2. Release spring (10, Figure 11) disengaged or broken.	2. Engage spring with locking lever, or replace spring.
	3. Eccentric bushing (12, Figure P) improperly adjusted.	3. Readjust bushing per paragraph 43, step i.
Loop restorer cycles continuously	1. Restorer out of adjustment.	1. Adjust per paragraph 44.
	2. Shuttle retractor pin (29, Figure 12) sticking.	2. Clean and lubricate pin.
	3. Pressure plate (5B, Figure 10) binding on aperture plate edge guide.	3. Realign pressure plate.
Slack film in soundhead area	1. Sprocket guards sticking.	1. Clean sprocket shoe pivots.
	2. Take-up jerking.	2. Check take-up torque and check for binding in take-up reel arm.
	3. Jockey rollers (soundhead) sticking.	3. Clean and lubricate.
	4. Soundhead improperly positioned.	4. Reposition per paragraph 40, step g.
	5. Dirt or obstruction between sound drum and exciter lamp cover.	5. Remove obstruction.
Film scratches	1. Caked emulsion on film path parts.	1. Clean film path.
	2. Film chips in sprocket guards.	2. Remove film chips.
	3. Scratches or burrs on film guides, guards, aperture or pressure plate.	3. Polish with crocus cloth or replace.
	4. Jockey rollers (soundhead) sticking.	4. Clean and lubricate.
Perforations checked	1. Shuttle not retracting.	1. Adjust per paragraph 43, step f.
	2. Pressure plate not lifting from aperture plate.	2. Adjust per paragraph 43, step g.
	3. Excessive feed or take-up tension.	3. Adjust tension.
Film dimpled between perforations	1. Sprocket shoes sticking.	1. Clean sprocket shoe pivots.
	2. Shuttle not retracting.	2. Adjust per paragraph 43, step f.
	3. Sprockets out of time.	3. Retime per paragraph 45.
	4. Inadequate pressure on leaf spring (26, Figure 11).	4. Adjust per paragraph 43, step j.
	5. End of film leader not cut clean and square.	5. Check your film cutter; replace if dull or broken.

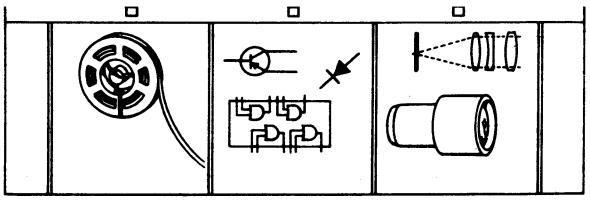
TROUBLE	PROBABLE CAUSE	REMEDY
Film escape mechanism does not open to permit exit of film	1. Film exit latching is out of adjustment.	1. Readjust per paragraph 43, step d.
Film escape locking pawl does not seat properly; film exits constantly	1. Torsion spring (46C, Figure 11) is disconnected.	1. Connect torsion spring.
	2. Locking pawl (46E, Figure 11) out of adjustment.	2. Readjust locking pawl per paragraph 43, step d.

BELL & HOWELL

7100 N. McCormick Road Chicago, Illinois 60645

GENERAL SERVICE BULLETIN

A-78-266



SUBJECT 16MM PROJECTORS: WIRING ON MAIN FUNCTION SWITCH DATE 11-28-78

REFERENCE: MANUAL THREADING MODEL SERVICE MANUAL #73584 & 74405
AUTOMATIC THREADING MODEL SERVICE MANUAL #73583 & 74404
SLOT THREADING MODEL SERVICE MANUAL #74403

The first part of this bulletin refers to the following models:

1592)
1592H)
1592B)
1592BH)
1592C)
1592CH) Only Serial Numbers below 8300001

A possibility exists in the above cited models that a portion of the lamp transformer may become shorted, draw excessive current, and subsequently overheat causing the line fuse to blow. This situation arises when the brown/green wire leads shown on the attached wiring diagram at position 2C on the main function switch (P/N 48625) are installed in a reversed manner or become bent so that they touch the orange wire lead at position 2D.

All of these models presently in your stock should be checked for this condition. If the brown/green wire leads are found to be reversed, they should be removed and installed correctly. If found in the correct position but with the leads touching, then straighten both leads to prevent contact.

A flag style insulator, P/N 709600, shown in Figure 1, should then be added to the orange wire lead at position 2D. This insulator will prevent shorting if the leads are reversed and/or bent so as to touch.

All projectors brought in for service work should also have this flag style insulator installed.

This flag style insulator is of the clam shell type. To install it, open the large end of the insulator and insert the lug on the end of the orange wire. Push the lug into the insulator until the end of the lug is flush with the narrow end of the insulator. The orange wire itself should exit the insulator at the hole near its large end. In this condition the orange wire with its insulated lug may now be reinstalled at position 2D on the main function switch.

The second part of this bulletin refers to the following models:

1574C	)
1579C	)
1580C, 1580N	)
1585C, 1585ML	)
1590C	)
1592C, 1592CH	) Only Serial Numbers below 8300001

A possibility exists in these models ~~where~~ the projector motor may not operate and may be subject to overheating, causing the thermal protective fuze to open. This situation may arise when the red/black wire leads on position 2B of the main function switch, shown in the attached wiring diagram, are installed in a reversed manner or become bent, thus touching the blue wire lead on position 2A.

All of these models brought in for service should be checked for this condition. If the red/black wire leads are found to be reversed, they should be removed and installed correctly. If found in the correct position but with the leads touching, then straighten both leads to prevent contact.

A straight style insulator, P/N 709599, shown in Figure 2 below, should then be installed on the blue wire lead attached to position 2A. This insulator will prevent shorting if the leads are reversed and/or bent so as to touch.

Insert the lug on the end of the blue wire into the larger end of the straight insulator and push forward until a click is heard (or felt) which will indicate the lug is locked into the insulator. Should this click not be heard, remove the lug, turn it over and again insert it into the larger end of the insulator until the click is heard. Once the lug is locked into the insulator, the now insulated blue lead should be re-installed onto position 2A on the main function switch.

FOR MODELS 1592C AND 1592CH BELOW S/N 8300001 BOTH INSULATORS, AS DESCRIBED IN PART ONE AND IN PART TWO OF THIS BULLETIN, SHOULD BE ADDED AT THE SAME TIME.

An operational check with the back off of the projector should be performed after the insulators have been installed.

All projectors manufactured after S/N 8300001 will have shrink tubing installed over positions 2A, 2B, 2C and 2D on the main function switch at the time of manufacture. This will prevent either possibility from arising.

The following parts may be ordered at NO CHARGE on service parts order form 36570 (sample attached) by indicating the quantity of parts required, the part number, and the description. Indicate "Requested per Bulletin A-78-266 in the price column. This Bulletin Number must be included in order to receive the parts at no charge.

QUANTITY REQUIRED FOR EACH PROJECTOR	PART NUMBER	DESCRIPTION
1	709599	Straight style insulator (white)
1	709600	Flag style insulator (blue)

All orders for these parts should be sent to:

Bell & Howell Company
General Service Department
7100 McCormick Road
Chicago, Illinois 60645

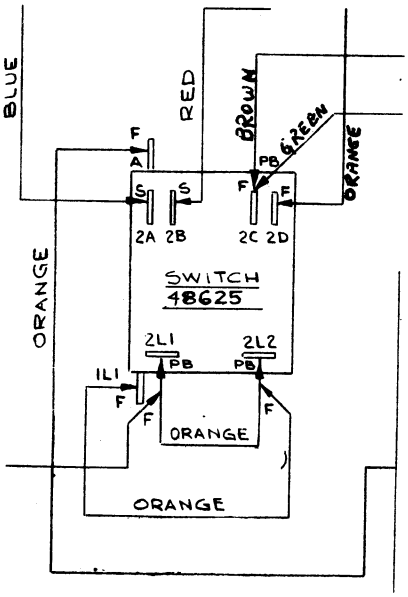
Reimbursement for performing the actions required by the first part of this bulletin will be a $5.00 flat rate. A warranty service report (Form #501) must be submitted for reimbursement. In the space on this form where the customer's complaint is indicated, fill in "Wiring on Main Function Switch per Bulletin A-78-266.

Units covered by the regular product warranty that require the actions of the second part of this bulletin, will be included in the regular warranty flat rate amount.

Units,that are OUT OF WARRANTY, requiring the actions of the second part of this bulletin will be reimbursed the $5.00 flat rate amount as stated above.

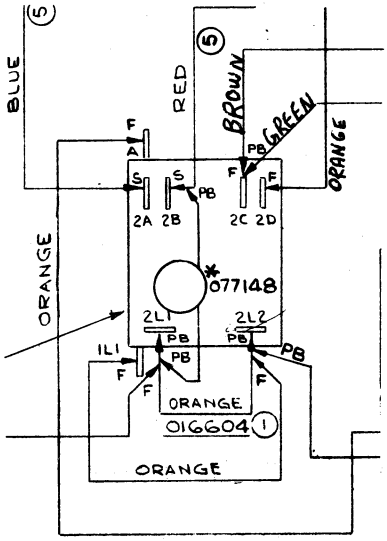
NOTE: REIMBURSEMENT WILL BE MADE ONLY TO AUTHORIZED DEALERS AND SERVICE STATIONS.

GENERAL SERVICE DEPARTMENT



P/N 709600
Flag Insulator

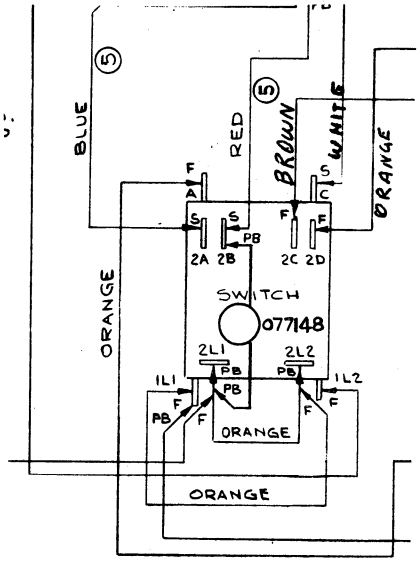
1592's below
serial number 8300001



P/N 709599
Straight Insulator

P/N 709600
Flag Insulator

1592's above
serial number 8300001



P/N 709599
Straight Insulator

All Models
except 1592

PARTS CATALOG

AUTOLOAD®
FILMOSOUND® 16mm PROJECTOR
(AUTOMATIC THREADING)

MODELS:

1585A, ML

1590A, B

1592A, B, C, H, BH

BELL & HOWELL

GENERAL SERVICE DEPT.
7100 McCORMICK ROAD
CHICAGO, ILLINOIS 60645

PART NO. 73583-1 PRINTED IN U.S.A. REVISED JANUARY 1977

Replacement Parts

The following pages illustrate and list, by part number and description, all replacement parts for Bell & Howell Automatic Threading Filmosound Projectors, Designs 1585, 1590 and 1592. These projectors are physically and mechanically similar, except that Model 1585 is not equipped with the mechanism cover assembly (item 11, Figure 1) and only the 1592 models are equipped with the Directamotion and "Still" picture control features. Models 1585A, 1585ML, 1590A, 1592A and 1592H are equipped with the metal "snap-in" lamphouse (item 1-13). Models 1590B, 1592B and 1592BH are equipped with a hinged plastic lamphouse (see inset, Figure 1), plus the newly designed front and top covers. Models 1592H and 1592BH are wired for 50/60Hz operation; all other models are wired for 60Hz only.

When ordering replacement parts, be sure to check the "Usable on Code" column to be certain that the part in question is applicable to the projector being serviced. Where this column is blank, the listed part is applicable to all projector models. Code letters used are listed in the following table. The code letters "NP" indicate that the listed part is "not procurable" in its completely disassembled form and, if in need of replacement, the complete assembly of which it is a part must be replaced.

Model No.	Code
1585A	A
1590A	B
1592A	C
1590B	D
1592B	E
1592H	F
1592BH	G
1585ML	H
1592C	J

AVAILABLE ACCESSORIES

Directamotion Remote Control	P/N 014128
Take-Up Reel (400 Foot)	P/N 014570

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		COVERS AND LAMPHOUSE		
1-1	015504	COVER ASSEMBLY, Front (NOTE A) (early models)	1	ABCF
1-1	016222	COVER ASSEMBLY, Front (NOTE A) (current models)	1	
1-1	016527	COVER ASSEMBLY, Front	1	J Only
-1A	48621	. LABEL, Instruction (adhesive backed) (early models)	1	ABCF
-1A	707118	. LABEL, Instruction (adhesive backed) (current models)	1	
-1B	44536	. RIVET, Semi-tubular (early models)	4	ABCF
-1B	765460	. RIVET, Semi-tubular (current models)	4	
-1C	48092	. LATCH, Cover release (early models)	2	ABCF
-1C	45083	. LATCH, Cover release (current models)	2	
-1D	48059	. SPRING, Cover latch, front (early models)	1	ABCF
-1D	49283	. SPRING, Cover latch, front (current models)	1	
-1E	48060	. SPRING, Cover latch, rear (early models)	1	ABCF
-1E	49282	. SPRING, Cover latch, rear (current models)	1	
-1F	49284	. PLATE, Stiffener (all current models)	1	
-1G	No Number	. COVER, Front (replace complete cover assembly)	NP	
-2	48058	NAMEPLATE, Front cover	1	
-3	49638	SCREW, Hex washer head, 6-32 by 1/2 inch	4	
-4	707195	BRACKET, Line cord retainer	1	ABCF
-5	48062	PLATE, Control panel cover	1	ABCDEHJ
-5	48191	PLATE, Control panel cover	1	FG
-5A	46524	LABEL, UL listing (adhesive backed)	1	
-6	708246	SCREW, Hex washer head, 6-32 by 3/4 inch	4	
-6A	49275	SCREW, Special	3	
-7	48055	COVER, Rear	1	
-8	49638	SCREW, Hex washer head, 6-32 by 1/2 inch	2	
-9	No Number	COVER AND HANDLE ASSEMBLY, Top (NOTE A)	NP	
-9A	707449	. SCREW, Hex washer head, tapping, 8-18	4	
-9B	48052	. HANDLE, Carrying	1	
-9C	48063	. BRACKET, Cover mounting	2	
-9	016262	. COVER ASSEMBLY, Top (NOTE A) (early models)	1	ABCF
-9	016534	. COVER ASSEMBLY, Top (NOTE A) (current models)	1	DEGJ

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		COVERS AND LAMPHOUSE (CONT'D)		
-9	016544	. COVER ASSEMBLY, Top (NOTE A) (current models)	1	H
-9D	700816	. . RIVET, Tubular, 0.123 inch diameter (early models)	4	ABCF
-9D	26126	. . RIVET, Tubular, 0.123 inch diameter (current models)	2	
-9E	48061	. . PLATE, Front cover latch (early models)	2	ABCF
-9E	45087	. . STRIKER, Front plate latch (current models)	2	
-9F	48093	. . SPACER, Latch plate (early models)	2	ABCF
-9F	31020	. . WASHER, Flat (current models)	2	
-9G	No Number	. . COVER, Top (replace with assembly #016262, #016534, or #016544	NP	
-10	48080	NAMEPLATE, Handle (adhesive backed)	1	AH
-10	48079	NAMEPLATE, Handle (adhesive backed)	1	BD
-10	48064	NAMEPLATE, Handle (adhesive backed)	1	CEFGJ
-11	014572	COVER ASSEMBLY, Mechanism	1	BCF
-11A	30808	. SCREW, Hex washer head, 6-32 by 5/16 inch	3	BCF
-11B	31609	. LATCH, Cover	1	BCF
-11C	44354	. BAR, Hinge	1	BCF
-11D	44355	. SPRING, Cover retaining	1	BCF
-11E	36070	. LABEL, Cover removal (adhesive backed)	1	BCF
-11F	No Number	. COVER, Mechanism (replace complete cover assembly)	NP	BCF
-12	44548	NAMEPLATE, "FOCUS" (adhesive backed)	1	BCF
-13	015660	LAMPHOUSE ASSEMBLY	1	A
-13	015659	LAMPHOUSE ASSEMBLY	1	B
-13	015658	LAMPHOUSE ASSEMBLY	1	CF
-13	015657	LAMPHOUSE ASSEMBLY	1	H
-13A	44398	. RIVET, Semi-tubular, 0.123 inch diameter	1	ABCFH
-13B	44396	. DEFLECTOR, Air	1	ABCFH
-13C	44397	. WASHER, Spacer	1	ABCFH
-13D	49982	. LATCH, Lamphouse	1	ABCFH
-13E	48628	. DECAL, Control knob (adhesive backed)	1	A
-13E	48627	. DECAL, Control knob (adhesive backed)	1	B
-13E	48626	. DECAL, Control knob (adhesive backed)	1	C
-13E	49944	. DECAL, Control knob (adhesive backed)	1	F
-13F	No Number	. LAMPHOUSE (Replace complete lamphouse assembly)	NP	
-14	44549	NAMEPLATE, Lamphouse (adhesive backed)	1	ABCF
-15A	30807	SCREW, Hex washer head, 6-32 by 1/4 inch	2	
-15B	30808	SCREW, Hex washer head, 6-32 by 5/16 inch	1	
-16	016371	LAMPHOUSE ASSEMBLY	1	D
-16	016356	LAMPHOUSE ASSEMBLY	1	EGJ
-16A	31953	. SCREW, Pan head tapping, 4-24 by 3/16 inch	2	DEGJ
-16B	8180	. WASHER, Lock	2	DEGJ
-16C	707081	. LATCH, Lamphouse	2	DEGJ
-16D	766693	. SCREW, Pan head tapping, 4-40	3	DEGJ
-16E	016452	. BRACKET AND HINGE ASSEMBLY	1	D
-16E	016451	. BRACKET AND HINGE ASSEMBLY	1	EGJ
-16F	44173	. . KNOB, Still/Run	1	EGJ
-16G	No Number	. . BRACKET AND HINGE (Replace item -16E)	1	DEGJ
-17	707077	DEFLECTOR, Air	1	DEGJ
-18	707115	LABEL, Switch position (adhesive backed)	1	DG
-18	707114	LABEL, Switch position (adhesive backed)	1	EJ
-19	707231	LABEL, Lamp type (adhesive backed)	1	D
-19	707229	LABEL, Lamp type (adhesive backed)	1	EGJ
-20	015509	COVER ASSEMBLY, Exciter lamp (see Figure 9 for detail parts)	1	
-21	44461	LABEL, Speed change warning (adhesive backed)	1	ABCDEHJ
-21	44490	LABEL, Speed change warning (adhesive backed)	1	FG
-22	87129	LABEL, Caution (adhesive backed)	1	DEGJ

NOTE A: Because of the differences in front cover latching, the current front cover assembly (item 1) and top cover assembly (item 9) are not interchangeable with the earlier assemblies. The new covers are used on all models above Serial No. 5290001.

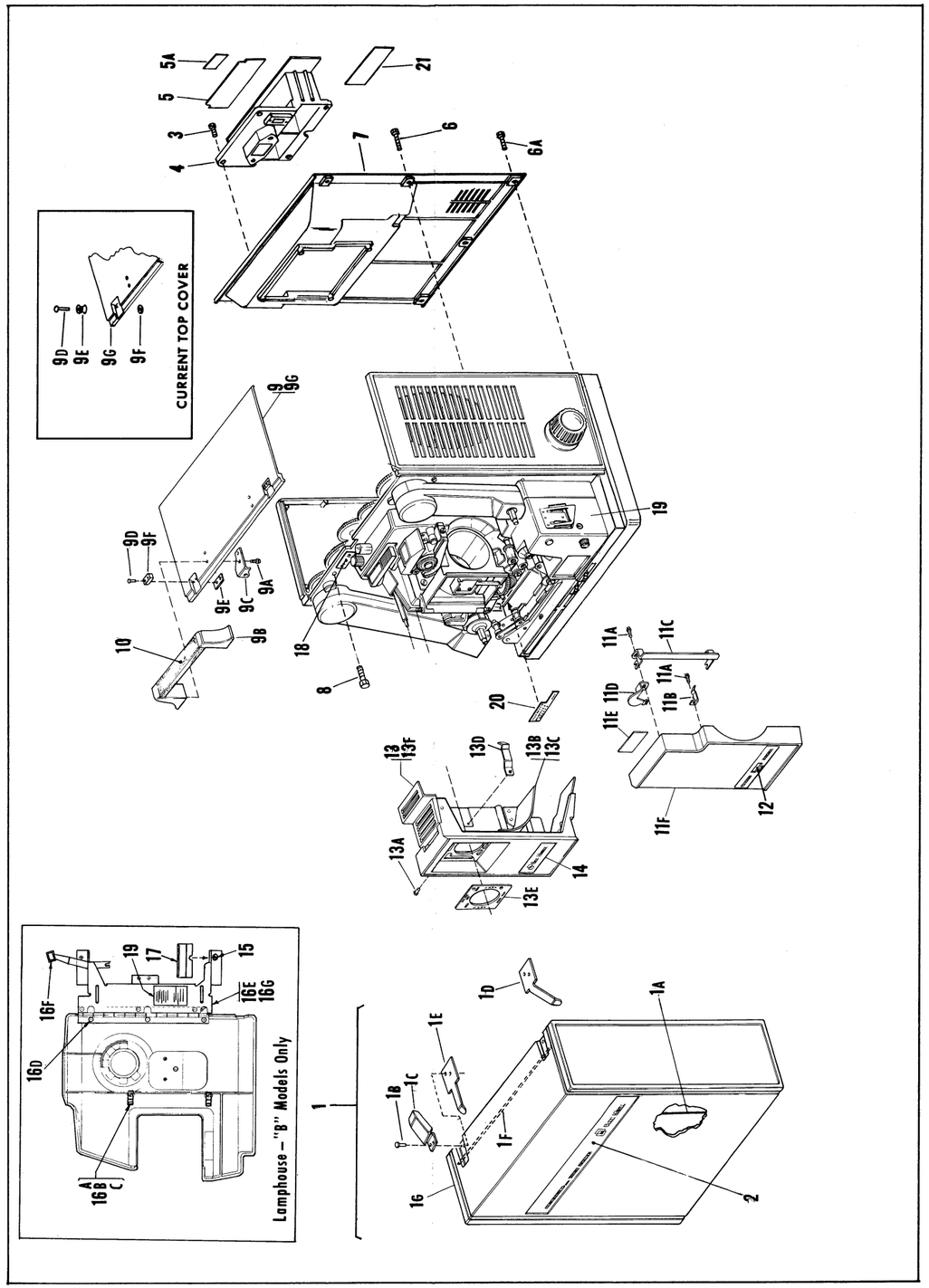


Figure 1. Covers and Lamphouse

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		END CAPS AND LAMP PARTS		
2-1	36769	SETSCREW, Fluted socket cup pt, 8-32 by 1/4 inch	1	
-2	09807	KNOB ASSEMBLY, Tilt	1	
-3	708246	SCREW, Hex washer head, 6-32 by 3/4 inch	4	
-3A	47974	SPACER, Sleeve	1	
-4	708246	SCREW, Hex washer head, 6-32 by 3/4 inch	4	
-5	48167	NUT, Speed	12	
-6	015507	END CAP ASSEMBLY, Front	1	
-6	016610	END CAP ASSEMBLY, Front	1	J Only
-6A	765363	. RING, Retaining, grip-type	4	
-6A	45102	. NUT, Tinnermann	4	J Only
-6B	44225	. SPEAKER, 16 ohm	1	
-6B	48907	. SPEAKER, 8 ohm	1	J Only
-6C	48053	. END CAP, Front	1	
-7	015559	END CAP ASSEMBLY, Rear	1	ABDH
-7	015506	END CAP ASSEMBLY, Rear	1	CEFG
-7	016609	END CAP ASSEMBLY, Rear	1	J
-7A	30809	. SCREW, Hex washer head, 6-32 by 3/8 inch	4	Except J
-7B	44226	. CLAMP, Capacitor	1	Except J
-7C	45692	. CAPACITOR, Starting	1	Except J
-7D	44298	. RIVET, Semi-tubular, 0.146 inch diameter	2	CEFGJ
-7E	82946	. WASHER, Flat	2	CEFGJ
-7F	44587	. RECEPTACLE	1	CEFGJ
-7G	48066	. COVER, Receptacle opening (adhesive backed)	1	ABDH
-7G	48065	. NAMEPLATE, Receptacle (adhesive backed)	1	CEFGJ
-7H	49992	. END CAP, Rear	1	
-8	19010	NUT, Hex locking	1	
-9	43878	. JACK, Auxiliary speaker (less wires)	1	
-10	25368	WASHER, Insulating	1	
-11	44307	KNOB, "Fwd-Rev-Lamp" control	1	ABH
-11A	44304	KNOB, "Fwd-Rev-Lamp" control	1	CF
-11B	44540	KNOB, "Still-Run" control	1	CF
-11C	707073	KNOB, "Fwd-Rev-Lamp" control	1	DEGJ
-11D	436745	LEVER, Crank, Still/Run	1	DEGJ
-12	47431	LAMP, Projection (Type EKS or EMM)	1	ACEFGHJ
-12	44223	LAMP, Projection (Type BAB)	1	BD
-13	30808	SCREW, Hex washer head, 6-32 by 5/16 inch	2	
-14	44389	SHIELD, Lamp	1	ABCFH
-14	707075	SHIELD, Lamp	1	DEGJ
-15	014575	LAMPHOLDER ASSEMBLY	1	ACEFGHJ
-15	015192	LAMPHOLDER ASSEMBLY	1	BD
-16	47432	LABEL, Lamp designation (adhesive backed)	1	ACEFGH
-16	48026	LABEL, Lamp designation (adhesive backed)	1	BD
-17	707116	LABEL, Still/Run (adhesive backed)	1	EGJ

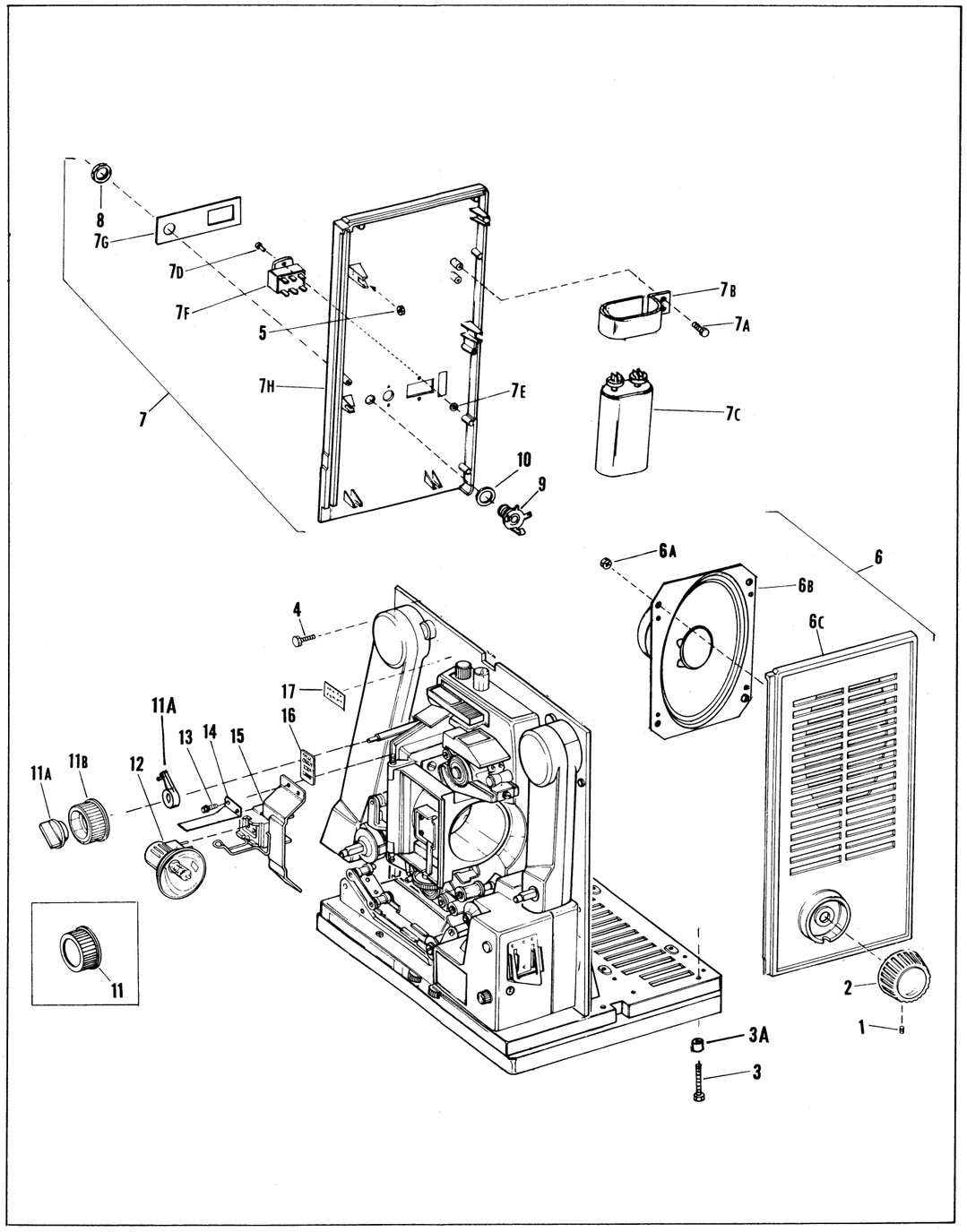


Figure 2. End Caps and Lens Parts

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		TRANSFORMERS, MOTOR AND BLOWER		
3-1	19327	NUT, Plain hex, 6-32	2	ACEFGH
-2	45598	SCREW, Slotted round head, 6-32 by 1-7/8 inch	2	ACEHJ
-2	45675	SCREW, Slotted round head, 6-32 by 2-1/8 inch	2	FG
-3	700735	LOCKWASHER, External tooth, No. 6	2	ACEFGHJ
-3A	44492	SPACER, Sleeve	2	FG
-4	48608	TRANSFORMER, Power	1	ACEFGH
-4	016580	TRANSFORMER ASSEMBLY, Power	1	J
-5	19037	NUT, Hex Sems, 8-32	2	ACEFGHJ
-6	46484	SCREW, Slotted round head, 8-32 by 2-1/4 inch	2	ACEHJ
-6	45676	SCREW, Slotted round head, 8-32 by 2-1/2 inch	2	FG
-7	44345	BRACKET, Power transformer, L.H.	1	ACEFGH
-7	707746	BRACKET, Power transformer, L.H.	1	J
-8	44346	BRACKET, Power transformer, R.H.	1	ACEFGH
-8	707470	BRACKET, Power transformer, R.H.	1	J
-9	30815	SCREW, Pan washer head, 8-32 by 3/8 inch	2	ACEFGH
-9A	30817	SCREW, Hex washer head, 8-32 by 1/2 inch	2	ACEFGHJ
-10	015663	TRANSFORMER ASSEMBLY, Lamp	1	ACEHJ
-10	014999	TRANSFORMER ASSEMBLY, Lamp	1	FG
-10	016431	TRANSFORMER ASSEMBLY, Lamp	1	H
-10	016579	TRANSFORMER ASSEMBLY, Lamp	1	J
-10A	19037	. NUT, Hex Sems, 8-32	2	ACEFGHJ
-10B	46484	. SCREW, Slotted round head, 8-32 by 2-1/4 inch	2	ACEHJ
-10B	45676	. SCREW, Slotted round head, 8-32 by 2-1/2 inch	2	FG
-10C	44332	. BRACKET, Lamp transformer, L.H.	1	ACEFGHJ
-10D	44333	. BRACKET, Lamp transformer, R.H.	1	ACEFGHJ
-10E	015662	. TRANSFORMER, Lamp	1	ACEH
-10E	014249	. TRANSFORMER, Lamp	1	FG
-10E	016432	. TRANSFORMER, Lamp	1	H
-10E	No Number	. TRANSFORMER, Lamp	NP	J
-11	072848	CLAMP AND SLEEVE ASSEMBLY, Leadwire	2	ACEFGHJ
-13	30815	SCREW, Pan washer head, 8-32 by 3/8 inch	4	BD
-14	015656	TRANSFORMER ASSEMBLY, Power	1	BD
-14A	24831	. RIVET, Semi-tubular	4	BD
-14B	600970	. WASHER, Flat	4	BD
-14C	44332	. BRACKET, Power transformer, L.H.	1	BD
-14D	44333	. BRACKET, Power transformer, R.H.	1	BD
-14E	No Number	. TRANSFORMER, Power (replace assembly item -14)	NP	BD
-15	30822	SCREW, Hex washer head, 10-32 by 7/16 inch	4	
-16	30809	SCREW, Hex washer head, 6-32 by 3/8 inch	4	
-17	30810	SCREW, Hex washer head, 6-32 by 1/2 inch	3	
-18	072848	CLAMP AND SLEEVE, Leadwire retaining	1	
-19	44377	HOUSING, Blower fan	1	
-20	80408	SETSCREW, Fluted socket flat pt, 6-32 by 3/16 inch	2	
-21	014538	FAN AND HUB ASSEMBLY, Blower	1	
-22	44376	COVER, Fan housing	1	
-23	44459	BELT, Drive	1	
-24	48610	STRAIN RELIEF, Line cord	1	
-25	015650	CORD ASSEMBLY, Line	1	ABCDEFG
-25	016434	CORD ASSEMBLY, Line	1	H
-25	016608	CORD ASSEMBLY, Line	1	J
-26	80408	SETSCREW, Fluted socket flat pt, 7-32 by 3/16 inch	2	
-27	44433 or	PULLEY, Motor (plain anodize) (NOTE A)	1	ABCDEHJ
-27	44457 or	PULLEY, Motor (black anodize) (NOTE A)	1	ABCDEHJ
-27	44458	PULLEY, Motor (red anodize) (NOTE A)	1	ABCDEHJ
-27	44489	PULLEY, Motor (export models only)	1	FG
-28	31265 or	CLAMP, Motor	2	
-28	41323	CLAMP, Motor	2	

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		TRANSFORMERS, MOTOR AND BLOWER (CONT'D)		
3-29	015922	BRACKET ASSEMBLY, Motor clamp	1	Except J
-29	016582	BRACKET ASSEMBLY, Motor clamp.	1	J
-29A	015921	FUSE AND SLEEVE ASSEMBLY	1	
-30	44356	BRACKET, Motor mounting	2	
-31	015573	MOTOR AND LUG ASSEMBLY, 60Hz	1	ABCDEH
-31	015574	MOTOR AND LUG ASSEMBLY, 50/60Hz (export models only)	1	FG
-31	016607	MOTOR AND LUG ASSEMBLY, 60Hz (NOTE B)	1	J
-32	302153	FUSE, Slo-blo, 1/2 amp	1	Except J
-32	308638	FUSE, Slo-blo, 3/4 amp	1	J
-33	30809	SCREW, Hex washer head, 6-32 by 3/8 inch	2	CEFGJ
-34	014573	SWITCH AND BRACKET ASSEMBLY, Animation	1	CEFGJ
-34A	44536	. RIVET, Tubular	2	CEFGJ
-34B	88672	. SWITCH, Animation	1	CEFGJ
-34C	No Number	. BRACKET, Switch (replace complete switch assembly)	NP	CEFGJ
-35	015664	SWITCH AND BRACKET ASSEMBLY, Rotary	1	CEJ
-35	014621	SWITCH AND BRACKET ASSEMBLY, Rotary	1	FG
-35A	44467	. NUT, Hex locking	1	CEFGJ
-35B	600736	. LOCKWASHER, Internal tooth	1	CEFGJ
-35C	48625	. SWITCH, Rotary	1	CEJ
-35C	45695	. SWITCH, Rotary	1	FG
-35D	No Number	. BRACKET ASSEMBLY	NP	CEFGJ
-36	30807	SCREW, Hex washer head, 6-32 by 1/4 inch	2	ABDH
-37	48623	BRACKET, Rotary switch (early models only)	1	ABD
-38	44467	NUT, Hex locking	1	ABDH
-38A	600736	LOCKWASHER, Internal tooth	1	ABDH
-39	45695	SWITCH, Rotary	1	ABDH
-40	42392	SCREW, Slotted pan head, 6-32 by 1/4 inch	1	ABDH
-41	44586	FUSEHOLDER	1	ABDH
-42	36763	SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	2	CEFGJ
-43	36533	COLLAR, Solenoid rod	2	CEFGJ
-44	45575	SCREW, Binding head, 6-32 by 7/16 inch	3	CEFGJ
-45	33285	WASHER, Spacer	3	CEFGJ
-46	31489	BUSHING, Rubber	3	CEFGJ
-47	014617	SOLENOID ASSEMBLY, Complete	1	CEFG
-47	016584	SOLENOID ASSEMBLY, Complete	1	J
-48A	700103	SCREW, Binding head, 10-32 by 1/4 inch	2	CEFGJ
-48B	014558	. SOLENOID ASSEMBLY	1	CEFG
-48B	No Number	. SOLENOID ASSEMBLY	NP	J
-48C	44328	. PLATE, Solenoid mounting	1	CEFGJ

NOTE A: If motor pulley (item -27) must be replaced, be sure to replace with a pulley of identical color (plain, black or red).

NOTE B: Motor assemblies P/N 016612 and P/N 016495 also available for Model 1592C.

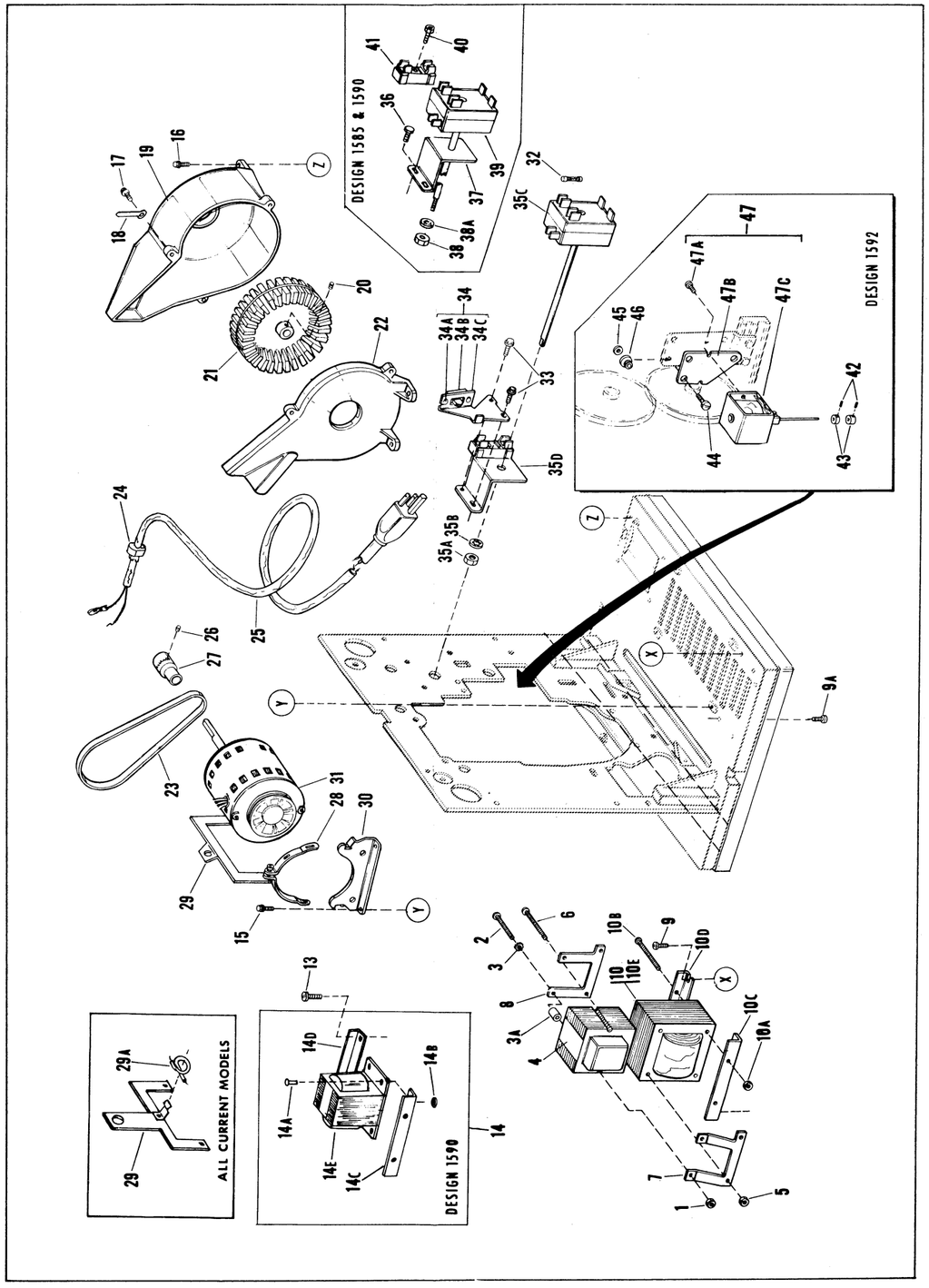


Figure 3. Transformers, Motor and Blower

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		GEARS, REEL ARMS AND SOUNDHEAD		
4-1	765777	RING, Retaining, external, 0.250 inch ID	4	
-2	014947	GEAR AND BEARING ASSEMBLY	1	
-3	34861	WASHER, Flat	AR	
-4	44370	GEAR, Spur	2	
-5	31029	WASHER, Flat	2	
-6	30211	RING, Retaining, grip-type.	1	
-7	39092	WASHER, Spring tension, bowed	1	
-8	45581	WASHER, Thrust	1	
-9	44371	GEAR, Spur	1	
-10	47137	WASHER, Friction	1	
-11	014527	IDLER ASSEMBLY, Arm and gear	1	
-11A	765777	. RING, Retaining, external, 0.250 inch ID	1	
-11B	44370	. GEAR, Spur	1	
-11C	014526	. ARM ASSEMBLY, Idler	1	
-12	44312	KEY, Gear retaining	1	
-13	44317	WASHER, Flat	1	
078976 -14	~~015919~~	CLUTCH ASSEMBLY, Rewind	1	
-15	765777	RING, Retaining, external, 0.250 inch ID (NOTE A)	1	
-16	31015	WASHER, Thrust (NOTE A)	1	
-17	31237	WASHER, Flat (NOTE A)	1	
-18	014949	CLUTCH ASSEMBLY, Take-up (NOTE A)	1	
-18A	016394	BEARING ASSEMBLY (NOTE A)	1	J
-19	46534	GEAR, Spur (NOTE A)	1	
-19A	707112	GEAR, Clutch (NOTE A)	1	J
-19B	707110	GEAR, Rewind (NOTE A)	1	J
-20	44312	KEY, Gear retaining	1	
-21	36083	RING, Retaining, external, 0.250 inch ID	1	
-22	1953	WASHER, Flat	1	
-23	44372	GEAR, Idler	1	
-24	44537	SPRING, Torsion	1	
-25	014530	LEVER AND GEAR ASSEMBLY, Rewind	1	
-25A	36083	. RING, Retaining external, 0.250 inch ID	2	
-25B	31015	. WASHER, Flat	1	
-25C	44373	. GEAR, Spur	2	
-25D	014529	. LEVER ASSEMBLY, Rewind	1	
-26	30809	SCREW, Hex washer head, 6-32 by 3/8 inch	6	
-27	44313	DISC, Reel arm	2	
-28	014948	REEL ARM ASSEMBLY, Front (see Figure 7 for detail parts).	1	
-29	014946	REEL ARM ASSEMBLY, Rear (see Figure 8 for detail parts) .	1	ABCFH
-29	016263	REEL ARM ASSEMBLY, Rear (see Figure 8 for detail parts) .	1	DEGJ
-30	016585	BUTTON ASSEMBLY, Reel arm lock	2	
-31	44507	SPRING, Lock button	2	
-32	765777	RING, Retaining, external, 0.250 inch ID	1	
-33	45581	WASHER, Flat	1	
-34	44512	WASHER, Bowed	1	
-35	31592	FLYWHEEL	1	
-36	31491	SCREW, Binding head, 8-32 by 1/2 inch	3	
-37	31243	WASHER, Flat	3	
-38	39787	CLAMP, Leadwire	1	
-39	42453	SLEEVE, Insulating	1	
-40	015510	SOUNDHEAD ASSEMBLY (See Figure 9 for parts)	1	Except J
-40	016586	SOUNDHEAD ASSEMBLY (See Figure 9 for parts)	1	J
-41	48630	DECAL, No. 2 (adhesive backed)	1	

NOTE A: All projector models above Serial No. 6352004 are equipped with the front reel arm clutch parts shown in the center inset of Figure 4. Earlier models were equipped with the corresponding parts shown in the main view (items 15 thru 20).

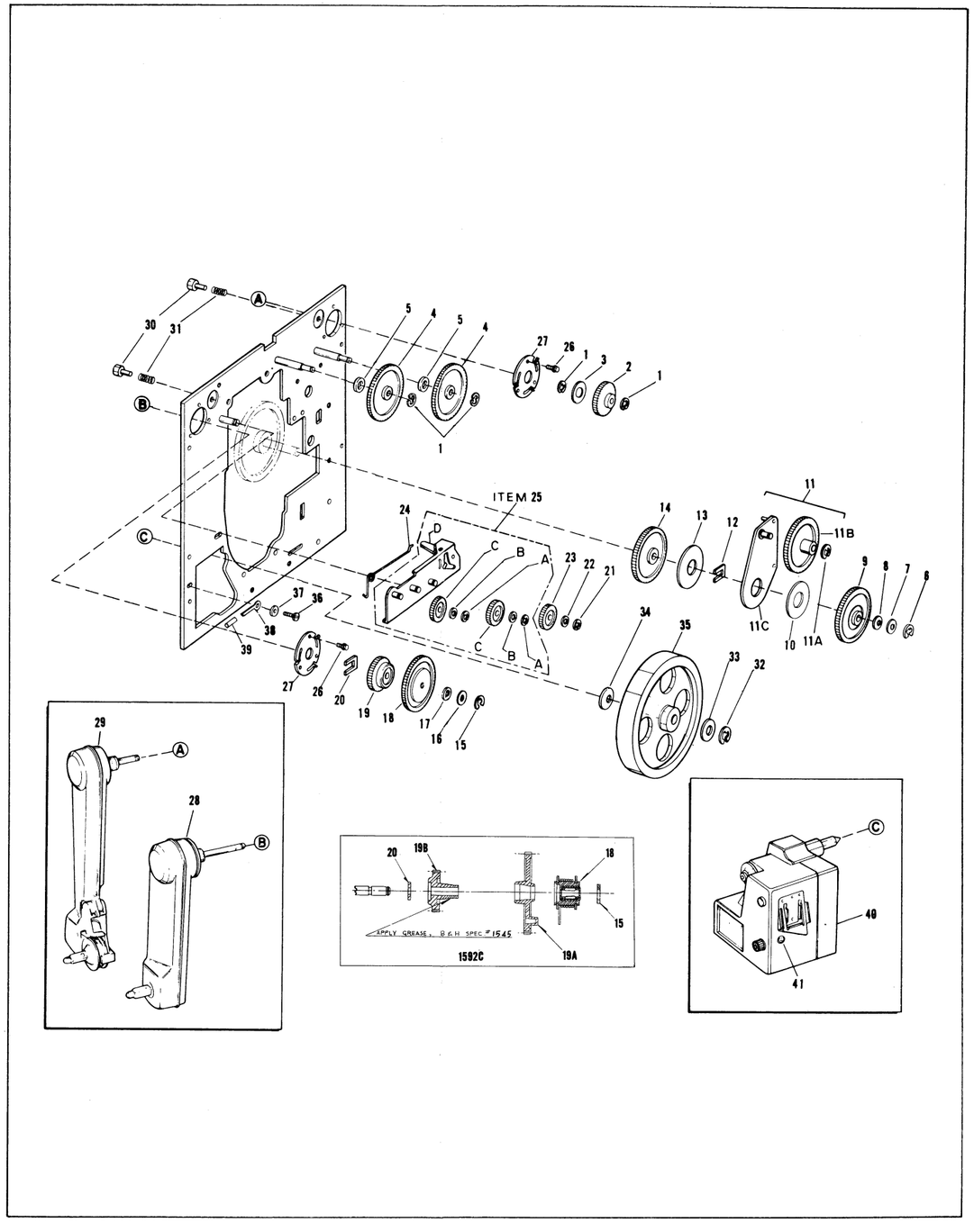


Figure 4. Gears, Reel Arms and Soundhead

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		RUN-STILL LINKAGE AND MECHANISM ASSEMBLY		
5-1	36763	SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	2	CEFGJ
-2	36533	COLLAR	2	CEFGJ
-3	33302	SPRING	1	CEFGJ
-4	44516	ROD, Still-Run	1	CEFGJ
-5	36763	SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	1	CEFGJ
-6	36533	COLLAR	1	CEFGJ
-7	44395	SPRING	1	CEFGJ
-8	44515	ROD, Fire shutter	1	CEFGJ
-9	44519	RING, Retaining	2	CEFGJ
-10	014548	ARM ASSEMBLY, Run-Still	1	CEFGJ
-11	44426	TUBE, Switch shaft	1	CF
-11	707082	TUBE, Switch shaft	1	EGJ
-12	44424	SCREW, Shoulder	2	CEFGJ
-13	014539	LINK ASSEMBLY, Sliding	1	CEFGJ
-14	44427	SPACER	2	CEFGJ
-15	44429	SCREW, Pivot	1	CEFGJ
-16	765449	RING, Retaining, external, 0.188 inch ID	1	CEFGJ
-17	700710	WASHER, Flat	1	CEFGJ
-18	014547	LINK ASSEMBLY, Pivoting	1	CEFGJ
-19	44430	SPACER	1	CEFGJ
-20	44514	SPRING, Torsion	1	CEFGJ
-21	700710	WASHER, Flat	1	CEFGJ
-22	31245	RING, Retaining, external, 0.187 inch ID	2	
-23	44526	SPRING, Torsion	1	
-24	44294	STUD, Shoulder	2	
-25	014579	BRACKET ASSEMBLY, Belt shifter	1	
-26	47408	SPACER	2	
-27	44297	SCREW, Special	4	
-28	44348	BRACKET, Idler gear adjustment	1	
-29	No Number	MECHANISM ASSEMBLY, Complete (see Figures 10 - 13 for detail parts)	NP	

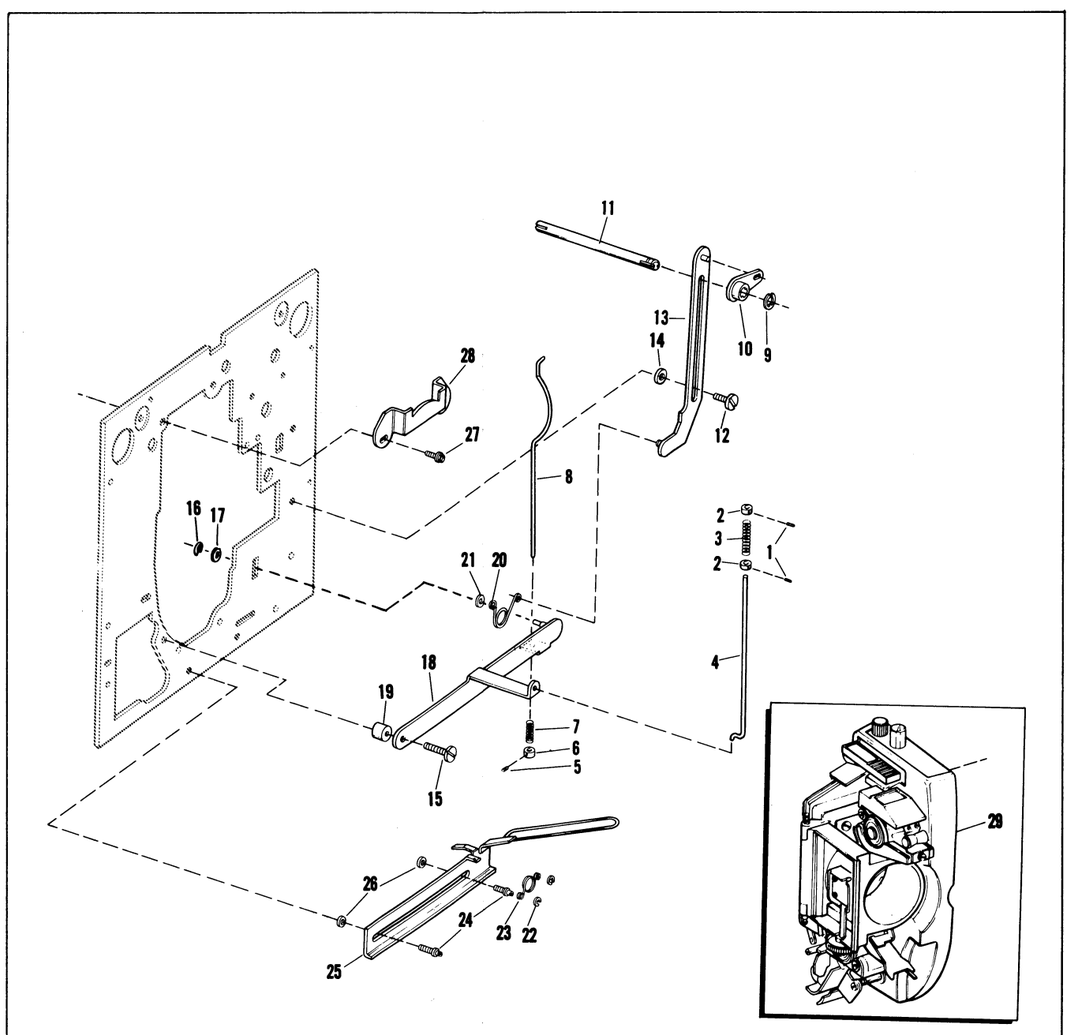


Figure 5. Run-Still Linkage and Mechanism Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MAINPLATE AND BASE COMPONENTS		
6-1	765449	RING, Retaining, external, 0.188 inch ID	1	ABCFH
-2	24443	RING, Retaining, external, 0.140 inch ID	1	ABCFH
-3	33866	WASHER, Flat	1	ABCFH
-4	44531	SPRING, Snubber lever	1	ABCFH
-5	36857	SCREW, Slotted pan head, 10-32 by 1/2 inch	1	ABCFH
-6	44439	POST, Snubber spring	1	ABCFH
-7	44440	SHAFT, Adapter	1	
-8	44435	ROLLER, Film guide	1	
-9	44364	SCREW, Pan head, 6-32	1	
-10	014596	FILM GUIDE ASSEMBLY, Sliding	1	
-10A	765449	. RING, Retaining, external, 0.188 inch	2	
-10B	44339	. ADAPTER, Film guide	1	
-10C	44437	. ROLLER, Film guide	2	
-10D	014595	. BRACKET ASSEMBLY, Film guide	1	
-11	48067	NAMEPLATE, "Tone/Volume" (adhesive backed)	1	
-12	No Number	NAMEPLATE, "Model/Serial" (adhesive backed)	NP	
-13	46524	LABEL, U.L. (adhesive backed)	1	
-14	87129	LABEL, Caution (adhesive backed)	1	
-15	766395	SCREW, Hex washer head, 6-32 by 5/16 inch	5	
-16	48069	COVER, Amplifier assembly	1	
-17	30808	SCREW, Hex washer head, 6-32 by 5/16 inch	2	
-18	014603	EDGE CONNECTOR ASSEMBLY	1	Except J
-18	016590	EDGE CONNECTOR ASSEMBLY	1	J
-19	30811	SCREW, Hex washer head, 6-32 by 5/8 inch	2	
-20	014583	AMPLIFIER ASSEMBLY (See Figure 15A for layout of parts)	1	Except J
-20	016530	AMPLIFIER ASSEMBLY (See Figure 15B for layout of parts)	1	J
-21	47974	SPACER, Sleeve	2	
-22	766395	SCREW, Hex washer head, 6-32 by 5/16 inch	4	
-23	48078	COVER, Volume/Tone control	1	
-24	766395	SCREW, Hex washer head, 6-32 by 5/16 inch	4	
-25	015502	VOLUME AND TONE CONTROL ASSEMBLY	1	Except J
-25	016613	VOLUME AND TONE CONTROL ASSEMBLY	1	J
-25A	48074	. KNOB, Control	2	
-25B	48075	. TRIMPLATE, Volume knob (adhesive backed)	1	
-25C	48076	. TRIMPLATE, Tone knob (adhesive backed)	1	
-25D	48077	. BRACKET, Control	1	
-25E	48088	. . CONTROL, Volume, 50K	1	
-25F	48089	. . CONTROL, Tone, 250K	1	
-26	34889	SCREW, Binding head, 1/4-28 by 3/8 inch	1	
-27	8179	LOCKWASHER, Spring, 1/4 inch	1	
-28	34766	BAR, Tilt	1	
-29	31561	FOOT, Rubber (cement in place)	4	
-30	30816	SCREW, Hex washer head, 8-32 by 5/8 inch	4	
-31	44532	FOOT, Rubber	4	
-32	44462	WASHER, Flat	1	
-33	300797	SCREW, Lock, speed change	4	
-34	30810	SCREW, Hex washer head, 6-32 by 1/2 inch	1	
-35	015512	MAINPLATE ASSEMBLY		

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MAINPLATE AND BASE COMPONENTS (CONT'D)		
6-36	015503	BASE ASSEMBLY, Complete	1	
-37	30809	. SCREW, Hex washer head, 6-32 by 3/8 inch	1	
-38	48070	. ADAPTER, Filt gear rack	1	
-39	48071	. GEAR RACK	1	
-40	21736	. RING, Retaining, 0.207 inch ID	1	
-41	48073	. GEARSHAFT, Tilt	1	
-42	34822	. WASHER, Spring tension	1	
-43	44533	. PIN, Spring	1	
-44	48072	. WORM GEAR, Tilt	1	
-45	48083	. BASE, Projector	1	
-46	708237	PLUG, Hole	1	DEGJ
-47	707276	LABEL, Model No.	1	DEGJ
-48	708200	LABEL, Threading diagram (adhesive backed)	1	J
-49	49986	SCREW, Lever stop	1	J
-50	015762	STOP AND PIN ASSEMBLY, Lever	1	J

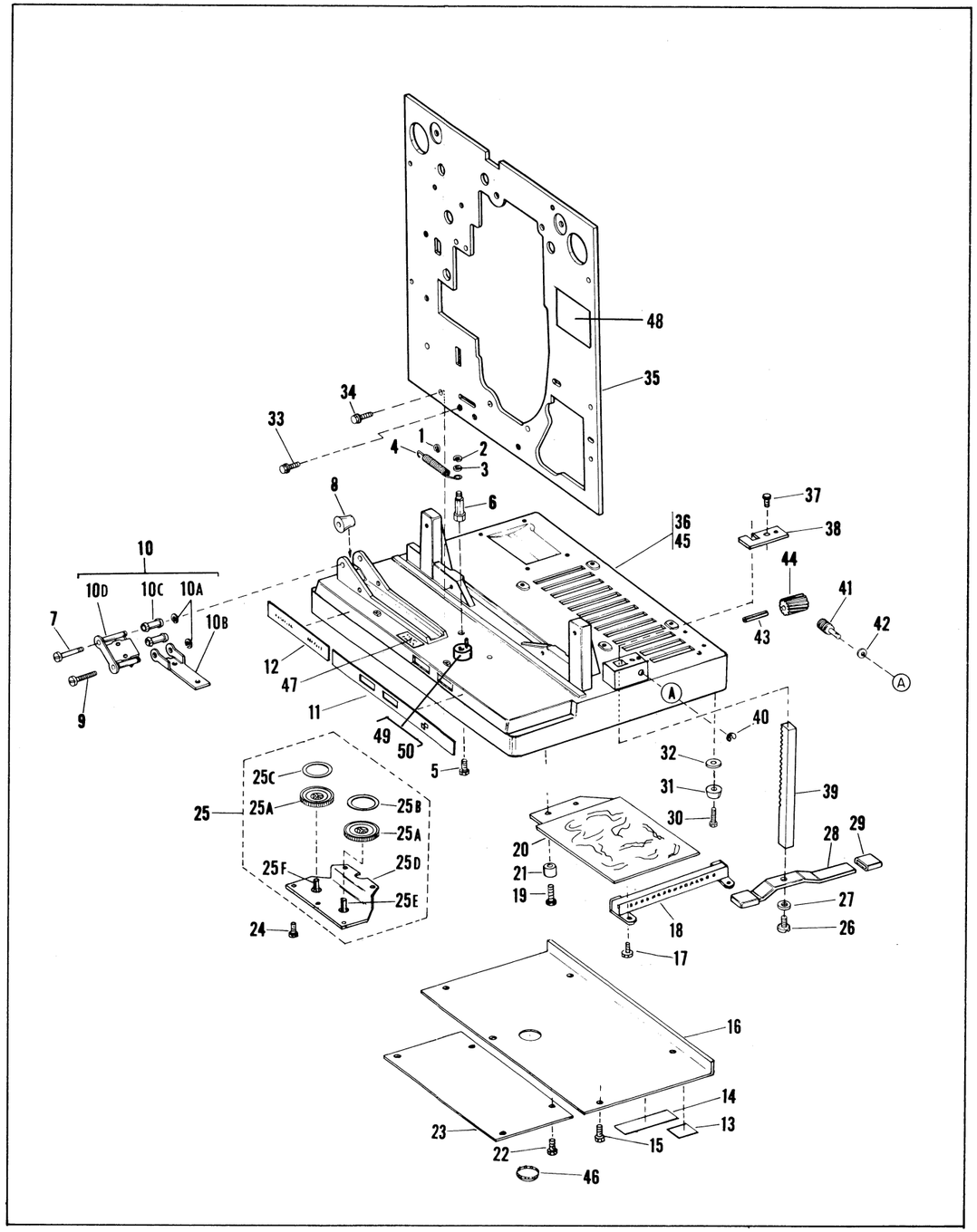


Figure 6. Mainplate and Base Components

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		FRONT REEL ARM ASSEMBLY		
7-	014948	REEL ARM ASSEMBLY, Front	REF	
-1	30879	. SCREW, Hex washer head, special	2	
-2	49696	. COVER, Front reel arm	1	
-3	34859	. WASHER, Shim (early models only)	2	
-4	31247	. SCREW, Special	1	
-5	No Number	. SPINDLE ASSEMBLY, Feed	NP	
-5A	765777	. . RING, Retaining, 0.250 inch ID (early models only)	1	
-5B	36769	. . SETSCREW, Fluted socket cup pt, 8-32 by 1/4 inch	2	
-5C	708498	. . GEAR, Face, lower (NOTE A) SER #6355001 & UP	1	
-5D	31359	. . WASHER, Flat	1	
-5E	016952	. . SPINDLE ASSY, FEED (NOTE A) SER #6355001 & UP	1	
-6	700672	. WASHER, Shim (early models only)	1	
-7	31038	. RING, Retaining, external, 0.156 inch ID	1	
-8	36764	. SETSCREW, Fluted socket cup pt, 6-32 by 3/16 inch	1	
-8A	36765	. SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	1	
-9	45577	. GEAR, Face, upper	1	
-9A	45578	. SLEEVE, Plastic	1	
-10	45579	. SPRING, Torsion	1	
-11	765777	. RING, Retaining, external, 0.250 inch ID (NOTE B)	1	
-12	31017	. WASHER, Thrust	1	
-13	700672	. WASHER, Spacer (NOTE B)	1	
-14	707111	. SHAFT, Front reel arm (NOTE C)	1	
-15	31245	. RING, Retaining, grip type, 0.187 inch ID	1	
-16	33385	. GEAR, Spur, upper	1	
-17	31241	. CLIP, Gear retaining	2	
-18	31243	. WASHER, Flat	1	
-19	31239	. GEAR, Spur, lower	1	
-20	44407	. SHAFT, Gear	1	
-21	31236	. BEARING, Nylon	2	
-22	014616	. ARM AND BEARING ASSEMBLY, Front reel	1	

NOTE A: When replacing the face gear (5C) or spindle assembly (5E) on earlier models which use retaining ring (5A), the gear, spindle and the setscrews (5B) must be replaced as a set.

NOTE B: The earlier front reel arms used an additional retaining ring (11) and the spacer washer (13).

NOTE C: Current models (SER #6352004 & UP) use shaft #707111 which replaces & is interchangeable with earlier shaft. Shaft #707111 must be used with new clutch assembly shown in FIG 4.

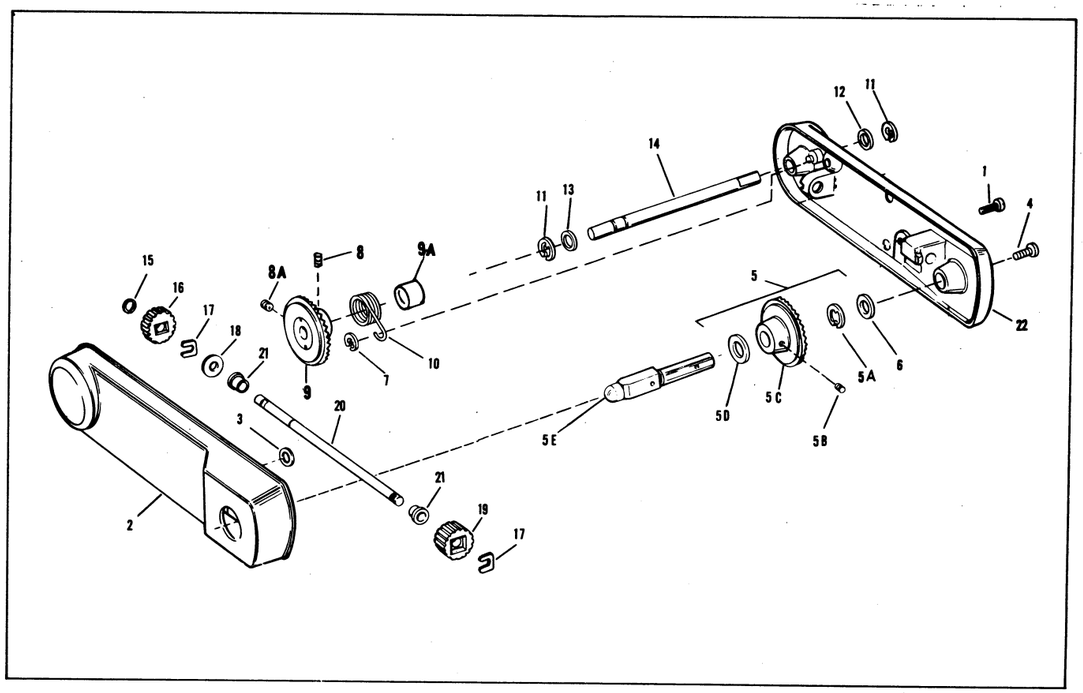


Figure 7. Front Reel Arm Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY.	USABLE ON CODE
		REAR REEL ARM ASSEMBLY		
8-	014946	REEL ARM ASSEMBLY, Rear (early models)	REF	ABCF
8-	016263	REEL ARM ASSEMBLY, Rear (current models)	REF	
-1	30879	. SCREW, Hex washer head, special	2	
-2	45682	. COVER, Rear reel arm	1	
-3	34874	. WASHER, Shim (early models)	AR	
-4	24047	. BELT, Take-up	1	
-5	36038	. SPRING, Tension	1	
-6	31247	. SCREW, Hex socket button head, 10-32 by 1/4 inch	1	
-7	016546	. SPINDLE AND PULLEY ASSEMBLY, Take-up	1	
-8	700672	. WASHER, Shim	1	
-10	765449	. RING, Retaining, external, 0.188 inch	1	
-11	45580	. WASHER, Flat	1	
-12	45684	. SLEEVE, Rubber	1	
-13	36764	. SETSCREW, Fluted socket cup pt, 6-32 by 3/16 inch	1	
-14	45685	. GEAR, Face, lower	1	
-15	34101	. WASHER, Shim	1	
-16	45683	. SHAFT, Gear	1	
-17	31038	. RING, Retaining, external, 0.156 inch ID	1	
-18	707136	. SPRING, Torsion	1	
-19	31245	. RING, Retaining, grip type, 0.187 inch ID	1	
-20	33385	. GEAR, Spur, upper	1	
-21	31241	. CLIP, Gear retaining	2	
-22	31239	. GEAR, Spur, lower	1	
-23	34101	. WASHER, Flat	1	
-24	44412	. SHAFT, Gear	1	
-25	31236	. BEARING, Nylon	2	
-26	36764	. SETSCREW, Fluted socket cup pt, 6-32 by 3/16 inch	1	
-27	44367	. GEAR, Face, upper	1	
-28	765777	. RING, Retaining, external, 0.250 inch ID	1	
-29	700672	. WASHER, Spacer	1	
-31	49532	. SHAFT, Rear reel arm	1	
-32	014667	. ARM AND BEARING ASSEMBLY, Rear and take-up	1	

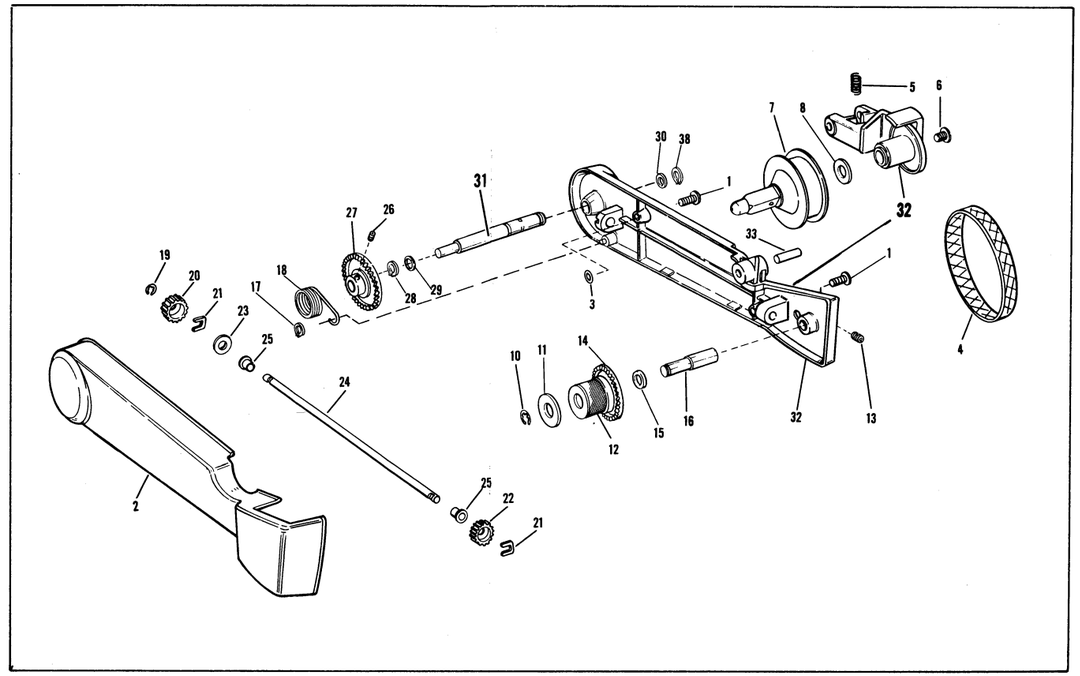
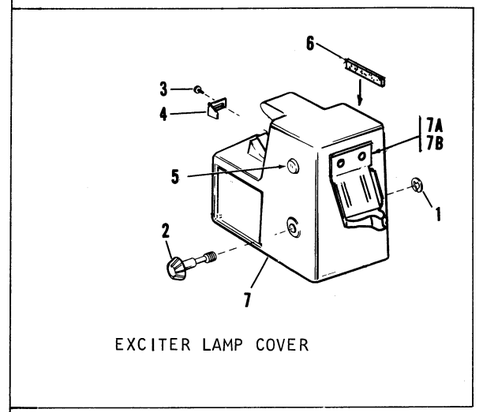
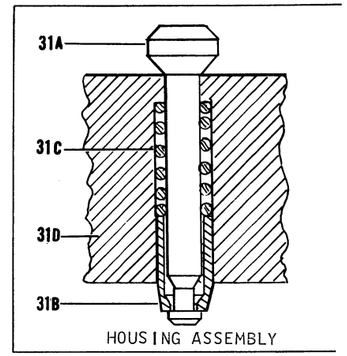


Figure 8. Rear Reel Arm Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		EXCITER LAMP COVER AND SOUNDHEAD		
9-	015509	COVER ASSEMBLY, Exciter lamp, complete	REF	
-1	20808	. RING, Retaining, 0.145 inch ID	1	
-2	43288	. SCREW, Cover retaining	1	
-3	30163	. SCREW, Binding head, 5-40 by 3/8 inch	2	
-4	35823	. GUIDE, Film	1	
-5	34787	. PLUG, Hole	1	
-6	36094	. SHIELD, Light (adhesive backed) (trim off excess)	1	
-7	015508	. COVER ASSEMBLY, Lamp	1	
-7A	765337	. . RIVET, Semi-tubular	2	
-7B	014631	. . FILM CUTTER ASSEMBLY	1	
9-	015510	SOUNDHEAD ASSEMBLY, Complete	REF	Except J
9-	016586	SOUNDHEAD ASSEMBLY, Complete	REF	J
-8	34884	. LAMP, Exciter	1	
-9	34892	. NAMEPLATE, Lamp designation	1	
-10	49932	. SCREW, Optical slit	1	
-11	020240	. SLIT ASSEMBLY, Optical	1	
-12	31673	. SPRING, Stabilizer arm tension	1	
-13	31671	. RING, Retaining, external, 0.250 inch ID	1	
-14	31630	. SCREW, Roller adjusting	1	
-15	013935	. ARM ASSEMBLY, Stabilizer, complete	1	
-15A	30163	. . SCREW, Binding head, 5-40 by 3/8 inch	2	
-15B	31674	. . WASHER, Flat	2	
-15C	09834	. . ROLLER, Flanged, upper	1	
-15D	09835	. . ROLLER, Plain, lower	1	
-15E	30804	. . SCREW, Hex washer head, 4-40 by 1/4 inch	2	
-15F	31659	. . ARM, Stabilizer	1	
-15G	39789	. . SPRING, Torsion	1	
-15H	09832	. . ARM ASSEMBLY, Stabilizer, lower	1	
-15J	09838	. . ARM ASSEMBLY, Stabilizer, upper	1	
-16	31638	. SCREW, Fillister head, 6-32 by 0.438 inch	2	
-17	09828	. CONTACT ASSEMBLY, Exciter lamp	1	
-18	31636	. RING, Lamp release	1	
-19	36765	. SETSCREW, Fluted socket cup pt, 6-32 by 1/4 inch	1	
-20	36668	. SCREW, Pan head Sems, 6-32 by 5/16 inch	2	
-21	014532	. SOUND DRUM AND SHAFT ASSEMBLY	1	
-22	31669	. RETAINER, Light pipe	1	
-23	015569	. LIGHT PIPE AND PHOTOCELL ASSEMBLY	1	
-24	09826	. SCREW ASSEMBLY, Edge guide	1	
-25	17676	. RING, Retaining, external, 0.156 inch ID (E)	1	
-26	33837	. WASHER, Friction, 0.096 inch ID	1	
-27	44420	. ADJUSTER, Stabilizer tension	1	
-28	44511	. RETAINER, Stabilizer tension spring	1	
-29	30804	. SCREW, Hex washer head, 4-40 by 1/4 inch	1	
-30	31675	. TERMINAL, Solder lug	1	
-31	014533	. HOUSING ASSEMBLY, Soundhead, complete	1	Except J
-31	014554	. HOUSING ASSEMBLY, Soundhead, complete	1	J
-31A	41321	. . PIN, Lamp mounting	3	
-31B	41320	. . BUSHING, Mounting pin	3	
-31C	602339	. . SPRING, Tension	3	
-31D	No Number	. . HOUSING, Soundhead (order complete assembly, item -31)	NP	





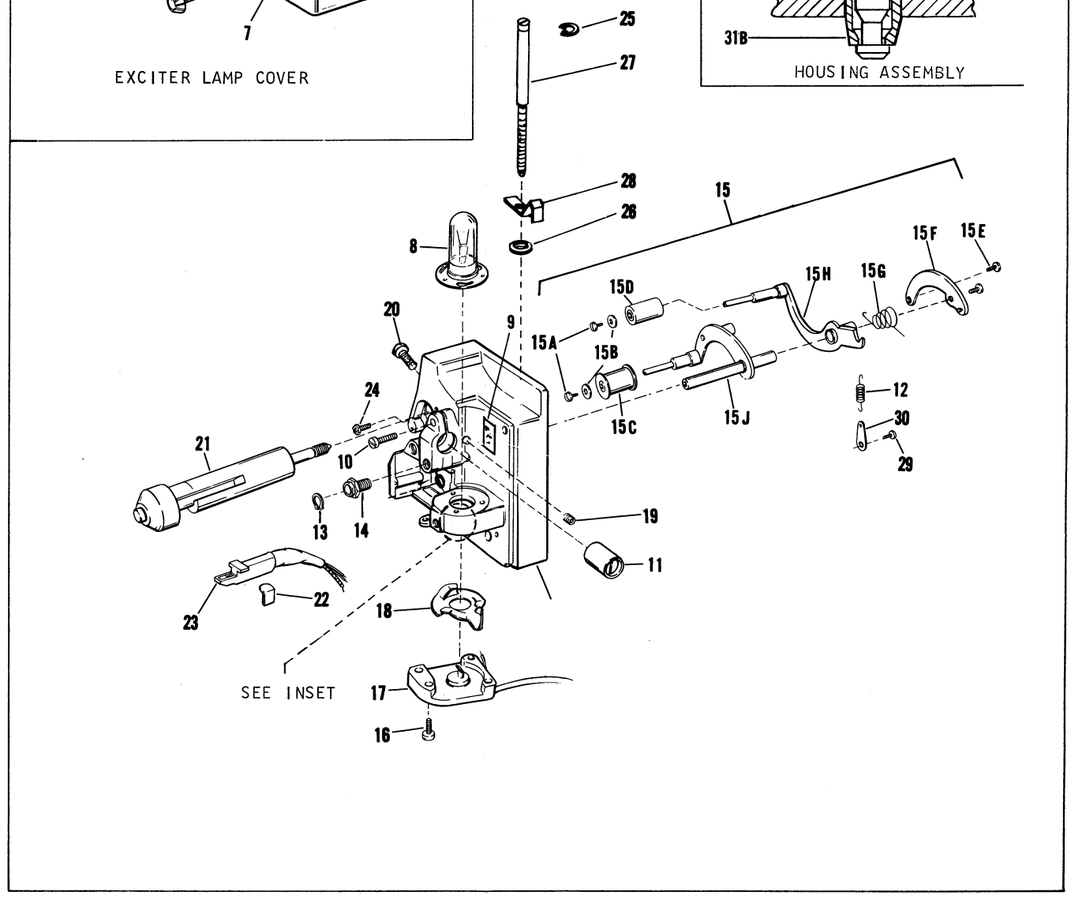


Figure 9. Exciter Lamp Cover and Soundhead

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MECHANISM ASSEMBLY		
10-	No Number	MECHANISM ASSEMBLY, Complete (see Figure 5 for mounting)	REF	
-1	31957	. PIN, Hinge, upper	1	
-2	31957	. PIN, Hinge, lower	1	
-3	31019	. WASHER, Spring tension	1	
-4	31020	. WASHER, Flat	1	
-5	014581	. LENS CARRIER ASSEMBLY	1	Except J
-5	016840	. LENS CARRIER ASSEMBLY	1	J
-5A	35880	. . SCREW, Truss head, 3-56 by 0.434 inch	2	Except J
-5A	45688	. . SCREW, Special	2	J
-5B	31092	. . PLATE, Pressure	1	
-5C	35868	. . BUSHING, Sleeve, upper	1	Except J
-5D	31097	. . BUSHING, Sleeve, lower	1	Except J
-5D	45687	. . WASHER, Flat	1	J
-5E	34897	. . SPRING, Compression	2	
-5F	35819	. . LEVER, Pressure plate	1	
-5G	30804	. . SCREW, Hex washer head, 4-40 by 1/4 inch	2	
-5H	31095	. . PLATE, Adjustment	1	
-5J	44589	. . NAMEPLATE, Lens carrier (adhesive backed)	1	ABCFH
-5J	707117	. . NAMEPLATE, Lens carrier (adhesive backed)	1	DEGJ
-5K	30804	. . SCREW, Hex washer head, 4-40 by 1/4 inch	2	
-5L	31093	. . SPRING, Pinion	1	
-5M	014577	. . KNOB AND PINION ASSEMBLY	1	Except J
-5M	016841	. . KNOB AND PINION ASSEMBLY	1	J
-5N	014576	. . CARRIER AND PIN ASSEMBLY	1	
-6	20808	. RING, Retaining, 0.145 inch ID	1	
-7	014623	. LEVER ASSEMBLY, Actuating	1	Except J
-7	44378	. LEVER, Actuating	1	J
-8	44545	. PLATE, Instruction (adhesive backed)	1	
-9	30807	. SCREW, Hex washer head, 6-32 by 1/4 inch	2	
-10	707162	. HOOD	1	
-11	36771	. SETSCREW, Fluted socket cup pt, 8-32 by 3/8 inch	4	
-12	014510	. GEAR ASSEMBLY, Sprocket, upper	1	
-13	012126	. GEAR ASSEMBLY, Sprocket, lower	1	
-14	31015	. WASHER, Spring tension	2	
-15	31928	. SCREW, Binding head, 6-32 by 1/2 inch	2	
-16	014562	. GUARD ASSEMBLY, Sprocket, upper	1	
-16A	31551	. . SCREW, Pan head, 5-40 by 1/4 inch	1	
-16B	700639	. . WASHER	1	
-16C	012332	. . CHANNEL AND ROLLER ASSEMBLY	1	
-16D	44388	. . GUARD, Sprocket	1	
-17	014536	. SPROCKET ASSEMBLY, Upper	1	
-18	31017	. WASHER, Thrust	1	
-19	013946	. SPROCKET ASSEMBLY, Lower	1	
-20	35910	. FLANGE, Sprocket	1	
-21	31017	. WASHER, Thrust	1	
-22	765449	. RING, Retaining, external, 0.188 inch ID	1	
-23	44417	. BUTTON, Rewind	1	
-24	31042	. SPRING, Rewind button	1	
-25	44224	. SCREW, Hex washer head, 4-40 by 3/16 inch	3	
-26	34878 or	. WASHER, Shim	AR	
-26	34879	. WASHER, Shim	AR	
-27	35814	. GUARD, Sprocket	2	
-28	36999	. GUARD, Sprocket	1	
-29	36081	. ROLLER	3	

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MECHANISM ASSEMBLY (CONT'D)		
10-30	35830	. SPRING, Torsion	3	
-31	31049	. SCREW, Binding head, 6-32 by 1/4 inch	1	
-32	44321	. GUIDE, Film exit	1	
-33	44546	. SEAL (cement in place)	1	CEFGJ
-34	36764	. SETSCREW, Fluted socket cup pt, 6-32 by 3/16 inch	2	CEFGJ
-35	014622	. LEVER ASSEMBLY, Animation switch	1	CEFG
-35	44381	. LEVER, Animation switch	1	J
-35A	44299	. NAMEPLATE, Animation lever (adhesive backed)	1	CEFGJ
-36	31038	. RING, Retaining, external, 0.156 inch ID	1	CEFGJ
-37	44535	. CRANK, Animation switch lever	1	CEFGJ
-38	31536	. PLUG, Press-in	1	ABDH
-39	44596	. DECAL, Autoload position "4" (adhesive backed)	1	
-40	44544	. LABEL, Rewind instruction	1	

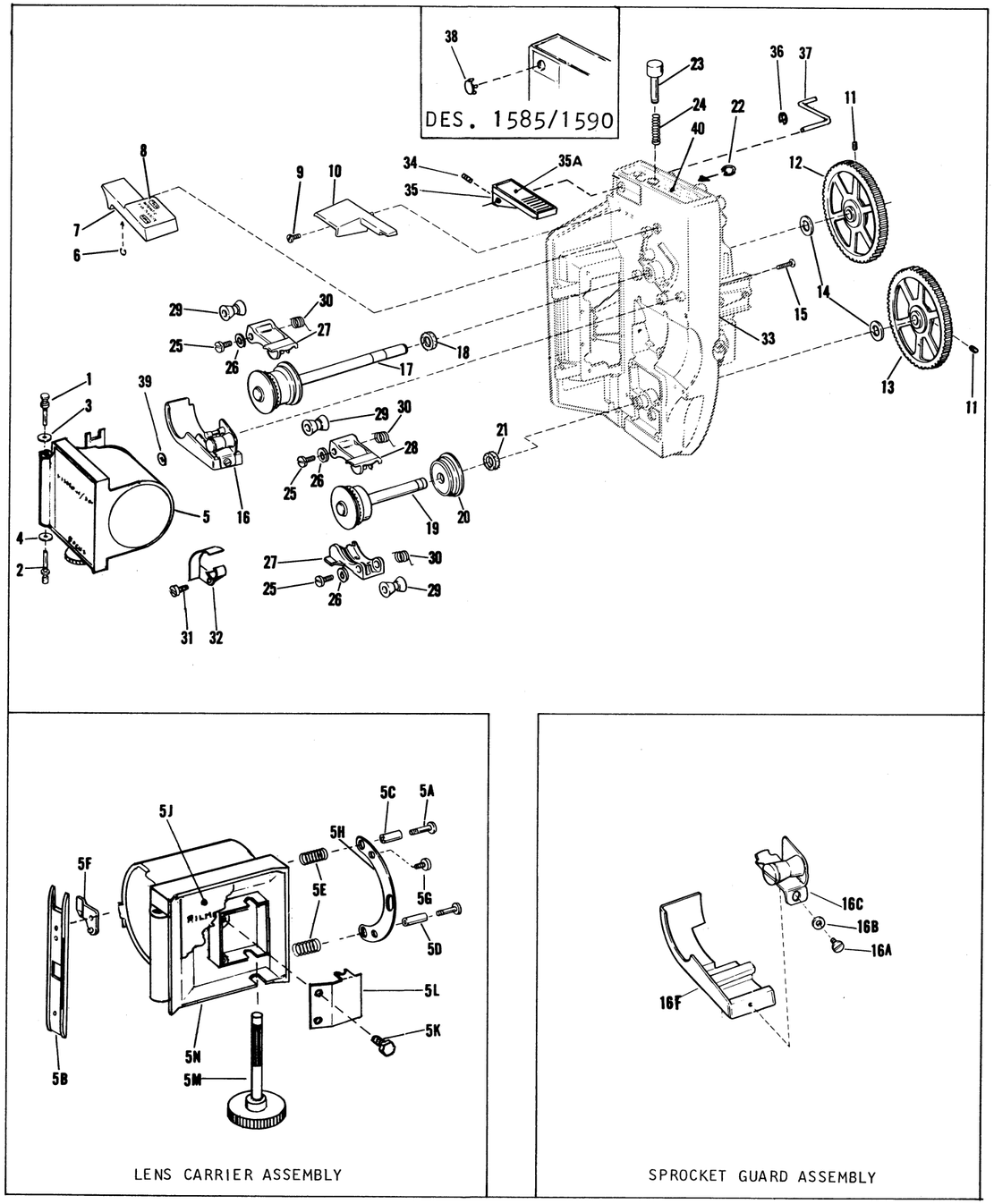


Figure 10. Mechanism Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		MECHANISM ASSEMBLY (CONT'D)		
11-1	30164	. SCREW, Binding head, 4-40 by 3/16 inch	3	
-2	36082	. ROLLER, Flanged	3	
-3	97509	. RING, Retaining, external, 0.250 inch ID	1	
-4	48939	. ARM, Threading	1	
-4A	44597	. DECAL, NO. 2 (adhesive backed)	1	
-5	48938	. SPRING, Torsion	1	
-6	36061	. SCREW, Truss head, 5-40 by 0.123 inch	1	
-7	44469	. ROLLER, Idler	1	
-8	44361	. STUD, Idler roller	1	
-9	44359	. ECCENTRIC, Locking lever	1	
-10	49979	. SPRING, Torsion	1	
-11	015138	. LEVER AND GUIDE ASSEMBLY, Autothread	1	ABC
-11	016314	. LEVER AND GUIDE ASSEMBLY, Autothread	1	DEFGHJ
-11A	36061	. . SCREW, Truss head, 5-40 by 0.123 inch	1	
-11B	44338	. . GUIDE, Film	1	
-11C	41330	. . ROLLER, Flanged	1	
-11D	35066	. . SCREW, Round head, 4-40 by 1/8 inch	1	
-11E	44343	. . GUIDE, Film	1	
-11F	014594	. . LEVER ASSEMBLY, Autothread	1	ABC
-11F	016313	. . LEVER ASSEMBLY, Autothread	1	DEFGHJ
-12	17676	. RING, Retaining, external, 0.156 inch ID	1	
-13	35874	. LOOPFORM, Lower	1	
-14	35838	. SPRING, Torsion	1	
-15	31551	. SCREW, Pan head, 5-40 by 1/4 inch	1	
-16	35822	. BRACKET, Back-up	1	
-17	31413	. RING, Retaining, 0.416 inch ID	1	
-18	35834	. WASHER, Flat	2	
-19	35850	. GUIDE, Film, lower	1	
-20	31551	. SCREW, Pan head, 5-40 by 1/4 inch	2	
-21	015924	. PLATE ASSEMBLY, Guard mounting, lower	1	
-22	17639	. RING, Retaining, external, 0.125 inch ID	1	
-23	011221	. LEVER AND PIVOT ASSEMBLY, Toggle	1	
-24	35846	. GUIDE, Film, lower	1	
-25	303541	. SCREW, Binding head, 3-56 by 1/8 inch	2	
-26	36018	. SPRING, Leaf	1	
-27	33347	. SCREW, Locking, hex head	1	
-28	09789	. LEVER ASSEMBLY, Threading	1	
-29	013922	. LOOPFORMER ASSEMBLY, Lower	1	
-30	17639	. . RING, Retaining, external, 0.125 inch ID	1	
-31	011233	. . LOOPFORMER ASSEMBLY, Upper	1	
-32	31555	. . SCREW, Pan head, 3-56 by 3/16 inch	1	
-33	83663	. . WASHER, Lock	1	
-33A	31451	. . WASHER, Flat	1	
-34	35820	. . RETRACTOR, Shuttle	1	
-35	011218	. . LINK AND STUD ASSEMBLY, Connecting	1	
-36	41342	. SCREW, Hex washer head, 10-32 by 1/4 inch	1	
-37	30807	. SCREW, Hex washer head, 6-32 by 1/4 inch	1	
-38	49980	. CATCH, Lens carrier	1	ABCF
-39	13918	. WASHER, Flat (early models only)	2	
-40	31551	. SCREW, Pan head, 5-40 by 1/4 inch	1	
-41	011212	. PLATE ASSEMBLY, Guard mounting, upper	2	
-42	36763	. SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	1	
-43	011214	. SHAFT AND LINK ASSEMBLY, Upper loopformer	1	
-44	44513	. SPRING, Torsion	1	
-45	34878	. WASHER, Flat		

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MECHANISM ASSEMBLY (CONT'D)		
11-46	013962	. LOOPFORMER AND LOCK PAWL ASSEMBLY, Upper . . .	1	
-46A	99828	. . RING, Retaining, external, 0.062 inch ID	2	
-46B	37303	. . SHAFT, Locking pawl	1	
-46C	37304	. . SPRING, Torsion	1	
-46D	30164	. . SCREW, Binding head, 4-40 by 3/16 inch	1	
-46E	37302	. . PAWL, Locking	1	
-46F	012134	. . HUB ASSEMBLY, Pawl bracket	1	
-46G	012133	. . LOOPFORMER ASSEMBLY, Upper	1	
-47	30164	. SCREW, Binding head, 4-40 by 3/16 inch	1	
-48	35840	. ROLLER, Plain	1	
-49	30808	. SCREW, Hex head washer, 6-32 by 5/16 inch	1	
-50	21238	. WASHER, Flat	1	
-51	36044	. SPRING, Tension	1	
-52	36801	. SCREW, Sems, 6-32 by 1/4 inch	1	
-53	21238	. WASHER, Flat	1	
-54	011249	. CAM FOLLOWER AND SUPPORT ASSEMBLY	1	
-54A	31555	. . SCREW, Pan head, 3-56 by 3/16 inch	2	
-54B	31474	. . BRACKET, Alignment	1	
-54C	36027	. . SPRING, Cam follower	2	
-54D	36099	. . DAMPER, Spring	1	
-54E	36047	. . FOLLOWER, Cam	1	
-54F	36028	. . SUPPORT, Cam follower	1	
-55	33347	. SCREW, Hex head cup pt, 6-32 by 1/4 inch	1	
-56	011250	. ARM ASSEMBLY	1	
-57	34878	. WASHER, Flat	1	
-58	011219	. LEVER AND SHAFT ASSEMBLY	1	
-59	20808	. RING, Retaining, external, 0.145 inch ID	1	
-60	31551	. SCREW, Pan head, 5-40 by 1/4 inch	2	
-61	31977	. WASHER, Lock	2	
-62	31020	. WASHER, Flat	2	
-63	011248	. SELF-CENTERING ASSEMBLY	1	
-64	31049	. SCREW, Binding head, 6-32 by 1/4 inch	2	
-65	No Number	. APERTURE PLATE ASSEMBLY (See Figure 14 for parts).	NP	

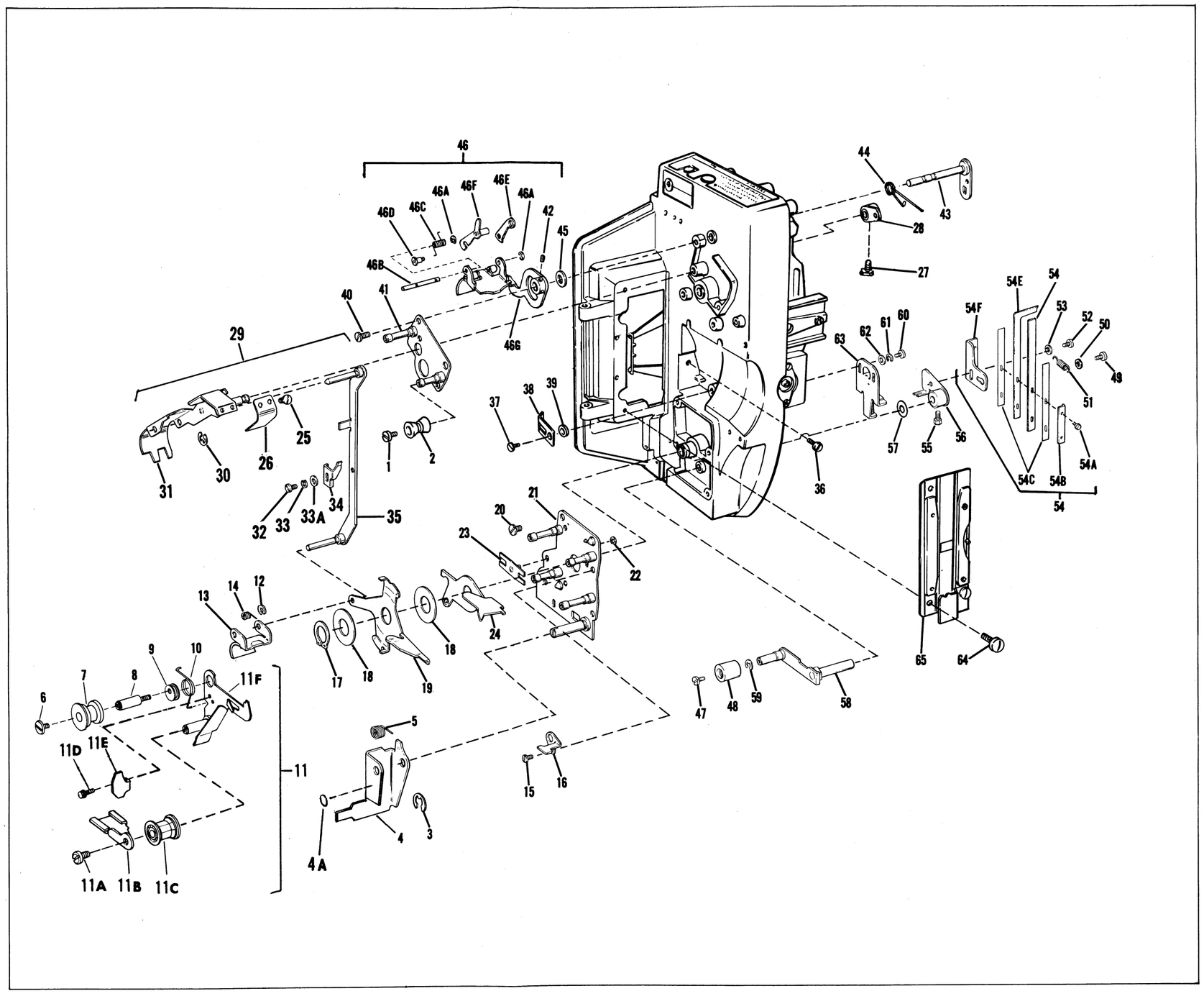


Figure 11. Mechanism Assembly (Continued)

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		MECHANISM ASSEMBLY (CONT'D)		
12-1	36770	SETSCREW, Fluted socket cup pt, 8-32 by 1/4 inch	2	
-2	44261	PULLEY, Mechanism	1	ABCDEHJ
-2	44488	PULLEY, Mechanism	1	FG
-3	30809	SCREW, Hex washer head, 6-32 by 3/8 inch	4	
-3A	33300	WASHER, Flat	4	
-4	44329	BRACKET, Support	1	ABDH
-4	014549	FIRE SHUTTER ASSEMBLY	1	CEFG
-4A	31143	. SPRING, Tension	1	CEFG
-4B	34823	. SPRING, Filter retainer	1	CEFG
-4C	31153	. RETAINER, Filter	1	CEFG
-4D	31407	. DISC, Fire shutter	1	CEFG
-4E	200508	. FILTER, Heat	1	CEFG
-4F	No Number	. BRACKET ASSEMBLY, Fire shutter (order P/N 014549)	NP	CEFG
-5	30809	SCREW, Hex washer head, 6-32 by 3/8 inch	2	
-6	36662	BAFFLE, Heat	1	
-7	31005	NUT, Shutter	1	
-8	31037	WEIGHT, Counterbalance	1	
-9	41308	SHUTTER, 3-blade	1	ABCDEHJ
-9	41309	SHUTTER, 2-blade	1	FG
-10	34797	WASHER, Fiber	1	
-11	46464	NUT, Hex	2	
-12	011886	BALL AND STUD ASSEMBLY	2	
-13	36015	SPRING, Extension	1	
-14	36013	WIPER, Felt	1	
-15	36014	WICK, Felt	1	
-16	31557	SHUTTLE	1	
-17	011235	ARM AND BEARING ASSEMBLY, Shuttle	2	
-17A	31011	. BEARING, Shuttle link	1	
-17B	31003	. FOLLOWER, Pull-down cam	1	
-18	41307	CAM, Pull-down	1	
-19	36668	SCREW, Pan head Sems, 6-32 by 3/8 inch	2	
-20	31001	CAM, In-out	1	
-21	011236	BRACKET ASSEMBLY, In-out cam	1	
-21A	09702	. FOLLOWER, In-out cam	1	
-21B	707211	. SPRING, Tension, in-out cam	1	
-22	30817	SCREW, Hex washer head, 8-32 by 1/2 inch	2	
-23	013917	PLATE ASSEMBLY, Shuttle arm	1	
-24	09712	. SUPPORT ASSEMBLY, Bearing	1	
-25	36048	PIN, Stop, framer	1	
-26	44422	KNOB AND SHAFT, Framer	1	
-27	30801	SCREW, Hex washer head, 2-56 by 3/16 inch	1	
-28	35837	SPRING, In-out	1	
-29	36667	PIN, Shuttle retractor	1	CEFG
-30	20808	RING, Retaining, external, 0.145 inch ID	2	CEFG
-31	31396	SHAFT, Stop pawl	1	CEFG
-32	48177	PAWL, Stop	1	CEFG
-33	30807	SCREW, Hex washer head, 6-32 by 1/4 inch	2	CEFG
-34	44327	BRACKET, Bearing	1	CEFG
-35	41377	SCREW, Shoulder	2	CEFG
-36	44325	BRACKET, Stop pawl shaft	1	
-37	24852	GROMMET, Rubber	2	

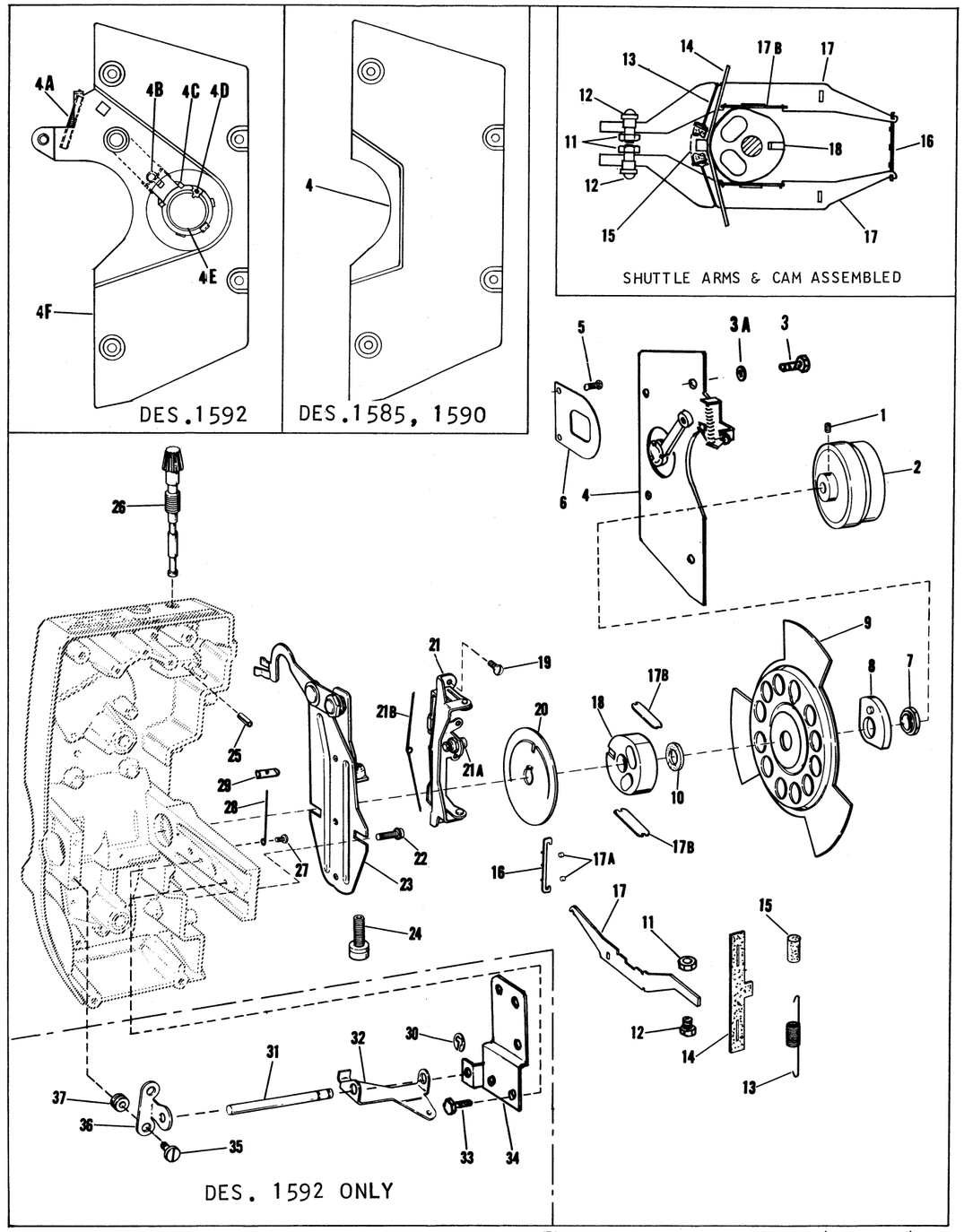


Figure 12. Mechanism Assembly (Continued)

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MECHANISM ASSEMBLY (CONT'D)		
13-1	31397	. NUT, Round	1	CEFG
-2	31020	. WASHER, Flat	1	CEFG
-3	31048	. BRACKET, Shuttle adjustment	1	CEFG
-4	31976	. SCREW, Pan head, 5-40 by 0.312 inch	1	CEFG
-5	30162	. SCREW, Binding head, 5-40 by 3/8 inch	1	CEFG
-6	31977	. WASHER, Lock	2	CEFG
-7	09870	. BRACKET ASSEMBLY, Animated clutch	1	CEFG
-7A	31405	. . SETSCREW, Fluted socket oval pt, 4-40 by 3/8 inch	1	CEFG
-7B	17639	. . RING, Retaining, external, 0.125 inch ID	3	CEFG
-7C	31403	. . SHAFT, Clutch bracket	1	CEFG
-7D	31399	. . BUMPER, Slide	1	CEFG
-7E	31456	. . WASHER, Flat	1	CEFG
-7F	31036	. . SPRING, Compression	1	CEFG
-7G	09886	. . BAR ASSEMBLY, Clutch slide	1	CEFG
-7H	41317	. . SCREW, Strike, 4-40 hex washer head	1	CEFG
-7J	31451	. . WASHER, Flat	1	CEFG
-7K	41318	. . STRIKE	1	CEFG
-7L	09885	. . BRACKET ASSEMBLY, Clutch	1	CEFG
-8	31009	. RING, Retaining, internal, bowed, 0.866 inch ID	1	
-9	30804	. SCREW, Hex washer head, 4-40 by 1/4 inch	2	
-10	42244	. SPRING, Bearing loading	1	
-11	36763	. SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	1	
-12	31007	. BEARING, Ball	1	
-13	09710	. CLUTCH ASSEMBLY, Driver	1	CEFGJ
-14	31035	. SPRING, Torsion, clutch	1	CEFGJ
-15	09711	. CLUTCH ASSEMBLY, Driven	1	CEFGJ
-16	21736	. RING, Retaining, external, 0.207 inch ID	2	CEFGJ
-17	31029 and/or	. WASHER, Shim	AR	CEFGJ
-17	44205	. WASHER, Shim	AR	CEFGJ
-18	31400	. BEARING, Sleeve	1	CEFGJ
-19	31145	. TRIGGER	1	CEFGJ
-20	31149	. PIN, Shoulder	2	CEFGJ
-21	31147	. YOKE, Clutch	1	CEFGJ
-22	31148	. SPRING, Compression	1	CEFGJ
-23	09728	. BEARING ASSEMBLY	1	CEFGJ
-24	012666	. WORM GEAR ASSEMBLY	1	ABDH
-24	013919	. WORM GEAR ASSEMBLY	1	CEFGJ
-24A	36769	. . SETSCREW, Fluted socket cup pt, 8-32 by 1/4 inch	2	ABDH
-24A	31083	. . SETSCREW, Fluted socket oval pt, 4-48 by 1/4 inch	1	CEFGJ
-24B	41319	. . BANC-LOK	1	CEFGJ
-24C	31063	. . SCREW, Interlock retainer	2	CEFGJ
-24D	31081	. . RETAINER, Shuttle interlock	1	CEFGJ
-24E	No Number	. . WORM GEAR (Order P/N 013919)	NP	CEFGJ
-25	31031	. BUSHING, Rubber	3	CEFGJ
-26	31029 and/or	. WASHER, Shim	AR	CEFGJ
-26	44205	. WASHER, Shim	AR	CEFGJ
-27	36042	. CAM, Loop restorer	1	
-28	31078	. RING, Retaining, external, bowed, 0.312 inch ID	1	
-29	31006	. BEARING, Ball	1	
-30	36065	. CAMSHAFT	1	ABDH
-30	36039	. CAMSHAFT	1	CEFGJ
-31	014543	. HOUSING ASSEMBLY, Mechanism	1	ABH
-31	014500	. HOUSING ASSEMBLY, Mechanism	1	C
-31	016391	. HOUSING ASSEMBLY, Mechanism	1	D
-31	016392	. HOUSING ASSEMBLY, Mechanism	1	EFGJ

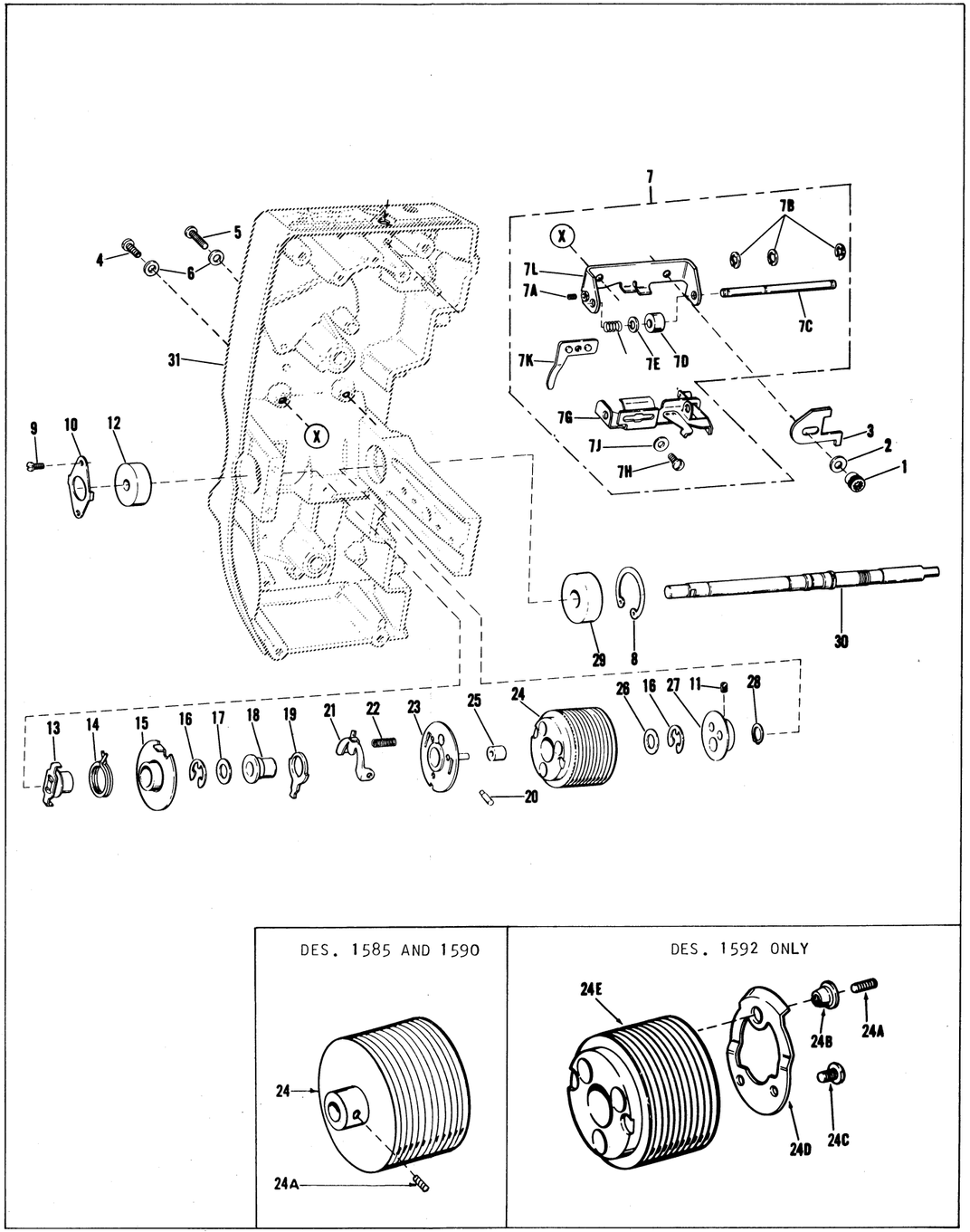


Figure 13. Mechanism Assembly (Continued)

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		APERTURE PLATE ASSEMBLY		
14-	013926	APERTURE PLATE ASSEMBLY (See Figure 11 for mounting)	REF	
-1	31978	. SCREW, Slotted pan head, 3-56 by 1/8 inch	2	
-2	36064	. RAIL, Film guide	1	
-3	37296	. SCREW, Slotted pan head, 3-56 by 1/4 inch	2	
-4	36078	. COVER, Spring retaining	1	
-5	37295	. BUSHING, Spacer	2	
-6	37293	. RAIL, Film tension	1	
-7	31135	. SPRING, Side tension	1	
-8	31978	. SCREW, Slotted pan head, 3-56 by 1/8 inch	1	
-9	36075	. GUIDE, Film	1	
-10	012132	. PLATE, Aperture	1	

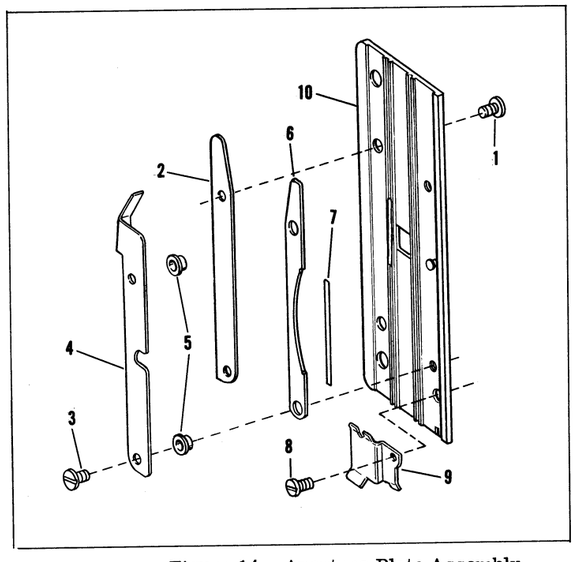
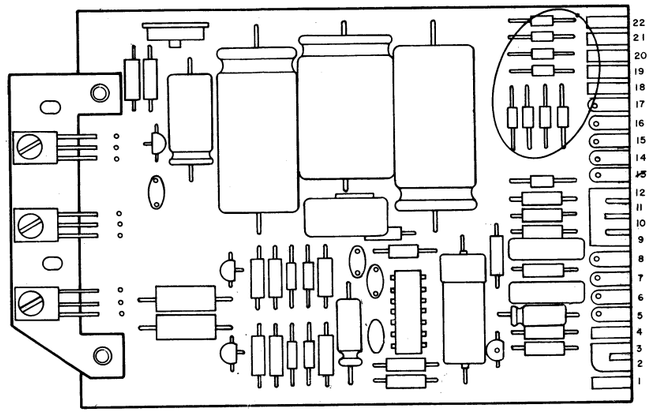
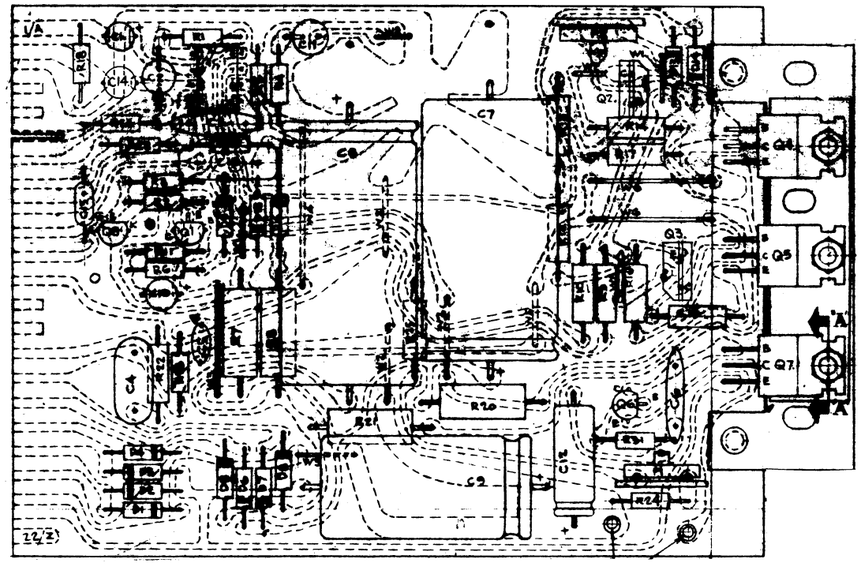


Figure 14. Aperture Plate Assembly



BOARD LAYOUT ONLY
SEE FIG. 16 FOR SCHEMATIC

Figure 15A. Amplifier Assembly P/N 014583



BOARD LAYOUT – SEE FIG.17A FOR SCHEMATIC

Figure 15B. Amplifier Assembly P/N 016530

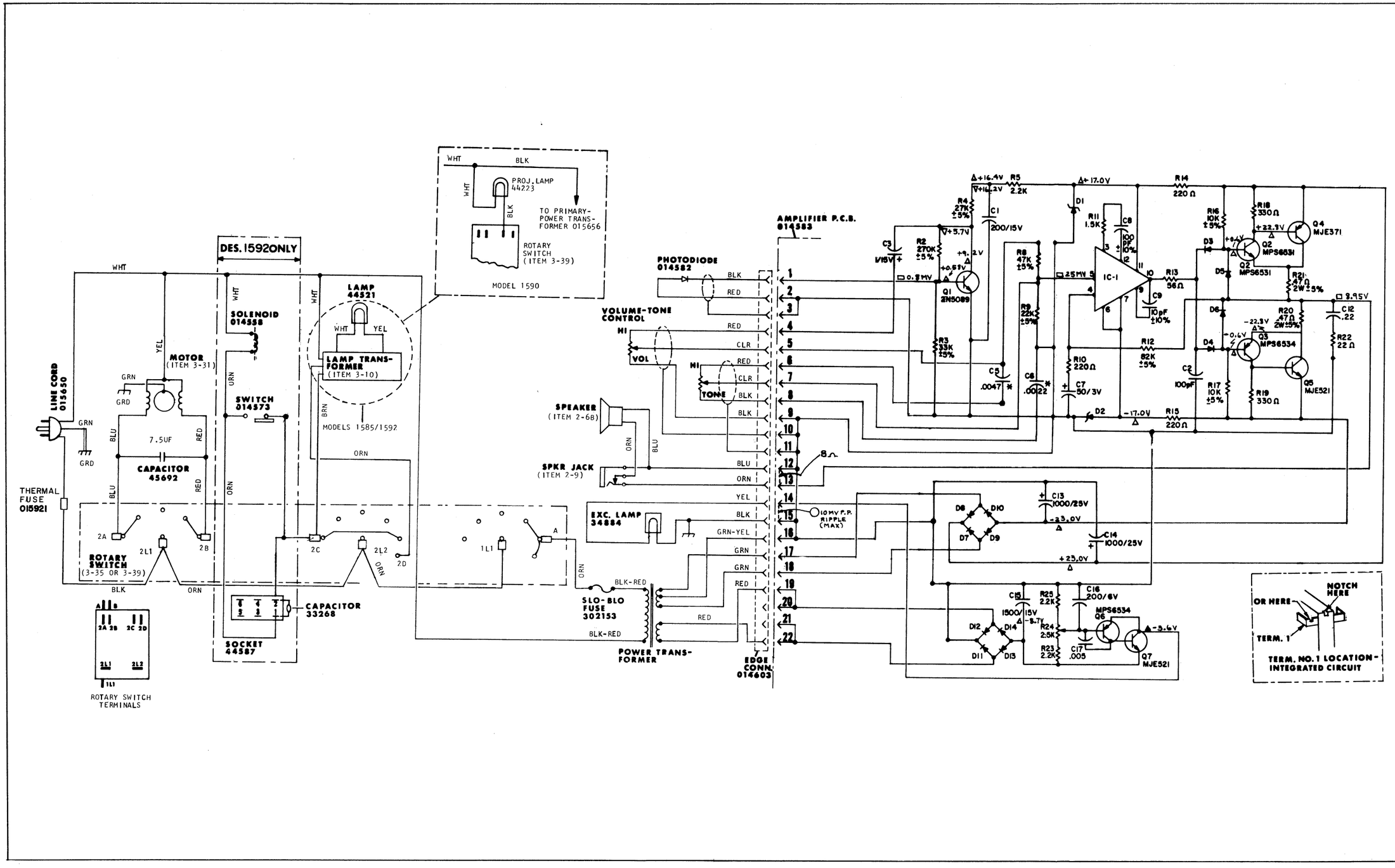


Figure 16. Projector/Amplifier Wiring Diagram
(All Models Except 1592C)

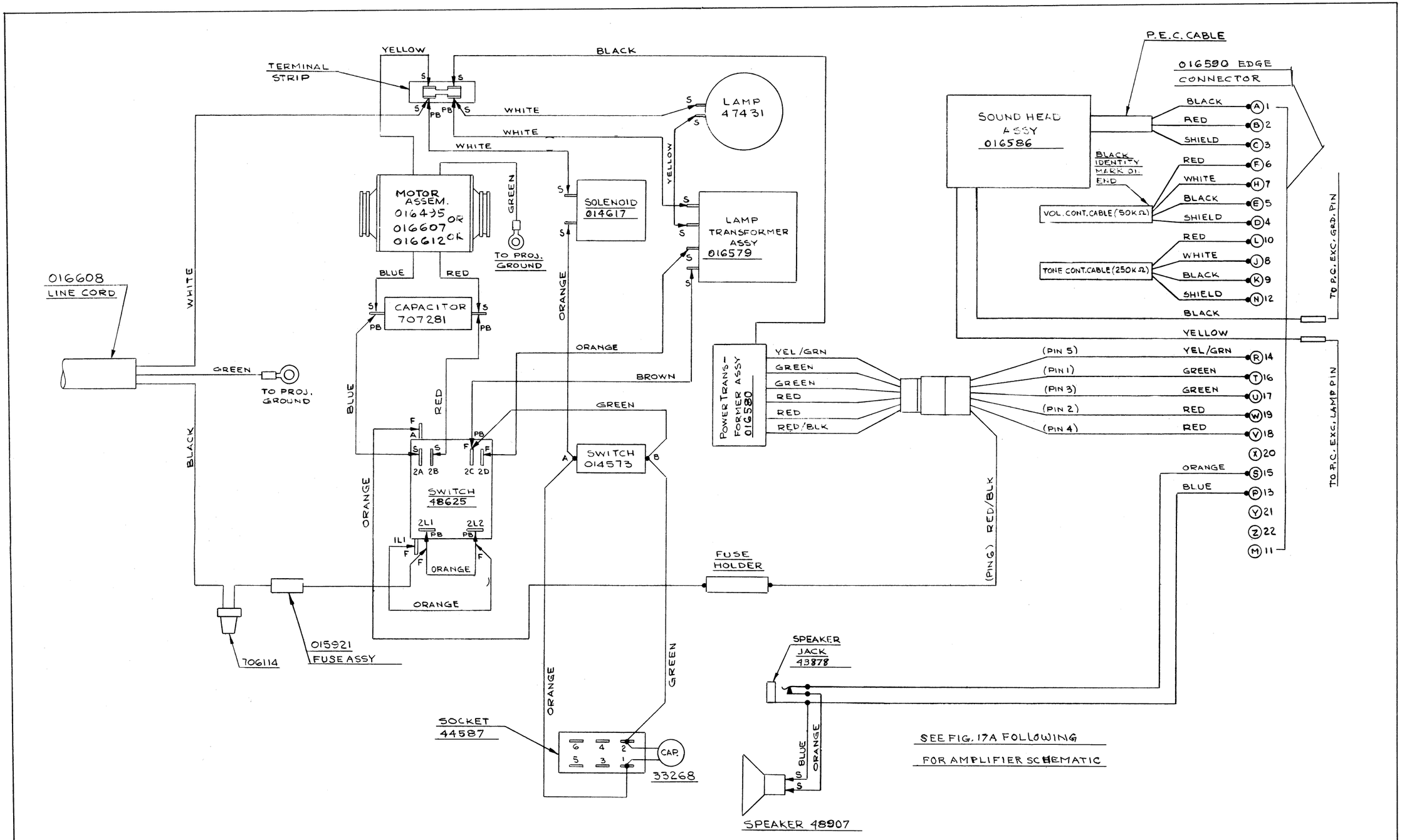


Figure 17. Projector/Amplifier Wiring Diagram (Model 1592C)

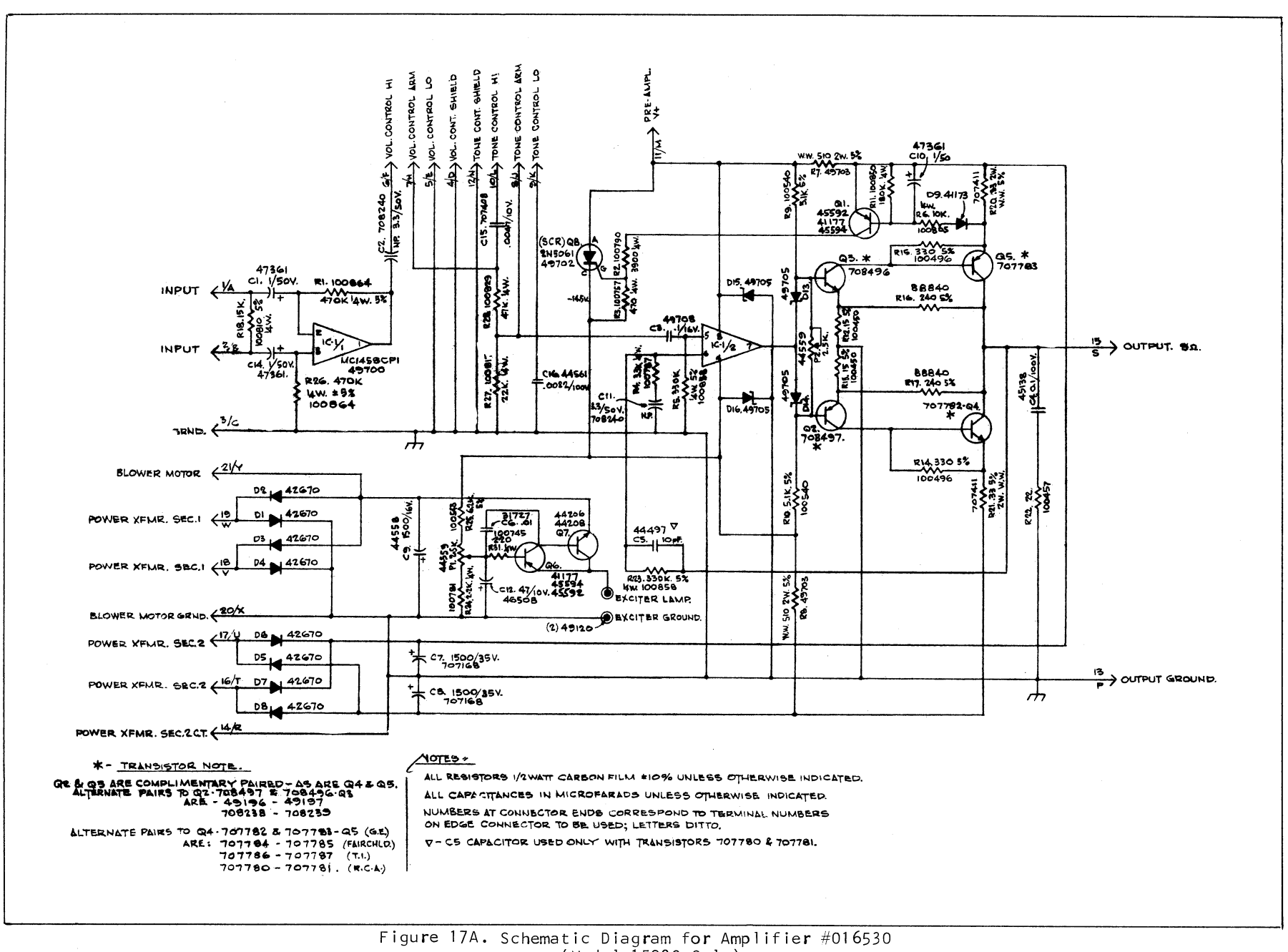


Figure 17A. Schematic Diagram for Amplifier #016530
(Model 1592C Only)

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