SERVICE INSTRUCTIONS

LUMINA II™

Super 8/Regular 8 mm Movie Projector

MODEL NO..	CAT. NO.	MODEL NO.	CAT. NO.
LX30	1422A/1422Z	----	1462Z
MX43	1440A/1440Z	QX80	1464Z
MX45	1445Z	QX95	1480A/1480Z
MX60	1460A/1460Z	----	1481Z

BELL & HOWELL

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BELL & HOWELL

GENERAL SERVICE DEPT.
7100 McCORMICK ROAD
CHICAGO, ILLINOIS 60645

PART NO. 74401 PRINTED IN U.S.A. OCTOBER 1977

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Evanston, Illinois 60202
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4801 Fulton Industrial Building
Atlanta, Georgia 30336
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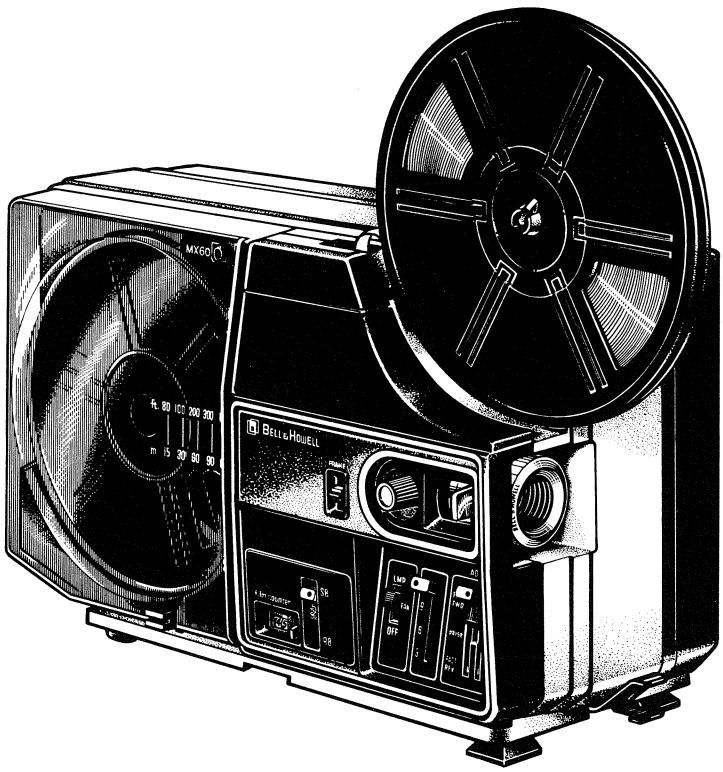


Catalog No. 1460 Regular 8/Super 8 Silent Movie Projector (Model MX60)

FEATURE DESCRIPTION LIST

General	Silent movie projector with "no trim" automatic film threading.
Type of Film	Regular 8 or Super 8
Projector Operation	Forward-Still-Reverse (Models 1460, 1462, 1464 and 1480 have Forward-Reverse "Search" feature).
Rewind Operation	Through-the-system (Note: Only the Model 1480 is equipped with the "auto-stop" feature).
Operating Voltage:	
Models 1462 and 1481	110/120/130/220/240V, 50/60Hz
All other Models	120V, 60Hz
Projection Lamp:	
Models 1422/1440/1445/1460/1464	Type DLD (P/N 451811)
Models 1462/1481	Type A1/30 (Atlas) (P/N 19908)
Model 1480	Type ELB (P/N 450891)
Projector Speed:	
Model 1422	18 fps only
All other Models	18/9/6/3 fps
Power Cord:	
Models 1462 and 1481	3-conductor cord, 2-pin DIN plug
All other Models	2-conductor cord, 2-blade plug
Projector Lenses:	
Models 1422A/1440A/1460A/1480A	F/1.6 fixed focus (P/N 450123)
Models 1422Z/1440Z/1460Z/1464Z	F/1.5, 20-32mm zoom (P/N 450220)
Models 1445Z/1462Z/1480Z/1481Z	F/1.3, 15.5-30mm zoom (P/N 450221)

Introduction

GENERAL.

These Service Instructions have been prepared to assist in the repair and adjustment of the Bell & Howell Company Super 8/Regular 8mm Silent Movie Projectors listed below. Special design and operating characteristics are listed on the preceding page. You will note that all Projector Models include a suffix letter A or Z; for example, Models 1422A and 1422Z. The letter A indicates that the projector is equipped with a fixed focus lens; the letter Z indicates that the projector is equipped with a zoom lens. In all other respects, however, the Models 1422A and 1422Z are identical mechanically and electrically. Since the only difference between A and Z models is in the lens, the instructions covering those models will reference only the basic model number (1422, 1440, 1460 and 1480). The lenses provided with the various models are listed in the Feature Description List on the preceding page.

An Illustrated Parts Catalog section is included at the rear of the manual to identify replacement parts and to assist the repairman in the disassembly and reassembly of the equipment. As shown in the following chart, each model has been assigned a code letter which will appear in the "Usable on Code" column. Be sure to check this column to make certain that the part in need of replacement is applicable to the projector being repaired.

Cat. No.	Code	Cat. No.	Code
1422A & Z	A	1462Z	E
1440A & Z	B	1464Z	F
1445Z	C	1480A & Z	G
1460A & Z	D	1481Z	H

DESCRIPTION.

The projectors covered by these instructions are very similar in appearance, operating characteristics and mechanical construction. The major differences are listed in the Feature Description List on the preceding page. You will note, for example, that the Models 1462 and 1481 are equipped with a voltage selector switch to provide for operating at voltages ranging from 110V, 50-60Hz to 240V, 50-60Hz, where as all other projectors are operated at 120V, 60Hz only. Also, that the Model 1422 can be operated at 18fps only, while all other models are provided with the Multi-Motion speed selection feature which permits projection at four different speeds: 18, 9, 6 and 3 fps. Specific features which do not apply to all models are as follows.

a. Room Lamp Receptacle. This receptacle is provided only on the Model 1480 projector.

b. Controls Pilot Lamp. The Models 1460, 1464 and 1480 only are provided with a pilot lamp to illuminate the control panel.

c. Forward-Reverse Search. This feature is provided only on the Models 1460, 1462, 1464 and 1480 projectors and is used in conjunction with a frame "position" counter. This permits the operator to shift quickly in forward or reverse to any desired frame for showing or reshowing a particular film sequence.

d. Automatic Film Stop. All models except the 1480 are equipped with this feature. It provides a means for stopping the feed mechanism in case the supply reel stops accidentally, thereby minimizing the possiblity of damage to the film.

SPECIAL MAINTENANCE PRECAUTIONS.

NOTE: The disassembly and reassembly instructions are presented as if the projector is to be stripped down completely. Repairmen must use their own judgement in determining how far a projector must be disassembled in order to correct specified malfunction.

The removal and reassembly of projector parts is relatively simple and, for the most part, will require only those tools normally available in photo products repair shops (retaining ring pliers, Bristol setscrew wrenches, assorted screwdrivers, hex socket wrenches, pencil type soldering gun, etc.). Certain of the tests and adjustments require the use of special gages and equipment. These are listed at the end of this section.

When repairing the equipment, be sure that the work bench surface is clean and unclutered by parts from other equipment. As parts are removed, group them in an orderly fashion. This will avoid confusion and speed-up reassembly. As parts are removed, loosely reassemble the attaching parts to the removed component or to the appropriate tapped casting holes.

Remove dirt and old lubricant from reusable parts with a nonflammable solvent. Clean electrical parts with a dry, lint-free cloth. Clean all film path parts (guide rollers, aperture plate, shuttle, etc.) with a lint-free cloth dampened with isopropyl alcohol. Hardened film emulsion can be removed from film path parts by moistening with alcohol and scraping with a toothpick or sharpened orange stick. Under no circumstances should a metal tool be used to scrape film emulsion from film path parts.

During reassembly, be sure to lubricate parts as specified in the instructions. Unless otherwise noted, the grease to be used is Bell & Howell Company Spec. 1956. If this lubricant is not immediately available, use only the very best grade of ball bearing grease obtainable from local commerical outlets.

Following are the recommended lubricants and special solvents required.

General Purpose Grease.. B&H Co. P/N 070034
Projector Oil ..... B&H Co. P/N 04978
Heptane Cleaner Solvent ..... purchase locally
Isopropyl Alcohol ..... purchase locally

After the projector has been repaired, reassembled and adjusted, perform the inspections and tests outlined in the Adjustments section to make certain that the projector is operating properly.

REPAIR TOOLS LIST

Tools Available From Bell & Howell Company	
Part Number	Description
G-5091-F66	Grip ring pliers
G-5091-F5	E-ring applicator
G-1271-F1	#4 Bristol wrench
STK-3852-B	#6 Bristol wrench
G-165-F1	#8 Bristol wrench
G-1659-F1	1/8 inch split screwdriver (long)
G-1659-F2	1/8 inch split screwdriver (short)
G-1658-F2	1/4 inch split screwdriver (short)

Tools To Be Purchased Locally
Description
1/4 inch open end wrench
3/16 inch open end wrench
1/4 inch nut driver, 10 inches long
3/16 inch nut driver
#2 Phillips screwdriver
1/4 inch blade screwdriver
Offset screwdriver

SPECIAL TOOLS LIST

TOOL NO.	DESCRIPTION	AVAILABLE FROM
1014	E-ring applicator/removal tool	Ames Supply 2537 Curtis Street Downers Grove, Illinois 60515
LP-36 LP-8	Chatillon push-pull scale (0 to 36 ounces) Chatillon push-pull scale (0 to 8 ounces)	Master Gage Company 1150 West Grand Avenue Chicago, Illinois 60622

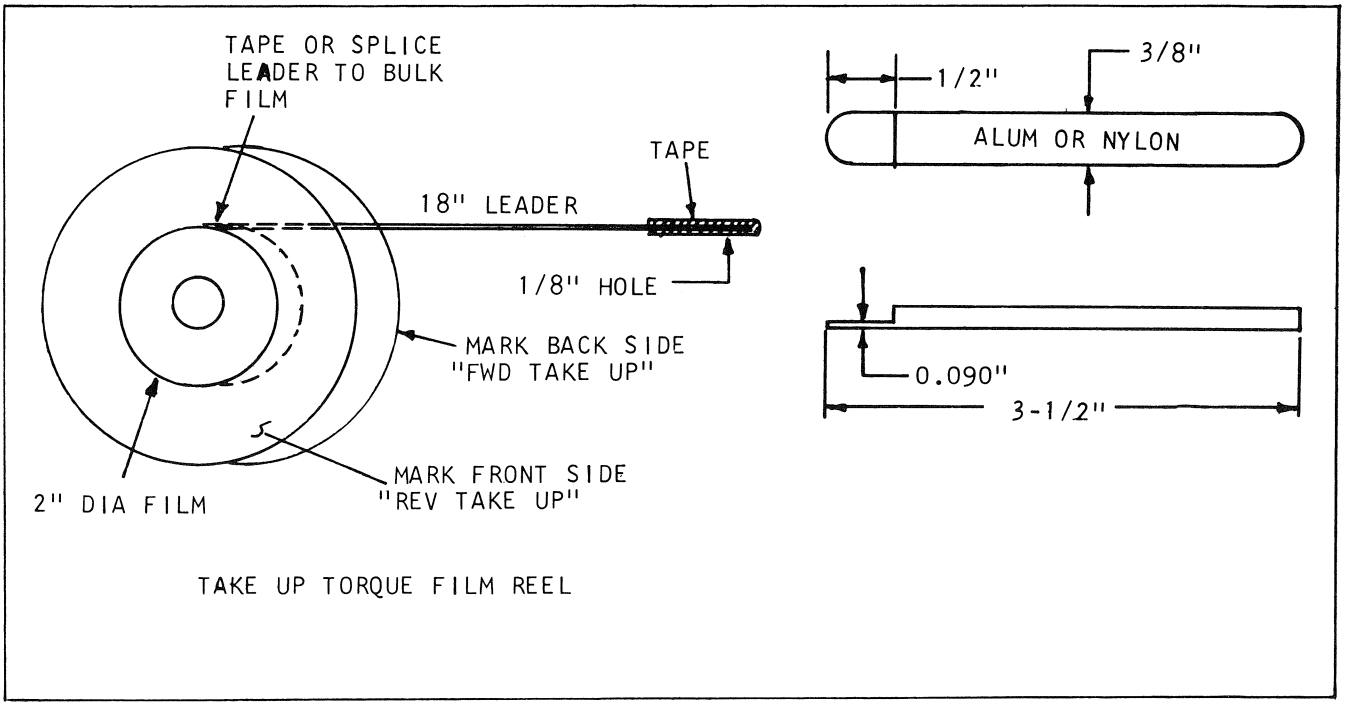


Figure A. Tools Which Can Be Shop-Made

Disassembly Procedure

1. GENERAL PRECAUTIONS.

NOTE: This section provides instructions for the complete disassembly of the projector and its main assemblies. Since complete disassembly of the projector will rarely, if ever, be required, repairmen must use their own judgement in determining the extent of disassembly necessary to correct the indicated malfunctions.

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 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.

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

e. In some instances, the screws used to secure the rear cover to the mainframe may tend to strip out because of frequent cover removal and the softness of the mainframe casting. When this happens, use the oversize screws listed in Note A of parts list Figure 1.

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

NOTE: Adhesive backed trimplates, labels, etc. should be replaced only if defaced so as to be unreadable. If you are replacing a cover which a trimplate or trimplates are mounted, be sure to order new trimplates to assemble to the replacement cover.

a. All Models Except 1422/1462. Depress the release latch (1E) at the bottom center of the outer cover (1) and disengage the two cover pins at the top of the outer cover from the locating holes in the mainframe. The release latch parts are secured with a rivet (1B) and should not be removed unless the latch is broken or inoperative.

b. Models 1460, 1462, 1464, 1480 and 1481. Depress the release latch at the bottom center of the dust cover (2E) and lift off the dust cover, disengaging its locating tabs from the slots in the top of the mainframe. If the latch is broken or inoperative, remove the retaining ring (2A) and disassemble the latch parts from the cover. If replacing the cover itself, be sure to save all latch parts for reassembly to the replacement cover.

c. If anticipated repairs involve the operating levers at the rear of the mainframe, carefully pry the control knobs (5), (6) and (7) from the ends of those levers. Remove the film track cover assembly (8) by pulling outward at the top and disengaging the tabs at the bottom from the slots in the base of the mainframe.

NOTE: For Models 1462, 1480 and 1481, a captivated locking screw (8B) must also be loosened before the film track cover can be removed.

d. Remove the rear cover screws (17) and (18) with lockwashers (19) and withdraw the rear cover assembly (20) to the limit of attached leadwires. One of the four screws (18) is located in the storage area for the spare lamp and can be exposed by opening the storage door (23). To free the rear cover assembly completely, the leadwires must be disconnected from cover electrical components. The carrying handle (21) can be lifted free when the rear cover is removed.

e. Remove the lamp storage door (23) by pressing the serrated door button and sliding upward; then rotating the door to the left or right to disengage the retaining tabs. The cord retainer (25) is secured by two screws (24) and need not be removed unless damaged and in need of replacement.

NOTE: The Models 1462 and 1481 only are equipped with a line cord receptacle (28C) and a separate line cord. On all other models, the line cord is wired directly into the projector. The cord receptacle is secured to the rear cover with two rivets (28A) and flat washers (28B). Also note that only the Model 1480 is equipped with the room lamp receptacle (30), attached to the rear cover with two screws (29). If any of these electrical items are

to be replaced, disconnect leads as necessary from their terminal lugs.

f. Models 1445, 1462, 1480 and 1481 Only. These models are equipped with the spiral focus knob (35) and face gear (39) arrangement. These parts are shown in the inset in Figure 1. The knob insert (32) is secured with adhesive and must be pried out to expose the knob attaching screw (33).

3. REMOVING MOTOR AND CLUTCH COMPONENTS (Figure 2). Remove parts, as necessary, in their indexed order of disassembly, noting any special precautions.

a. The wire clamp (1), control insert (4) and trim cover (5) need not be removed unless damaged. Remove the reel retainer (2) and pull the take-up reel (3) from the rear spindle.

b. Support the motor assembly (8) while removing the four screws (6) that attach the motor brackets to the mainframe. Disengage the motor shaft from the coupling (20A) and remove the motor assembly. Disconnect leadwires from the motor terminals. Refer to paragraph 9 for further motor disassembly. The washers (7) are cemented to the motor bracket grommets and need not be removed.

c. Remove the screws (9) and washers (10) that attach the upper gear shaft bearings (11) to the mainframe. Loosen the setscrews (12) in the coupling (14) and disassemble the upper gear and shaft assembly (13) from the coupling. Lift the lower gear and shaft assembly (15) from the support bracket (20C), leaving the coupling (14), retaining ring (15A) and bushing (15B) assembled to the shaft.

d. Unhook and remove the brake spring (16). Remove the retaining ring (17) and withdraw the rear spindle and pin assembly (18) from the clutch disc shaft. Remove the three screws (19) and lift the clutch bracket and shaft assembly (20) from the clutch disc shaft and the mainframe. Note that the Models 1462 and 1481 are equipped with a fan which is secured to the shaft with a setscrew. In all other models, the fan is a press-fit on the fan shaft.

e. If in need of repair, the brake arm assembly (22) can be removed at this point by removing the retaining ring (21). Withdraw the gear and sleeve assembly (23) from the end of the clutch disc shaft. Remove the adjusting nut (42) and lift the outer clutch lever (43) from the threaded post of the clutch plate and bracket assembly (41).

f. Remove the screws (24) and retainers (25) and lift the clutch idler assemblies (28) with idler shafts (26) and washers (27) from the mainframe. Inspect the idler cones for wear and possible need for replacement. Disengage the clutch drive assembly (29) by compressing the spring (30) and remove the assembled clutch disc parts by withdrawing the clutch disc shaft from the bearing in the mainframe. Loosen the setscrew (32) and remove the clutch drive assembly (29), spring (30), clutch disc (31) and clutch driver (33) from the main shaft of the module.

g. Disassemble the clutch disc parts (34 through 39) only as needed to replace damaged or badly worn parts. The clutch plate and bracket assembly (41) is secured to the mainframe with two screws (40). Do not remove this assembly or the lever (43) unless damaged.

4. REMOVING TILT AND CONTROL COMPONENTS (Figure 3). Remove parts, as necessary, in their indexed order of disassembly, noting any special precautions.

a. Remove the accordion rivet (1) from the upper end of the tilt plate (2) and withdraw the plate from the underside of the base. If in need of replacement, disassemble the feet (3) from the tilt plate.

b. Remove the tilt adjusting nut (4) from the screw (5) and disassemble the screw and washer (6) from the underside of the base. Remove the tilt foot spring (7). Remove the screw (8) and lift the tilt foot support (9) from the base.

c. Disconnect the auto stop spring (10) from the back-up plate (12) and auto stop actuating lever (15). Remove the two screws (11) that attach the back-up plate (12) to the mainframe. Remove the screw (13) and washer (14) and lift out the actuating lever (15).

d. Remove the two screws (16) and washers (17) that secure the bearings (18) to the tapped bosses of the mainframe, and lift out the control shaft (21) with reverse control cam (20). The cam is secured to the shaft with setscrew (19). Remove the two retaining rings (22) and disassemble the format shift link (23) from the studs of the format shift lever (36) and the gate control crank.

e. Remove the retaining ring (24) that secures the multi-motion link of the module to the stud on the multi-motion lever (33). Remove the screws (25) and washers (26) that secure the bearings (27) to the mainframe bosses at the ends of the control cam and shaft assembly (28). Lift the assembled shaft, cams and levers from the mainframe. The cams and levers are all preset on the shaft and should not be removed unless replacement is necessary. Be careful not to lose the steel ball (38) and spring (39) located in the cam detent hole of the mainframe.

f. Models 1460, 1464, 1480 and 1481. Disengage the counter drive belt (42) from the counter pulley. Remove two screws (40) and disassemble the frame counter (41) from the mainframe.

5. REMOVING LAMP, SWITCHES AND MODULE (Figure 4). Remove parts, as necessary, in their indexed order of disassembly, noting any special precautions.

a. Remove the retaining ring (1) and disassemble the brake arm (2). The brake arm pads (2A) are cemented in place and need not be removed unless badly worn and in need of replacement. Loosen the setscrew (3) and withdraw the clutch driver (4) from the main shaft.

b. Models 1462 and 1481 Only. Release the lamp retaining spring in the lamp housing of the module and remove the lamp (5). Disassemble the lamp from the lamp shield (5A). Disconnect the lamp socket from the lamp. Disconnect the lamp socket leads from their terminals.

c. Remove the two screws (6) and nuts (7) and disassemble the module brackets (8) and (9) and washer (15) from the module and mainframe. Remove the grip ring (10) and disconnect the module shuttle control link from the stud of the mainframe. Remove the two screws (11) and the bearing retainer (12). Remove the three module attaching screws (13), taking care not to lose the washer (14) used at the U-shaped mounting hole. Carefully withdraw the assembled module (16) from the mainframe. Remove the bearing (17) from the module main shaft. Disassembly instructions for the module will be found in paragraphs 7 and 8.

d. Disconnect the leads from the terminals of the main switch (22). Remove two screws (21) and the leadwire clamp (19) and lift the switch from the mainframe.

e. All Models Except 1422. Unhook the extension spring (24) from the lip of the pawl (27) and remove the screw (23) that secures the opposite end of the spring to the mainframe. Remove the screw (25) and disassemble the trip arm guide (26), pawl and stud assembly (27), pawl arm (28) and bushing (29) from the mainframe. Unhook the trip arm spring (31) from the trip arm and remove the grip ring (30) to release the other spring end from the mainframe stud. Remove the screw (32) and disassemble the bushing (33), trip arm (34) and flat washer (35) from the mainframe. The sleeve (36) need not be removed from the trip arm unless damaged.

f. Models 1462 and 1481 Only. Disconnect the leads from the terminals of the voltage selector switch (40). Remove two nuts (37) and screws (38) and disassemble the switch, with spacers (39) and leadwire clamp (41) from the mainframe.

6. DISASSEMBLING REEL ARM COMPONENTS (Figure 5). Remove parts, as necessary, in their indexed order of disassembly, noting any special precautions.

a. Withdraw the lamp ejector (1) from its slot below the lamp socket (all models except 1462, 1480 and 1481). Press the shuttle control link (2) downward until it can be lifted from the keyed boss of the shuttle control crank (4). Remove the two retaining rings (3) and lift the shuttle control crank and gate control crank (5) from the left-hand and right-hand posts of the mainframe.

b. Remove the screw (6) and washer (7) that secure the snubber spring (8). Place the tip of a finger on the open end of the snubber spring "U," twist the spring gently and withdraw it from the slot in the mainframe. Disassemble the two rollers (9) from the open end of the spring.

c. Open the reel lock (11) and withdraw the Super-8 adapter (10) from the reel spindle (13). Twist the reel lock slightly to disengage it from the slot in the spindle and lift out the lock. Remove the retainer (12) and disassemble the spindle from the reel arm shaft.

d. Remove the reel arm cover (14) by pulling outward firmly on the lower end of the cover; then disengaging the lip at the upper curved end from the reel arm plate (19). Remove the gears (15) from the plate stud and shaft. Remove the retaining clip (16) and disassemble the gear and shaft assembly (17) from the mainplate.

e. Compress the spindle (13) and plate assembly (19) and disassemble the retaining ring (18) from the slot in the plate bearing. Remove the plate assembly from the mainframe. Remove the steel ball (20) and spring (21) from the hole located to the upper left of the plate bearing hole.

f. Remove the two grip rings (22) and lift the light shield (23) from the two mounting pins at the back of the mainframe (24).

g. Note the manner in which the male guide rollers (26) and female guide rollers (27) are assembled. Remove the grip rings (25) and disassemble the rollers from the mainframe pins. Remove the rear snubber (28) from its recess in the mainframe with a long-nose pliers. The upper end of the snubber is secured with adhesive. If in need of replacement, remove the rubber feet (30) by taking out the attaching screws (29).

7. DISASSEMBLING THE FRONT AND REAR MODULES (Figure 6). Remove parts, as necessary, in their indexed order of disassembly, noting any special precautions.

a. Note the manner in which the lens tension spring (1) is assembled in the lens bore before you remove it. Also note the engagement of the tension lever springs (4) before disassembling the face tension lever assemblies (2) and (3) from the front module.

Disassembling Rear Module from Front Module.

b. Remove the screw (5) and square nut (6) from the lower holes of the module, thus freeing the L-shaped bearing support bracket (7). Remove the square nut (6) and screw (8) that join the front module (9) and rear module (10) or (11) at the upper holes, and separate the two modules. Disassembly procedures for the front module are covered in paragraph 8, following.

Disassembling the Rear Module (Models 1422, 1440, 1445 and 1460).

c. The lamp socket (10B) and leadwire clamp (10C) are attached to the rear module (10E) with rivets (10A) and should not be removed unless obviously damaged or defective. Use a drill slightly smaller than the rivet diameter to remove the rivets, taking care not to enlarge the rivet holes in the module.

Disassembling the Rear Module (Models 1462, 1464, 1480 and 1481).

d. Once the projection lamp has been removed, the lamp socket (11A) hangs loose, its leadwires held by the clamp (11E) secured to the rear of the module with the hex nut (11C), washer (11D) and the lower lamp bracket attaching screw (11F). The socket need not be removed unless replacement is necessary. Note the manner in which the ends of the retaining spring (11B) are retained before it is removed. If the lamp bracket (11H) must be replaced, remove the screws (11F) and (11G).

8. DISASSEMBLING THE FRONT MODULE (Figure 7). Remove parts, as necessary, in their indexed order of disassembly, noting any special precautions.

a. Remove the drive belt (1) from the shutter pulley. Loosen the setscrew (2) and withdraw the shutter wheel (3) and spring (4) from the main shaft.

b. Remove the nut (6), screw (7), flat washer (8) and bowed washer (9) that secures the shuttle assembly (12) to the pivot post of the front module. Carefully lift out the shuttle assembly, disengaging the shuttle teeth from the slot in the aperture plate. Remove the pull-down cam (10) from the main shaft and lift off the crank and pin assembly (5). Remove the cam shoes (11) from the shuttle assembly. Remove the screw (13) and washer (14) and disassemble the shuttle adjustment plate (15) from the shuttle.

c. Turn in the setscrew (16) until it is flush with the post of the yoke (18) and remove the spring (17). Disassemble the yoke from the front module. Lift the washer (19) from the main shaft.

d. Remove the retaining ring (20) and disassemble the spring (21) and the actuator bracket and shaft assembly (22) from the front module.

NOTE: The Model 1422 is an 18fps only projector and the spring (21) is not included. Instead, two retaining rings (20) are used to retain the actuator assembly in the 18fps position.

e. All Models Except 1422. Remove the retaining ring (23) and lift the assembled multimotion actuator (26) and link (27) from the pivot post of the front module. The link is secured to the actuator with a screw (24) and washer (25). It is not necessary to disassemble these parts unless the actuator or link are damaged and in need of replacement.

f. Note the positioning of the timing ribs on the staked multi-track cam gear, the timing gear (29) and the drive gear (31). Remove the grip ring (28) and lift the timing gear (29) from its post on the front module. Loosen the setscrew (30) and disassemble the drive gear (31) and bearing spacer (32) from the main shaft (3). Tap lightly on the shutter end of the main shaft to unseat the washer (34) and retaining ring (35) from the recess in the front module and withdraw the shaft. Disassemble the washer and retaining ring from the shaft.

NOTE: If the teeth of the multi-track cam gear are broken, chipped, or badly worn, the front module assembly (54) must be replaced.

g. Note the manner in which the legs of the torsion spring (37) are engaged to the front module and the fire shutter actuator (40). Remove the screw (36) and disassemble the torsion spring (37), flanged spacer (38), washer (39) and fire shutter actuator (40) from the front module.

h. Remove the screw (41) and disassemble the retractor spring (42) and retractor lever (43) from the front module.

i. Remove the two screws (44) and (45) and two square nuts (48), and disassemble the bearing retainer (46) main shaft bearing (47) from the front module.

j. Remove the four screws (49) and (50) and the square nuts (51) and lift the assembled aperture retract slider (52) and aperture plate (53) from the front module. Note the manner in which the slider is assembled to the aperture plate before separating these two components.

9. DISASSEMBLING THE MOTOR, FAN AND PULLEY (Figure 8). Remove parts, as necessary, in their indexed order of disassembly, noting any special precautions.

a. The washers (14) are cemented to the grommets (12) and need not be disturbed unless the grommets are damaged and in need of replacement.

b. Loosen the setscrew (1) and disassemble the pulley (2) from the motor shaft. Loosen the setscrew (3) and disassemble the blower fan (4) from the motor shaft.

c. Remove the screws (6) and hex nuts (7) and disassemble the brackets (8), (9), (10) and (13) from the motorformer (15). Remove the grommets (12) and spacers (11) from the brackets (8) and (9).

10. DISASSEMBLING THE APERTURE PLATE (Figure 9). Remove parts, as necessary, in their indexed order of disassembly, noting any special precautions.

a. Note the manner in which the legs of the torsion spring (3) are engaged. Remove the retaining ring (1) and disassemble the fire shutter

screen assembly (2) and torsion spring (3) from the stud at the rear of the aperture plate.

b. Note the manner in which the bent tabs of the film guide (5) are engaged in the slots of the aperture plate. Remove the two screws (4) and disassemble the film guide from the aperture plate.

c. Check the tension of the aperture plate side tension arm with a 0 to 250 gram push-pull gage. The arm should move at between 160 and 180 grams. If the arm does not meet the tension requirements, the tension spring (6) must be removed and the legs carefully preformed (Figure B) or the spring replaced.

Reassembly Procedure

11. GENERAL INSTRUCTIONS.

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

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

c. When rewiring electrical components, use a pencil type soldering gun and solder all connections carefully. Avoid cold-soldered joints and be careful that solder does not drip onto other electrical components and cause short circuits. Avoid the direct application of solder gun heat to adjacent components by using a heat sink. Refer to the appropriate wiring diagram at the end of the Parts Catalog section for proper leadwire connections.

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

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

12. REASSEMBLING THE APERTURE PLATE (Figure 9). Reassemble Figure 9 parts as outlined below, noting any special precautions.

a. Assemble the tension spring (6) to the aperture plate with the spring ends inserted into the holes in the ears of the side tension arm. Engage the open legs of the spring with the groove in the pivot stud and press in to seat the loop in the groove. Check the tension of the side tension arm with an accurate 0 to 250 gram push-pull gage. The arm should move at between 160 and 180 grams. If the arm does not meet the tension requirements, remove and carefully preform the spring legs as shown in Figure B. If this procedure fails to correct the condition, replace the spring.

b. Assemble the fixed film guide (5) to the aperture plate with the tabs of the film guide inserted into the slots in the aperture plate. Install two screws (4).

c. Clean the aperture mask openings with a Q-tip moistened in isopropyl alcohol.

d. Assemble the torsion spring (3) to the pivot hub of the fire shutter screen assembly (2). The long leg of the spring must be inserted through the hole in the bent tab below the screen. Assemble the screen assembly and spring to the stud at the rear of the aperture plate, winding the short leg of the spring and hooking it behind the adjacent bent tab on the plate. Secure the screen assembly with the retaining ring (1) and manually actuate the screen to check for smoothness of operation.

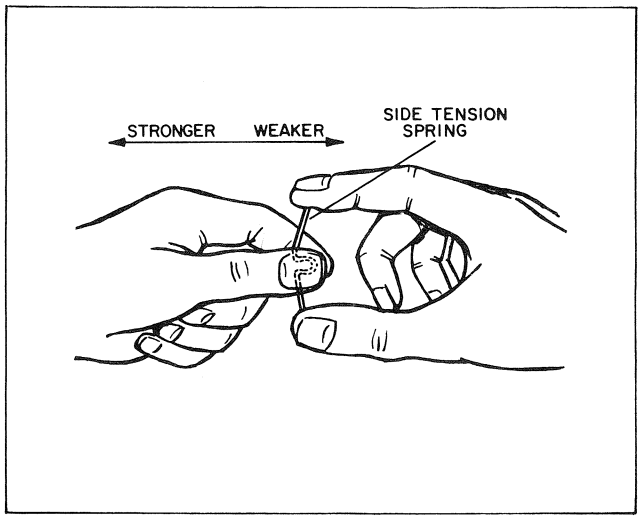


Figure B. Adjusting Aperture Spring Tension

13. REASSEMBLING MOTOR, FAN AND PULLEY (Figure 8). Reassemble Figure 8 parts in the following manner, noting any special precautions.

a. Assemble a grommet (12) into the two left-hand motor brackets (9) and into the two right-hand motor brackets (8). Insert a spacer (11) into each grommet.

b. Assemble all brackets (8), (9), (10) and (13) to the motorformer (15), orienting the brackets as shown in Figure 8. Secure all parts with the screws (6) and hex nuts (7). Hold the motor bracket down against the face of the motor to insure the proper engagement of the boss within the mating hole in the motor before tightening the screw.

c. Assemble the blower fan (4), hub facing out, to the motor shaft opposite the motor connecting lugs. Position the fan on the shaft to the dimension shown in Figure C and tighten the setscrew (3) securely. Assemble the motor pulley (2), as shown, to the same end of the motor shaft. Position the pulley to the dimension shown in Figure C and tighten the setscrew (1) securely.

d. Squeeze a drop of cement (3M Co., No. 880) on the mounting face of each grommet and assemble a washer (14) to each grommet, aligning the holes carefully. Allow cement to dry before mounting the motor.

14. REASSEMBLING THE FRONT MODULE (Figure 7). Reassemble Figure 7 parts as outlined in the following paragraphs, noting any special precautions.

a. Lightly brush grease to the module where the side of the aperture plate (53) and the tab of the retract slider (52) will make contact. Assemble the retract slider to the aperture plate, guiding it beneath the face tension actuator and pressure slide retractor. Insert the four square nuts (51) into the pockets in the back side of the aperture area of the module. Position the aperture plate carefully on the module with the mounting holes aligned. Install the three screws (50) through the inner two holes and the bottom outer hole; the remaining screw (49) through the upper outer hole. Press and hold the inner edge of the aperture plate against the module and tighten all screws.

b. Assemble the two square nuts (48) into the pockets in the module and hold them in place while inverting the module. Assemble the bearing (47) into the bearing opening with the bearing notch in the bottom position. Install the bearing retainer (46) with its tab engaged in the bearing notch. Secure the retainer with screws (44) and (45). Place a drop of oil (Bell & Howell Co. STK #1543) on the bearing.

c. With a brush, lightly grease the shuttle retractor lever slot in the module. Assemble the retractor lever (43) to the module and the retractor spring (42), formed tab up, to the lever. Secure all parts with the screw (41).

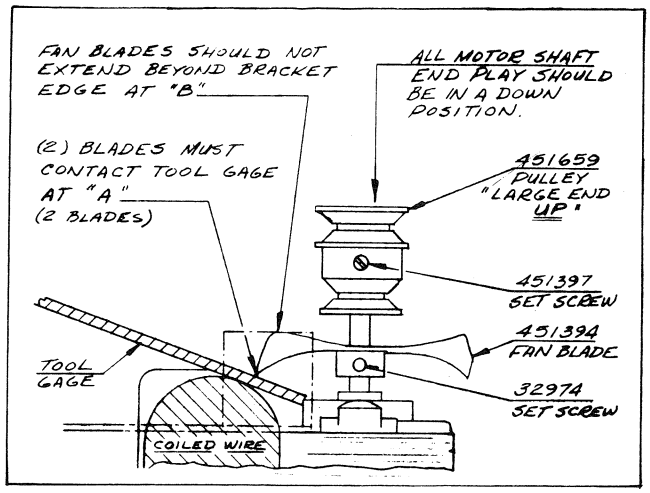


Figure C. Presetting the Motor Fan and Pulley

d. Assemble the fire shutter actuator (40) and washer (39) over the boss on the module. Assemble the spacer (38), large diameter first, to the screw (36). Assemble the torsion spring (37) to the spacer with the short leg toward the screw head. Assemble the screw into the tapped boss, hooking the short leg of the spring into the pocket of the module and the long leg behind the actuator. Work the actuator to check for free movement of the fire shutter. Tighten or loosen the screw as necessary.

e. Preassemble the retaining ring (35) and flat washer (34) to the front end of the main shaft (33). Insert the bearing spacer (32) into the pocket behind the assembled front bearing (47) and hold in place while inserting the shaft through the bearing (47) and spacer (32). Insert a 0.005-inch (0.076mm) shim between the bearing and the washer (34) and lightly tap the short end of the shaft to seat the retaining ring and washer.

f. Dip the setscrew (30) in shellac and assemble it loosely to the drive gear (31). Assemble the drive gear, hub up, to the long end of the shaft and down against the spacer (32). Hold parts together and tighten the setscrew against the flat on the shaft.

g. Lightly grease the post to which the timing gear (29) is to be installed. Rotate the multi-track cam gear (staked to the module casting) until the "V" timing ribs are set at approximately 11 o'clock as shown in Figure D. Insert a No. 41 drill up through the timing hole in the module located at approximately two o'clock in relation to the timing gear post (Figure D). Assemble the timing gear, small gear hub down, to the gear post. Before seating the timing gear, rotate the cam gear and the drive gear so that their timing marks are aligned as shown in Figure D. Carefully seat the timing gear, engaging the gear teeth, and withdraw the drill from the timing hole. Assemble the grip ring (28) over the post to secure the timing gear. Lightly grease all gear teeth with a small brush.

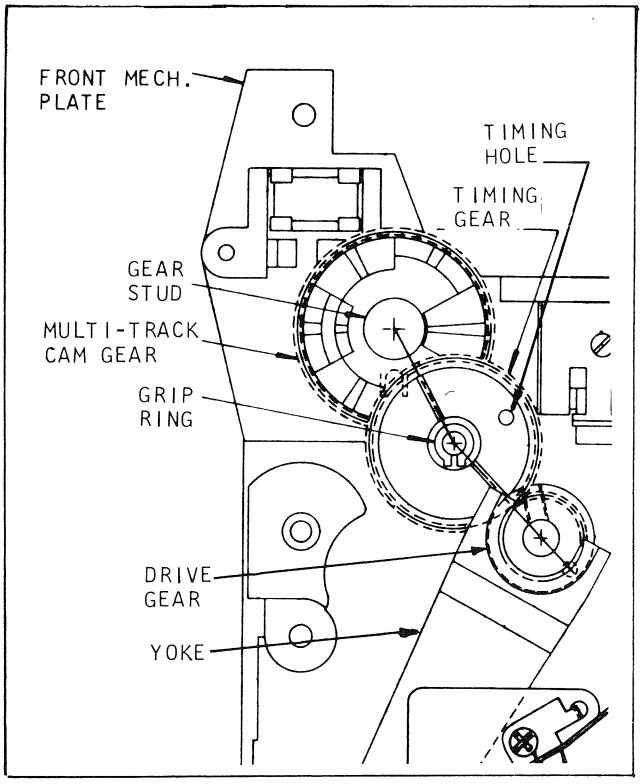


Figure D. Timing the Module Gears

h. All Models Except 1422. Hold the multimotion actuator (26) so that the straight edge is at the right and the narrow end is at the top. Assemble the multimotion link (27) to the actuator so that its straight edge is at the right and the slotted hole at the bottom. Secure these two parts with the screw (24) and washer (25). Lightly brush the post for the link and actuator with grease. Pick up the assembled link and actuator and, with the hook to the left, assemble just the first hole of the tab to the post. Work the hook over the mechanism and timing gear; then seat the actuator and link and secure with the retaining ring (23). Apply a touch of grease to the contact surface of the actuator.

i. Lightly grease the shaft of the actuator shaft and bracket assembly (22), and insert the shaft through the opening in the module with the bracket positioned over the multi-track cam. Assemble the spring (21) over the shaft and compress the spring until the retaining ring (20) can be installed in the outer ring groove of the shaft.

NOTE: The Model 1422 is an 18fps projector and the spring (21) is not included. Instead, two retaining rings (20) must be installed in the outer and inner grooves of the shaft.

j. Assemble washer (19) to the main shaft and down against the drive gear (31). Assemble the setscrew (16) to the yoke (18) until the head of the setscrew is flush with the post of the yoke. Assemble the post of the yoke through the hole in the module with the "U" end of the yoke encircling the main shaft. Assemble the spring (17) to the post of the yoke and compress it while backing out the setscrew to retain the spring.

k. Assemble the shuttle adjustment plate (15) to the shuttle assembly (12) with the screw (13) and washer (14). Adjust the screw (12A) until the screw end deflects the shuttle spring enough to create initial tension on the shuttle (see Figure E).

l. Assemble two cam shoes (11) to the shuttle assembly. A white cam shoe should be at the top position. Carefully pass the pull down cam (10) crosswise through the shuttle, taking care that the cam is at right angles to the cam shoes (not tilted). The cam should have a light but noticeable drag when passing through the shuttle. If no drag is felt, or if drag is too tight, exchange cam shoes until correct drag is obtained. Rotate the cam into working position (parallel to the shuttle). Hold the cam and shuttle, pinching the left-hand edge of the cam to prevent it from moving. With finger and thumb of right hand, lightly press the cam back and forth in the shuttle opening. The cam should rock slightly under light pressure. If the cam will not rock (too tight) or rocks more than one-half the cam width (too loose), select cam shoes to obtain the proper fit. Apply a small dab of grease to two places (top and bottom shoe contact surfaces) on the cam. Rotate cam to spread the lubricant. Temporarily set these parts aside.

m. Assemble the crank and pin assembly (5) to the front module, engaging the notched pin on the support extension into the hole in the hex detent of the module. Make sure that the finger of the mask actuator is located between the two tabs of the fire shutter arm.

n. Wipe the main shaft with a clean, lint-free cloth or Kimwipes to remove all foreign matter. Spray the shaft with a good commercial silicone mold release and, with a hypodermic needle, apply the same solution to the springs between the cam driver and pull-down cam. Slide the cam (10) down

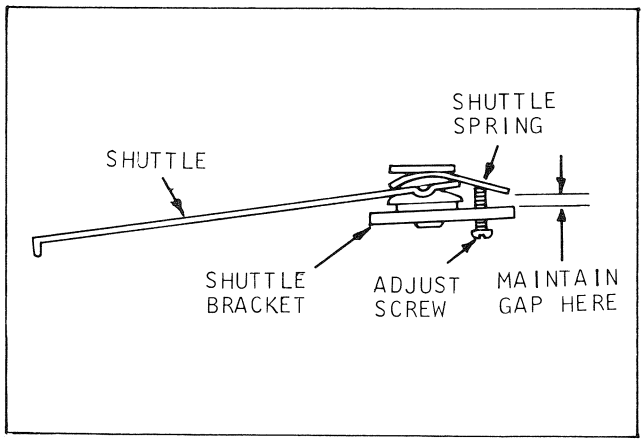


Figure E. Preadjusting Shuttle Spring Tension

into place on the main shaft. Lightly grease the shuttle pivot post on the front module and flip the actuator assembly (22) over the in-out cam. Carefully assemble the shuttle assembly over the pull down cam, with the shuttle teeth inserted through the slot in the aperture plate and the shuttle bracket on the module pivot post. NOTE: On the Model 1462, guide the banana slot in the shuttle adjustment plate over the pin in the format shifting crank (5). Assemble the bowed washer (9), concave side up, to the pivot post. Secure the shuttle assembly with the screw (7), flat washer (8) and nut (6).

o. Assemble the spring (4) to the main shaft. With a Q-tip apply a very light film of silicone lubricant (Dow-Corning #6000) to the face of the shutter which will be in contact with the pull down cam. Assemble the shutter wheel (3), hub up, to the main shaft. Align the setscrew hole in the hub with the flat on the shaft and install and tighten the setscrew (2). Loop the drive belt (1) around the shutter pulley.

15. REASSEMBLING FRONT AND REAR MODULES (Figure 6). Reassemble Figure 6 parts as outlined in the following paragraphs, noting any special precautions.

Assembling the Rear Module, Models 1462, 1464, 1480 and 1481).

a. Position the lamp bracket (11H) on the rear module (11J) with the mounting holes aligned and secure the bracket with screw (11G) at the top hole and screw (11F) at the bottom hole. Assemble the leadwire clamp (11E) to the protruding threaded end of the lower screw and install the washer (11D) and nut (11C). The retaining spring (11B) has a U-shaped loop at both ends, but the lower loop has a slight bend in the free end. Compress the lower loop and engage it into the small lower hole in the lamp bracket. Latch the upper loop over the top of the lamp bracket. Thread the leads of the lamp socket assembly (11A) through the rectangular hole in the rear module and fasten them with the clamp (11E). The socket will be loose until the module assembly is mounted to the projector mainframe and the lamp is installed.

Assembling the Rear Module, Models 1422, 1440, 1445 and 1460.

b. Assemble the leadwire clamp (10C) with its insulating sleeve (10D) to the rear module (10E) with a rivet (10A). Assemble the lamp socket (10B) into the rear module with the lamp locating notch of the socket toward the inner right-hand corner of the module. Secure the socket with two rivets (10A).

Assembling Rear Module to Front Module.

c. Assemble the rear module (6-10) or (6-11) to the front module (6-9) and insert the screw (6-8) through the upper hole of both modules and into the square nut (6-6). Assemble this screw loosely. Line up the modules so they are flush at the top and hold firmly while tightening the upper screw.

d. Assemble the L-shaped bearing support bracket (7) to the pin on the format shifting crank assembly (5, Figure 7). Align the hole in the support bracket with the lower holes in the front and rear modules and secure the bracket and lower end of both modules with the screw (5) and square nut (6).

e. (Figure F). Assemble a spring (4) to the left-hand tension lever (3). Hook the long end of the spring into the notches at the top of the lens bore. Pull back on the lever and seat its stud between the notches at the rear of the lens bore. Turn the module over and repeat the process with the spring (4) and right-hand tension lever (2).

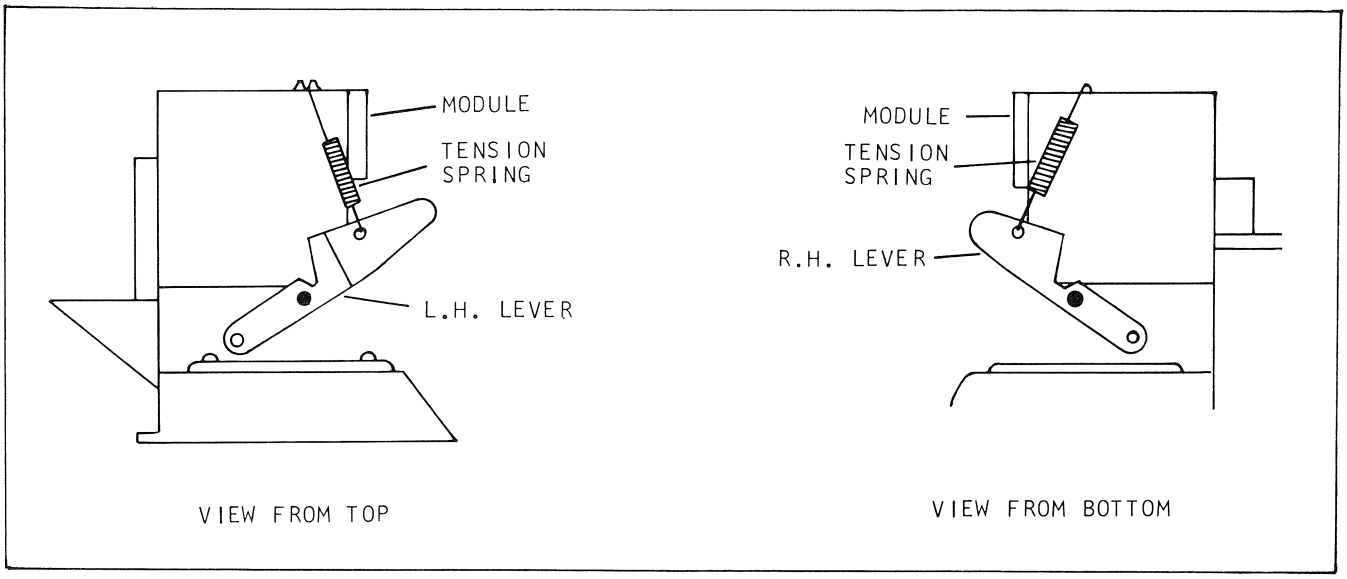


Figure F. Installing the Face Tension Levers

f. Insert the flat-angled end of the lens tension spring (1) into the lens mount opening. The spring must be between the two center guide rails along the inner wall of lens bore and captured beneath those rails. Slide the spring in place until the more sharply bent end butts against the lens opening. Lightly grease the top surface of the spring and all guide rails in the lens bore.

Checking Format Operation.

g. Shift the module into the super 8 format and frame down. Check the format shifting finger for movement. If the finger moves, adjust by carefully bending the finger down a slight amount with a long nose pliers. Shift the module to regular 8 format and frame up. Check the shifting finger for movement. If the finger moves, carefully bend the finger upward a slight amount with a long nose pliers. Recheck super 8 format and readjust as necessary.

16. REASSEMBLING REEL ARM COMPONENTS (Figure 5). Reassemble Figure 5 components as outlined in the following paragraphs, noting any special precautions.

a. Secure the two rubber feet (30) to the mainframe (31) with the two screws (29). Apply a small amount of adhesive (Loctite Super Bonder #415) to the snubber (28) at the points indicated in Figure G. Grip the rear snubber with a long nose pliers and insert it into the cavity of the mainframe (Figure G), making certain that the snubber notch fits into the small boss of the mainframe. The lower end of the snubber must not rub on the mainframe. Lightly grease the four guide roller pins. Assemble the four female rollers (27), recessed face up, to the roller pins of the mainframe. Assemble the male rollers (26) to the pins with the hubs engaging the recess in the female rollers. Insert a 0.005 inch (0.127mm) shim between the female roller and the mainplate. Install the four grip rings (25), pressing them down into contact with the male rollers. Remove the shim.

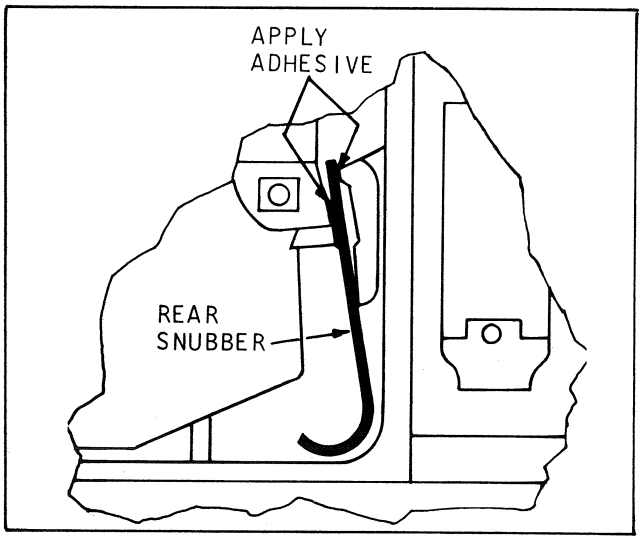


Figure G. Installing the Rear Snubber

b. Assemble the light shield (23) over the two mounting pins at the back of the mainframe adjacent to the module opening and secure it in place with the two grip rings (22).

c. Brush the spring (21) with grease and insert it into the hole located to the upper left of the spindle bearing opening. Add a small amount of grease to the end of the spring and add the steel ball (20). Lightly brush the length of the bearing surface of the reel arm plate assembly (19) with grease and assemble the plate bearing into the hole located to the lower right of the spring hole. Compress the spindle and plate assembly until the retaining ring (18) can be assembled into the slot in the plate bearing. Be careful not to mar the inside diameter of the bearing. Release the pressure and move spindle up and down to check detent action.

d. Lightly brush grease on each of the bearing surfaces of the reel arm gear and shaft assembly (17). Insert the assembly into the spindle bearing from the rear and lock in place by assembling the retaining clip (16) over the flats on the reel arm shaft. Grease well to hold the clip in place. Place a drop of oil on the bearing surfaces of the reel arm plate stud and shaft. Assemble the gears (15), square opening down, on the stud and shaft. Spin the gears while brushing the gear teeth with grease. Assemble the front reel arm cover (14) to the plate by first hooking the lip on the inside of the curved end over the plate; then pressing firmly on the flat sides and snapping the cover in place.

e. Assemble the reel spindle (13) over the shaft extending through the hole in the reel arm cover. Assemble the retainer (12) into the slot on the shaft to retain the spindle, and spin the spindle and shaft to distribute the grease. Assemble the reel lock (11) into the slot of the spindle, twisting the lock to snap it in place. Open the spindle lock and press the super-8 adapter (10) in place until it is fully seated; then close the lock.

f. Brush the "U"-bent end of the snubber spring (8) with grease and assemble the two rollers (9), small diameters mated, to the open end of the "U." Insert the long end of the spring through the slot from the front of the mainframe and hold in position from the back of the mainframe with the "U" end of the spring up. With the tip of a finger on the open end of the "U," move the spring and rollers to the bottom of the slot while twisting gently and, at the same time, pulling the long end of the spring from the back. When the rollers are in position, hold the spring under the guide bar of the mainframe and fasten in place with the screw (6) and washer (7).

g. Assemble the gate control crank (5) to the right-hand post of the mainframe and the shuttle control crank (4) to the left-hand post. Secure both cranks with a retaining ring (3). Match the keyed hole of the shuttle control link (2) with the keyed boss of the shuttle control crank (4). The tip of the link must face toward the mainframe. Mate the link

to the crank and move the link upward until it locks in place. Assemble the lamp ejector (1) into its slot below the lamp socket (all models except 1462, 1480 and 1481).

17. REASSEMBLING LAMPS, SWITCHES AND THE MODULE (Figure 4). Reassemble Figure 4 parts as outlined in the following paragraphs, noting any special precautions.

a. Models 1462 and 1481 Only. Assemble the voltage selector switch (40) to the mainframe with the notch to the back of the mainframe in the following manner. Install the two screws (38) through the switch mounting holes and place a spacer (39) over the threaded end of each screw. Install the selector switch (40) on the two screws and assemble the cable clamp (41) to the lower screw, capturing all switch leadwires. Install and tighten the two nuts (37). Route the leads down close to the mainframe and secure with a wire tie where leads go under the fan shroud. Refer to the appropriate wiring diagram (Figure 12 or 15) for proper switch leadwire connections.

b. All Models Except 1422. Assemble the sleeve (36) to the auto stop trip arm (34). Assemble the shoulder bushing (33), large diameter first, to the screw (32). Insert the screw through the mounting hole in the trip arm and assemble the washer (35) to the screw. Assemble the trip arm to the upper left side hole in the mainframe with the sleeve inserted into the banana-shaped slot in the mainframe and tighten the screw securely. Secure one end of the trip arm spring (31) to the spring stud (Figure H, View A) with the grip ring (30) and hook the other end beneath the trip arm. Assemble the bushing (29), large diameter first, to the screw (25). In sequence, add the pawl arm (28), pawl and stud assembly (27) and trip arm guide (26) to the screw (Figure H, View B). Lift these assembled parts up into position with the notched out end of the trip arm guide straddling the handle boss of the mainframe. Tighten the screw (25) securely. Hook the short end of the extension spring (24) to the lip of the pawl (27) and fasten the long end to the hole above and to the left of the pawl arm (28) with the screw (23).

c. Assemble the main switch (22) to the mainframe with the two screws (21). Make leadwire connections to the switch as shown in the appropriate wiring diagram (Figures 10 through 15). Secure the panel lamp (20) to the mainframe with the screw (18) and the leadwire clamp (19). Do not tighten the screw until the lamp leads have been captivated by the clamp and connected to the lamp terminals as shown in the appropriate wiring diagram.

d. Grease the washer (15) and assemble it to the long screw protruding through the bracket of the module assembly (16). Assemble the bearing (17) to the main shaft of the module. Assemble the module into the module opening from the rear of the mainplate, inserting the long screw through the hole just above the gate control crank. At the same time, slide the bearing on the main shaft until it seats in the pocket of the mainframe, and make certain that the pin on the control crank engages the slot in the aperture retractor slider of the module. Align the mounting holes of the module with those in the mainframe and install the three mounting screws (13). Use a washer (14) with the screw that is installed in the U-shaped mounting hole of the module. Press down on the top of the module while tightening all screws securely; then place a drop of oil on the main shaft at the bearing (17). Secure the bearing into its pocket with the retainer (12) and two screws (11). Assemble the shuttle control link of the module over the stud on the mainframe and secure the link with the grip ring (10). Lightly grease the stud. Assemble the bracket (9) to the long screw of the module and up against the washer (15) and secure the bracket with the nut (7). Attach the opposite end of the bracket to the mainframe with the screw (6). (See

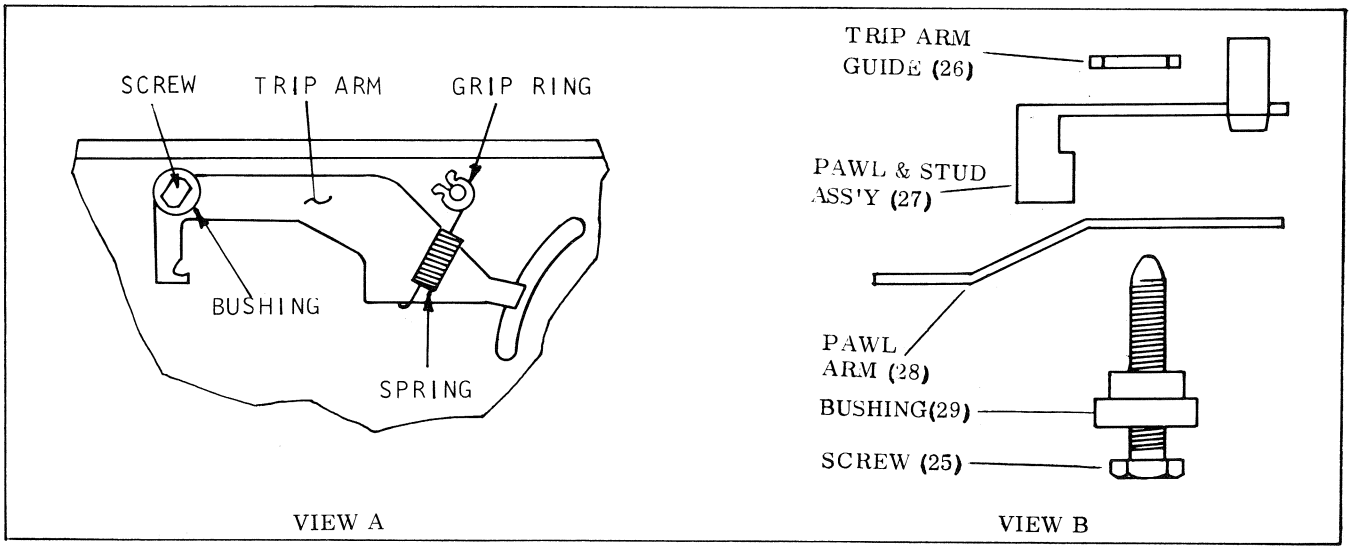


Figure H. Installing the Autostop Trigger Mechanism

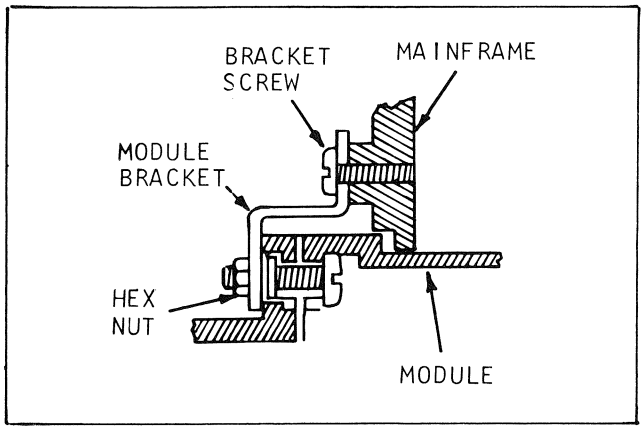


Figure J. Assembling Module Brackets to Mainframe

Figure J.) Attach bracket (8) to the module and mainframe in the same manner. Be sure to tighten bracket screws and nuts evenly so as not to distort the module.

NOTE: On Models 1462, 1480 and 1481, be sure that the lamp socket leads from the module are not pinched between the module and mainframe during module installation. Connect lamp socket leads per the appropriate wiring diagram. On all other models, connect the leads to the lamp socket per the appropriate wiring diagram before installing the module.

e. Models 1462 and 1481 Only. Apply a small amount of adhesive to the back of the lamp shield (5A). Assemble the shield to the lamp (5), with the slot over the lamp pins and the cup to the base of the lamp. Be careful not to leave fingerprints on the reflective surface of the lamp. Press the lamp firmly into the lamp socket. Hold open the retaining spring of the lamp housing bracket and position the lamp into the bracket slots. Release the spring to retain the lamp.

f. Assemble the setscrew (3) to the clutch driver (4) and assemble the driver to the main shaft and up against the main shaft bearing. Tighten the setscrew just enough to hold the driver in place. Clean the brake pads (2A) and the drum surface which they will contact with Heptane solvent. Assemble the brake arm assembly (2) to its post by inserting the opening over the drive shaft and then dropping it down on the post. Secure the arm with the retaining ring (1).

18. REASSEMBLING TILT AND CONTROL COMPONENTS (Figure 3). Reassemble Figure 3 parts in the following manner, noting any special precautions.

a. Models 1460, 1464, 1480 and 1481. Assemble the counter (41) into the back of the mainframe slot with the pulley up and to the left. Secure the counter to the mainframe with the two screws (40). The drive belt (42) need not be installed at this time. Lightly brush the spring (39) with grease and insert it into the hole in the mainframe. Place a speck of grease on the end of the spring and insert the steel ball (38).

b. Preassemble the control shaft, cams, and levers (28) in the following manner (preassembled parts are shown in Figure K). To the control cam and shaft assembly (37), assemble the format shift lever assembly (36) with the gate control cam (35) between the legs of the lever. On all models except 1442, assemble the multi-motion lever assembly (33)

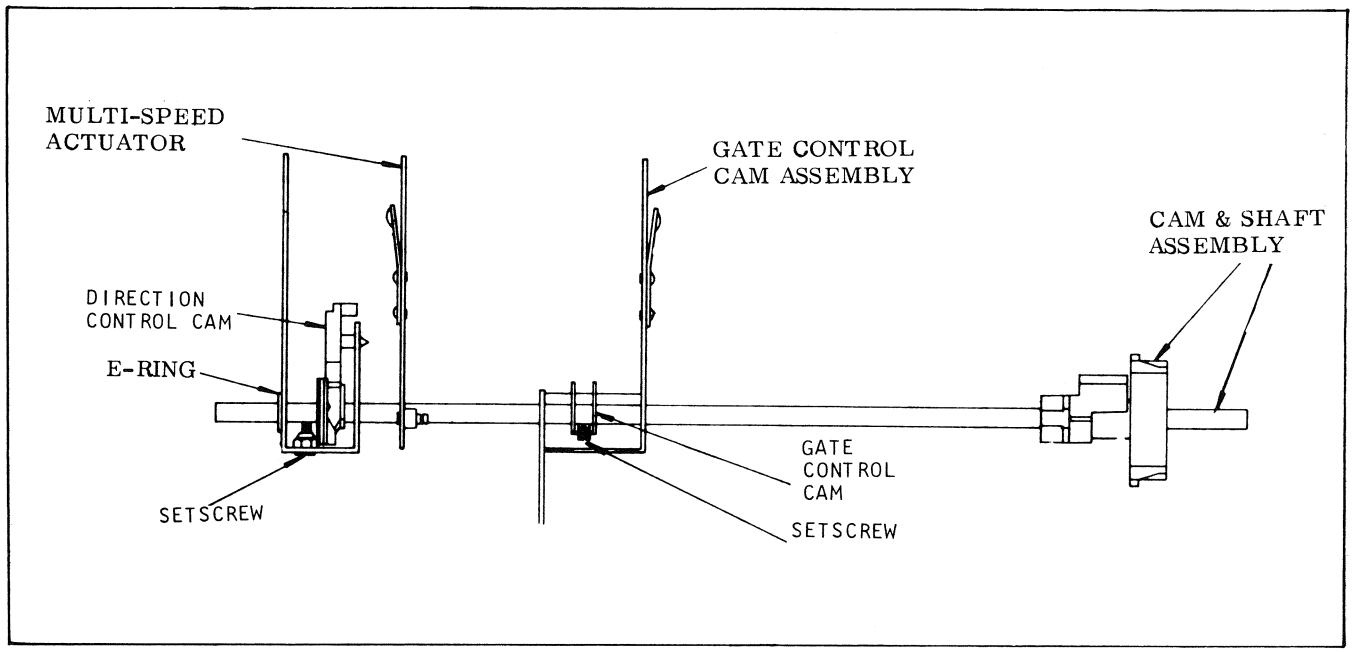


Figure K. Preassembling the Control Cams and Levers

to the control shaft. Assemble the control lever assembly (31) to the control shaft with the projector control cam (32) between the legs of the lever and the cam pin inserted through the hole in the lever arm. Assemble the retaining ring (29) into the ring groove of the control shaft. Loosely assemble the setscrew (30) into the staked nut of the control lever (31) and the setscrew (34) into the gate control cam (35).

c. Lightly grease the contact surface of each cam (32) and (35) and the cam of the cam and shaft assembly (37). Insert the assembled shaft into the mainframe, guiding the levers through their respective slots in the mainframe. Mate the projector control cam (32) with the shuttle control crank (item 4, Figure 5), the gate control cam (35) with the gate control crank (item 5, Figure 5) and the stud on the multimotion lever (33) with the multimotion link (item 27, Figure 7). Assemble the retaining ring (24) to the stud of the multi-motion lever to secure the link. Lightly grease the friction surfaces of the four bearings (27) and assemble two bearings to each end of the shaft. Lightly fasten the bearings to the bosses of the mainframe with the screws (25) and washers (26).

d. Assemble the format shift link (23) to the studs on the lever (36) and the gate control crank (item 5, Figure 5) and secure the link with the two retaining rings (22). Move the format shift lever to check for binding.

e. Assemble the reverse control cam (20) to the control shaft (21) and tighten the setscrew (19) just enough to hold. Assemble one end of the control shaft into the end of the yoke (item 18, Figure 7). Lightly grease the friction surfaces of the two bearings (18) and assemble them to the opposite end of the control shaft. Loosely assemble the bearings to the mainframe mounting bosses with the screws (16) and washers (17). Press the control shaft to the right until the end of the shaft is flush with the bearings and hold while tightening the screws (16). Shift the control lever to the "REV" (down) position and insert the spacing tool (Figure A) between the yoke boss and the control lever. Grease the mating surfaces of the reverse control cam and the projector control cam (32) and move the reverse control cam until it makes contact with the projector control cam as shown in Figure L. The tip of the reverse control cam must ride between the guide posts on the mainframe. Tighten the setscrew (19) to lock the cam in place; then tighten the setscrew in the yoke boss to secure the control shaft. Refer to paragraph 24 in the Adjustment section for adjustment of all control levers and cams.

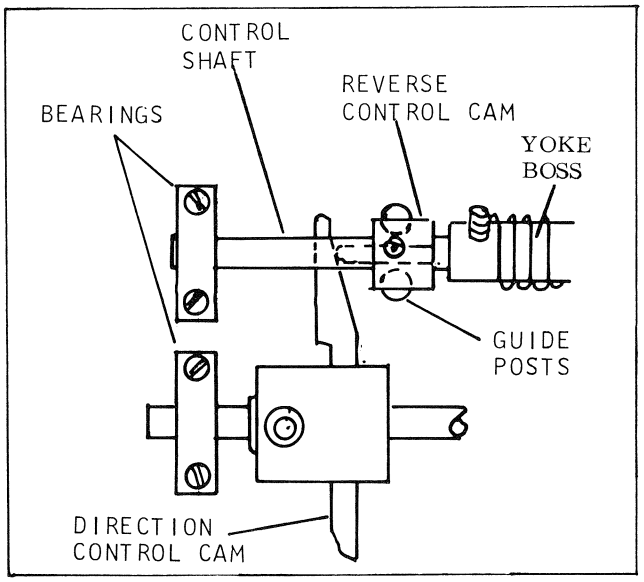


Figure L. Installing the Reverse Control Cam

f. Lightly grease the mainframe slots and bosses to which the autostop actuating lever (15) will be assembled. Position the lever (15) over the mounting boss and align the upper mounting hole, engaging the end of the trip arm as shown in Figure M. Secure the lever (15) with the screw (13) and washer (14). Be sure that the center bend of the lever is above the tip of the shuttle control link (Figure M).

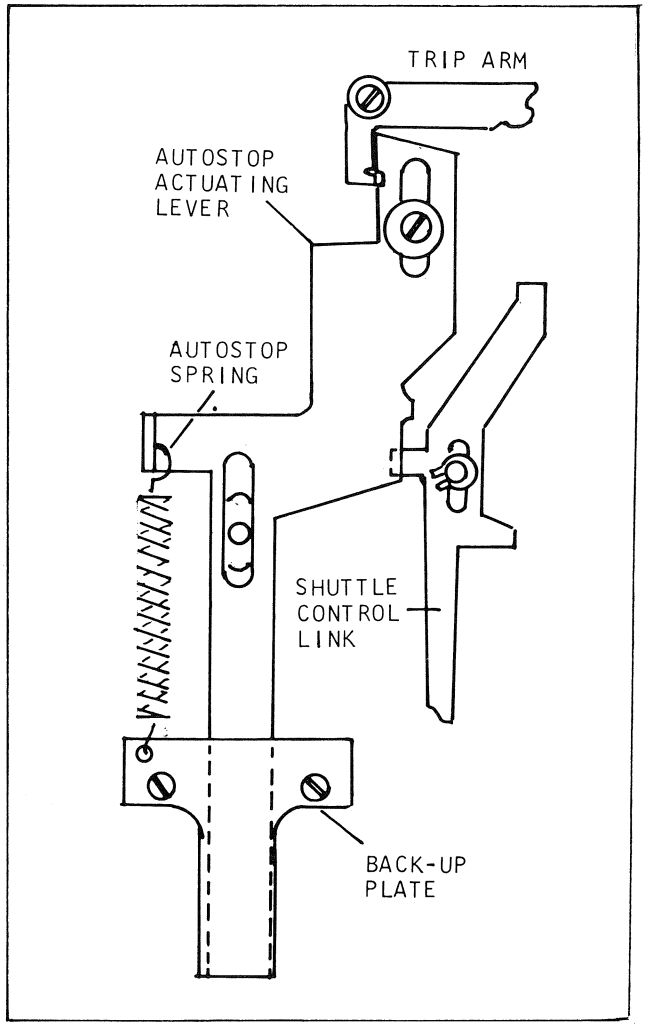


Figure M. Installing the Autostop Lever

Slip the tail of the back-up plate (12) down behind the reverse control shaft (21) and fasten the plate over the lower end of the lever with the two screws (11). Hook the autostop spring (10) between the actuating lever and back-up plate.

g. Secure the tilt foot support (9) to the base of the mainframe with the screw (8). Hold the tilt foot spring (7) with the bent end down and twist it slightly sideways to assemble it over the support and into the nest of bosses in the base. Assemble the washer (6) to the screw (5) and insert the screw up through the spring and the base. Assemble the adjusting nut (4), curved surface toward the base, to the threaded end of the screw. Insert a 0.020-inch (0.50mm) shim between adjusting nut and base and turn nut down against the shim. Assemble the tilt feet (3) to the tilt foot plate (2). Slide the shaft of the tilt plate up through the slots in the spring (7) and mainframe and assemble the accordian rivet (1) through the hole in the upper end of the tilt foot plate. Raise the projector and make sure that it holds in the up position. Activate the spring to release the tilt and see that it drops smoothly. Place a weight (approximately seven pounds) on the mainframe and check to make certain that the tilt holds at the full up and midway positions and does not squeal when released. Adjust the nut (4) until proper operation is obtained.

19. REASSEMBLING MOTOR AND CLUTCH COMPONENTS (Figure 2). Reassemble Figure 2 components in the following manner, noting any special precautions.

a. Assemble the clutch levers (43) to the clutch plate and bracket assembly (41) with the center hole over the threaded post and the slotted hole over the lower post. The protrusions on the lever must face toward the bracket. Install the adjusting nuts (42), curved end toward the lever, turning the nuts down until the threads are even with the face of the nut. Temporarily set these assembled parts to one side.

b. Lightly grease both ends of the drive disc and shaft assembly (39). Assemble a washer (38), spring (37) and bushing (36) to each end of the shaft. Assemble the clutch driver assemblies (34) and (35) to the shaft. The driver assembly with the silver spring must be assembled to the retaining ring grooved end of the shaft; the driver assembly with the blue spring to the flatted end of the shaft.

c. Insert the preassembled clutch levers and plate (step a) into the recess opposite the reel well area, making certain that the lower part of the levers are behind the control cam of the cam and shaft assembly (item 37, Figure 3). Secure the assembly with the two screws (40).

d. Assemble the clutch driver (33), hub toward the shutter, to the main shaft of the module assembly and slide it in toward the main shaft bearing. Insert a 0.082 inch (2.1mm) shim between the bearing and the driver and hold the driver up against the shim while tightening the driver setscrew (32). Assemble the clutch disc (31) to the module main shaft with the open face of the disc toward the clutch driver.

e. Clean the drive cones of the clutch idler assemblies (28) and clutch drive assembly (29) with Heptane solvent. Assemble a clutch idler assembly (28) to each of the idler shafts (26) so that the end of the shaft is flush with the small diameter end of the metal driver. Slide a washer (27) on each shaft and up against the large diameter of the drivers. Assemble the spring (30) to the clutch drive assembly (29) and assemble these parts to the module main shaft with the spring against the clutch disc (31) and the long hub of the clutch driver inserted through the center opening of the clutch disc and resting against the clutch driver (33).

f. Install the preassembled clutch disc and shaft parts (steps b and c) as follows: While compressing the clutch drive (29) and spring (30), insert the retaining ring groove end of the clutch disc shaft through the bearing in the mainframe until the inside clutch plate assembly (35) rests between the upper fingers of the inner clutch lever (43). Release the clutch drive (29), allowing it to seat between the clutch disc (Figure N). Insert the cones of the clutch idler assemblies (28) between the clutch discs at the two and four o'clock positions and drop the shafts into the boss nests and against the stops, aligning the flat of the washers (27) with the ridge on the boss. Secure each clutch idler shaft with a retainer (25) and two screws (24) (see Figure N).

g. Assemble the outer clutch lever (43), protrusions facing the clutch disc, to the threaded post of the clutch plate and bracket assembly

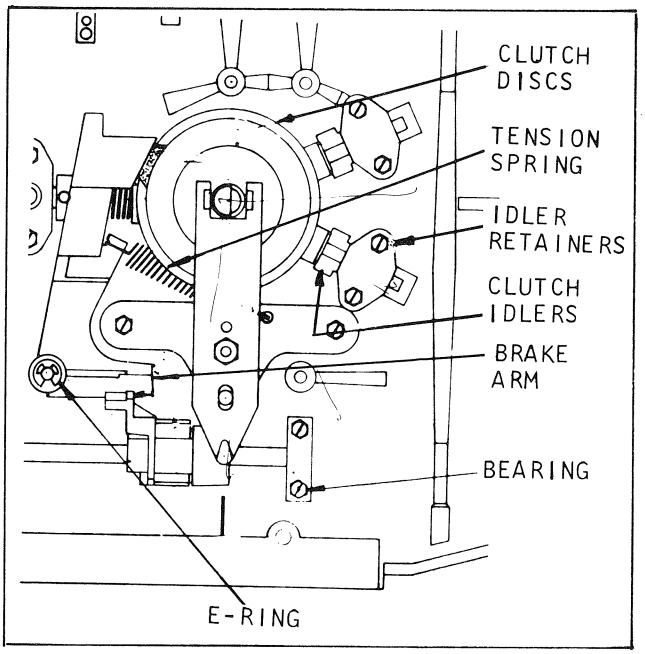


Figure N. Installing Clutch Drive and Idlers

(41). Install the adjusting nut (42), curved end in, to the threaded post and turn the nut down until the threads are flush with the outer face of the nut. The outside clutch plate assembly (34) must rest between the upper fingers of the clutch lever. Assemble the gear and sleeve assembly (23), gear out, to the clutch drive disc shaft until the inner end of the sleeve mates with the hub of the outside clutch plate. Lightly grease the teeth of the mitre gear.

h. Assemble the grommet (20E) unto the hole in the bent ear of the clutch support bracket. Assemble the bearing (20D) into the grommet with the flange to the outside. On Models 1462 and 1481, assemble the fan to the fan shaft so that end of shaft is flush with the outer hub of the fan; then tighten the setscrew. For all other models, the fan (20) is a press fit on the fan shaft (20B). Insert the fan shaft through the flanged bearing until the inner fan hub is against the bearing. Position the clutch support bracket (20C) on the tapped bosses of the mainframe while capturing the flatted end of the clutch disc shaft in the "D" hole of the bracket. Secure the bracket with the three screws (19).

i. Place a drop or two of oil on the hub of the spindle and pin assembly (18). From the front of the mainplate, assemble the spindle and pin assembly to the protruding end of the clutch disc shaft. Press the spindle in place until the flats on the spindle hub and inside clutch driver (35) are mated. Secure the spindle assembly to the shaft with the retaining ring (17). On models equipped with the frame counter, loop the free end of the counter belt around the pulley grooves on the outer face of the spindle.

j. Loosen the setscrew (32) and slide the clutch driver (33) toward the clutch drive discs until the outer face of the cone on the clutch drive assembly (29) is even with the edges of the drive discs. Make certain that the flats are mated while tightening the clutch driver setscrew (32). Be sure there is clearance between the hub face of the driver and the bearing retainer immediately to its left.

k. Assemble the brake spring (16) between the clutch lever plate (41) and the brake arm (22) and make sure that the brake arm pads bear against the rims of the clutch drivers (34) and (35). Insert the plug gage (Figure A) all the way into the coupling (14). Assemble the shoulder bushing (15B) to the lower gear shaft (15) with the small diameter toward the mitre gear. Dip the end of the shaft in Loctite and insert it into the coupling until it contacts the gage. Remove the plug gage and assemble the upper gear shaft (13) into the coupling. Secure both shafts with setscrews (12) dipped in Loctite. Lightly grease the mitre gears at the ends of the shafts as well as the friction surfaces of the bearings (11). Assemble the lower shaft assembly (15) into the guide slot of the clutch support bracket (20C), seating the bushing (15B) in the hole and meshing the idler gears. Install the retaining ring (15A) to retain the bushing. Guide the upper shaft (13) between the multi-motion cam and module and mesh the upper mating idler gears. Secure the bearings (11) to the tapped bosses of the mainframe with the screws (9) and washers (10). Loosen the lower setscrew (12) slightly. Insert a 0.015-inch (0.38mm) between the flange of the bushing (15B). Apply pressure to both shafts in opposite directions and hold while tightening the setscrew. All mating gears should mesh and turn freely.

l. Pick up the motor, fan and pulley assembly (8) and apply a small amount of adhesive (3M Co. #880) to the mounting surface of each grommet. Carefully assemble a washer (7) to each grommet with the holes aligned and allow the cement to dry. Lift the motor assembly up into position against the mainframe while guiding the shaft into the coupling (20A). Secure the motor brackets with the four screws (6). Reconnect the leadwires to the motor terminals per the appropriate wiring diagram.

m. Carefully peel the backing from the format shift trim cover (5). Line up the slot in the trim cover with the slot in the mainframe and press the cover squarely in place. Assemble the control insert (4) to the lower right-hand inset of the mainframe in the same manner.

n. Assemble the reel assembly (3) to the rear spindle with the opaque flange facing out and secure with the reel retainer (2). Assemble the wire clamp (1) into the hole in the mainframe until it snaps in place.

20. REASSEMBLING PROJECTOR COVERS (Figure 1). Reassemble Figure 1 parts as outlined in the following paragraphs, noting any special precautions.

NOTE: When replacing adhesive backed trimplates, labels, etc., be sure that the surface to which they are to be assembled is clean and free of old adhesive. This can be accomplished by wiping the area with a cloth dampened in solvent. Remove the paper backing from the trimplate and brush the adhesive with a mixture of three parts Toluol to one part trichloroethylene. When the adhesive is "tacky," press the trimplate squarely and evenly in place, smoothing it down with a dry, lint-free cloth. Wipe away excess adhesive with a cloth dampened with solvent.

a. Models 1445, 1462, 1480 and 1481 Only. Lightly grease the teeth of the face gear (39) and assemble the gear to the bracket (38). Assemble the washer (36), bowed surface up, over the hub of the face gear. Lightly grease the cavity of the focus knob (35) and assemble the knob to the gear hub, matching the flats. Secure the knob to the gear hub with the screw (33) and washer (34). Make certain that the supports inside the top of the focus knob are free of grease. Place a drop of adhesive (B&H Co. #327) on each of these supports and press the insert (32) in place. Lift the bracket up into position and secure it to the mainframe with the two screws (37).

b. Model 1480 Only. Assemble the room lamp receptacle (30) to the cord retainer (25) with the screws (29). Assemble the trimplate (30A) to the cord retainer. Connect leadwires to receptacle as shown in the wiring diagrams, Figure 14.

c. Models 1462 and 1481 Only. Assemble the line cord receptacle (28C) to the rear cover (31) with the rivets (28A) and washers (28B). Connect leadwires to receptacle as shown in Figure 12 (Model 1462) or Figure 15 (Model 1481).

d. On all models except the 1462 and 1481, insert the connecting leadwire ends of the line cord (26) through the opening at the bottom of the cord retainer (25) before securing the cord retainer to the rear cover (31) with the two screws (24). Assemble the insulating sleeve (27) over the leadwire ends of the line cord and connect line cord leads as shown in the appropriate wiring diagram (Figure 10, 11, 12 or 14).

NOTE: Before proceeding, check all wiring connections carefully and dress all leadwires away from moving parts. All operating tests and adjustments (see Adjustments section following) should be made before the projector covers are assembled to the projector. When adjustments have been satisfactorily completed, assemble the covers as follows.

e. Lift the rear cover (20) up into position against the mainframe, assembling the carrying handle (21) before the cover is fully seated. If the holes for the two upper outer cover screws (17) have been stripped out, use oversize screws P/N 46198. If the holes for the remaining four screws (18) have been stripped out, use oversize screws P/N 450542 (one of these screws is installed in the lamp storage compartment). Use lockwashers (19) on screws (18). Rotate the storage door (23) slightly while inserting the door spring until the spring tabs can be engaged. Then press down until the spring is fully seated.

f. No special instructions are required for reassembling the release latch parts to the dust cover (2). When reassembling latch parts to the outer cover (1) be sure to support the cover firmly during the riveting operation.

21. MECHANICAL INSPECTION.

a. Pick up the projector, turn it over, and shake it to make certain that no loose parts are inside.

b. Check the fit of the outer cover on projectors so equipped. Pull outward on the bottom edge of the outer cover to make certain that the latch is holding it securely. Press the release latch and remove the outer cover.

c. Check the fit of the plastic dust cover. The cover should fit with a minimum of side movement. Press the release latch and remove the dust cover. Inspect the cover for cracks and make certain that the remaining tabs at the top are not broken off.

d. Check the fit of the film track cover. This cover should fit snugly, with little or no play. If the cover seems loose at the top, check to make sure that the fingers which snap into the retainer slots of the mainframe are not broken. Also check the condition of the locating tabs at the bottom edge of the cover.

e. Check the action of all control levers. The levers should move smoothly with slight function and should detent and hold in any of the positions indicated on the trimplates.

f. Rotate the lens focus knob in both directions. The lens should move in and out smoothly but with a slight amount of "drag" or resistance. If the lens seems loose or moves too freely, remove the lens and check for the presence and condition of the lens tension spring (item 1, Figure 6) between the ribs inside the lens barrel.

g. Check to make certain that both tension lever springs (item 4, Figure 6) are present and connected between the face tension levers and the front edge of the lens barrel. Check the action of the face tension levers.

h. Check to make certain that the reel retainer (item 2, Figure 2) mounts tightly and securely on the hub of the reel and, when installed, must snap positively in place.

22. OPERATING INSPECTION.

a. Connect the line cord to any convenient 120 volt Ac, 60Hz outlet. On Models 1462 and 1481, set the voltage selector switch at the 120 volt position and connect the line cord between the line cord receptacle and the 120 volt AC outlet.

b. Place the direction lever in the "Still" position and move the main switch to the "ON" position. The projection lamp should light and the motor-former should operate. Move the switch to the "HI" position. There should be a noticeable increase in the brightness of the lamp.

c. With the main switch still in the "ON" position, move the direction lever to the "FWD" (up) position. The take-up reel must rotate in a clockwise direction. Move the direction lever down to the "REV" position. The feed spindle should rotate in a counterclockwise direction. Switch off the main switch.

d. Remove the pressure shoe by releasing the face tension levers. Switch on the main switch and project the light on a nearby wall or partition. Switch the format lever several times between the S8 and R8 positions, checking to see that the masks snap surely into position without binding and that there are no cut-off (dark) areas at the edges of the aperture images.

Adjustments

23. GENERAL.

For all tests and adjustments which require operation of the projector, the line cord should be connected to a 120 volt AC, 60Hz outlet. For Models 1462 and 1481, set the voltage selector switch at 120 volts AC.

24. DIRECTION CONTROL LEVER ADJUSTMENT (Figure P).

a. Position and hold the direction control lever (1) in the center of the "H" slot at the front control panel and loosen the lever setscrew (2). Shift the control cam shaft assembly (3) until the retaining ring (4) is in contact with the arm of the direction control lever and tighten the setscrew (2) securely.

b. Shift the direction control lever to "FAST REV" (left side slot of "H" and down). Insert the tip of a screwdriver blade underneath the aperture retract slider (item 52, Figure 7) and raise and hold the slider in the up position. The retractor pin should move to the right.

c. While holding the slider in the up position, loosen the gate control cam setscrew (5) and shift the control cam (6) to the right until the left arm of the cam just contacts the retractor pin; then tighten the setscrew (5).

d. Shift the direction control lever to "REV" (right side slot of "H" and down). Loosen the reverse cam setscrew (7) and press the yoke boss (8) to the right, taking care not to bend the arm of the boss. Move the control shaft (9) to the right until the end of the shaft is flush with the nylon shaft bearings (10), and hold the shaft and yoke boss while tightening the yoke setscrew (11). Slide the reverse control cam (12) to the left until it just contacts the tip of the projector control cam arm (13) and hold in place while tightening the setscrew (7).

25. MULTI-MOTION LEVER ADJUSTMENT (Figure P).

NOTE: This adjustment applies to all models except 1422.

a. Place the direction control lever in "FWD" (right side slot of "H" and up). Assemble an E-ring P/N 765449 (14) to the shaft of the multi-speed actuator assembly (15). Place the multi-motion lever in the "18" fps position and make sure that the tip of the actuator shaft is riding on the outer most rim (18 fps) of the cam.

b. Loosen the hex head screw (16) and move the multi-motion actuator (17) back until its bent arm (18) is in firm contact with the metal bracket of the actuator shaft. Hold the lever in place while retightening the hex head screw. Remove the E-ring (14).

c. Run the projector in "FWD" and shift the multi-motion lever rapidly through the various speed ranges. There should be no "knocking" sound when the lever is moved. When transporting film, there should be no image "jitter" at any speed.

26. SHUTTLE ADJUSTMENTS.

a. Shuttle Teeth Centering. Remove the lens and pressure shoe from the projector and rest the projector on its back end (lens opening facing up). Rotate the shutter counterclockwise until the shuttle is at the bottom of the stroke and at maximum protrusion. Place the format lever in the Super-8 position and lay a strip of Super-8 film in the film channel. With a magnifying glass, check the centering of the shuttle tooth in the film perforation. Centering can be adjusted by slightly loosening the screw which attaches the upper end of the shuttle bracket to the rear arm of the shuttle assembly. Insert the blade of an offset screwdriver into the triangular opening at the center of the shuttle bracket and, by carefully bending the screwdriver up or down, bring the tooth into the center of the perforation. Hold while retightening the bracket to shuttle arm screw.

b. Shuttle Tooth Penetration. Shuttle tooth penetration should be checked at the top and bottom of the stroke with the penetration gage (B&H Company #G9991-N1). The 0.042 inch (1.06mm) "GO" step of the gage must pass over the tooth, but the 0.028 inch (0.71mm) "NO GO" step must catch on the tooth. Penetration is adjusted by means of the cam follower screw (item 22A, Figure 7). Turn this screw in to increase penetration or out to decrease penetration. Check penetration between adjustments. If one tooth penetrates more than the other, engage the notched end of the shuttle bending tool (B&H Company #SER356-1-FX1) with the top edge of the shuttle just back of the cam shoe area. Moving the tool handle down will increase lower tooth penetration; moving the tool handle up will increase upper tooth penetration.

27. SPINDLE DRIVE SHAFT ADJUSTMENT.

Insert a 0.015 inch (0.38mm) shim between the clutch fan bracket and nylon bearing. Loosen the setscrew in the coupling between the upper and

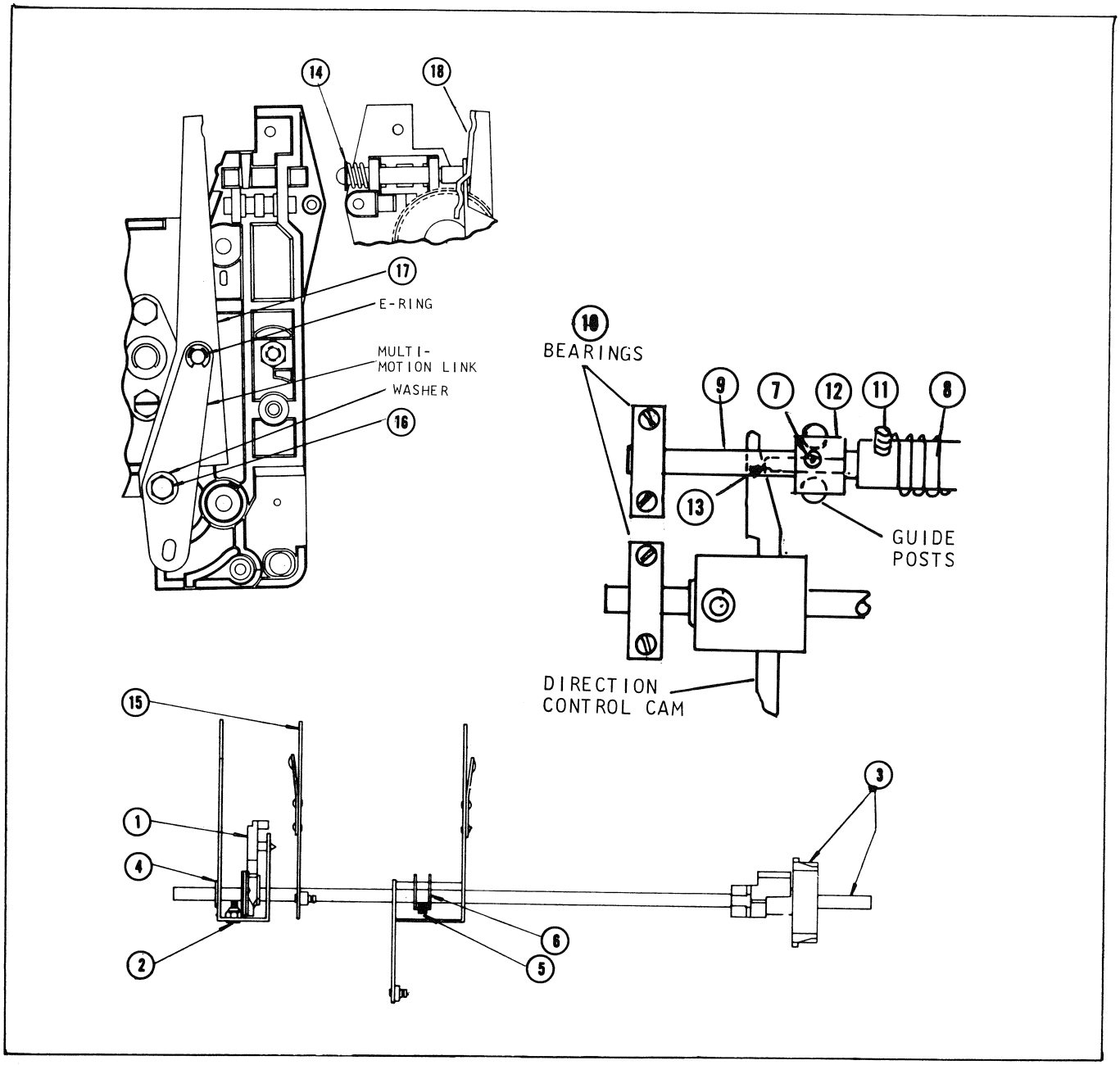


Figure P. Adjusting Control Levers

lower drive shafts. Spread the shafts so that the shim is retained, and hold while tightening the setscrew. Check for minimum end play. The two shafts with coupling can be removed at any time without disturbing this adjustment.

28. DRIVE CLUTCH ADJUSTMENT.

a. Connect the projector line cord to a variac set at 120 volts AC and move the direction control lever to "FWD."

b. With any appropriate wrench, turn the outer clutch adjusting nut (see Figure N) clockwise until the feed spindle turns freely. Then slowly back off the nut until the spindle appears to turn as if catching slightly (intermittent). Back out the adjusting nut an additional one-half turn.

c. Remove the wrench and move the control lever back and forth between "Still" and "FWD" two or three times. The feed spindle must not move. Test spindle manually for freeness. Move the direction control lever to "REV". The feed spindle now should turn freely.

d. With the projector still in "REV", engage the wrench with the inner clutch adjusting nut (below the take-up spindle) and turn the nut in until the take-up spindle turns. Then slowly back off the

nut until the spindle appears to turn as if catching slightly (intermittent). Back off the nut an additional one-half turn.

e. Remove the wrench and move the control lever back and forth between "Still" and "REV" two or three times. The take-up spindle should not move. Test spindle manually for freeness.

f. Make certain that there is clearance between the clutch driver and the shaft bearings to the left of the driver (Figure N) and that the large diameter of the cone on the spring-loaded clutch drive assembly is flush with the edges of the clutch discs. If necessary, loosen the clutch driver setscrew and reposition these parts; then retighten the setscrew.

29. SPINDLE TORQUE ADJUSTMENT. For torque adjustments, use the modified film reel shown in Figure A. Make torque adjustments as follows:

a. Reverse Take-Up Torque. Install the test reel on the front (feed) spindle so that the film peels off in a clockwise direction. Unroll about 8 inches of the film leader and connect the 0 to 8 oz. Chatillon scale to the end of the leader so that the scale hangs vertical. Gradually pull down on the scale while running the projector in reverse, checking the tension registered at the point where the reel is just stopped from rotating. Acceptable limits for reverse take-up torque are 0.8 to 2.0 inch-ounces (60 to 150 gm/cm).

b. Forward Take-Up Torque. Install the test reel on the rear (take-up) spindle so that the film peels off in a counterclockwise direction. Unroll about 8 inches of film leader and connect the 0 to 8 oz. Chatillon scale to the end of the leader so that the scale hangs vertical. Gradually pull down on the scale while running the projector in forward, checking the tension registered at the point where the reel is just stopped from turning. Acceptable limits for forward take-up torque are 1.0 to 2.0 inch-ounces (75 to 150 gm/cm).

c. Rear Spindle Brake Torque. With the test reel installed as in step b, connect the 0 to 36 oz. Chatillon scale to the end of the leader. With the control lever in "Pause", gradually pull up on the scale to measure braking torque. The scale should read greater than 11 inch-ounces (792 gm/cm) minimum counterclockwise.

d. Front Spindle Brake Torque. With the test reel installed as in step a, connect the 0 to 36 oz. Chatillon scale to the end of the leader. With the control lever in "Pause," gradually pull up on the scale to measure braking torque. The scale should read greater than 12 inch-ounces (864 gm/cm) minimum clockwise.

PARTS CATALOG

LUMINA II™

Super 8/Regular 8 mm Movie Projector

MODEL NO..	CAT. NO.	MODEL NO.	CAT. NO.
LX30	1422A/1422Z	----	1462Z
MX43	1440A/1440Z	QX80	1464Z
MX45	1445Z	QX95	1480A/1480Z
MX60	1460A/1460Z	----	1481Z

BELL & HOWELL

GENERAL SERVICE DEPT.
7100 McCORMICK ROAD
CHICAGO, ILLINOIS 60645

PART NO. 74401-001 PRINTED IN U.S.A. OCTOBER 1977

Replacement Parts

The following pages illustrate and list, by part number and description, all replacement parts for the Bell & Howell Company Super-8/Regular 8mm Projectors listed below. Parts are listed in a suggested order of disassembly to assist maintenance personnal in repair operations. Each projector in this Parts Catalog has been letter-coded to indicate specific application of parts. Where the "Usable on Code" column is blank, the listed part applies to all models.

MODEL NO.	CODE
1422	A
1440	B
1445	C
1460	D
1462	E
1464	F
1480	G
1481	H

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		COVERS AND TRIMPLATES		
1-1	046482	OUTER COVER ASSEMBLY, Complete	1	BCDF
-1	046576	OUTER COVER ASSEMBLY, Complete	1	GH
-1A	450411	. TRIMPLATE (Adhesive backed)	1	
-1B	46496	. RIVET, Semitubular	1	
-1C	31451	. WASHER, Flat	1	
-1D	450286	. BUSHING, Shoulder	1	
-1E	450285	. LATCH, Cover release	1	
-1F	450287	. SPRING, Leaf	1	
-1G	No Number	. COVER, Outer (replace complete assembly)	NP	
-2	046483	DUST COVER ASSEMBLY, Complete	1	DEFGH
-2A	17639	. RING, Retaining, Type E	1	DEFGH
-2B	450213	. STUD, Latch.	1	DEFGH
-2C	450211	. LATCH, Cover	1	DEFGH
-2D	450212	. SPRING, Leaf	1	DEFGH
-2E	450210	. COVER, Dust (replace complete assembly).	1	DEFGH
-3	451207	LABEL, Caution (adhesive backed)	1	
-4	451235	LABEL, Lamp type (adhesive backed)	1	ABCD
-4	451238	LABEL, Lamp type (adhesive backed)	1	E
-4	451236	LABEL, Lamp type (adhesive backed)	1	F
-4	451237	LABEL, Lamp type (adhesive backed)	1	GH
-5	450249	KNOB, Format control	1	
-6	450214	KNOB, Forward/Reverse	1	
-7	450214	KNOB, Multi-Motion	1	BCDEF
-8	046577	COVER AND GUIDE ASSEMBLY, Film track	1	ABC
-8	046578	COVER AND GUIDE ASSEMBLY, Film track	1	DF
-8	046715	COVER AND GUIDE ASSEMBLY, Film track	1	EGH
-8A	203687	. RING, Retaining	1	EGH
-8B	450814	. SCREW, Locking, film track cover	1	EGH
-9	450496	TRIMPLATE, Film track (adhesive backed)	1	A
-9	450497	TRIMPLATE, Film track (adhesive backed)	1	B
-9	451262	TRIMPLATE, Film track (adhesive backed)	1	C
-9	450402	TRIMPLATE, Film track (adhesive backed)	1	D
-9	451208	TRIMPLATE, Film track (adhesive backed)	1	E
-9	451200	TRIMPLATE, Film track (adhesive backed)	1	F
-9	451211	TRIMPLATE, Film track (adhesive backed)	1	GH
-10	450405	TRIMPLATE, Film framer (adhesive backed)	1	ABCDF
-10	451215	TRIMPLATE, Film framer (adhesive backed)	1	EGH

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		COVERS AND TRIMPLATES (CONT'D)		
1-11	450409	TRIMPLATE, Film format (adhesive backed)	1	ABC
-11	450410	TRIMPLATE, Film format (adhesive backed)	1	DF
-11	451218	TRIMPLATE, Film format (adhesive backed)	1	E
-11	451217	TRIMPLATE, Film format (adhesive backed)	1	GH
-12	450406	TRIMPLATE, Rotary zoom (adhesive backed)	1	CEGH
-13	450404	SKIRT, Focus knob (2 required for 1445/1462/1480/1481)	1	
-14	450412	INSERT, Focus knob (2 required for 1445/1462/1480/1481)	1	
-15	450311	TRIMPLATE, Operating instructions (adhesive backed)	1	ABCDF
-15	451212	TRIMPLATE, Operating instructions (adhesive backed)	1	EGH
-16	450407	TRIMPLATE, Control box (adhesive backed)	1	A
-16	450424	TRIMPLATE, Control box (adhesive backed)	1	BC
-16	450408	TRIMPLATE, Control box (adhesive backed)	1	D
-16	451214	TRIMPLATE, Control box (adhesive backed)	1	EGH
-16	451201	TRIMPLATE, Control box (adhesive backed)	1	F
-17	450480	SCREW, Rear cover (NOTE A)	2	
-18	765674	SCREW, Rear cover (NOTE A)	4	
-19	17168	LOCKWASHER	4	
-20	No Number	REAR COVER ASSEMBLY	NP	
-21	450208	. HANDLE, Carrying	1	ABCDF
-21	450446	. HANDLE, Carrying	1	EGH
-22	450473	. SLEEVING, Lamp	1	
-23	450218	. DOOR, Lamp storage	1	ABCDF
-23	450477	. DOOR, Lamp storage	1	EGH
-24	450837	. SCREW, Cord retainer	2	
-25	450238	. RETAINER, Cord (black)	1	ABCDF
-25	450894	. RETAINER, Cord (grey)	1	EH
-25	450478	. RETAINER, Cord (grey)	1	G
-26	046054	. LINE CORD ASSEMBLY	1	ABCDFG
-26	707482	. LINE CORD	1	EH
-27	39575	. SLEEVE, Line cord	1	ABCDFG
-28A	33473	. RIVET, Semitubular	2	EH
-28B	40492	. WASHER, Flat	2	EH
-28C	19925	. RECEPTACLE, Line cord	1	EH
-29	450837	. SCREW, Room lamp receptacle	1	G
-30	45917	. RECEPTACLE, Room lamp	1	G
-30A		. TRIMPLATE, Room lamp receptacle (adhesive backed)	1	G
-31	450165	. COVER, Rear	1	ABCDF
-31	451221	. COVER, Rear	1	EH
-31	450447	. COVER, Rear	1	G
-32	450412	INSERT, Focus knob (cement in place)	1	CEGH
-33	766174	SCREW, Slotted hex head, 4-24	1	CEGH
-34	611251	WASHER, Flat	1	CEGH
-35	450254	KNOB, Focus, spiral	1	CEGH
-36	450146	WASHER, Bowed	1	CEGH
-37	765674	SCREW, Face gear bracket	2	CEGH
-38	450252	BRACKET, Face gear	1	CEGH
-39	450253	FACE GEAR	1	CEGH

NOTE A: If screws #450480 (-17) strip-out, use oversize screw #46198 as replacements.
If screws #765674 (-18) strip-out, use oversize screw #450542 as replacements.

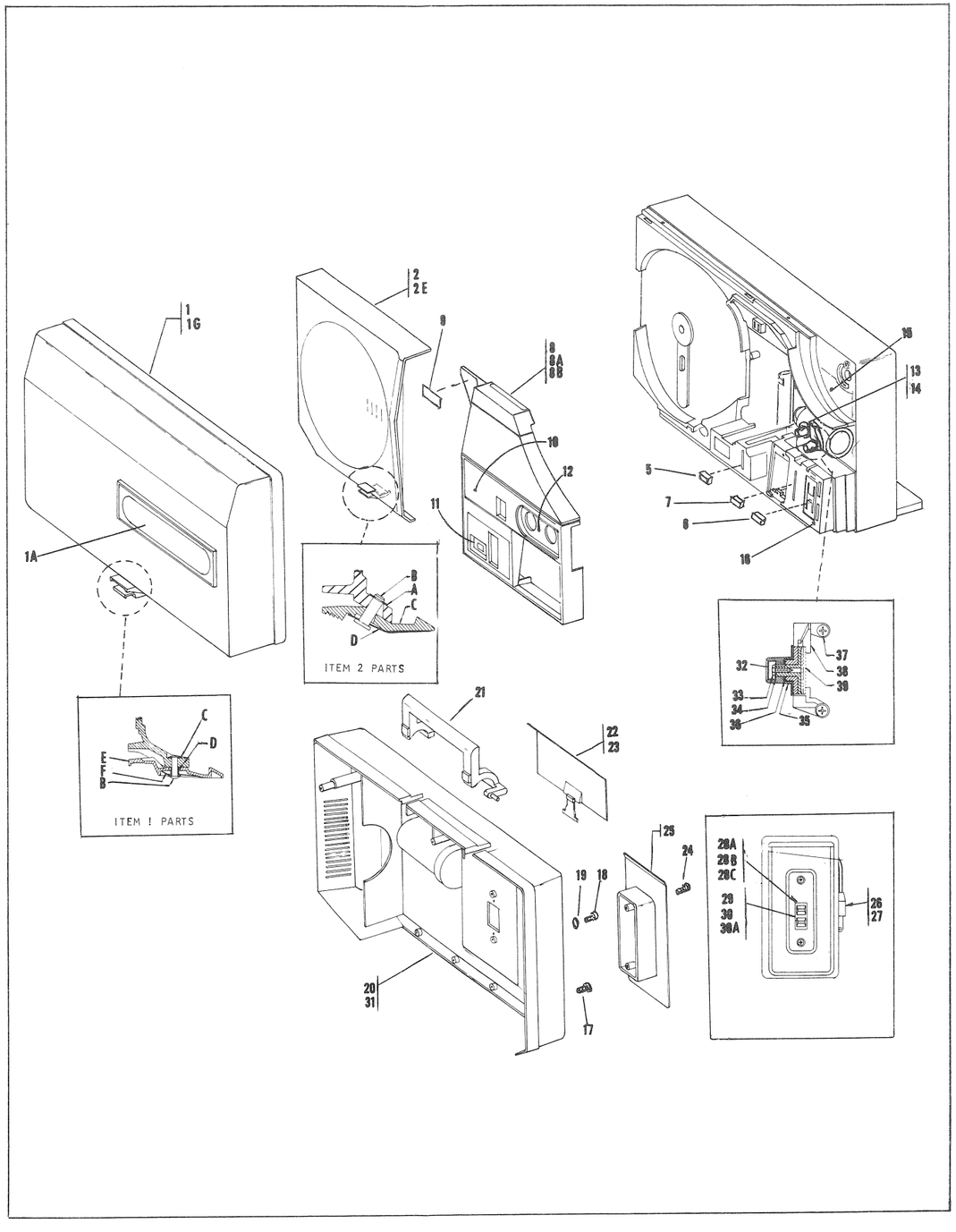


Figure 1. Covers and Trimplates

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MOTOR AND CLUTCH COMPONENTS		
2-1	450489	CLAMP, Wire	1	
-2	450487	RETAINER, Reel	1	ABCDF
-2	451310	RETAINER, Reel	1	EGH
-3	046031	REEL ASSEMBLY, Take-up	1	ABCDF
-3	046533	REEL ASSEMBLY, Take-up	1	EGH
-4	450289	INSERT, Control (adhesive backed)	1	ABC
-4	450288	INSERT, Control (adhesive backed)	1	DEFGH
-5	450463	TRIM COVER, Format shift (adhesive backed)	1	
-6	47698	SCREW, Motor mounting	4	
-7	43857	WASHER, Flat	2	
-8	No Number	MOTOR, FAN AND PULLEY ASSEMBLY (See Figure 8 for replacement parts)	NP	
-9	766174	SCREW, Slotted hex head, 4-24	2	
-10	31020	WASHER, Flat	2	
-11	450295	BEARING, Drive shaft	2	
-12	12498	SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	2	
-13	046012	GEAR AND SHAFT ASSEMBLY, Upper	1	
-14	451333	COUPLING, Drive shaft	1	
-15	046011	GEAR AND SHAFT ASSEMBLY, Lower	1	
-15A	765449	RING, Retaining, Type E	1	
-15B	450182	BUSHING, Shoulder	1	
-16	450888	SPRING, Brake	1	
-17	17639	RING, Retaining, Type E	1	
-18	046056	SPINDLE AND PIN ASSEMBLY	1	
-19	766174	SCREW, Slotted hex head, 4-24	3	
-20	No Number	BRACKET AND FAN ASSEMBLY, Clutch	NP	
-20A	450420	. COUPLING, Rubber	1	
-20B	046582	. FAN AND SHAFT ASSEMBLY, Projector cooling	1	ABCDFG
-20B	No Number	. FAN AND SHAFT ASSEMBLY, Projector cooling	1	EH
2-	32974	. . SETSCREW, Fluted socket cup pt, 8-32 by 1/8 inch	1	EH
2-	046099	. . FAN, Projector cooling	1	EH
2-	450858	. . SHAFT, Fan	1	EH
-20C	450190	. BRACKET, Clutch support	1	
-20D	450264	. BEARING, Flanged	1	
-20E	450265	. GROMMET, Rubber	1	
-21	17676	RING, Retaining, Type E (see item 4-1)	REF	
-22	046072	ARM AND PAD ASSEMBLY, Brake (see item 4-2)	REF	
-23	046024	GEAR AND DRIVE SLEEVE ASSEMBLY	1	
-24	766174	SCREW, Slotted hex head, 4-24	4	
-25	450110	RETAINER, Idler	2	
-26	450296	SHAFT, Idler	2	
-27	450115	WASHER, Flat	2	
-28	046570	CLUTCH IDLER ASSEMBLY	2	
-29	046571	CLUTCH DRIVE ASSEMBLY	1	
-30	451243	SPRING, Compression	1	
-31	451244	DISC, Clutch	1	
-32	80591	SETSCREW, Fluted socket cup pt, 6-32 by 3/16 inch	1	
-33	451246	DRIVER, Clutch	1	
-34	046568	DRIVER AND CLUTCH PLATE ASSEMBLY, Outside	1	
-35	046569	DRIVER AND CLUTCH PLATE ASSEMBLY, Inside	1	
-36	450111	BUSHING	2	
-37	450258	SPRING, Compression	2	
-38	309264	WASHER, Flat	2	
-39	046567	DRIVE DISC AND SHAFT ASSEMBLY, Clutch	1	
-40	766174	SCREW, Slotted hex head, 4-24	2	
-41	046021	CLUTCH PLATE ASSEMBLY	1	
-42	450179	NUT, Clutch adjusting	1	
-43	450047	LEVER, Clutch	1	

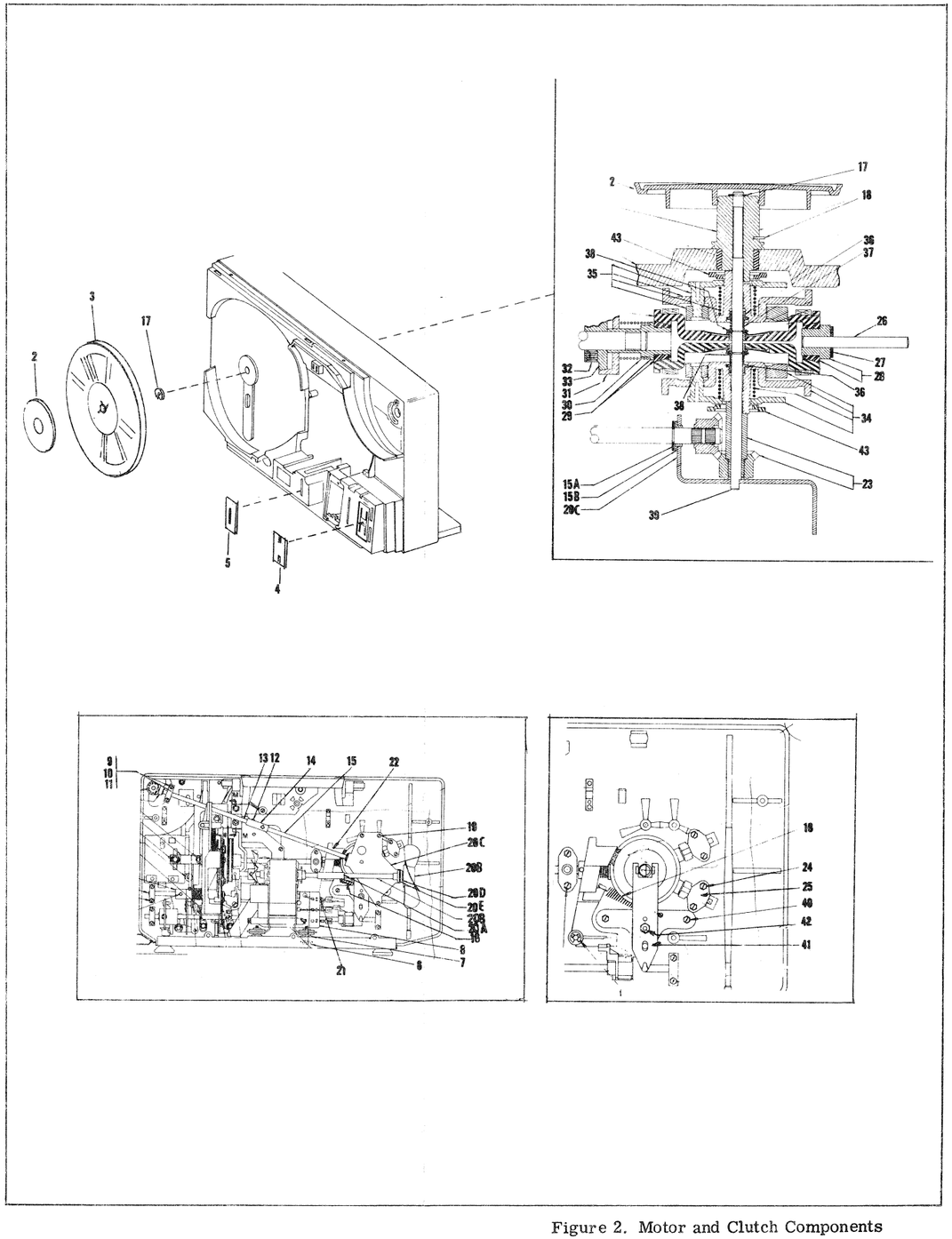


Figure 2. Motor and Clutch Components

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		TILT AND CONTROL COMPONENTS		
3-1	450283	RIVET, Accordian	1	
-2	450026	PLATE, Tilt	1	
-3	450231	FOOT, Tilt plate	2	
-4	450179	NUT, Tilt adjusting	1	
-5	45718	SCREW, Hex washer head, 4-40 by 3/4 inch	1	
-6	31020	WASHER, Flat	1	
-7	450025	SPRING, Tilt foot	1	
-8	49426	SCREW, Hex washer head tapping, 6-20 by 1/2 inch	1	
-9	450434	SUPPORT, Tilt foot	1	
-10	450876	SPRING, Auto stop	1	
-11	36505	SCREW, Back-up plate	2	
-12	450449	PLATE, Back-up	1	
-13	36505	SCREW, Actuating lever	1	
-14	46146	WASHER, Flat	1	
-15	451307	LEVER, Auto-stop actuating	1	
-16	766174	SCREW, Slotted hex head, 4-24	2	
-17	31020	WASHER, Flat	2	
-18	450295	BEARING, Control shaft	2	
-19	36770	SETSCREW, Fluted socket cup pt, 8-32 by 1/4 inch	1	
-20	451375	CAM, Reverse control	1	
-21	450038	SHAFT, Control	1	
-22	17676	RING, Retaining, Type E	2	
-23	450235	LINK, Format shift	1	
-24	17639	RING, Retaining, Type E	1	
-25	766174	SCREW, Slotted hex head, 4-24	4	
-26	31020	WASHER, Flat	4	
-27	450295	BEARING, Control shaft	4	
-28	No Number	CONTROL SHAFT, CAM AND LEVERS ASSEMBLY	NP	
-29	765449	. RING, Retaining, Type E	1	
-30	450481	. SETSCREW, Control lever	1	
-31	046572	. CONTROL LEVER ASSEMBLY, Direction	1	
-32	450035	. CAM, Projector control	1	
-33	046573	. LEVER ASSEMBLY, Multi-motion	1	BCDEFGH
-34	80147	. SETSCREW, Phillips binding head, 5-40 by 3/16 inch	1	
-35	450095	. CAM, Gate control	1	
-36	046574	. SHIFT LEVER ASSEMBLY, Format	1	
-37	046010	. CAM AND SHAFT ASSEMBLY, Control	1	
-38	145	BALL, Steel	1	
-39	450094	SPRING, Compression	2	DFGH
-40	450484	SCREW, Counter	1	DFGH
-41	450236	COUNTER, Frame	1	DFGH
-42	450230	BELT, Counter drive		

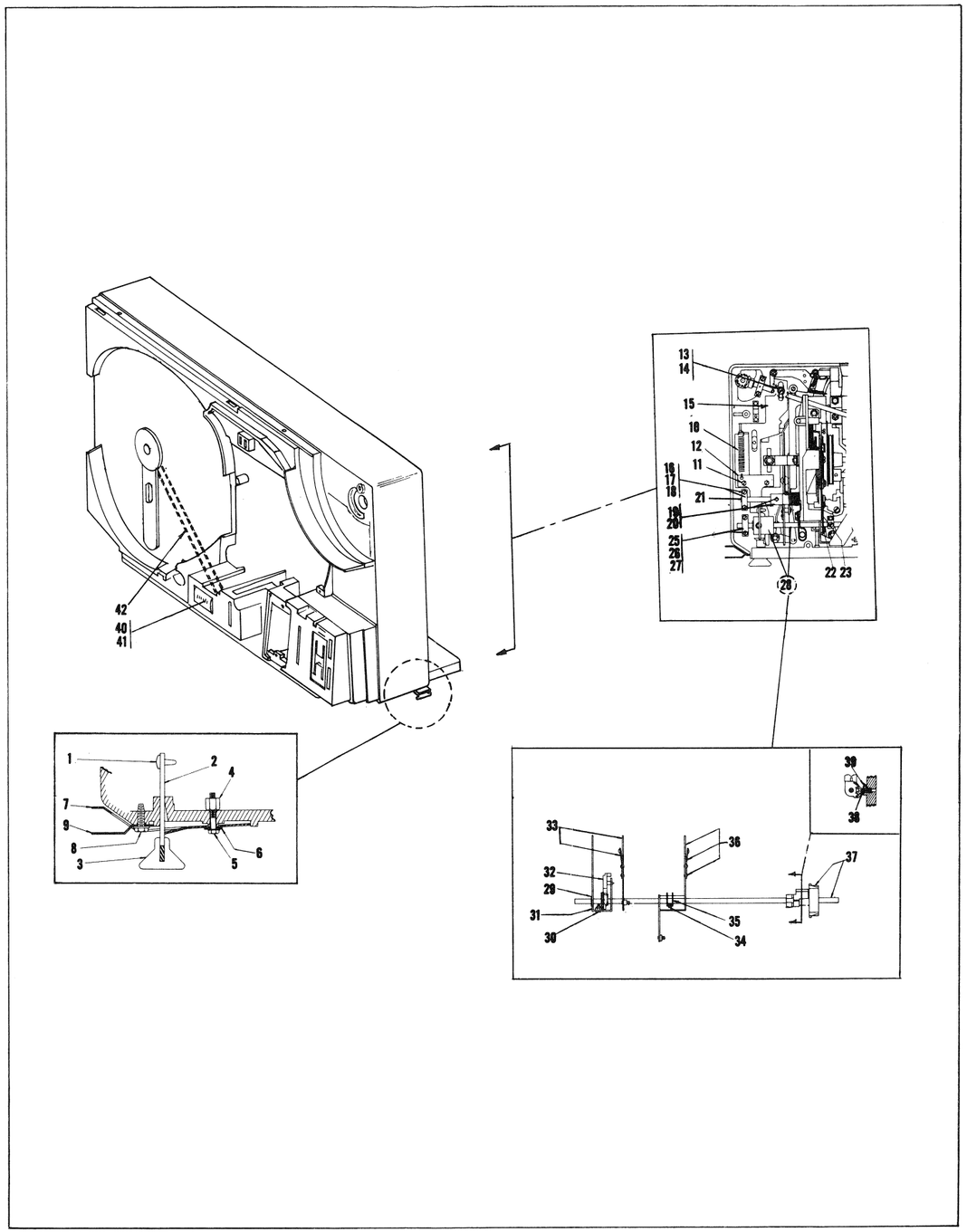


Figure 3. Tilt and Control Components

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		LAMPS, SWITCHES AND MODULE		
4-1	17676	RING, Retaining, Type E	1	
-2	046072	BRAKE ARM ASSEMBLY	1	
-2A	451342	. PAD, Brake (cement in place)	2	
-3	12498	SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	1	
-4	451246	DRIVER, Clutch	1	
-5	451811	LAMP, Projection, Type DLD	1	ABCDF
-5	450891	LAMP, Projection, Type ELB	1	G
-5	19908	LAMP, Projection, Type A1/30 (Atlas)	1	EH
-5A	451391	SHIELD, Lamp	1	EH
-6	700346	SCREW, Module bracket	2	
-7	19936	NUT, Hex	2	
-8	451336	BRACKET, Module	1	
-9	451323	BRACKET, Module	1	
-10	29694	RING, Grip	1	
-11	766174	SCREW, Slotted hex head, 4-24	2	
-12	450001	RETAINER, Bearing	1	
-13	766174	SCREW, Slotted hex head, 4-24	3	
-14	31020	WASHER, Flat	1	
-15	451337	WASHER, Flat	1	
-16	No Number	MECHANISM MODULE ASSEMBLY, Complete (see Figures 6 and 7 for replacement parts)	NP	
-17	46131	BEARING	1	
-18	49426	SCREW, Hex washer head tapping, 6-20 by 1/2 inch	1	
-19	450868	CLAMP, Leadwire	1	
-20	046091	LAMP ASSEMBLY, Panel	1	
-21	766174	SCREW, Slotted hex head, 4-24	2	ABCDFG
-21	450432	SCREW, Main switch	2	EH
-22	046542	SWITCH ASSEMBLY, Main	1	ABCDG
-22	046566	SWITCH ASSEMBLY, Main	1	EH
-22	046035	SWITCH ASSEMBLY, Main	1	F
-23	766174	SCREW, Slotted hex head, 4-24	1	BCDEFGH
-24	451351	SPRING, Extension	1	BCDEFGH
-25	450880	SCREW, Trip arm guide	1	BCDEFGH
-26	451392	GUIDE, Trip arm	1	BCDEFGH
-27	046583	PAWL AND STUD ASSEMBLY	1	BCDEFGH
-28	451388	ARM, Pawl	1	BCDEFGH
-29	450870	BUSHING, Shoulder	1	BCDEFGH
-30	40048	RING, Grip	1	BCDEFGH
-31	451319	SPRING, Trip arm	1	BCDEFGH
-32	766174	SCREW, Slotted hex head, 4-24	1	BCDEFGH
-33	450893	BUSHING, Shoulder	1	BCDEFGH
-34	451370	ARM, Trip	1	BCDEFGH
-35	451846	WASHER, Flat	1	BCDEFGH
-36	451308	SLEEVE, Trip arm	1	BCDEFGH
-37	26906	NUT, Hex Sems	2	EH
-38	451817	SCREW, Voltage selector switch	2	EH
-39	44390	SPACER, Voltage selector switch	2	EH
-40	046555	SWITCH, Voltage selector	1	EH
-41	450868	CLAMP, Leadwire	1	EH

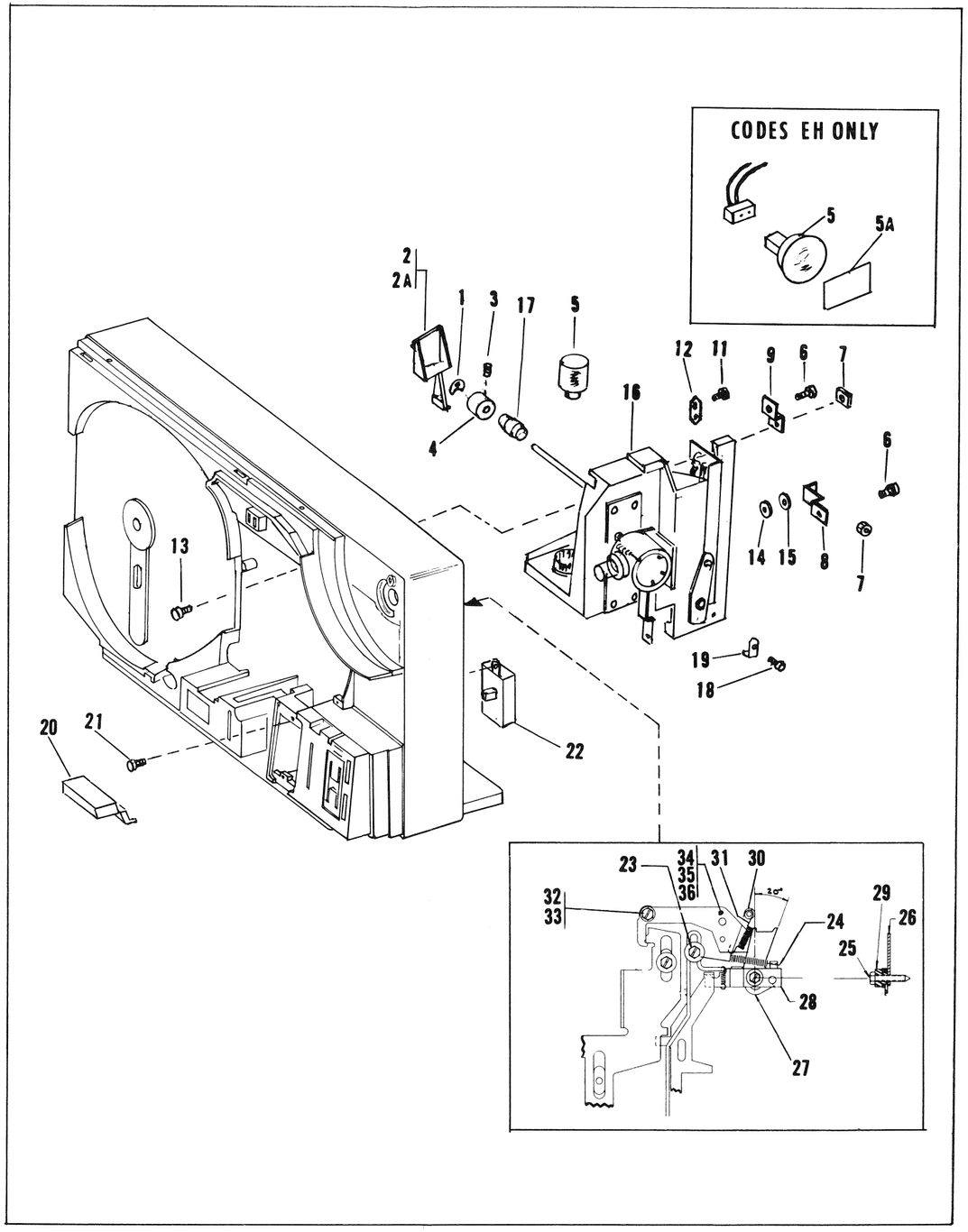


Figure 4. Lamps, Switches and Module

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		REEL ARM AND MAINFRAME COMPONENTS		
5-1	450091	EJECTOR, Lamp	1	BBCDF
-2	450031	LINK, Shuttle control	1	
-3	17676	RING, Retaining, Type E	2	
-4	450034	CRANK, Shuttle control	1	
-5	450032	CRANK, Gate control	1	
-6	766181	SCREW, Slotted hex head, 4-24	1	
-7	451846	WASHER, Flat	1	
-8	450084	SPRING, Snubber	1	
-9	451959	ROLLER, Idler	2	
-10	450240	ADAPTER, Super-8	1	
-11	450242	LOCK, Film reel	1	
-12	450239	RETAINER, Spindle	1	
-13	450014	SPINDLE, Reel	1	
-14	450842	COVER, Front reel arm	1	ABCDF
-14	450843	COVER, Front reel arm	1	EGH
-15	450201	GEAR, Spur	2	
-16	31241	CLIP, Retaining	1	
-17	046014	GEAR AND SHAFT ASSEMBLY, Reel arm	1	
-18	22113	RING, Retaining, Type E	1	
-19	046015	PLATE ASSEMBLY, Reel arm	1	
-20	1261	BALL, Steel	1	
-21	450050	SPRING, Compression	1	
-22	26133	RING, Grip	2	
-23	450400	SHIELD, Light	1	
-24	No Number	MAINFRAME ASSEMBLY, Complete	NP	
-25	29694	. RING, Grip	4	
-26	450140	. ROLLER, Guide, male	4	
-27	450141	. ROLLER, Guide, female	4	
-28	450030	. SNUBBER, Rear	1	
-29	450248	. SCREW, Mainframe feet	2	
-30	45561	. FEET, Rubber	2	
-31	No Number	. MAINFRAME AND STUD ASSEMBLY	NP	

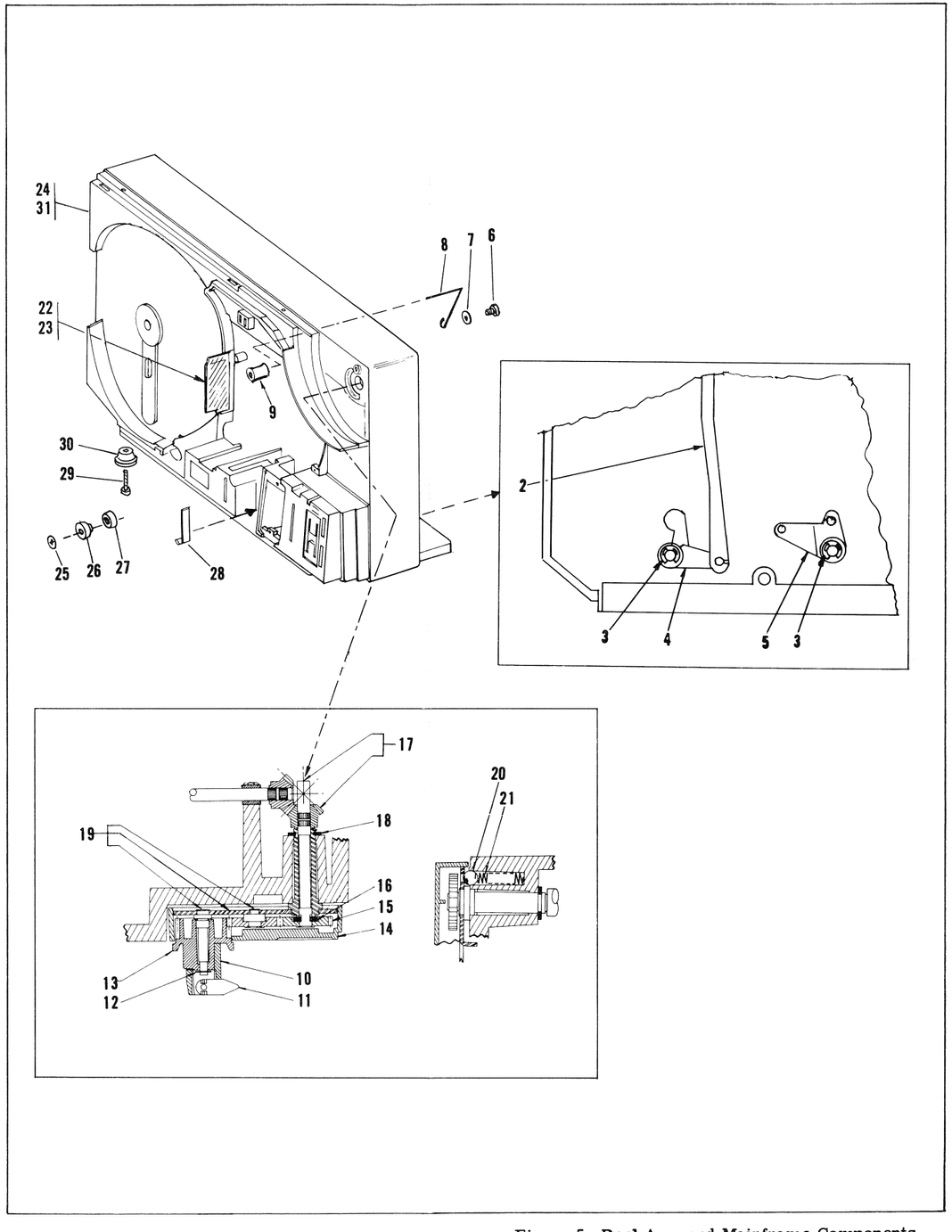
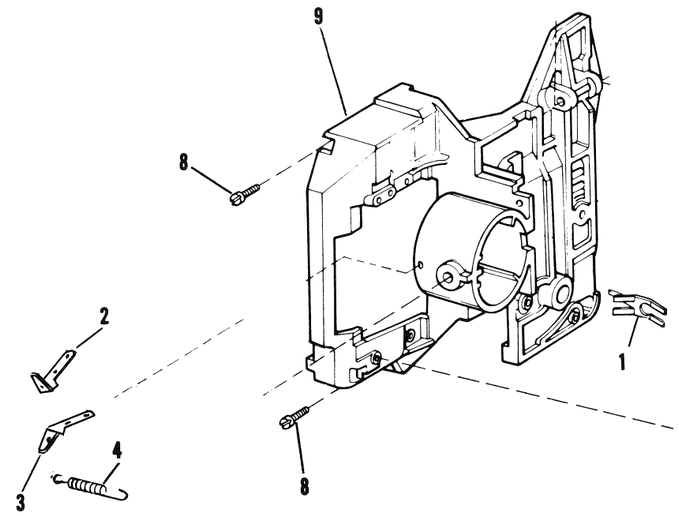
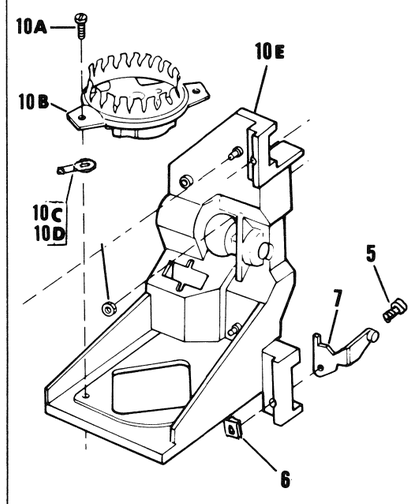


Figure 5. Reel Arm and Mainframe Components

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		FRONT AND REAR MECHANISM MODULE		
6-	046028	MECHANISM MODULE ASSEMBLY, Complete	1	A
6-	046029	MECHANISM MODULE ASSEMBLY, Complete	1	BCD
6-	046093	MECHANISM MODULE ASSEMBLY, Complete	1	E
6-	046502	MECHANISM MODULE ASSEMBLY, Complete	1	F
6-	046503	MECHANISM MODULE ASSEMBLY, Complete	1	G
6-	046501	MECHANISM MODULE ASSEMBLY, Complete	1	H
-1	450892	. SPRING, Lens tension	1	
-2	046703	. LEVER ASSEMBLY, Face tension, right-hand	1	
-3	015248	. LEVER ASSEMBLY, Face tension, left-hand	1	
-4	46096	. SPRING, Tension lever	1	
-5	36846	. SCREW, Slotted pan head, 6-32 by 5/8 inch	1	
-6	46167	. NUT, Square, 6-32	2	
-7	450152	. BRACKET, Bearing support	1	
-8	36844	. SCREW, Slotted pan head, 6-32 by 1/2 inch	1	
-9	No Number	. MODULE ASSEMBLY, Front (see Figure 7 for replacement parts)	NP	
-10	046701	. MODULE ASSEMBLY, Rear	1	ABCD
-10A	115482	. . RIVET, Semitubular	3	ABCD
-10B	46134	. . SOCKET, Lamp	1	ABCD
-10C	31585	. . CLAMP, Leadwire	1	ABCD
-10D	766324	. . SLEEVE, Insulating	1	ABCD
-10E	450040	. . MODULE, Rear	1	ABCD
-11	No Number	. MODULE ASSEMBLY, Rear	NP	EFGH
-11A	046088	. . SOCKET ASSEMBLY, Lamp	1	E
-11A	046094	. . SOCKET ASSEMBLY, Lamp	1	FGH
-11B	450124	. . SPRING, Lamp retaining	1	EFGH
-11C	26906	. . NUT, Hex Sems	1	EFGH
-11D	17632	. . WASHER, Flat	1	EFGH
-11E	450896	. . CLAMP, Leadwire	1	EFGH
-11F	30810	. . SCREW, Hex washer head, 6-32 by 1/2 inch	1	EFGH
-11G	30808	. . SCREW, Hex washer head, 6-32 by 5/16 inch	1	EFGH
-11H	450122	. . BRACKET, Lamp	1	E
-11H	450121	. . BRACKET, Lamp	1	FGH
-11J	450040	. MODULE, Rear	1	EFGH





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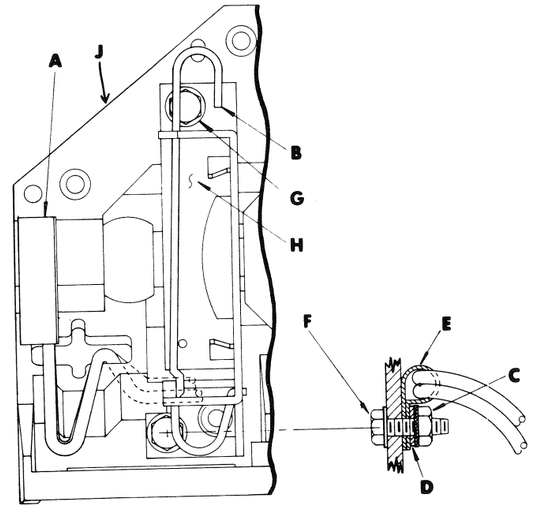


ITEM 11 COMPONENTS FOR CODES EFGH

Figure 6. Front and Rear Mechanism Module

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		FRONT MODULE ASSEMBLY		
7-	No Number	MODULE ASSEMBLY, Front, complete	REF	
-1	46820	. BELT, Drive	1	
-2	80591	. SETSCREW, Fluted socket cup pt, 6-32 by 3/16 inch	1	
-3	046022	. SHUTTER WHEEL ASSEMBLY	1	
-4	450667	. SPRING, Compression	1	
-5	046019	. CRANK AND PIN ASSEMBLY, Format shifting	1	
-6	26906	. NUT, Hex sems	1	
-7	36847	. SCREW, Slotted pan head, 6-32 by 1-1/4 inch	1	
-8	43857	. WASHER, Flat	1	
-9	451256	. WASHER, Bowed	1	
-10	046702	. PULL DOWN CAM ASSEMBLY	1	
-11	32947	. CAM SHOE (NOTE A)	AR	
-11	33712	. CAM SHOE (NOTE A)	AR	
-12	046700	. SHUTTLE ASSEMBLY, Complete	1	
-12A	32926	. . SCREW, Shuttle tension adjusting	1	
-13	766147	. SCREW, Slotted hex washer head, 6-32 by 3/16 inch	1	
-14	17632	. WASHER, Flat	1	
-15	450184	. PLATE, Shuttle adjustment	1	
-16	36770	. SETSCREW, Yoke (NOTE B)	1	
-17	48686	. SPRING, Yoke	1	
-18	48687	. YOKE	1	
-19	450371	. WASHER, Flat	1	
-20	765449	. RING, Retaining, Type E	2	A
-20	765449	. RING, Retaining, Type E	1	BCDEFGH
-21	450529	. SPRING, Compression	1	
-22	015313	. BRACKET AND SHAFT ASSEMBLY, Actuator	1	
-22A	450677	. . SCREW, Cam follower	1	
-23	17676	. RING, Retaining, Type E	1	BCDEFGH
-24	30807	. SCREW, Hex washer head, 6-32 by 1/4 inch	1	BCDEFGH
-25	17632	. WASHER, Flat	1	BCDEFGH
-26	450076	. ACTUATOR, Multi-motion	1	BCDEFGH
-27	450077	. LINK, Multi-motion	1	BCDEFGH
-28	29694	. RING, Grip	1	
-29	451312	. GEAR, Timing	1	
-30	80591	. SETSCREW, Fluted socket cup pt, 6-32 by 3/16 inch	1	
-31	450528	. GEAR, Drive	1	
-32	46003	. SPACER, Bearing	1	
-33	451338	. MAIN SHAFT	1	
-34	30667	. WASHER, Flat	1	
-35	26131	. RING, Retaining, Type C	1	
-36	766219	. SCREW, Hex washer head, 4-40 by 3/8 inch	1	
-37	47885	. SPRING, Torsion	1	
-38	45946	. SPACER, Flanged	1	
-39	34878	. WASHER, Flat	1	
-40	47737	. ACTUATOR, Fire shutter	1	
-41	45321	. SCREW, Pan head tapping, 2-32 by 3/8 inch	1	
-42	46039	. SPRING, Retractor	1	
-43	45813	. LEVER, Shuttle retractor	1	
-44	117139	. SCREW, Hex head, 6-32 by 3/8 inch	1	
-45	83957	. SCREW, Slotted hex head, 6-32 by 1/4 inch	1	
-46	451833	. RETAINER, Bearing	1	
-47	46131	. BEARING, Main shaft	1	
-48	46167	. NUT, Square	2	
-49	48834	. SCREW, Special	1	
-50	36837	. SCREW, Special	3	
-51	39223	. NUT, Square	4	
-52	451816	. SLIDER, Aperture retract	1	
-53	No Number	. APERTURE PLATE ASSEMBLY (See Figure 9 for replacement parts)	1	
-54	046705	MODULE AND FOCUS KNOB ASSEMBLY	1	A
-54	046704	MODULE AND FOCUS KNOB ASSEMBLY	1	BCDEFGH

NOTE A: Use any combination of black and/or white cam shoes to obtain proper fit on pull-down cam.
NOTE B: If the setscrew hole in the yoke (18) is enlarged and will not accept screw P/N 36770 (16) use screw P/N 30822.

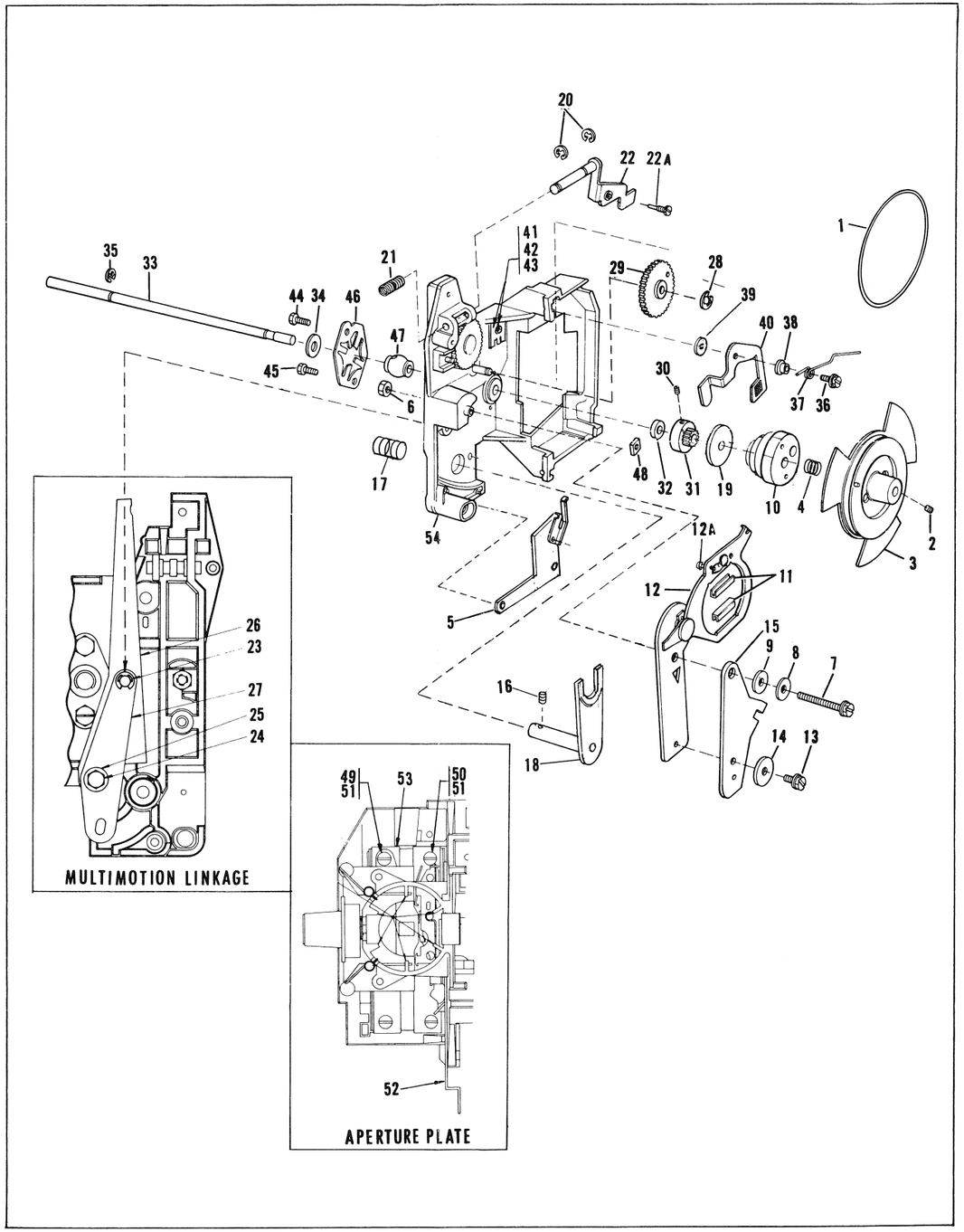


Figure 7. Front Module Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MOTOR, FAN AND PULLEY ASSEMBLY		
8-	No Number	MOTOR, FAN AND PULLEY ASSEMBLY	REF	
-1	80591	. SETSCREW, Motor pulley	1	ABCDF
-1	451397	. SETSCREW, Motor pulley	1	EGH
-2	451358	. PULLEY, Motor	1	ABCDFG
-2	451659	. PULLEY, Motor	1	EH
-3	32974	. SETSCREW, Blower fan	1	
-4	451268	. FAN, Motor cooling	1	ABCDFG
-4	451394	. FAN, Motor cooling	1	EH
-5	046049	. MOTOR FORMER AND BRACKETS ASSEMBLY, Complete	1	ABCD
-5	046065	. MOTOR FORMER AND BRACKETS ASSEMBLY, Complete	1	E
-5	046018	. MOTOR FORMER AND BRACKETS ASSEMBLY, Complete	1	FG
-5	046068	. MOTOR FORMER AND BRACKETS ASSEMBLY, Complete	1	H
-6	32744	. . SCREW, Motor bracket	2	
-7	26906	. . NUT, Hex sems	2	
-8	451254	. . BRACKET, Motor, R.H.	3	
-9	450541	. . BRACKET, Motor, L.H.	2	
-10	451204	. . BRACKET, Motor support	1	
-11	45968	. . SPACER	4	
-12	45429	. . GROMMET, Rubber	4	
-13	451267	. . BRACKET, Fan guard	1	
-14	43857	. . WASHER, Flat	4	
-15	No Number	. . MOTOR FORMER (Replace complete assembly)	NP	

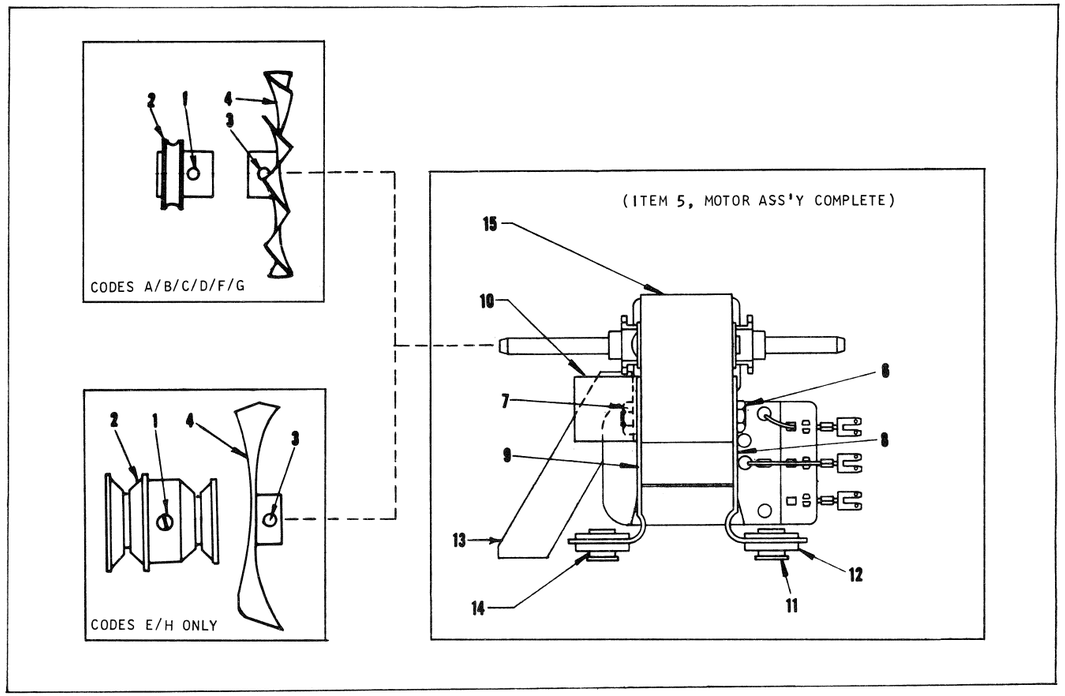


Figure 8. Motor, Fan and Pulley Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY
		APERTURE PLATE ASSEMBLY	
9-	046025	APERTURE PLATE ASSEMBLY, Complete	1
-1	765449	. RING, Retaining, Type E	1
-2	015216	. SCREEN ASSEMBLY, Fire shutter	1
-3	47740	. SPRING, Torsion	1
-4	45978	. SCREW, Guide rail	2
-5	450453	. GUIDE RAIL, Fixed	1
-6	40531	. SPRING, Tension, guide rail	1

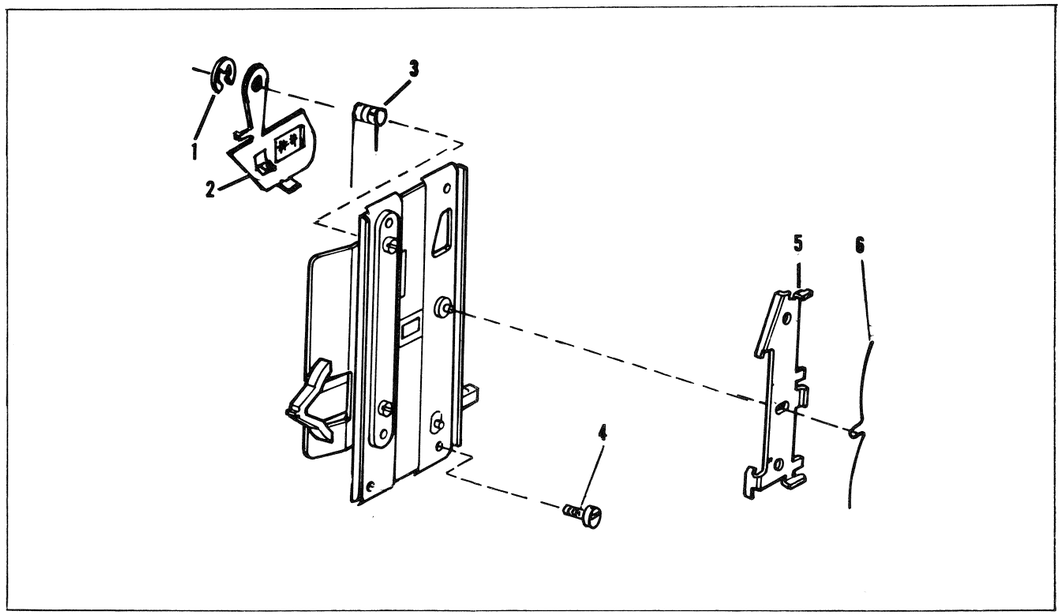


Figure 9. Aperture Plate Assembly

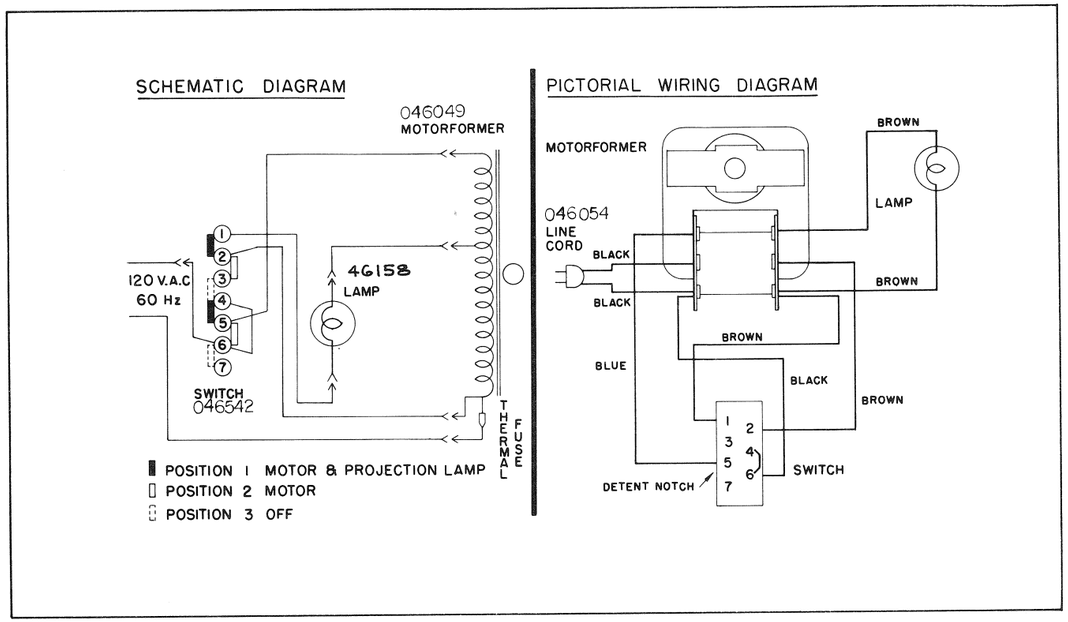


Figure 10. Wiring Diagrams for Cat. No. 1422, 1440 and 1445 Projectors

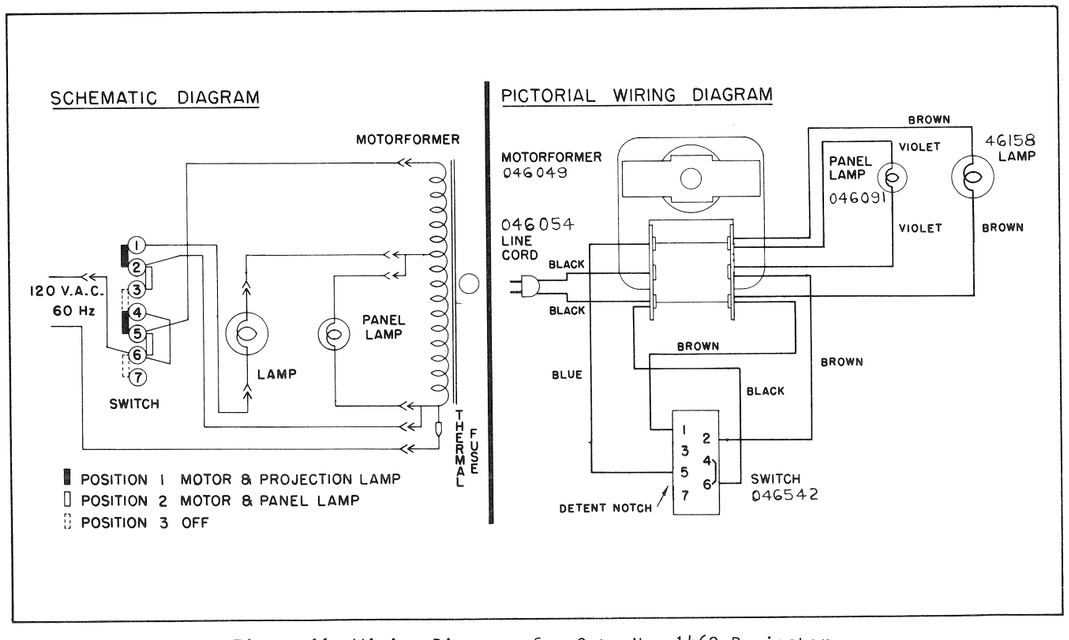
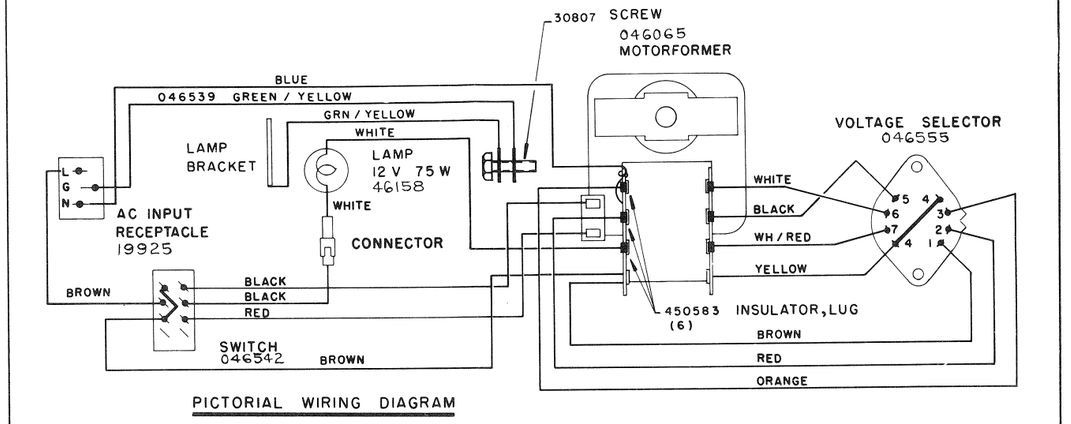


Figure 11. Wiring Diagrams for Cat. No. 1460 Projector



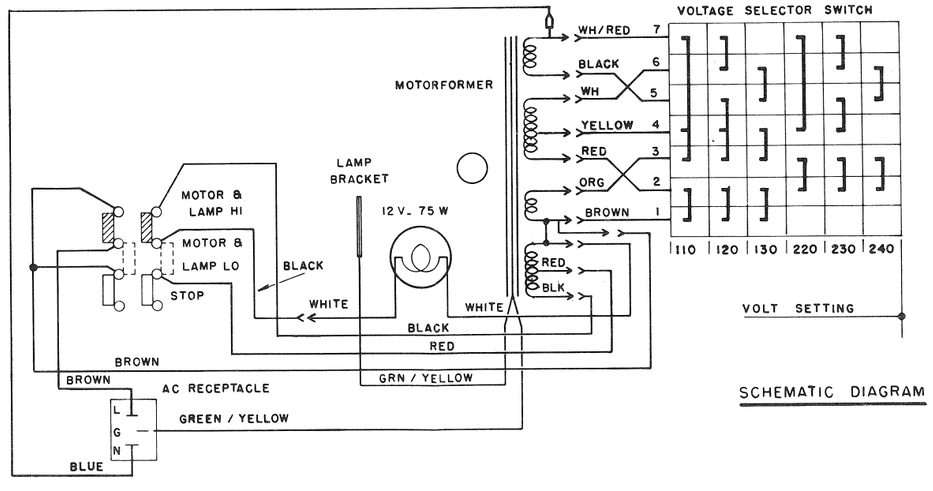


Figure 12. Wiring Diagrams for Cat. No. 1462 Projector

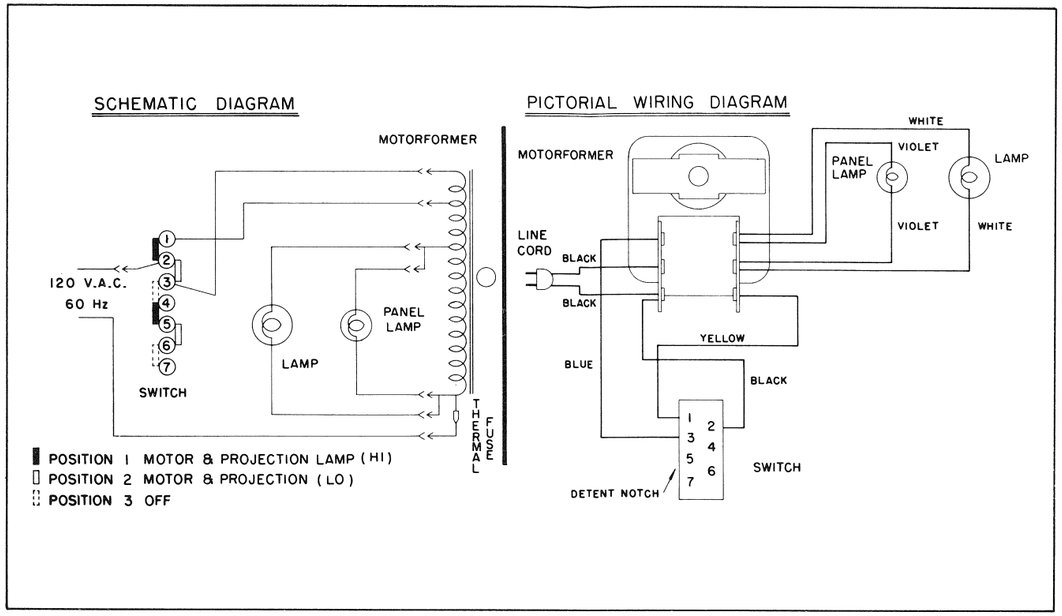


Figure 13. Wiring Diagrams for Cat. No. 1464 Projector

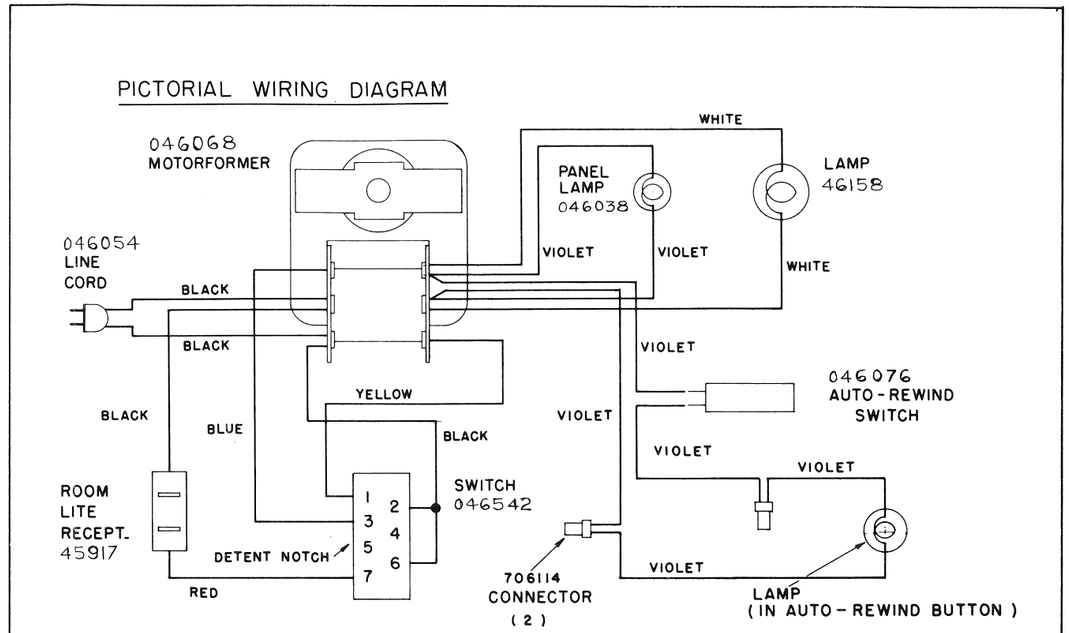


Figure 14. Wiring Diagrams for Cat. No. 1480 Projector

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