SERVICE INSTRUCTIONS

MONITOR SLIDE PROJECTOR

DESIGNS 950, 960, 961

BELL & HOWELL

PHOTO SALES COMPANY
GENERAL SERVICE DEPT.
7100 McCORMICK ROAD
CHICAGO, ILLINOIS 60645

PART NO. 70490

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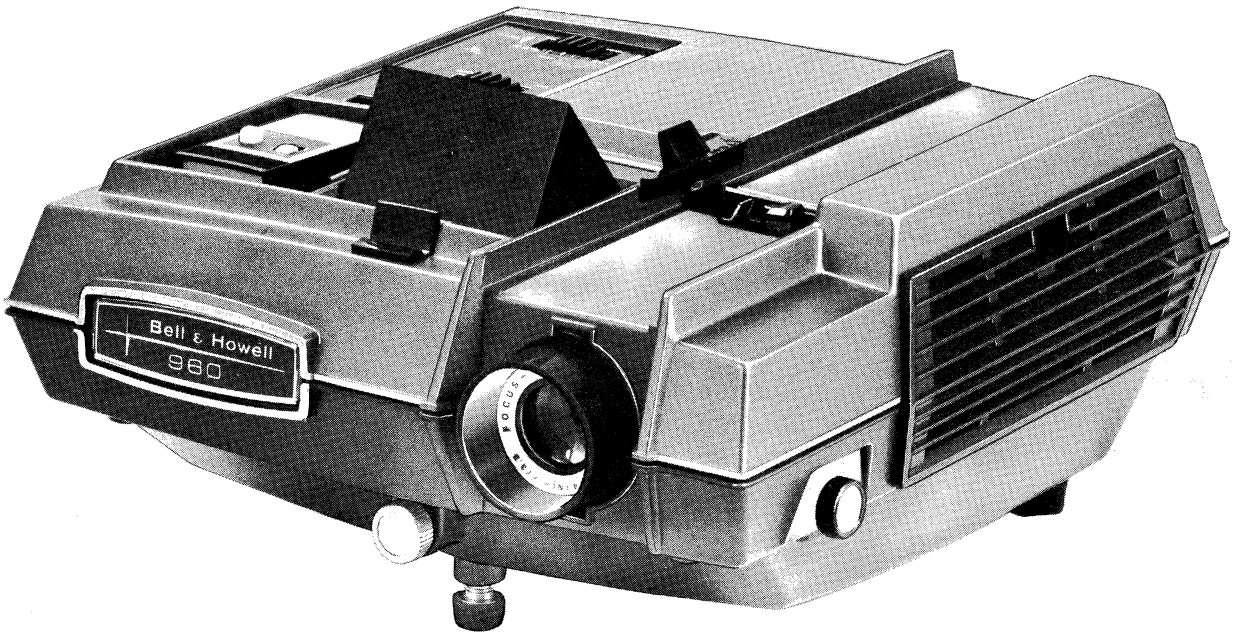

FEATURE DESCRIPTION LIST

Color (Design 950 and 960)	Blue
Color (Design 961)	Charcoal
Special Features	Remote control, slide previewer and editor, lamp eject lever, mechanism safety clutch, (*) automatic focus and (*) auto-cycle timer (asterisked features provided only on Models 960 and 961)
Type of Slides	35-mm slide mounts with double or single frame, super slides mounted with cardboard or plastic to 0.100 inch thick
Projector Operation	Forward-reverse-slide change cycle
Slide Tray Accommodation With Adapters	30 and 40 septum in-line tray; 100 septum circular
Projector Lamp	Type DHN, 120 volt, 500 watt, 25 hour, with proximity reflector
Preview Lamp	Type 312W, 50 candlepower, 28 volt, 1.30 amp, 300 hour, double contact bayonet base
Projection Lens	4 inch, f/3.5, straw coated
Operating Voltage	120 volts AC, 60 cycles
Motor	120 volts AC, 60 cycles, 1-1/2 inch stack
Tilt Mechanism	Gravity drop, knob lock
Housing	Die cast
Weight	19 pounds

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PRODUCT ONLY

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Introduction

GENERAL.

This manual has been prepared to aid in the servicing and repair of Bell & Howell Monitor Slide Projectors, Design 950, 960 and 961. An illustrated parts catalog is included at the rear of the manual to identify replacement parts and to aid the serviceman in the disassembly and reassembly of the projector.

All parts in the Parts Catalog exploded view illustrations are indexed in a suggested order of disassembly, with attaching parts immediately preceeding those parts which they attach. Where disassembly and reassembly of parts is purely mechanical and no critical adjustments are involved, no attempt has been made to elaborate on the removal or installation of such items. When making specific repairs, the serviceman must use his own judgement in eliminating unnecessary steps of procedure. Illustrations referred to by letter (Figure A, Figure B) will be found in the Service Instructions portion of this manual, while those identified by number (Figure 1, Figure 2) will be found in the Parts Catalog section.

DESCRIPTION.

All Bell & Howell Monitor Slide Projectors accommodate 35-mm, and super slides loaded in circular and in-line trays. The loaded in-line trays must be mounted in adapters. A remote control, which includes a forward-reverse switch and slide change button, allows remote operation up to 10 feet from the projector. An exclusive preview screen and preview slide eject lever permit viewing and editing of slides before they are projected. A mechanism safety clutch will disengage in case of malfunction due to damaged or warped slides.

The three models of the Monitor Slide Projector covered by this Service Manual (950, 960 and 961) are basically identical in appearance and construction. The Models 950 and 960 are blue in color; the Model

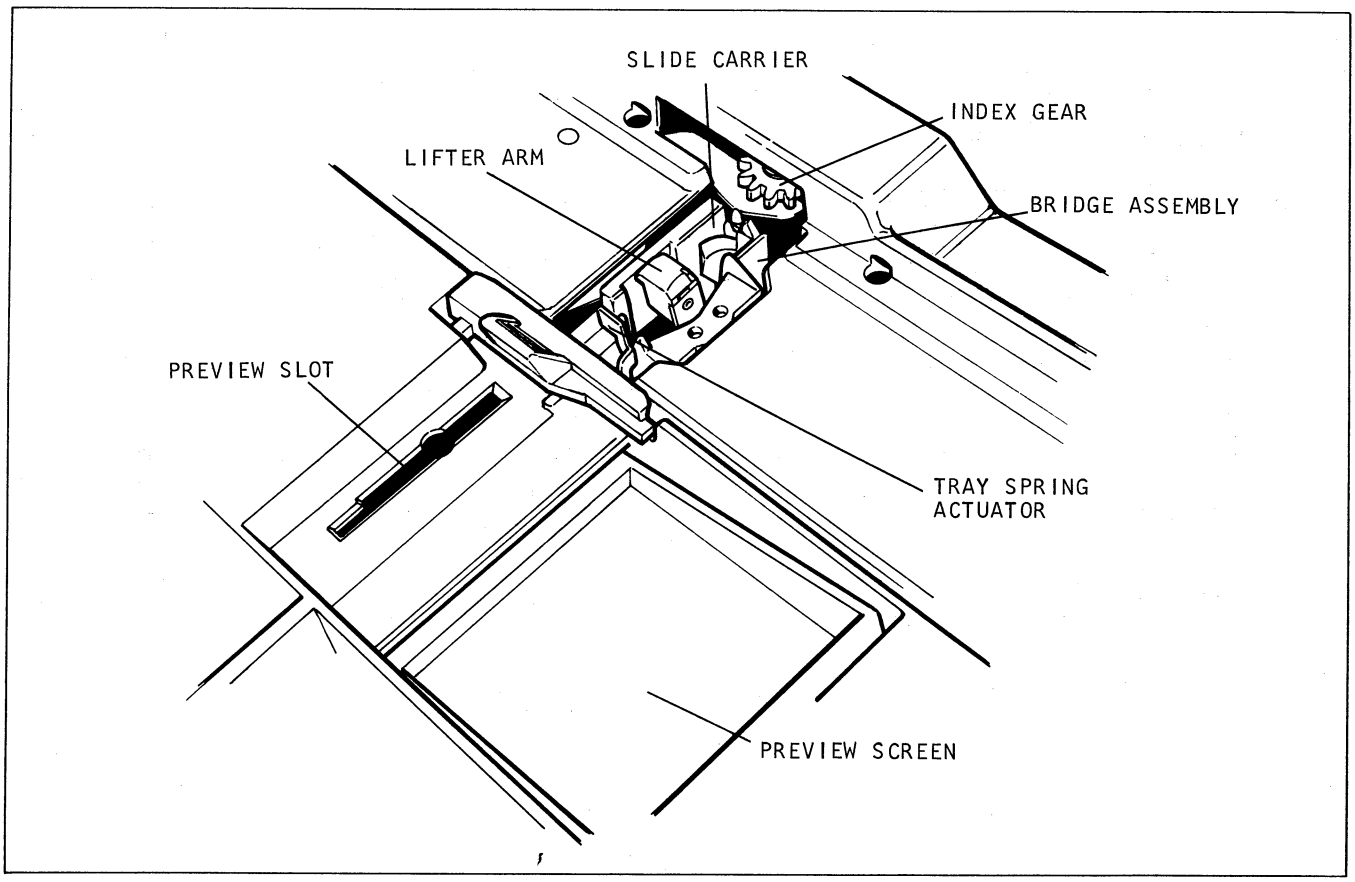


Figure A. Slide Handling Mechanism

961 is charcoal grey and is equipped with a three-wire power cord.

As noted in the Feature Description List, the automatic focus feature and auto-cycle timer feature are provided only on the Models 960 and 961, and operate in the following manner. After the first slide has been projected and manually focused, the projector will automatically focus each succeeding slide. The auto-cycle timer feature provides completely automatic operation by changing slides at any preselected time interval. For the Model 950 projector, each slide must be focused and changed manually.

Model 950 and 960 projectors have undergone certain design changes to improve projector performance. These design differences between early and current models are noted and illustrated in the parts list section of the manual and the repairman should familiarize himself with the variations in design. Except where specifically noted, current parts are not interchangeable with early parts (see "Special Maintenance Precautions" following).

NOTE: The Model 961 projector did not undergo any design changes; therefore, only one version of the Model 961 is covered by these instructions.

THEORY OF OPERATION.

With the projector motor switch in the OFF position, the slide handling mechanism is in the half-cycle position. In the half-cycle position, the slide carrier (Figure A) is in line with the bridge assembly and the lifter arm is in up position. When the motor switch is turned to the ON position, the projector will automatically make a half-cycle, dropping the lifter arm and moving the slide carrier to the preview position. This is considered the start position for a full cycle.

With an adapter mounted tray of slides in the tray channel of the projector and the motor switch turned to ON, the lifter arm drops, allowing the first slide to fall into the slide carrier. The carrier then moves to the preview position, thus completing the second half of the cycle. The projector now is ready to operate in full cycles.

When the slide change button is depressed, the slide carrier (containing the first slide) moves back under the slide tray. The lifter arm lifts the first slide back into the first septum of the tray and the adapter fingers hold it in place. The gearing is synchronized so that at this time the tray is indexed forward one septum. The adapter fingers under the first and second slide are released by the tray spring actuator. The first slide drops into the bridge assembly for

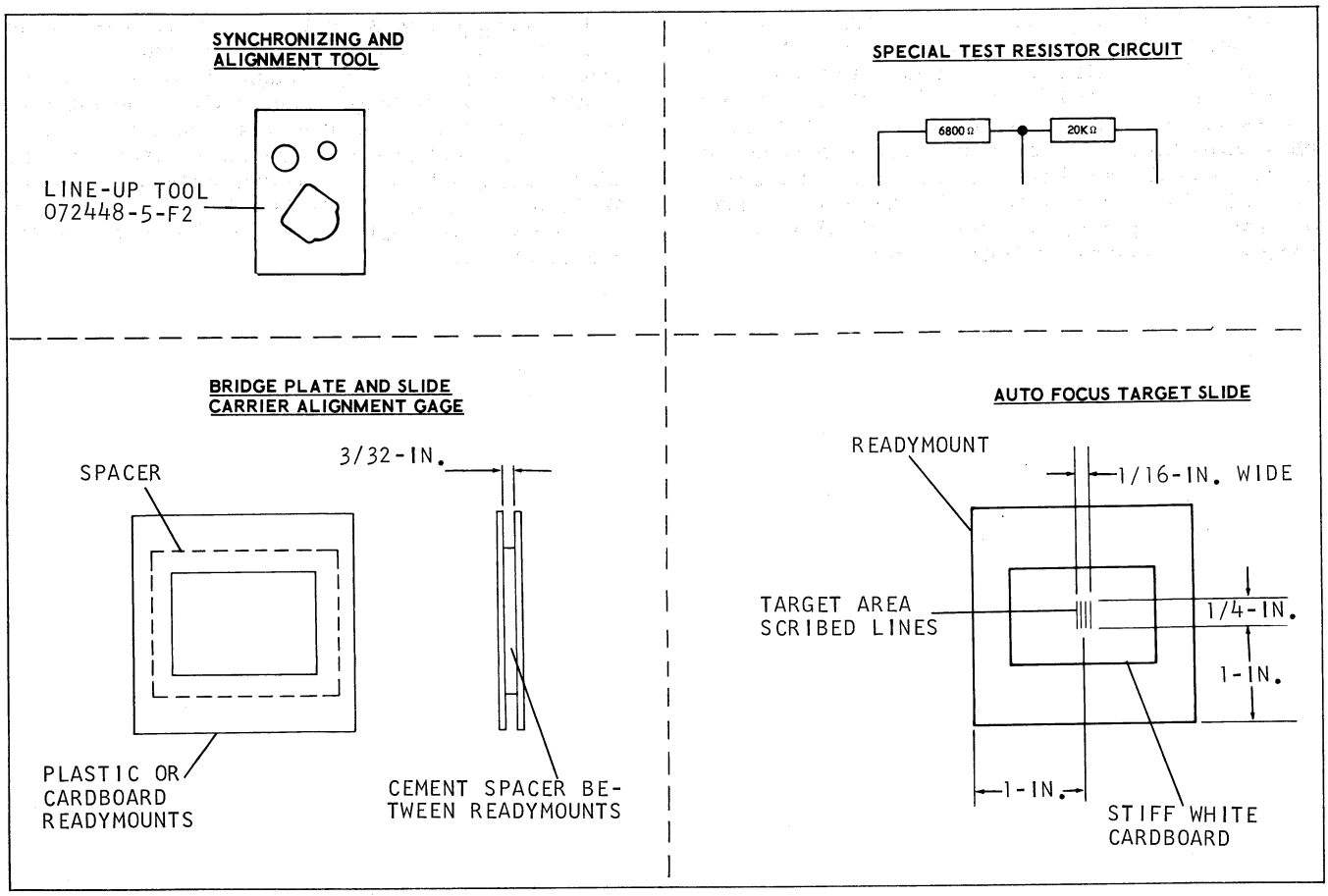


Figure B. Special Tools

projection and the second slide drops into the slide carrier which moves into the previewing position, completing the cycle.

This cycling continues, activating two slides simultaneously, until the slide tray has completed its course through the tray channel, resulting in each slide moving from preview position to projection position with each full cycle.

NOTE: When using a circular tray, the motor switch must be in OFF position while tray is installed.

SPECIAL MAINTENANCE PRECAUTIONS.

The removal and installation of projector parts is comparatively simple and, for the most part, requires only those tools normally available in most repair shops. The special tools and gages illustrated in Figure B are required for the proper alignment and adjustment of the projector.

When repairing the projector, be sure that the work table surface is clean. As parts are removed, group them in an orderly fashion to avoid confusion during reassembly. Clean dirt and old lubricant from parts (except electrical components) by washing them in a pan of solvent.

Before proceeding with any repairs, the repairman should perform the operating tests outlined in the Final Test section of this manual to verify customer complaints and determine the extent of repair necessary. Reference then can be made to the Trouble shooting Chart, where the most common causes of specific troubles are listed. Unless the initial inspection of the Monitor Projector indicates that extensive overhaul is required, disassemble only those parts necessary to remove the faulty components.

Always check the Usable on Code column of the parts lists to make certain that the proper replacement part is used in the specific projector model being repaired. The repairman also is cautioned to observe all "notes" in the parts list section pertaining to design changes and special replacement instructions. Where design changes have been made, new parts used in current models are not interchangeable with parts used in earlier models.

After the projector has been repaired, reassembled, and adjusted, perform the inspection and test procedures outlined in the Final Test section to insure satisfactory projector operation.

LUBRICANTS AND ADHESIVES.

a. Lubricants. Lubricants should be applied sparingly. Make certain that the component or surface to be lubricated is clean, and use only recommended lubricants as follows:

Oil — Bell & Howell Part No. 067480 (2 oz. bottle)
Grease — Bell & Howell Part No. 70468
Silicon Lubricant — Bell & Howell Part No. 70506 (Dow-Corning DC-4)

b. Adhesives. Most of the nameplates used on the Monitor Projector are pre-coated with adhesive, protected by a paper backing. To apply these nameplates, remove the paper backing and activate the adhesive by moistening with a solvent (use a mixture of three parts Toluol and one part Trichlorethylene). Where adhesive is required for mounting other parts, use 3-M Company Adhesive EC1711. Five-ounce tubes of this adhesive are available from Bell & Howell under part number 70509.

Disassembly Procedure

1. GENERAL DISASSEMBLY INSTRUCTIONS.

a. Before beginning disassembly procedures, be sure to disconnect projector from the power source. Remove the projector lens by turning the focus knob counterclockwise until the lens is as far out as it will go. The lens then can be withdrawn easily from the projector. Wrap the lens in tissue paper and store it in a safe place.

b. If repairs required replacement of electrical items, refer to the wiring diagram at the end of the Parts Catalog as an aid to wire identification and unsolder or disconnect wires as necessary.

c. When replacing components that have been soldered in place, take care to limit the heat to the area being worked upon. Components such as small resistors and capacitors are easily damaged by heat. Removal of components from the printed circuit board (Models 960 and 961 only) can be accomplished by cutting the defective component in half and removing the halves from the leads, leaving leads as long as possible. If this procedure cannot be followed, cut the leads as close as possible to the body of the defective part. Solder the replacement part to these leads carefully, avoiding the application of heat to nearby components.

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

e. When attaching parts (screws, nuts, etc.) are removed, reassemble them loosely to the removed part or to the tapped casting to prevent loss.

f. When springs are to be removed, note carefully the manner in which the legs of torsion springs are engaged and the parts to which the bent ends of coil springs are hooked. Spring installations are illustrated in Figure T.

2. REMOVAL OF PARTS IN FIGURE 1. Remove parts as necessary, in their indexed order of disassembly, noting the following special instructions.

a. Remove the remote control assembly (2) from the recess in the top cover and disconnect the remote control cord (12) from the receptacle located in the floor of the recess. Remove the two screws (4) and (6), the weight plate (5) and disassemble the top housing (7) and front cover (8) from the bottom housing (13). If either switch (15) or (16) is in need of replacement, disconnect the remote control cord leads from the switch terminals and drill out the switch mounting rivets (14).

b. The upper edge of the grille (18) is held in place by an internal spring clip. Pull the upper edge outward and lift out the grille. Near the upper rear corner of the projection lamp housing is the lamp eject lever. Press this lever toward the front of the projector to ease the lamp from its socket. Withdraw the lamp completely and wrap it in tissue paper for protection.

c. Turn the projector over and rest it on its top while removing the four screws (20). Hold the top securely and again turn the projector right-side up. Release the preview screen latch so that the preview screen pops up into viewing position. Raise the back edge of the top assembly (21) from the projector base until the spring-loaded light shield (item 4, Figure 3) slides forward and catches under the upper end of the lifter arm. Disengage the shield from the lifter arm and lift off the top assembly, disconnecting the leads from the ON-OFF switch terminals. Refer to paragraph 4 for top disassembly instructions.

d. Press down on lamp (22), rotate lamp counterclockwise, and lift it from its socket. Wrap the lamp in tissue paper.

e. Loosen the setscrews (23) and withdraw the focus knob (24) from its shaft. Remove four slotted pan head screws (25) and lift the complete focus assembly (26) from the base. Refer to paragraph 6 for disassembly instructions.

f. Note, in Figure 1, the difference in the early model shutter (28) and current shutter (28A). Note also the torsion spring (29A) used in current models in place of the spring tension washer (29) supplied with earlier models. Remove the retaining ring (27) and withdraw the shutter.

g. Hold the condenser (31) by its top and bottom edges while removing the screws (30). Lift out the condenser.

h. Remove the screws (32) and lift out the interlock assembly (33) until the leadwires can be disconnected from the terminals of the interlock switch (35). If the switch is defective, the complete interlock assembly (33) must be replaced.

i. To disassemble the complete mechanism assembly (42) from the projector base, seven screws (36) and (37) must be removed. A screw (37) at the left rear corner also serves to attach the terminal strip

(40) and its insulator (41). The pigtail leads of the fuse (39) are soldered to lugs on the terminal strip. Do not unsolder fuse leads unless fuse is in need of replacement.

3. REMOVAL OF PARTS IN FIGURE 2. Remove parts, as necessary, in their indexed order of disassembly, noting the following special instructions.

a. Unhook the spring (1) from the spring notch in the shield (6) and the small hole in the lamp eject lever (5). Remove three screws (2) and lift off the assembled shield and eject lever. Remove the retaining ring (3) and washer (4) and disassemble the lamp eject lever (5) from the shield (6).

b. Lift out the shield (7) located in the lens area at the front of the projector. Remove four screws (8) and lift the assembled socket and bracket assembly (9) from the base. Disconnect the leadwires from the projection lamp socket. Each condenser (15) and (16) is held in place with two L-shaped retainers (14) which are secured by rivets. Should either condenser require replacement, the rivets must be drilled out and the retainers removed. The lamp socket (12) also is secured with rivets (11). If the socket is replaced, attach the new socket with two screws (part no. 31551) and hex nuts (part no. 28311).

c. Remove two screws (17) and lift out the lens barrel bracket (18), the light shield (19) and the previewer lens assembly (20).

d. Remove two screws (21) and the miniature lampholder (22). Disconnect the lampholder leads.

e. Remove two screws (23) and lift out the reflector bracket (24). When repairing early model projectors using motor assembly part no. 072443 (item 61, Figure 4), a 2-ohm, 10-watt resistor (item 22D, Figure 2) will be mounted to this bracket. See Reassembly instructions (Note following step e, paragraph 14).

f. Remove the two solenoid attaching screws (25). Carefully bend the tongue of the solenoid lever until it clears the pin in the solenoid plunger and lift out the solenoid (26). Remove the two screws (27) and lift the solenoid bracket and lever assembly (28) from the projector base.

g. Unscrew and remove the tilt knob (29). Remove the retaining ring (30) and disassemble the tilt shaft assembly (31) from the base. A bushing (32) was used on early model projectors. Remove the two screws (33) and rubber feet (34) from the rear corners of the base.

NOTE: On Model 961 projectors only, a leveling foot (item 44, Figure 1) is used in place of one of the rubber feet.

h. Remove two screws (35) and lift the remote cord storage bracket assembly (36) from the projector base. On all models, disassemble the remote socket assembly (37) from the bracket. On Models 960 and 961 only, remove two rivets (38) and disassemble the printed circuit board (39) and insulator (40) from the bracket. Refer to paragraph 8 for circuit board repair instructions. When the circuit board is reinstalled, attach the board to the bracket with two screws (part no. 31511) and hex nuts (part no. 28311).

i. Remove the two screws (42) and flat washers (43) and disassemble the end caps (44), handle (45) and handle insert (46) from the base. If the AC connector (57) is in need of replacement, drill out the rivets (54) and remove the bezel (56) and connector (57). When reinstalling these parts, use screws (part no. 31976) and hex nuts (part no. 28311) in place of the rivets.

j. Model 961 Projectors Only. (See lower right inset in Figure 2). Remove the hex nut (58) and lift the circuit breaker assembly (59) and internal tooth washer (60) from the circuit breaker guard (62). The guard is staked in place and need not be removed.

k. Do not remove the mirror (48) or other cemented parts unless replacement is necessary.

4. REMOVAL OF PARTS IN FIGURE 3. Remove parts, as necessary, in their indexed order of disassembly, noting the following special instructions.

a. Before disassembling parts from the projector top assembly, note the manner in which all torsion springs are engaged so that they can be reinstalled in the same manner. Remove the four retaining rings (1) and disassemble the springs (2) and (5), flat washer (3), light shield (4) and restrictor plate (6) from the cast posts. (When reassembling, refer to Figure T for proper installation of torsion springs.)

b. Remove retaining rings (7) and (13) and disassemble the torsion springs (8) and (14) from the casting. Unhook the long leg of spring (9) from the slot in the previewer assembly (18) and slide the spring from the end of the previewer shaft (12). Remove the screws (10) and clamps (11), slide out the shaft (12), and lift out the previewer assembly (18). The glass preview screen (19) is cemented in place and should not be removed unless damaged and in need of replacement.

c. Remove retaining rings (13) and (15) and disassemble the tray hold-down (16) and previewer latch (17) from the top. The grille latch (23) and slide switch (27) are secured to the casting with rivets which must be drilled out if either part is to be replaced.

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

NOTE: A considerable number of design changes were made in the Model 950 (at Serial Number 3201) and Model 960 (at Serial Number 18500) projectors. As indicated in the parts list notes, those items whose part numbers are preceded by a single asterisk were deleted by the change. Items whose part numbers are preceded by a double asterisk were replaced by newly designed parts which bear the same index number followed by a suffix letter, or letters. For example,

retaining ring (1) is no longer used in current model projectors; sector spring (2) has been replaced by the torsion spring (2A); clutch spring (15) has been replaced by a new clutch spring (15A) and retaining cups (15B) and (15C). Model 961 projectors were not involved in these design changes. Only one version of the Model 961 projector as been produced.

a. Remove the retaining ring (5) from the end of the camshaft (56). Washer (6) is not used in current model projectors. Remove two screws (7), one of which threads into a tapped post on the solenoid bracket (57); the other into a tapped post on the aperture plate (8). Separate the aperture plate assembly (8) from the rest of the mechanism. Refer to paragraph 7 for aperture plate disassembly instructions.

b. Model 961 and Early Models 950 and 960. Remove the master cam assembly (9), two washers (10), spring (11), driven clutch assembly (12), camshaft spring (13), flat washer (14) and clutch spring (15) from the end of the camshaft (56). Withdraw the camshaft (56) from the rear end of the gear assembly (53).

c. Current Models 950 and 960 Only. Current master cam parts are shown in the upper right inset of Figure 4. Remove the master cam (9A) from the end of the camshaft (56A), being careful not to lose the steel ball (10A) located between the master cam and the driven clutch (12A). Withdraw the clutch spacer (11A), clutch (12A), camshaft spring (13A), clutch spring (15A) and spring retainer cups (15B) and (15C) from the camshaft. Withdraw the camshaft (56A) from the rear end of the gear assembly (53A).

d. Model 961 and Early Models 950 and 960 Only. Remove the retaining ring (1) and unhook the sector spring (2) to remove it. On all current models, remove the retaining ring (16) and flat washer (16A) and withdraw the carrier drive sector (17) and torsion spring (2A) from the sector pivot post.

e. Remove the retaining ring (20), the cycle knob (21) and the torsion spring (22) or (22A).

f. All Model 960 and 961 Projectors. Remove the two screws (18) and the timer switch (19), unsoldering the switch leadwires. Remove retaining ring (23) and flat washer (24). Disengage the clamp bracket (28) from the shank of the timer knob (29) and withdraw the knob from the shaft assembly. Unhook and remove the ratchet arm spring (30). Remove retaining ring (31), spring tension washer (32) and ratchet arm (33).

g. Unsolder the leadwires from the miniature switch (36). Remove two hex nuts (34) and screws (35) and disassemble the switch (36), insulator (37) and two spacers (38) from the solenoid bracket (57). In early Model 950 and 960 projectors, solenoid (40) was attached with two screws (39). On all current models the solenoid is attached with two screws (39A) and flat washers (39B). Remove two retaining rings (41) and the half cycle slider (42) or (42A).

h. Models 960 and 961 Only. Remove the retaining ring (45) and withdraw the ratchet gear (46) from the end of the shaft assembly (49). Remove the two retaining rings (48) from the shaft; then loosen the two cluster gear setscrews (47) and withdraw the shaft assembly (49) from the solenoid bracket, catching the cluster gear (50) as it drops free. Press the bearings (55) from the shaft holes in the solenoid bracket.

i. Remove screw (3) and the gear sector pivot bridge (4). Remove two screws (43) and flat washers (44) and disassemble the solenoid bracket assembly (57) from the motor and plate assembly (58). Loosen the blower wheel setscrews and withdraw the blower wheel (59) from the motor shaft. Remove two screws (60) and flat washers (60A) and lift the motor assembly (61) and spacer washers (62) from the motor plate (63).

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

NOTE: Model 950 projectors are not equipped with the automatic focus feature which involves items 1 through 6, items 13 and 14, and items 16 through 28.

a. Model 950 Projectors. Remove two self-locking nuts (7) and flat washers (8) and separate the focus plate assembly (15) from the lens carriage assembly (29). Remove two retaining rings (9) and withdraw the focus shaft and gear assembly (10) from the gear bracket (12). Remove two screws (11) and disassemble the gear bracket (12) from the lens carriage.

b. Model 960 and 961 Projectors. Disassemble items noted in step a, preceding. The lamp (20), lenses (23) and (26), and photoconductive cell (27) are secured in place with adhesive and should not be removed unless in need of replacement. The lamp socket (22) is secured to the focus lamp bracket (24) with a single rivet (21). The focus motor (14) is secured to the focus plate (15) with two self-tapping screws (13).

7. REMOVAL OF PARTS IN FIGURE 6. Remove parts, as necessary, in their indexed order of disassembly, noting the following special instructions.

NOTE: A considerable number of design changes were made in the Model 950 (at Serial Number 3201) and Model 960 (at Serial Number 18500) projectors. As indicated in the parts list notes, those items whose part numbers are preceded by a single asterisk were deleted by the change. Items whose part numbers are preceded by a double asterisk were replaced by newly designed parts which bear the same index number followed by a suffix letter. For example, items 14, 15 and 16 have been deleted from current models; actuator spring (11) has been replaced by new actuator spring (11A), etc. Model 961 projectors were not involved in these design changes. Only one version of the Model 961 has been produced.

a. Make a note of the manner in which all springs are installed. Unhook and remove springs (1) and (2). Remove the retaining ring (4) and washer (5) and disassemble the lifter arm assembly (8) or (8A), washer

(9) and slide eject lever assembly (10) from the aperture plate (54). Remove the retaining ring (3) and disassemble the lifter arm button (7) and spring tension washer (6) from the lifter arm assembly. (During reassembly, refer to Figure T for installation of the springs).

b. Remove the actuator spring (11) or (11A). Remove the retaining ring (12) and withdraw the actuator assembly (13) or (13A) from the aperture plate.

c. All Model 961 and Early Model 950 and 960. Remove the screw (14), flat washer (15) and adjusting assembly (16).

d. Loosen two setscrews (17) and disassemble the shutter arm cam (18) or (18A) and cluster gear assembly (19) or (19A) from the aperture plate.

e. Remove two retaining rings (20) and disassemble the index latch (21) two idler gears (22). Loosen the two setscrews (26) and lift the drive gear shaft assembly (27) from the aperture plate, removing the flat washer (35), spring tension washer (34), index clutch (33), helical gear (32), bushing (30), reverse spring (31) and flat washer (36) as the shaft assembly is withdrawn. Remove the retaining ring (37) and disassemble the index drive gear (38) and flat washer (38A) from the drive shaft (27). Remove the retaining ring (28) and index gear (29) or (29A). Remove the retaining ring (23), flat washer (24) and locking gear (25).

f. Remove the retaining ring (39) so that the helical index gear (41) is free on the slide carrier rod (45) or (45A). Move the slide carrier rod in the direction of gear (41) until the opposite end of the rod disengages from the nylon bearing (53). Tip the rod upward slightly until the tang at the left end of the slide carrier (42) or (42A) is disengaged from the guide slot on the back of the aperture plate. Withdraw the rod completely from the aperture plate. Remove the thrust washer (40) from the gear end of the rod and the index gear (41), washers (39A) and slide carrier from the opposite end. Loosen two setscrews (43) to free the septum lock (44) or (44A).

g. Loosen the setscrews (46) and withdraw the shaft (47) upward, removing the bushing (48) or (48A), septum lock and bridge assembly (50) or (50A) and coil spring (49) as the shaft is withdrawn. Note the washers (48B), (48C) and (48D) used in all current Model 950 and 960 projectors. To replace nylon bearings (51), (52) or (53), press them from the bearing holes in the aperture plate.

8. REMOVAL OF PARTS IN FIGURES 7 AND 8 (MODELS 960 AND 961 ONLY). Most components mounted on the printed circuit board are soldered in place. Unsoldering should be done carefully to limit the transfer of heat to other components. Removal of components can be accomplished by cutting the defective component in half and removing the halves from the leads, leaving the leads as long as possible. If this procedure cannot be followed, cut the leads as close as possible to the body of the defective component. Solder the replacement part to these leads carefully, avoiding the application of heat to nearby components.

Reassembly and Adjustment

9. GENERAL REASSEMBLY INSTRUCTIONS.

NOTE: Be sure to check the Usable on Code column of the parts lists to make certain that the proper replacement part is used in the projector being repaired. In Model 950 and 960 projectors, new parts being used in current models as a result of the design change are not interchangeable with parts used in early model projectors.

a. Before reassembling parts, clean them thoroughly. Metal parts can be immersed in a pan of nonflammable solvent or wiped with a cloth dampened with solvent; then dried with a clean, lint-free cloth or compressed air. Do not immerse electrical components in solvent. Clean optical parts (mirrors, lenses, etc.) with lens cleaner and lens tissue. During the reassembly procedure, handle optical parts by their edges to avoid fingerprints.

b. When the reassembly procedure includes the staking of rivets or other parts, all riveting and staking should be done first to avoid the possiblity of damage to other parts. Be sure to support the parts solidly before riveting or staking.

c. All soldering should be done carefully; avoid cold soldered joints; avoid short circuits caused by dripping solder; and use only the best grades of resin cored solder. Tin components when necessary, out of the circuits in which they are used.

e. When installing electrical parts, refer to the wiring diagram at the end of the Parts Catalog for proper wiring connections.

f. The points at which the hooked ends of tension springs are to be engaged are clearly indicated in the exploded view illustration. For the proper method of engaging the legs of torsion springs, refer to Figure T at the end of the Reassembly and Adjustment section.

10. REASSEMBLY OF PARTS IN FIGURE 6. Reassemble parts in the reverse order of disassembly, noting the following special instructions.

NOTE: As indicated in the Figure 6 parts list, there are a number of physical differences between early and current Model 950 and 960 projectors. The design change in Model 950 projectors occurred at serial number 3201; in Model 960 projectors at serial number 18500. All Model 961 projectors were manufactured with early design parts. Those parts whose part numbers are preceded by a single asterisk are used in early models only and have been deleted from all current models. Those parts whose part numbers are preceded by a double asterisk have been superseded by parts bearing the same index number but with a letter suffix. For example, items (14) through (16) are used in early models only and are deleted from current models. Actuator spring (11) is used in early models only and, in current models, has been superseded by actuator spring (11A).

a. Install the five nylon bearings (53) in the aperture plate (54) with the large flange of the bearing facing upward or to the inside. Install nylon bearing (52) with large flange facing upward. Install nylon bearing (51) with large flange facing the inside.

b. Lightly grease the inside diameter of the assembled nylon bearings, the edge of the aperture opening that fits into the slot of the bridge assembly (50), and the slide carrier groove of the aperture plate.

c. Early Model 950 and 960 Projectors. Assemble the septum lock and bridge assembly (50) to the aperture plate (54) with the edge of the aperture opening in the groove of the bridge assembly. Line up the holes in the bridge assembly ears with the holes in the aperture plate. Position the spring (49) between the upper ear of bridge assembly and the aperture plate with large coils facing up. Lightly grease the septum lock shaft (47); then insert it through the aperture plate, spring (49) and two ears of bridge assembly (50). Insert bushing (48) with setscrews (46) assembled, between the bottom ear of bridge assembly and the aperture plate and complete insertion of shaft through bushing and aperture plate.

d. Current Model 950 and 960 Projectors Only. Lightly grease the septum lock shaft (47) and insert the shaft up through the lower nylon bearing in the aperture plate. In the following order, assemble a flat washer (48D), a felt washer (48C), the bushing (48A) with setscrews (46) preassembled, and two flat washers (48B) to the shaft. Hold the shaft. Hold the lock bridge assembly (50A) in position with its ears aligned with the shaft holes in the aperture plate. Push the shaft (47) upward through the ears of the bridge assembly. Assemble the coil spring (49), large coils up, between upper ear and aperture plate and press shaft up until lower end of shaft (47) is flush with the lower nylon bearing. Temporarily tighten the setscrews (46).

e. Position septum lock assembly (44), with setscrews (43) assembled, onto carrier rod, index gear, and cam assembly (45) or (45A) with nylon washer surface facing away from the cam. In current projectors, the septum lock (44A) does not have a nylon washer surface. Lightly grease the carrier rod; then assemble slide carrier (42) or (42A) onto the rod with the aperture opening toward the gear and the cam end

of the rod. Assemble spring tension washer (39A) and index gear (41) to the flatted end of carrier rod, lining up flat of rod with flatted hole of the index gear and push gear onto rod as far as possible. Assemble thrust washer (40) to short end of rod using a small amount of lubricant to hold it in place.

f. Lightly grease the area of the index drive gear and shaft assembly (27) between the gear and retaining ring groove. Assemble washer (38A) and gear (38) to shaft assembly (27) with the washer between gears and the single teeth of each gear adjacent to each other. Secure the gear (38) to the shaft with retaining ring (37). (See Figure H for proper alignment of gears.)

g. Assemble spring washer (34) and flat washer (35) to shank of index clutch (33) being sure that convex side of washer (34) is facing clutch. Position clutch shank through bottom aperture plate hole adjacent to the carrier rod cam. Assemble helical gear (32), lining up groove in gear with tang on index clutch. Lubricate index gear stud and ends of reverse spring (31) with grease. Assemble the washer (36) to the gear and shaft assembly (27) and insert the shaft through aperture plate hole adjacent to septum lock shaft (47) and assemble reverse spring (31) and bushing (30) with setscrews (26) preassembled. Continue feeding drive gear shaft through second hole of aperture plate, lining up flatted area of shaft with corresponding area in clutch, while simultaneously assembling index gear (29) or (29A) (hub down) to the adjacent stud with teeth of index gear between gear (38) and gear of gear and and shaft assembly (27). Install retaining ring (28).

h. Position line-up tool S-072448-5-F2 over cam of gear and shaft assembly (27) and the two empty studs (Figure C). Assemble cam end of carrier rod (45) so that gear engages with helical gear (32) with the high point of the cam (Figure D) touching the septum lock shaft (47). Slide the carrier rod into bearing. If cam is not positioned properly (Figure D) withdraw the rod from its bearing and rotate the rod one gear tooth forward or backward as required to align cam;

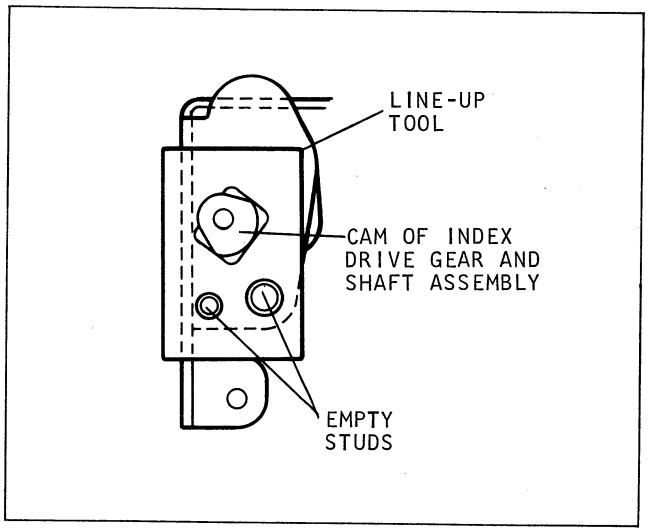


Figure C. Synchronizing Drive Gear Cam and Carrier Rod Cam

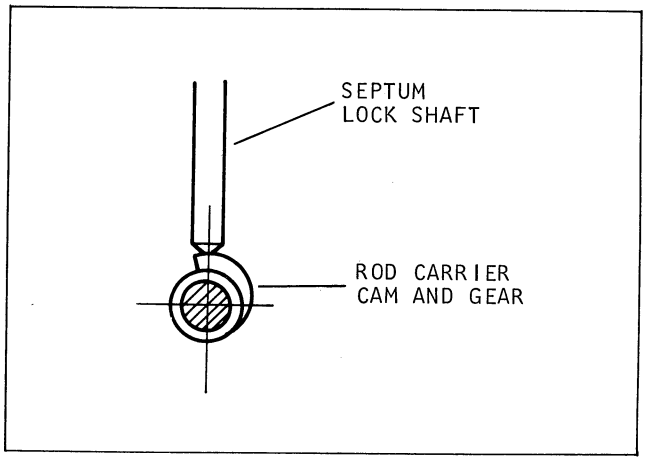


Figure D. Carrier Rod and Lock Shaft Positioning

then re-engage gears. While holding gear engagement, push index gear (41) into bearing (51) and assemble retaining ring (39). Position slide carrier (42) or (42A) back to gear (41) and insert tang of carrier into groove of the aperture plate, sliding the carrier forward to engage the groove.

i. Lightly grease the locking gear stud and while holding the gear (41) against the retaining ring (39) to remove backlash, assemble the locking gear (25) over the stud with helix down and engage the index gear (41) while aligning timing teeth of locking gear with bearing (53) located above elongaged hole of aperture plate (see Figure E). The locking gear may have to be disengaged from gear (41) and rotated to obtain proper alignment. Assemble washer (24) and retaining ring (23) to locking gear stud.

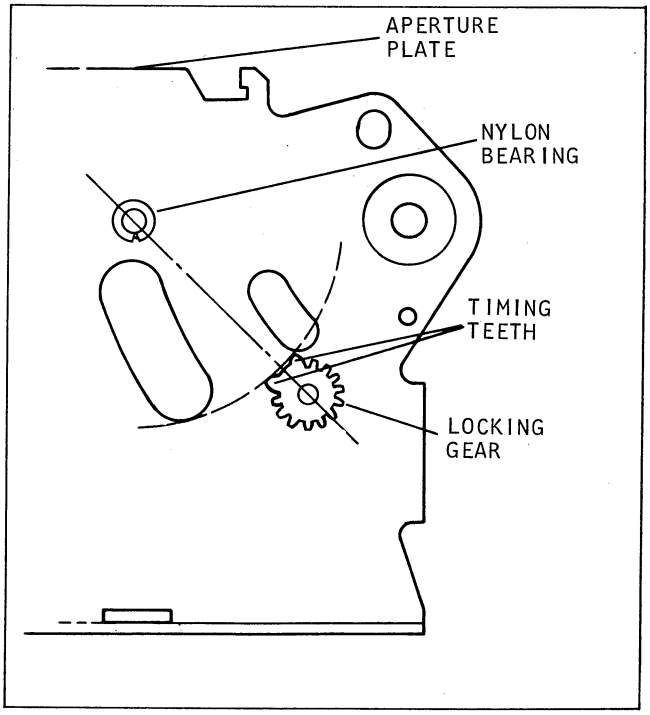


Figure E. Synchronizing the Locking Gear

j. All Early Model Projectors. While holding the septum lock shaft (47) against high point of cam, insert a 0.165 inch spacer, between bushing (48) or (48A) and the aperture plate flange (see Figure F). Tighten the bushing setscrew (46) to secure the bushing. Rotate the shaft and secure second setscrew. Remove spacer.

k. Current Model 950 and 960 Projectors Only. Loosen setscrews (46) in bushing (48A). Make certain that the high point of the cam is in the position shown in Figure D. Hold and lift the bushing (48A), thus raising the septum lock bridge until the bridge bears against the aperture plate. Hold in this position and insert a 0.010 inch shim on the high point of the cam; then press the septum shaft (47) down against the shim and tighten the bushing setscrews (46) securely.

l. Position the slide carrier (42) or (42A) to bridge assembly (50) or (50A) by inserting the line-up tool (fabricated tool) made from two slides and a spacer as shown in Figure B, into septums of carrier and bridge assembly.

NOTE: This positioning is important. Carrier and bridge assembly must be in line to allow slides to move in and out of septums without binding.

m. Lightly grease the actuator stud and with bridge assembly at high position, assemble tray spring actuator (13) or (13A) to actuator stud with formed finger against outer ear of the bridge assembly. Assemble retaining ring (12) to actuator stud.

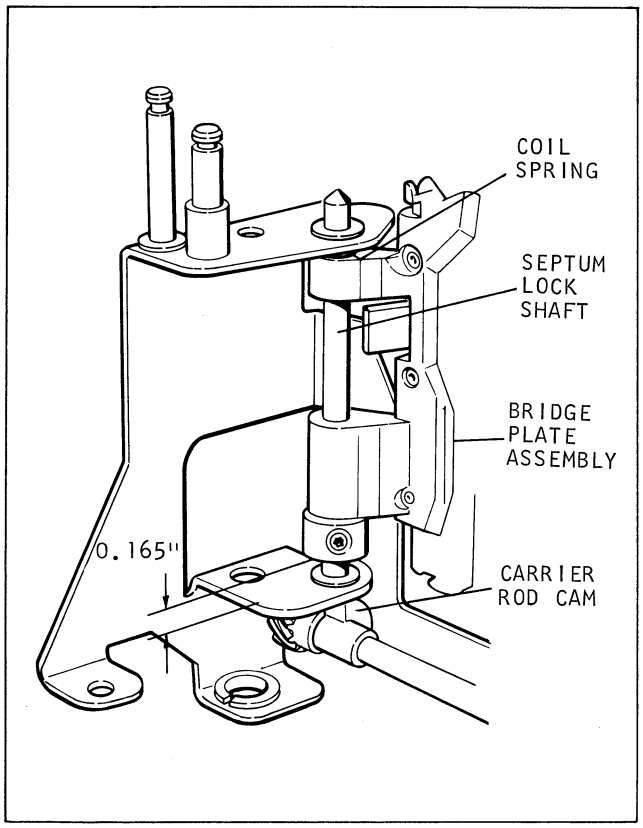


Figure F. Septum Lock Shaft Bushing Spacing (Early Model Projectors Only)

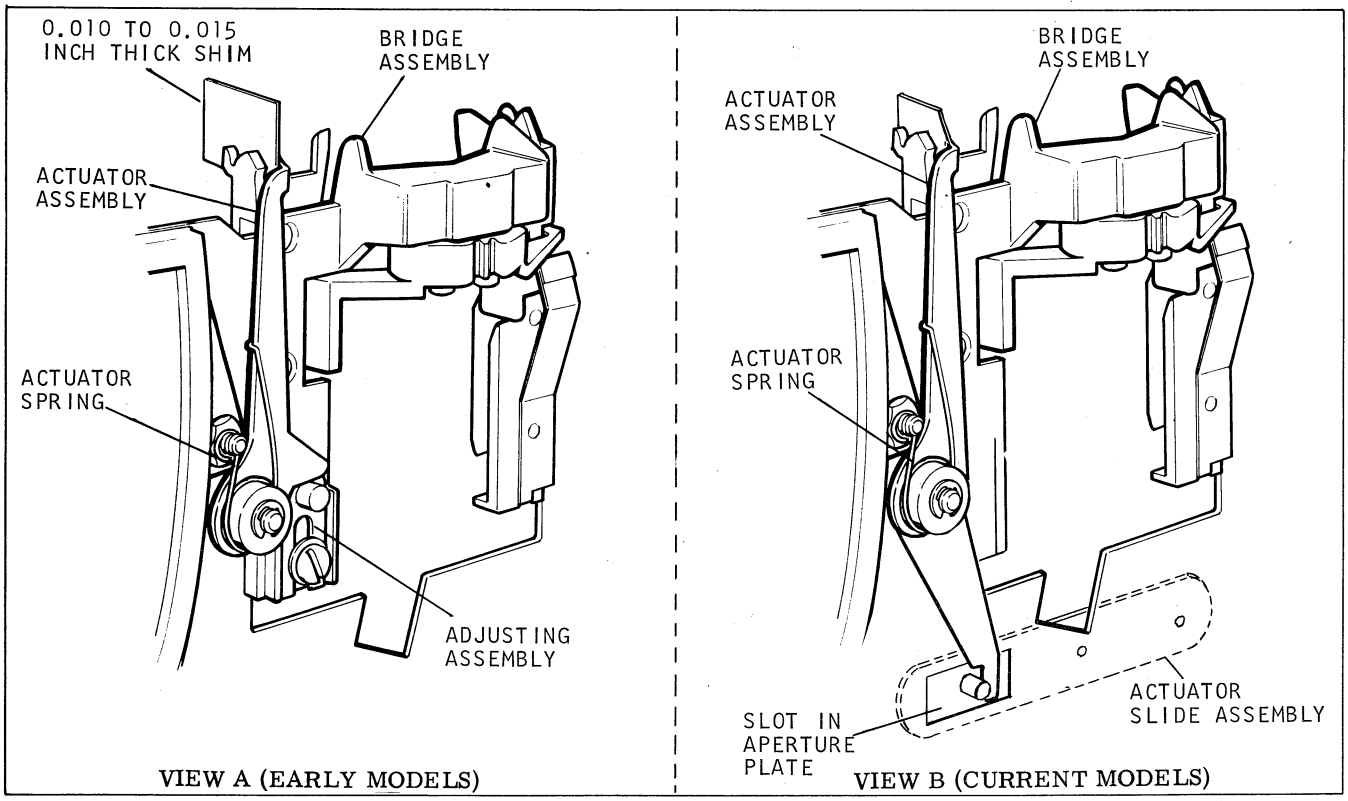


Figure G. Aligning Slide Carrier with Bridge Assembly and Positioning Tray Spring Actuator

n. All Early Model Projectors. Loosely assemble the adjusting assembly (16) to the bridge assembly. Insert a 0.010 to 0.015 inch shim (Figure G) between formed finger of actuator and ear of the bridge assembly. Slide adjusting assembly (16) up until actuator is held lightly against the shim. Secure adjustment screw (14) to each adjustment and remove shim. Assemble actuator spring (11) with coils over actuator hub, looped end over end of aperture plate screw and opposite end hooked under edge of actuator spring.

NOTE: In current projector models, the preceding adjustment is not necessary. As shown in View B of Figure G, the adjusting assembly is no longer used, since the actuator arm is mechanically activated by a slide bar on the aperture plate.

o. After carrier and bridge assembly are aligned, position lock assembly (44) or (44A) against carrier (42) or (42A) and lock in position with setscrews (43) tightened securely.

p. Remove line-up tool S-072448-5-F2 being careful not to disturb timing. Lightly grease the rectangular opening of index latch (21) and the two idler gear studs. Be sure septum lock shaft (47) is at the high point of cam (Figure D); then align the "buck" teeth on the index drive gear (29) and the gear and shaft assembly (27) (see Figure H). Assemble the index idler gear (22) to mesh with index drive gear (38). Assemble second idler gear (22) to mesh with top index drive gear (27). Assemble index latch (21) with rectangular opening over drive gear cam. Install two retaining rings (20), one to each stud.

q. Insert a 0.406 inch spacer between the reverse solenoid bushing (30) and aperture plate flange (Figure J). Hold drive gear and shaft assembly (27) in down position and tighten the setscrews (26) securely. Remove the spacer.

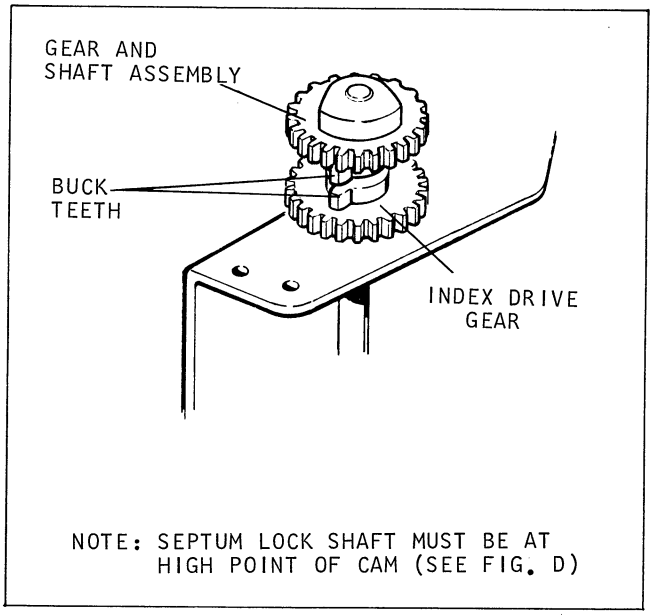


Figure H. Aligning Buck Teeth of Index Drive Gear

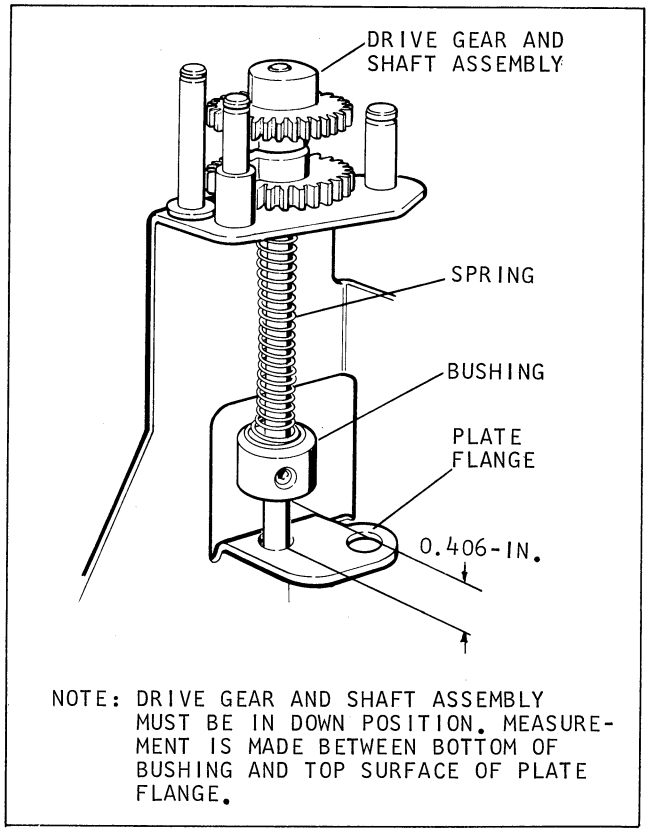


Figure J. Proper Spacing of Reverse Solenoid Bushing

r. All Early Model Projectors. Position slide carrier (42) to center in preview opening of aperture plate. Lightly grease the shaft of the cluster gear assembly (19). Insert the cluster gear assembly through boss of aperture plate and engage gear teeth with rack of carrier (42). Hold in position and assemble shutter arm cam (18) to the shaft of cluster gear assembly. Insert a 0.005 inch shim between cam and hub. Rotate cam to the position shown in Figure K, View A, and tighten the setscrews (17) securely. Remove shim.

s. Current Model 950 and 960 Projectors. Center the slide carrier in the preview opening of the aperture plate. Lightly grease the shaft of the cluster gear assembly (19A). Insert the cluster gear shaft through the boss of the aperture plate and engage gear teeth with rack of carrier (42A). Hold these parts and assemble the shutter cam (18A) to the cluster gear shaft. With the carrier centered in the preview opening, the "V" notch on the edge of the shutter cam must be in a vertical position or slightly off-center to the right as shown in View B, Figure K. Insert a 0.005-inch shim between the cam and aperture plate boss, hold all parts together in aligned position, and tighten the cam setscrews (17) securely. Remove the shim.

t. Lightly grease slide eject lever stud button on aperture plate, shaft of lifter arm assembly (8) or (8A), track on aperture plate where lifter arm button (7) rides, and the surface of aperture plate against which dimples of eject lever (10) bear.

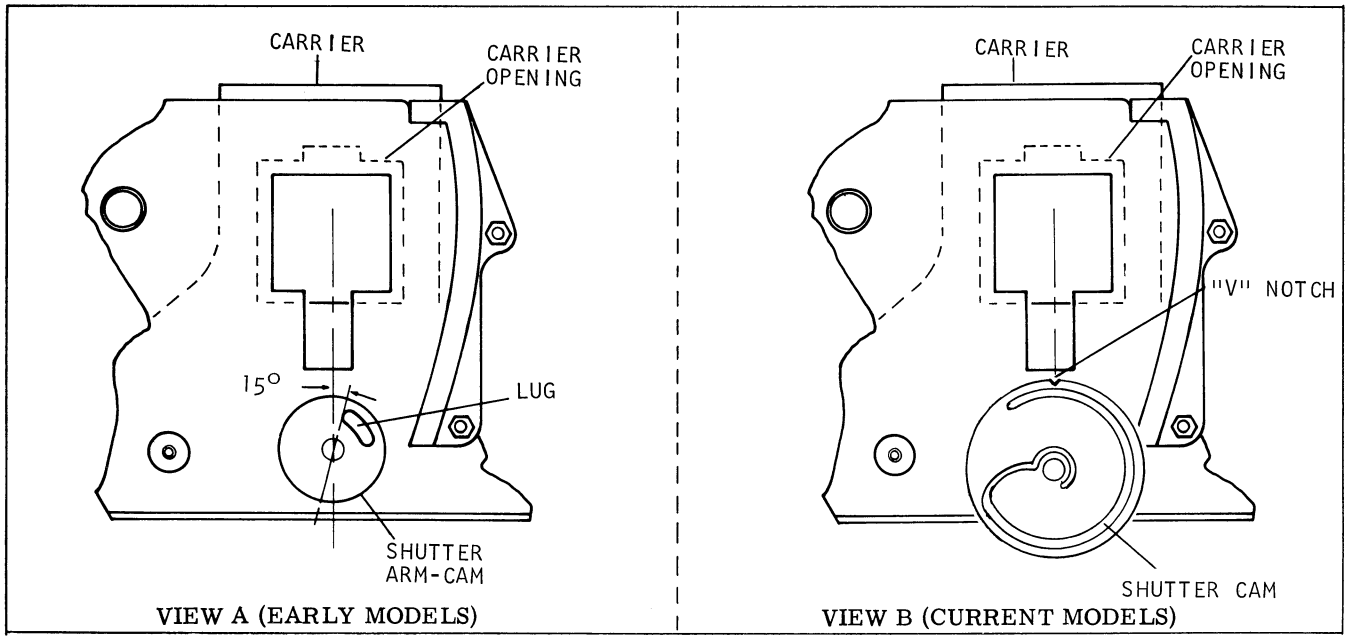


Figure K. Aligning Slide Carrier and Shuttle Arm Cam

u. Assemble slide eject lever assembly (10) with pivot hole over stud hub on aperture plate, with the eject stud placed in aperture preview opening. Install the flat washer (9). Assemble the lifter arm assembly (8) or (8A) with shaft in inside diameter of hub, simutaneously inserting the lifter arm button (7) between the lifter arm assembly and the aperture plate with the shank through the hole in the lifter arm and flange in the guide track. Secure the lifter arm assembly with the washer (5) and the retaining ring (4). Assemble washer (6) to shank of button (7) with concave side down. Install retaining ring (3) firmly on shank of button. Check movement of lifter arm assembly; it is important that lifter arm assembly move freely and not bind in any way. Install springs (1) and (2).

11. REASSEMBLY OF PARTS IN FIGURE 5. Reassemble parts in reverse order of disassembly, noting the following special instructions.

NOTE: Model 950 projectors are not equipped with the automatic focus feature. In the following reassembly procedure, steps a through f will apply only to the Model 960 and 961 projectors. The remaining steps (g through j) apply to all projectors and should be followed when repairing Model 950 projectors.

a. If photoconductive cell (27) was removed for replacement, insert replacement part into bracket (28) and secure the cell in place with adhesive applied to flange area of cell. The surface of cell facing lens (26) must be free of adhesive. Line up line across center of photocell with line on bracket. Double leads to be up toward open side of the bracket (see Figure L).

b. If lens (26) was replaced, cement new lens to the bracket (28) with plastic cement applied to outside perimeter of lens. Front and back faces of lens must be free of adhesive.

c. If lens (23) was replaced, cement new lens to the bracket (24) with plastic cement applied to outside perimeter of lens. Front and back faces of lens must be free of adhesive.

d. After inserting lamp (20) into socket (22) making sure it bottoms on lower strip, secure with plastic cement.

e. Remove cam gear of focus motor and reducer (14) and remesh by aligning cam rise centerline with flange boss as shown in Figure M. Position the focus plate (15) to focus motor and reducer (14) lining up bosses and holes in motor with holes in plate. Assemble two screws (13) through plate into motor and tighten the screws securely.

f. If disassembled, assemble light baffle (3) over counterbored end of light shield tube (2) with extruded flange toward tube. Assemble lens light baffle (1) to opposite end of tube (2) with extruded flange toward end of tube. Insert filter (4) into counterbored end of tube. Install assembly into photocell bracket of focus assembly with counterbored end over shoulder of photocell and opposite end over lens. Push both light baffles completely to ends of tube capturing tube between flanges of photocell bracket. Apply a dab of adhesive at inner side of both light baffles, securing them to tube. Fasten terminal strip (6) to carriage with screw (5).

g. Position lens drive gear bracket (12) to lens carriage assembly (29) lining up bracket holes with holes in carriage while holding bracket with flanges facing toward assembled stud of carriage. Assemble two screws (11) through bracket into carriage and tighten the screws securely.

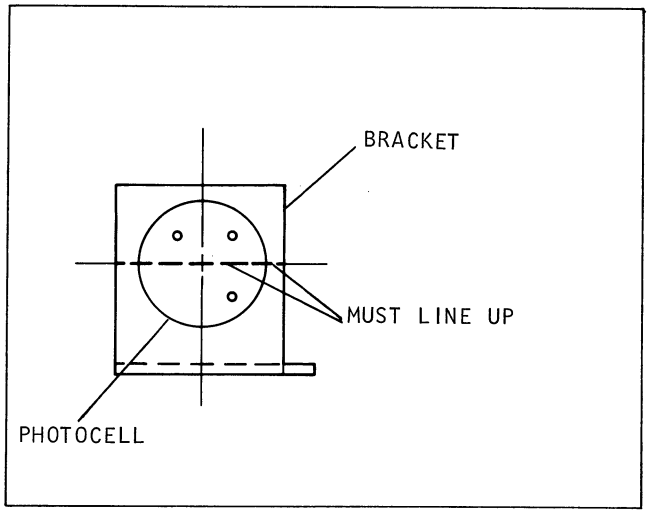


Figure L. Positioning Photocell In Bracket (Models 960 and 961 Only)

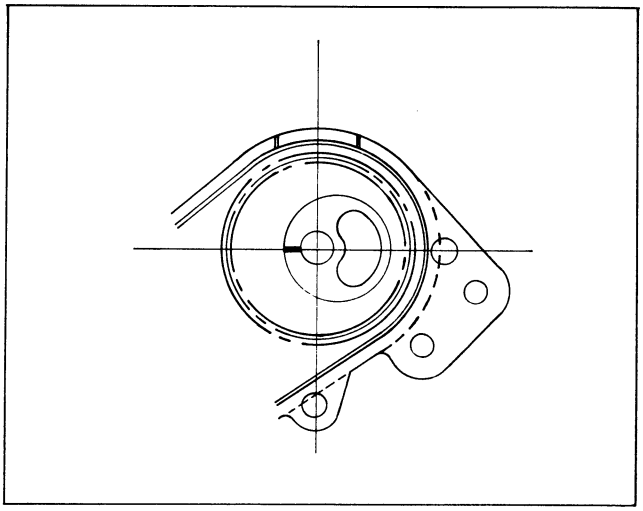


Figure M. Aligning Cam Gear in Motor and Reducer (Models 960 and 961 Only)

h. Assemble shaft and gear assembly (10) to drive gear bracket (12) with shaft through two flange holes and gear centered with lens carriage. Secure with two retaining rings (9).

i. Lightly grease the bottom surface that rides against focus plate and rectangular cam slot of lens carriage assembly (29). Assemble the focus plate to lens carriage (29) with stud of focus plate through slot in carriage and the stud of carriage through hole in focus plate. Lightly grease the focus plate (15) around the oblong slot. Position a 0.003 inch shim around stud against focus plate. Assemble the washer (8) to stud extending from focus plate. Assemble lock nut (7) to stud against washer. Back off nut to allow slight friction against shim. Remove shim.

j. Lightly grease the inner surface of lens carriage around oblong slot. Position a 0.003 inch shim around stud at inside of carriage. Assemble washer (8) to focus plate stud at inside of carriage. Assemble lock nut (7) to stud against washer. Back off nut to attain slight friction against shim. Remove shim.

12. REASSEMBLY OF PARTS IN FIGURE 4. Reassemble parts as outlined in the following paragraphs, noting any special instructions and precautions.

NOTE: As indicated in the Figure 4 parts list, there are a number of physical differences between early and current Model 950 and 960 projectors. The design change in Model 950 projectors occurred at serial number 3201; in Model 960 projectors at serial number 18500. All Model 961 projectors were manufactured with early design parts. Those parts whose part numbers are preceded by a single asterisk are used in early models only and have been deleted from all current models. Those parts whose part numbers are preceded by a double asterisk have been superseded by parts bearing the same index number but with a letter suffix. For example, sector spring (2) is used in early models only and, in current models, has been superseded by sector spring (2A). Clutch spring (15) is used in early models only and, in current models, has been superseded by clutch spring (15A) and spring retainer cups (15B) and (15C).

a. Use a speck of grease to hold the motor spacer washers (62) in place on the tapped mounting bosses of the motor plate (63). Assemble the motor (61) to the motor plate with the two screws (60) and flat washers (60A). Tighten the screws securely. Assemble the blower wheel (59) to the motor shaft, tightening the blower wheel setscrews into the recessed end of the shaft. The wheel must be positioned as close as possible to the plate without interfering with its rotation.

b. Assemble the two bearings (55) and single bearing (54) to the solenoid bracket assembly (57) or (57A), with the bearing flanges to the outside. Lightly grease the inner diameter of the bearings. Assemble the gear and hub assembly (53) or (53A) through the large bearing (54). In all early model projectors, this gear assembly is secured with a retaining ring (52). In the current Model 950 and 960 projectors, retaining ring (52) is not used.

c. Assemble a retaining ring (48) into the groove closest to the cam of the gear shaft (49). Preassemble the setscrews (47) into the cluster gear (50); then hold the cluster gear up in position within the solenoid bracket assembly, meshing the small diameter gear with the teeth of the gear and hub assembly (53) or (53A) and insert the gear shaft (49) through the bearings (55) and cluster gear (50). Secure the gear shaft with the remaining retaining ring (48).

d. Insert a 0.003 inch shim between the small gear end of the cluster gear (50) and gear shaft bearing (55). Hold the cluster gear against this shim and, while pressing the gear shaft (49) toward the rear (cam end), tighten the cluster gear setscrews (47) securely. Remove the shim.

e. Assemble the retaining ring (51) to the end of the camshaft (56) or (56A). Lightly grease the camshaft and insert it through the gear and hub assembly (53) or (53A). Grease the teeth of the motor worm gear and the gear and hub assembly. Assemble the motor and plate assembly (58) to the solenoid bracket assembly (57) or (57A), meshing the motor worm gear with the cluster gear (50) while aligning the mounting holes in the solenoid bracket and motor plate. Assemble washers (44) to screws (43) and secure the bracket to the motor plate with these two screws, one through the bracket leg below switch (19) and one through the bracket leg below solenoid (40). Tighten both screws securely.

f. Lightly grease both sides of the half cycle slider (42) or (42A) around the oblong slots. Assemble the slider to the mounting studs of the solenoid bracket assembly and secure it with the two retaining rings (41) or (41A). Assemble the solenoid (40) to the solenoid bracket assembly with the bent finger of the half cycle slider hooked behind the rivet in the solenoid plunger. Install and tighten screws (39), or screws (39A) and washers (39B), just enough to hold the solenoid securely to the bracket.

g. Assemble the screws (35) to the solenoid bracket assembly and assemble the spacers (38), insulator (37) and main switch (36) to the screws. Install and tighten the hex nuts (34) securely.

h. Model 960 and 961 Projectors Only. Install ratchet gear (46) and retaining ring (45) on short end of gear shaft (49). Check to make certain that the legs of the ratchet pawl spring on ratchet arm assembly (33) are hooked so that the point of pawl is forced toward ratchet gear (46) when the arm is installed. Hook the spring (30) through the small hole in the pawl end of the arm. Lightly grease the mounting stud on the solenoid bracket assembly and install the ratchet arm and the washer (32) on the stud. The concave surface of the washer (32) must face the arm (33). Install the retaining ring (31) and hook the free end of the spring (30) in hole (Y) of the solenoid bracket assembly. Assemble the timer knob bracket assembly (28) to the hub of the timer knob (29) and assemble the knob to the shaft (49), securing it with the washer (24) and retaining ring (23). The free end of the bracket (28) must be secured to the mounting tab of the solenoid bracket with rivet (27).

i. Assemble the cycle knob spring (22) or (22A) to the hub of the cycle knob (21). Secure the knob on the front end of the shaft (49) with the retaining ring (20). Hook the ends of the cycle knob spring as shown in Figure T. Note that the early style spring is hooked differently than the current style.

j. Model 960 and 961 Projectors Only. The gap between the contact point of the timer switch (19) must be 0.018 inch minimum to 0.026 inch maximum. Check the gap with the feeler gages and, if necessary, adjust by bending the bottom switch blade carefully as close as possible to the switch stack. Carefully assemble the timer switch to the solenoid bracket assembly so that the finger at the end of the lower blade contacts the ratchet gear (46). Install and tighten the two screws (18) securely.

k. Lightly grease the mounting stud for the carrier drive sector (17). In current projectors only, assemble the torsion spring (2A) to the hub of the sector and install the sector and flat washer (16A) on the mounting stud. Secure these parts with the retaining ring (16). Engage the ends of the torsion spring (2A) as shown in Figure T.

l. If disassembled for cleaning or replacement, the driven clutch (12A) and clutch spring retainer (12B) must be properly reassembled before installation. As shown in Figure N, the alignment differs somewhat in early and current projector models. In Model 961 and early Model 950 and 960 projectors, the retainer must be assembled into the clutch with the 0.190 inch slot and 32-degree opening aligned as shown in View A. In current Model 950 and 960 projectors, hold the driven clutch as shown in View B and assemble the retainer into the clutch so that the first right-hand tooth on the retainer meshes with the fifth tooth clockwise from the 30-degree opening in the driven clutch.

m. Early Models Only. Lightly grease the hub end of gear assembly (53). Install the clutch spring (15) onto the gear hub with the long tang of the spring pointing toward the half cycle finger stop of the slider (see View A, Figure P). Loosen the solenoid attaching screws slightly and, with the solenoid plunger fully compressed into the solenoid barrel, shift the solenoid in its elongated mounting slots until the half cycle finger stop is 1/32 inch from the end of the spring tang. Tighten the solenoid attaching screws securely. Lightly grease the outside diameter of clutch spring (15) and both ends of the camshaft spring (13). Assemble the washer (14), spring (13) and clutch assembly

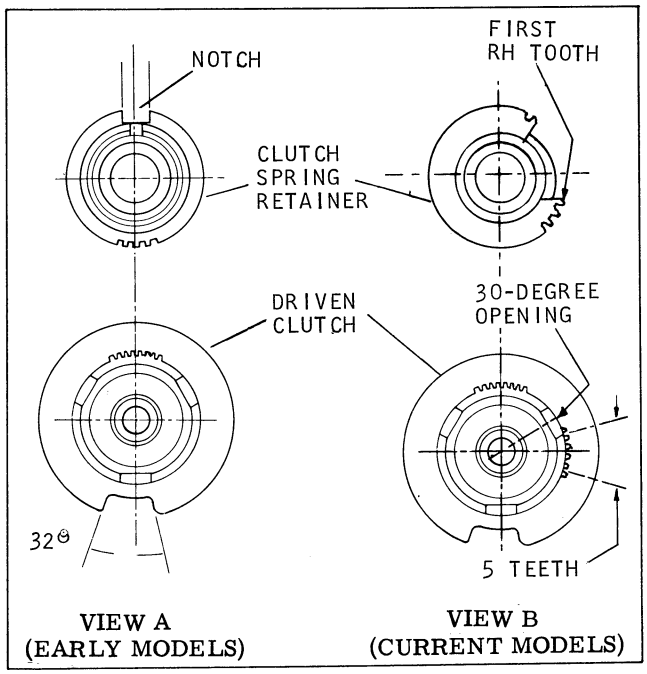


Figure N. Aligning Driven Clutch and Retainer

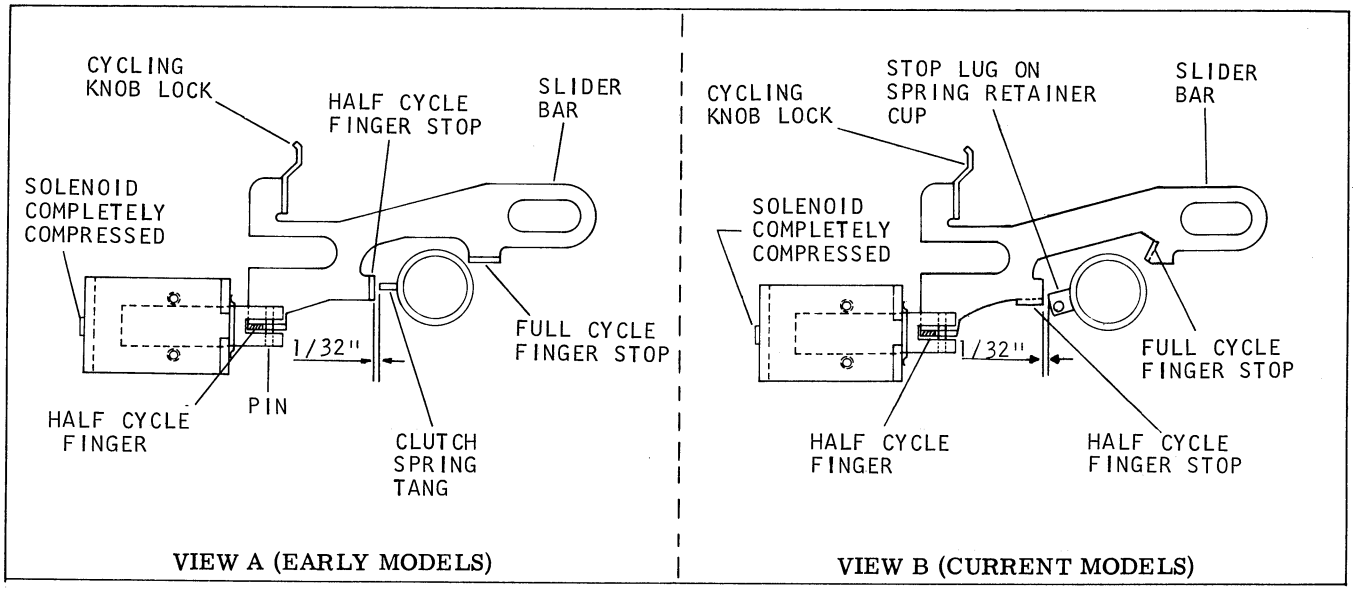


Figure P. Positioning the Cycling Solenoid

(12) to the camshaft, engaging the smaller tang of the clutch spring with the spring retainer slot in the clutch (12). Compress these parts and install the washers (10) and spring (11) to the camshaft. Assemble the master cam (9) to the camshaft over the spring engaging lugs of the clutch assembly and with the inner cam rise at approximately 9 o'clock.

n. Current Models 950 and 960 Only. Lightly grease the hub of the clutch spring retainer (12B) and assemble the retainer into the driven clutch (12A) with the locating finger and slot aligned. Lightly grease the inside of the spring retainer cups (15B) and (15C) and the outer diameter of the clutch spring (15A). Assemble the clutch spring and retainer cups and install these on the hub of gear assembly (53A). Make certain that the half cycle slider (42A) is fully to the right (solenoid in de-energized position). Rotate the spring retainer cups in opposite directions to enlarge the inside diameter of the spring (15A); then press the assembled cups and spring fully into place on the gear hub, making certain that the protrusion on the cup is located just beneath the slider tang nearest the solenoid. Loosen the solenoid attaching screws slightly and, with the solenoid plunger fully compressed into the solenoid barrel, shift the solenoid in its elongaged mounting slots until the half cycle finger stop is 1/32-inch away from the stop extrusion on the cup (15C) as shown in View B, Figure P. Hold solenoid while tightening the solenoid screws securely. Lightly grease the outside of spring cup (15B) and both ends of spring (13A). Lightly grease both sides of spacer (11A) and apply grease to the detent of the clutch driver, the camshaft and the detent and cam surfaces of the master cam (9A). Assemble the spring (13A) to the camshaft (56A). Lightly grease the inside surface and slot of spring retainer (12B) and assemble the spring retainer and driven clutch (12A) to the camshaft and over the spring (13A), engaging the slot in the retainer (12B) with the drive finger on spring retainer cup (15B). Compress and hold all clutch parts and install spacer (11A) on camshaft. Assemble steel ball (10A) into the ball seat of the master cam (9A) and assemble the master cam to the camshaft. Place the cam follower of the drive sector (17) against the zero setting on the master cam.

o. Compress the master cam and driven clutch parts while assembling the aperture plate assembly (8) to the solenoid bracket assembly. The cam end of the shaft (56) or (56A) must be inserted through the bearing in the aperture plate and the two tapped studs must be aligned with their respective elongated holes in the aperture plate and solenoid bracket.

NOTE: The cam follower stud of the lifter arm, assembled to the aperture plate (see Figure 4), must ride on the outside surface of the lifter arm cam section of the master cam (9) or (9A). The gear teeth of sector (17) must not be engaged.

p. Install the two screws (7); one through the solenoid bracket and into tapped mounting stud; the second through the aperture plate and into the tapped mounting stud. Tighten both screws securely. Assemble the washer (6) to the protruding end of the camshaft (56) or (56A) and secure the camshaft with retaining ring (5).

q. Lightly grease the teeth and cam surface of the master cam. Shift the slide carrier toward the master cam, lining up the aperture openings in the carrier aperture plate. Hold the cam follower of the sector (17) against the high point mark of the master cam as shown in Figure Q and engage the sector gear teeth with the aperture plate cluster gear (19, Figure 6).

r. Position the pivot bridge (4) on the leg of the solenoid bracket with the bent-up ear facing the aperture plate, and secure the bridge with the screw (3).

s. In early model projectors only, assemble the sector spring (2) and retaining ring (1).

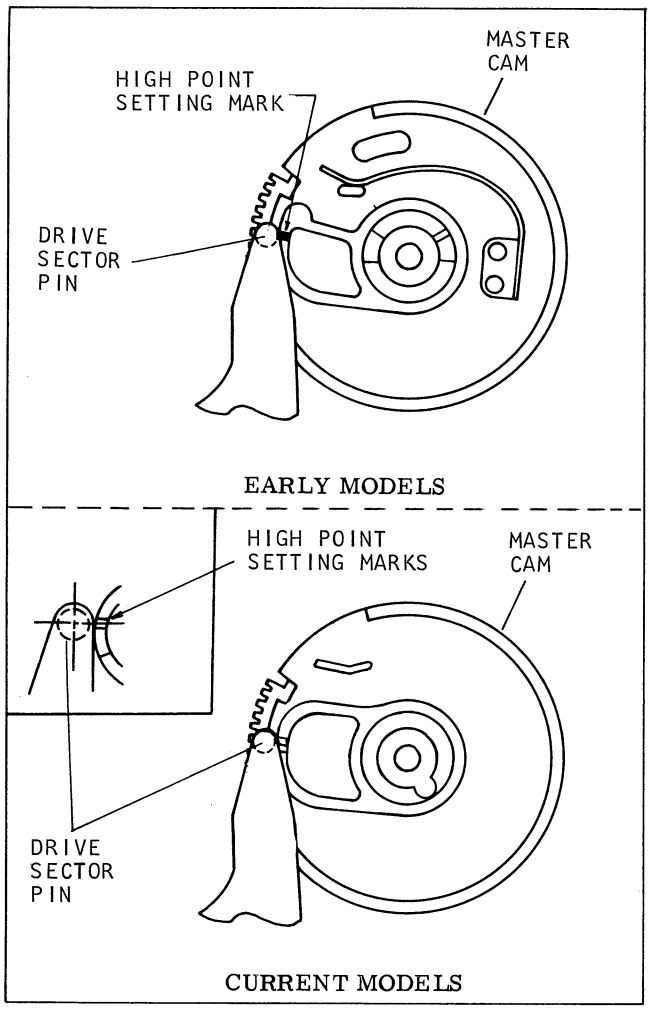


Figure Q. Positioning Carrier Drive Sector and Master Cam

13. REASSEMBLY OF PARTS IN FIGURE 3. Reassemble parts in reverse order of disassembly, noting the following special instructions.

NOTE: The proper installation of all torsion springs is illustrated in Figure T.

a. If preview screen (19) was removed from preview frame (20), insert screen into frame with frosted side facing the inside of frame by snapping into position under the three lugs of the frame. Apply a bead of adhesive along the edge of the screen at four sides. The adhesive is to be made from the following mixture: Three parts Methaline Chloride, two parts Toluol, and three parts Acetone mixed by volume.

b. Assemble the tray holddown (16) in cover assembly tray track area with forked leg through cover slot to the inside of the cover and fork around boss, and small boss of holddown through elongated hole of cover. Install preview screen latch (17) with boss through cover hole at front of previewer opening. Lubricate the cover with grease around preview screen latch and tray holddown bosses. Position three 0.005 inch shims as follows: one shim around latch boss at inside of cover, one shim around holddown boss at inside of cover, and one shim around cover boss at forked leg of tray holddown. Assemble retaining ring (15) and two retaining rings (13), one to each boss against the shim with flat side down. Remove shims. Assemble holddown spring (14) over cover boss adjacent to previewer latch with short leg against latch boss and long leg against inner wall of cover. Secure with third retaining ring (13).

c. Assemble preview shaft (12) through holes of previewer assembly (18). Position previewer assembly to inside of projector cover with screen side of previewer to outside and shaft (12) located in notches of cover with excess length of shaft pushed toward the switch (27) side. Insert screws (10) through clamps and tighten securely. Assemble the preview spring (9) to preview shaft (12) adjacent to spring clamp with short leg to outside and down against cover, long leg to inside with hooked end positioned in slot of previewer assembly.

d. Assemble holddown spring (8) to shortest boss at center of projector cover with short leg engaged between two lugs at end of forked leg of tray holddown (16). The long leg of spring (8) is to bear against the large boss adjacent to the spring boss. Secure spring with retaining ring (7). Assemble one retaining ring (1) to cover assembly boss at outer edge of tray holddown, with flat side of ring down. Ring to be approximately 3/32 inch from top of boss.

e. Position a 0.005 inch shim to the shoulder of cover assembly boss at tray holddown fork. Assemble restrictor spring (5) to the boss against shim with shear form upward, and plate extending over slide eject opening. Install restrictor plate spring (5) to the boss with legs toward eject opening; lower leg captured under shear form of restrictor plate. Assemble retaining ring (1) to boss securing spring and remove shim. Hook the free leg of spring under ring on boss at edge of the tray holddown.

NOTE: Restrictor plate must be free to move after assembly.

f. Position a 0.005 inch shim around light shield boss of cover assembly. Assemble light shield (4) to light shield boss with shear form upward and shield extending over slide channel opening. Install washer (3) (see Figure R). Install one retaining ring (1) to boss. Assemble light shield spring (2) to boss with double bend leg captured beneath light shield shear form and opposite end captured beneath ring on boss at edge of tray holddown. Assemble second retaining ring (1) to boss securing spring and remove shim.

NOTE: Light shield must be free to turn after assembly.

g. If replacing the nameplate (24), remove the paper backing and moisten the adhesive with solvent (three parts Toluol to one part Trichlorethylene). Apply the nameplate to the projector cover and rub with a clean cloth to assure adhesion and remove excess solvent.

14. REASSEMBLY OF PARTS IN FIGURE 2. Reassemble parts as outlined in the following paragraphs, noting any special instructions or precautions.

NOTE: Refer to the appropriate wiring diagram at the rear of the parts catalog section for proper wiring connections to all electrical components. Wherever possible, wiring connections should be made before components and assemblies are mounted in the projector base.

a. Model 961 Only. Assemble the lock washer (60) to the threaded hub of the circuit breaker (59). Assemble the circuit breaker into the guard (62), which is staked into the floor of the base, and secure the circuit breaker with the hex nut (58).

b. If the AC connector (57) was replaced, install the new connector and the bezel (56) with screws (P/N 31976), washers (55) and hex nuts (P/N 28311). The bumper (52) is cemented to the shutter pad (53) which, in turn, is cemented to the base. Light baffles (50) and (51) also are cemented to the base. If a new mirror (48) is being installed, apply adhesive to the three mounting bosses of the base casting and mount the mirror with the silvered surface facing the preview lens opening.

c. Model 960 and 961 Projectors Only. Assemble the printed circuit board (39) and insulator (40) to the storage bracket (41) with two screws (P/N 31551) and hex nuts (P/N 28311) in place of the rivets removed during disassembly.

d. Assemble two screws (27) through reverse solenoid bracket and lever assembly (28) and secure lever assembly to base. Tighten both screws securely while simultaneously holding bracket toward side wall of base. Assemble reverse solenoid and pin assembly (26) within flanges of solenoid bracket with the top of lever assembly (28) beneath pin of solenoid. Loosely assemble two screws (25) through bracket into solenoid. Line up top of solenoid with mounting bracket thus aligning solenoid in proper position. Tighten the screws (25) securely. Check to make certain that the tip of the reverse lever is centered in the solenoid plunger slot. Bend lever if necessary.

NOTE: If buzzing of solenoid should occur when operating projector, the solenoid may be lined up improperly and it will be necessary to shift it slightly in the slot of the bracket to allow the barrel to seat.

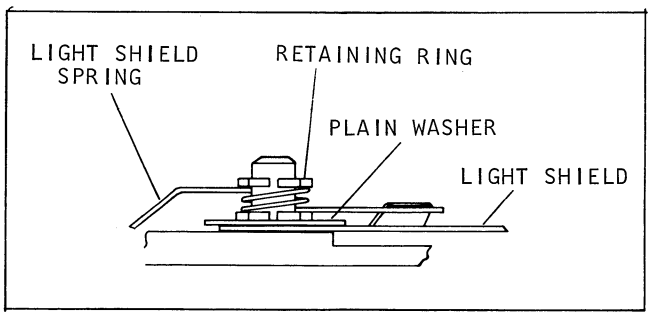


Figure R. Installing the Light Shield

e. Fasten the miniature lampholder (22) to the tapped bosses in the base with the two screws (21). Secure the reflector bracket (24) down into the base with two screws (23).

NOTE: When repairing early model projectors equipped with motor P/N 072443 (item 61, Figure 4), resistor parts (22A) through (22E) must be mounted to the reflector bracket and connected into the electrical circuit as shown in the wiring diagrams at the rear of this manual. When motor, P/N 072443 is no longer available, motor P/N 072370 will be furnished as a replacement. When this occurs, resistor parts (22A) through (22E) must be removed and the violet wire from the motor tap connected directly to the violet wire from the viewer lamp socket. Twist the violet leads together and hold the splice with a solderless connector.

f. Assemble the handle (45) and handle insert (46) and secure to the base with the tapped end caps (44), screws (42) and washers (43). Assemble the remote socket (37) into the storage bracket (41) with the socket retainer and, after wiring connections have been made to the socket, mount the bracket into the base with the two screws (35).

g. Loosely assemble preview lens bracket (18) to base assembly preview lens boss with two screws (17). Install previewer lens assembly (20) beneath bracket with recessed lens toward mirror mounting pad, large ribs at sides and smaller center rib down in "V" of base.

h. If socket assembly (12) is replaced, assemble with two screws (P/N 31551) and two nuts (P/N 28311) in place of rivets (11). Assemble socket and condenser bracket assembly (9) to base with three screws (8).

i. Form the "sunburst" hole in light shield (19) and fold at scores to shape as shown in Figure 2. Position folded light shield (7) or (7A) with mounting tab at the auto-focus assembly mounting hole.

j. Lubricate lamp eject lever (5) on both sides around the two oblong slots. Assemble lever to lamp socket shield and pivot assembly (6) with flat length of lever against shield and oblong slot over stud resting against shoulder. Assemble camshaft washer (4) to stud and over lever. Assemble retaining ring (3) to stud groove to retain lever and washer. Assemble eject lever spring (1) with inturned loop hooked through small hole of eject lever from lever side and opposite end hooked into shield notch from the lever side. Position shield and pivot assembly (6) with eject lever (5) assembled to lamp socket assembly (9), locating three holes in shield over three studs, eject lever to be down with center stud through oblong slot of lever. Install three screws (2) through shield into studs and tighten securely.

15. REASSEMBLY OF PARTS IN FIGURE 1. Reassemble parts as outlined in the following paragraphs, noting any special instructions or precautions.

NOTE: Refer to the appropriate wiring diagram at the rear of the parts catalog section for proper wiring connections to all electrical components. Wherever possible, wiring connections should be made before components and assemblies are mounted in the projector base.

a. Lightly grease the inside surface of reverse solenoid lever (28, Figure 2) to the first bend and on top of dimple. Position mechanism assembly (42) within the base assembly with motor plate tab beneath reflector bracket tab, lining up holes in motor plate and aperture plate with holes in base bosses. Start two screws (37) through aperture plate flange into base.

NOTE: Two holes in aperture plate flange located below septum lock bridge are to be left open.

Bend tab of cable clamp (38) to 90 degree angle and assemble to aperture plate flange with one screw (37). Start one screw (36) through terminal strip (40), insulator (41) and motor plate into base. Start two screws (37) through motor plate into base at shear form and below interlock switch. Install one screw (37) through leg of condenser bracket assembly and leg of aperture plate into base. Tighten all screws securely including the two screws (7, Figure 4) which attach the aperture plate to the solenoid bracket.

NOTE: With the mechanism assembly installed, set the distance between the aperture plate on the mechanism and the flange on the previewer lens (20, Figure 2) at 1.785 inch. This is the initial focus adjustment. Tighten screws (17, Figure 2) securely.

b. Position interlock switch (33) to motor plate lining up two holes in interlock assembly with holes in motor plate adjacent to motor coil. Assemble two screws (32) and tighten securely.

c. Assemble preview condenser (31) to condenser lens bracket of mechanism assembly with the shallowest curve facing toward the aperture plate. Tighten two screws (30) securely.

d. Early Models Only. Assemble spring washer (29) to aperture plate shutter stud with convex surface up. Lubricate shutter stud with grease, B & H Spec. 1307. Install shutter assembly (28) to shutter stud with arm out and above shutter cam. Assemble retaining ring (27) to groove of shutter stud.

e. Current Models. Assemble the shutter return spring (29A) to hub of shutter assembly (28A). Lightly grease the mounting stud protruding from the aperture plate and install the shutter, securing it to the stud with retaining ring (27).

f. Position focus assembly (26) within the base assembly, lining up four holes in focus plate with holes in base bosses and focus shaft extending through oblong hole at side of base. Assemble four screws (25), with the screw at forward hole near focus motor to extend through tab of light shield. Tighten the screws securely.

g. Apply Loctite to setscrews (23) and preassemble them to focus knob (24). Assemble focus knob to focus shaft, lining up one setscrew with the flat of the shaft. Tighten setscrews securely. Adjust mechanism (paragraph 17) before continuing with reassembly.

h. Install preview lamp (22) in socket by pressing down and to the right.

i. Clean surface of preview mirror and both sides of all condenser lenses with optics cleaner.

j. Set projection lamp (19) into socket and rotate slowly until it drops into position and cannot rotate further. Press firmly on lamp until it is seated. Replace grille (18) by hooking ears on bottom over the notches in the projector base and snapping the top into place.

k. Wipe the front and back surfaces of the projector lens with a soft, clean, lintless cloth. Install lens beneath spring clip firmly until it engages the threads on the lens housing. Turn focus knob until lens is returned to desired position.

l. Perform all adjustments (paragraph 15 through 20); then refer to FINAL TEST section and perform the required inspections and tests to insure that the projector is working properly.

m. Connect red and yellow leads from base assembly to On-Off switch terminals in top assembly (21). Carefully place the top assembly in position on the base, freeing the light shield (4, Figure 3) and at the same time making sure that the shield does not catch under the lifter arm. Be careful that the top does not hang up on the knobs. Press preview screen down until it locks in place. Hold the top firmly to the base and turn the projector over. Install mounting screws (20), one to each corner and tighten securely. Place projector right side up.

n. In order to mount the top plastic cover (P/N 072472), it is necessary that the motor switch be left on and the power cord disconnected from the AC outlet. With the motor switch left on, the projector is in a full cycle position and the preview slot restrictor plate (6, Figure 3) is out of the way allowing the plastic cover lock to be inserted.

15. ALIGNMENT OF FOCUS ASSEMBLY (FIGURE 5). Models 960 and 961 Only. The lamp bracket (19) and the photocell bracket (25) of the focus assembly must be properly aligned to provide automatic focusing of each slide as it is viewed. The alignment procedure is as follows:

a. Place the projector in half cycle and insert a target slide made as shown in Special Tools, Figure B, into the bridge assembly.

b. Position the lamp bracket assembly by loosening the two mounting screws (16) and shifting the bracket so that the light beam shines on the target area of the target slide. Reset the mounting screws.

c. Position the photocell bracket assembly by loosening the two mounting screws (16) and shift the bracket so that the reflected light beam appears at the center of the photocell. Reset the mounting screws.

d. If the focus motor keeps moving continually, the photocell is receiving too much light; bend the lamp (20) slightly so only a part of the light beam reflects into the photocell.

16. POSITIONING OF CYCLING SOLENOID (FIGURE 4, ITEM 40). Cycle the projector by using the motor switch. Depress the motor switch momentarily and projector should complete one full cycle.

NOTE: In the Model 961 and early Model 950 and 960 projectors, the tang of the clutch spring (15) should be against the half cycle finger stop on the slider (View A, Figure P). In current Model 950 and 960 projectors, the stop extension of the spring retainer cup (15C) will be against the half cycle finger stop (View B, Figure P).

Depress and hold the motor switch and projector should complete a half cycle. It is in this position that the motor switch can be fully depressed and the clutch spring tang (15) is against the full cycle finger stop, Figure N. If the projector does not stop at the full cycle finger stop, the distance between the half cycle stop and the spring tang should be increased slightly. See paragraph 11, step 1, of the Reassembly procedures.

17. CHECK AND ADJUSTMENT OF MECHANISM ASSEMBLY. Check and adjust the mechanism assembly as follows.

a. Activate motor switch.

b. Visually check that sector gear follower (17, Figure 4) lines up with timing mark on master cam (9). See paragraph 11, step p, of Reassembly procedures.

c. Visually check for centering of slide carrier (42, Figure 6) aperture opening with aperture plate preview opening. If openings are not aligned, grasp top of slide carrier, pull up to disengage rack teeth and adjust to center openings.

NOTE: The shutter cam must be held to keep from turning during this adjustment.

d. Activate timer switch to ON and allow machine to cycle two times. Deactivate timer switch.

e. Early Models Only. Check position of actuator arm (13, Figure 6) and readjust if necessary. See Figure G.

18. RELIEVING MOTOR SWITCH JAMMING. If the motor switch jams in the off position, the locking arm of the cycle knob (21, Figure 4) is not seated properly in the driven clutch (12) slot. Turn off the projector and relieve the pressure on the driven clutch by turning the blower wheel (59) clockwise. This will back off the worm gear of the motor (61) and allow the locking arm of the motor switch knob to be released.

19. SLIDE JAMMING.

a. Model 961 and Early Model 950 and 960 Projectors. If a slide, or slides, should jam in the projector, remove slide tray and any slide that can be easily reached by hand. Press the slide change button at least twice to clear projector of any other slides. If slide jamming occurs frequently, the fault may be in the lifter cam spring of master cam (9, Figure 4). Improper setting of the spring will cause the lifter arm to hit the slide tray (raise too high). Use a long nosed pliers to bend the spring slightly to allow the lifter arm to be dropped sufficiently so as not to hit the slide tray. See Figure S.

b. Current Model 950 and 960 Projectors. Because of design changes, it is highly improbable that slide jamming will occur in current Model 950 and 960 projectors. If it does, check for sluggish movement of the actuator arm (Figure G, View B). Sluggish actuator movement can be caused by the following.

(1) Excessive friction between the actuator slide assembly and aperture plate. Do not use oil or grease in this area and make certain that the carrier rod cams and gear is not excessively greased. Excess grease may "drift" onto the slide. Clean the area thoroughly and bend the slide slightly away from the aperture plate to relieve friction.

(2) The actuator spring may be weak. Either bend the spring to increase the tension or replace it.

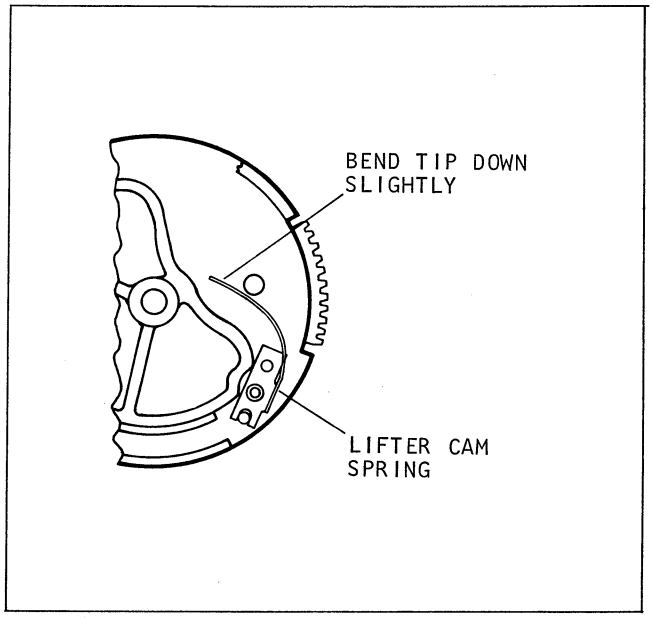


Figure S. Adjusting the Lifting Cam Spring (Early Models Only)

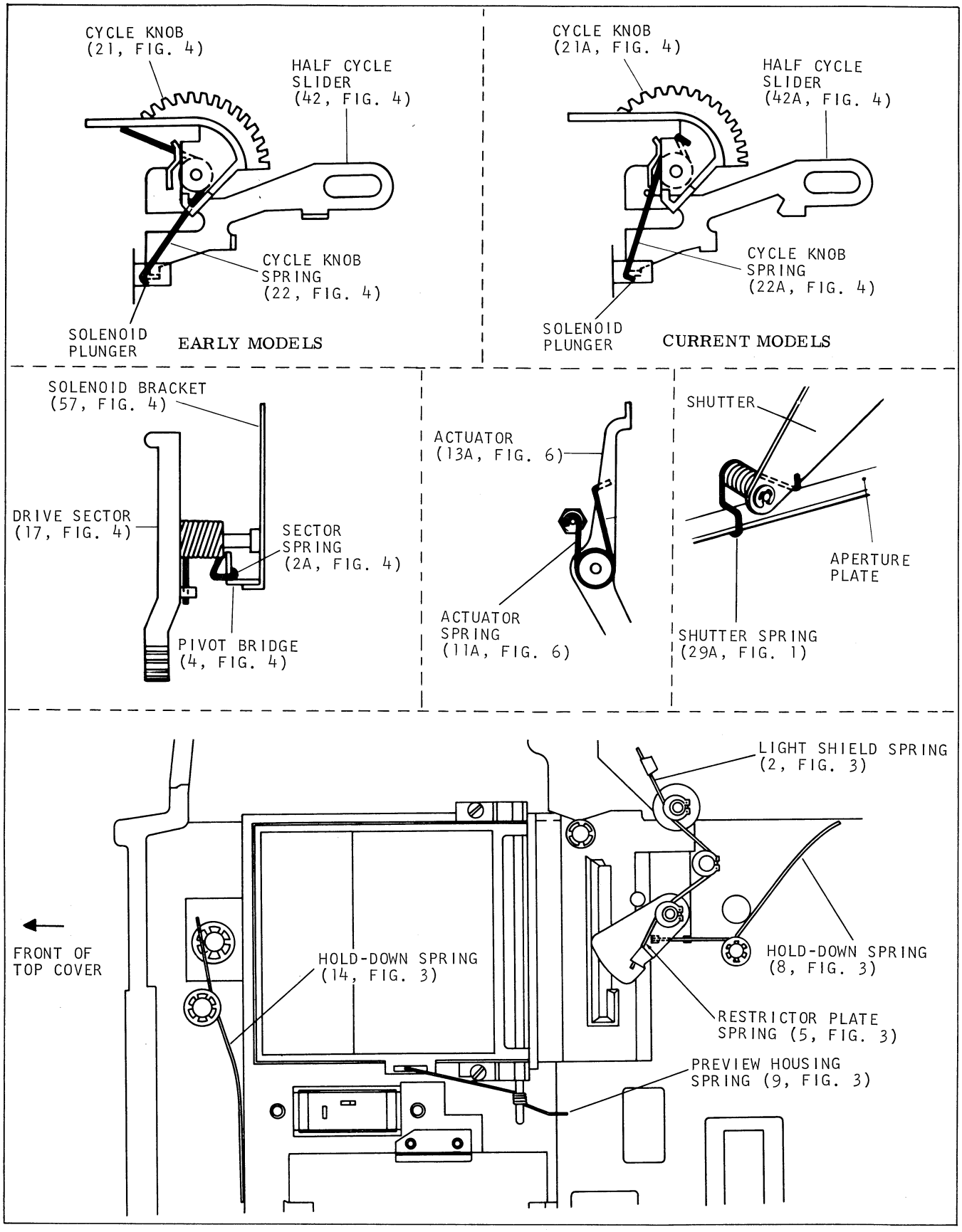


Figure T. Proper Installation of Torsion Springs

(3) If the projector being repaired has a grommet on the slide activating stud, remove and discard (do not replace) the grommet.

(4) If the up and down cam on the carrier rod is split, remove the cam and install a new one.

20. CLUTCH SYNCHRONIZATION. If the driven clutch and clutch spring retainer are not synchronized properly as shown in Figure N, the following problems may exist.

a. The master cam (9) will revolve too far and the guide lug of the gear sector (17) will override on the master cam so the projector will continue to cycle.

b. The master cam (9) will not revolve far enough and the lug of the gear sector (17) will not ride far enough on the cam allowing the carrier to stop before it reaches the previewing position.

c. The master cam teeth will activate the locking gear too soon or too late causing the slide tray index gear to move the tray out of synchronization with the return of the slide carrier and the upward movement of the lifter arm.

d. Place a screwdriver in a slot of the driven clutch and force the clutch spring retainer out far enough to insert a knife blade or similar flat piece of metal between the teeth of the retainer and the driven clutch. Rotate the retainer one tooth at a time toward the solenoid to eliminate problems noted in steps b and c above; or rotate the retainer one tooth at a time toward the gear sector to eliminate the problem of steps a and c above.

Trouble Shooting

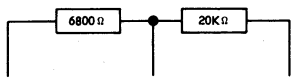
GENERAL.

Whenever there is a problem in the electrical operation of the projector, the line cord should be unplugged and a visual inspection made of the wiring. Check for: poor solder connections, wires that are not soldered, solder bridge between two or more lugs on the terminal strips, bare wires touching either each other, the chassis, or other metal parts of the projector, and finally, improper wiring in the projector. Proper wiring connections are shown in the pictorial wiring diagrams at the rear of this manual. Also, any time the motor does not turn, but the preview lamp and scan lamp light, the system should be checked to make sure that the motor is not locked-up due to some mechanical problem.

When checking the automatic focus assembly (Models 960 and 961 only), it should be remembered that before any testing of printed circuit board or photocell is begun, all connections and the alignment of the auto-focus system should be examined. This includes filter placement, lens placement, scan lamp operation, and proper voltages to printed circuit board. If there is no voltage at solenoids, the drive motor is open or shorted, or fuse is open, then the auto-focus system will not operate. If there is no filter in the system, or the scan lamp is bad, or one of the scanning lenses fell out, the system will not operate.

TROUBLE	PROBABLE CAUSE	REMEDY
Timer not working properly (Models 960 and 961 only).	1. Defective switch (19, Figure 4).	1. Replace switch.
	2. Spring (30, Figure 4) of ratchet arm not connected or stretched.	2. Connect spring or replace if distorted.
	3. Ratchet arm spring not positioned properly or broken.	3. Reposition or replace assembly.
	4. Switch (19, Figure 4) contacts not positioned properly.	4. Reposition contacts (paragraph 12, step j).
	5. Ratchet gear (46, Figure 4) teeth worn.	5. Replace ratchet gear.
	6. Ratchet gear stop finger on switch (19, Figure 4) not in contact with gear.	6. Readjust (paragraph 12, step j).
Motor switch jams in off position	1. Locking arm of switch knob not seated properly in slot of driven clutch.	1. See paragraph 18.
Slides jam in projector	1. Warped or damaged slides or improper setting of lifter arm spring of master cam.	1. See paragraph 19.
Focus motor moves continuously (Models 960 and 961 only)	1. Photocell receiving too much light.	1. See paragraph 15.
	2. Defective photocell or infra-red filter.	1. Replace defective parts.
Projector does not stop cycling	1. Clutch assembly not synchronized properly.	1. See paragraph 20.
Carrier stops before reaching preview position	1. Clutch assembly not synchronized properly.	1. See paragraph 20.
Tray index gear out of synchronization with lifter arm and carrier	1. Clutch assembly not synchronized properly.	1. See paragraph 20.
Openings of carrier and aperture preview not centered	1. Slide carrier not positioned properly.	1. See paragraph 17.
Focus assembly not functioning properly (Models 960 and 961 only)	1. Focus assembly not properly aligned.	1. See paragraph 15.
Focus assembly not operative (Model 960 and 961 only)	1. Defective lamp (20, Figure 5).	1. Replace lamp.
	2. Defective photocell (27, Figure 5).	2. Replace photocell.
	3. Defective motor (14, Figure 5).	3. Replace motor.

TROUBLE	PROBABLE CAUSE	REMEDY
Projector does not operate	1. Main switch not operating.	1. Check for line voltage across lugs 2 and 3 of terminal strip. If no voltage is measured between lug 2 of terminal strip and lug 1 of main switch (wiring diagram) and if line voltage exists between terminal strip and switch, replace main switch.
	2. Interlock switch not operating.	2. If no voltage exists between lug 2 of terminal strip and lug 1 of main switch, check wiring of interlock switch and/or replace interlock switch.
	3. Open line cord or lugs.	3. Check and replace.
Motor and preview lamp do not operate, but projector lamp does	1. One of motor wires in violet sleeving not crimped.	1. Turn off projector and check large crimp-on wire nut. Be sure three wires are crimped together.
Scan lamp flashes when cycle solenoid is actuated or when reverse switch is operated	1. Poorly connected or open fuse.	1. Check and replace.
Cycle solenoid operates with timer switch but not remote control (Models 960 and 961 only)	1. Defective remote control unit.	1. Replace remote control unit.
	2. Defective wiring or remote socket.	2. Check and repair.
Scan lamp does not light	1. Wire leads not crimped.	1. Measure voltage across lamp — 6 vac. If no voltage check crimping of three wires in orange sleeve.
	2. Defective bulb or connection.	2. Check blue lead from printed circuit board, if voltage is alright, check and repair bulb connection or replace defective bulb.
Auto focus carriage moves during half cycle (Models 960 and 961 only)	1. Light leak around shutter blade.	1. Off-center the scan lamp image to the right of center when looking at alignment slide.
	2. Filter improperly installed.	2. Install filter properly.
Slow auto focus system reaction (Models 960 and 961 only)	1. Improper alignment.	1. Center image of scan lamp on photocell (paragraph 15).
	2. Low motor secondary voltage.	2. Check for 28V and 120V input.
	3. Jammed motor.	3. Repair motor.
	4. Carriage too tight.	4. Loosen carriage mounting.
	5. Photocell defective.	5. Replace photocell.
	6. Printed circuit board defective.	6. Check circuit board for defective components.

TROUBLE	PROBABLE CAUSE	REMEDY
Machine cycles continuously even with projector lamp off and no slide in projector	1. Electrical component failure. 2. Bad solder connections.	1. Check circuit board for defective components. 2. Reheat connections at photocell terminal strip to insure no flux in connection. If system trouble persists, unsolder center and outer photocell leads from terminal strip and turn machine on. If system still cycles, trouble is in the printed circuit board. If system does not cycle with photocell leads disconnected, photocell is defective.
Auto-focus completely inoperative (Models 960 and 961 only)	1. Failure in electrical system.	1. Unsolder center and outer photocell leads from terminal strip. Connect three leads of special resistors to three terminals of terminal strip as shown in the following sketch: SPECIAL TEST RESISTORS  System shall operate (cam rotate). Reverse resistors; cam shall reverse direction. If system operates with resistors across terminal strip, photocell is defective. If system does not operate with resistors connected, the printed circuit board focus motor, or associated wiring is defective. Voltage to motor is checked by monitoring voltage across two yellow leads from printed circuit board with special resistors across terminal strip. Voltage should be about 13V or better with resistors across terminal strip and then reversed. If voltage is alright, motor or motor connector is defective.

Final Test

21. GENERAL.

This section contains specific inspections and tests to be performed to insure that the projector is in proper working order. These tests will also aid in diagnosis of the possible trouble or malfunction in the device for troubleshooting and servicing. Note that the unit is to be operated only from a 120 volt ac, 60 cycle power source.

22. INSPECTION PROCEDURE.

a. Visually check the projector for missing parts. Grasp the handle and the opposite side of the projector, invert it and shake to check for loose parts.

b. Position the projector for a Hy-Pot test. Plug in the remote control then, turn on the motor switch and the lamp switch. Set the Hy-Pot to 350 volts AC.

c. Apply the potential, for one second, between the remote storage bracket and each prong of the line cord socket. No breakdown shall occur.

NOTE: The Hy-Pot test must take place before the projector is plugged into any AC receptacle for the first time.

d. Insert lens into projector. Plug line cord into 105 volt source (lowest operating voltage) and into projector. Insert a loaded 40 septum slide tray with adapter into the machine.

e. Activate the preview screen latch allowing screen to rise to open position. The latch and screen must work smoothly with no binds. Check finish of screen (smooth side out), cleanliness, and for illumination.

23. OPERATIONAL TEST.

a. Position the remote control forward/reverse switch to forward. Index the first slide to project position.

b. Manually focus the first slide for a sharp picture.

NOTE: Model 960 and 961 Projectors Only. When projecting slides for all succeeding checks, the automatic focus assembly must focus each slide sharply. A firm push on the change button shall be sufficient to start the slide changing action. Slides should change smoothly with no noticeable jerks or abnormal light flashes. There should be no double cycling, and there should be no abnormal noises.

c. Index the projector through six cycles checking for any abnormal operation.

d. Remove one slide from the machine by activating the slide eject lever. Release the eject lever and reload the slide through the loading slot. The slide must load and unload without hanging up or jamming.

e. Check for half cycle operation by holding the remote slide change button down and racking the tray toward the rear.

f. Position the remote control forward/reverse switch to reverse and cycle six times.

g. Cycle four slides by using the slide change button. Check that index indicator aligns with numbers on the tray adapter.

h. Model 960 and 961 Projectors Only. Activate the timer switch to fast and allow the projector to cycle three times. Activate the timer switch to slow and allow the projector to cycle once. Deactivate the timer switch.

i. Unload the slide tray by operating the tray holddown.

j. Hold slide change button down so that machine is in half cycle and insert a slide into the preview slide carrier but do not allow it to drop all the way down. Cycle the machine two times using the slide change button; the projector should jam and the clutch should slip allowing the motor and fan to continue to operate.

k. Remove jammed slide and cycle the machine two times to achieve normal cycle.

l. Turn off switches and unplug line cord.

Replacement Parts

The following pages illustrate and list, by part number and name, all replacement parts of the Design 950, 960 and 961 Monitor Slide Projectors. Since the illustrations are indexed in the suggested order of disassembly, they will serve as an aid during disassembly and reassembly of the slide projector.

The Usable on Code column indicates, by letters, those parts which apply only to certain projector models. Parts which are used only in Model 950 projectors are coded A; parts which are used only in Model 960 projectors are coded B; parts which are used only in Model 961 projectors are coded C. Where the Usable on Code column is blank, such parts are applicable to all projector models.

There are a number of physical differences between early and current Model 950 and 960 projectors. The design change in Model 950 projectors occurred at serial number 3201; in Model 960 projectors at serial number 18500. Those parts whose part numbers are preceded by a single asterisk are used in early models only (no longer used in current models). Those parts whose part numbers are preceded by a double asterisk also are used in early models only. However, in current models, these double-asterisked parts have been replaced by newly designed parts which bear the same index number but with a letter suffix. For example, the sector spring (item 2, Figure 4) is used in early model projectors and, in current model projectors, has been superseded by sector spring (2A). The clutch spring (item 15, Figure 4) used in early model projectors has been superseded, in current models, by a new clutch spring (15A) and two spring retainer cups (15B) and (15C). CAUTION: Do not attempt to interchange early model parts with current model parts.

Certain accessory parts for the slide projector are listed below. These parts are not shown in the exploded views in the parts list section of this manual.

NON-ILLUSTRATED PARTS

DESCRIPTION	MODELS	PART NUMBER
Top Cover	950, 960	072472
Top Cover	961	072376
Remote Control, 15' extension cord	ALL	765359
Carrying Case Assembly	ALL	072357
Tray Adapter, 30-slide	ALL	072465
Tray Adapter, 40-slide	ALL	072466
Micro-Fit Tray	ALL	071079
Circular Tray, 100-slide	ALL	072468
Projection Lamp, Type DJH, 500W	ALL	765447
Projection Lens, 4-in. f/3.5 (see *Note)	ALL	020577

*NOTE: "Z" Models are equipped with zoom projection lens Part No. 020661 (3.5 to 4.5-inch f/3.5)

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MONITOR SLIDE PROJECTOR		
1-1	765258	CORD, Line	1	AB
-1	765772	CORD, Line, 3-wire	1	C
-1A	33438	ADAPTER, Plug	1	C
-2	072401	CONTROL ASSEMBLY, Remote	1	
-3	765198	. NAMEPLATE, Remote	1	
-4	35156	. SCREW, Flat head, tapping, 4-24 by 1-1/16 inch	1	
-5	765197	. PLATE, Weight	1	
-6	35157	. SCREW, Flat head, tapping, 4-24 by 3/4 inch	1	
-7	33176	. HOUSING, Remote control, top	1	
-8	706291	. COVER, Front	1	
-9	36802	. SCREW, Pan head, 6-32 by 3/8 inch	1	
-10	26906	. NUT AND WASHER, Sems, 6-32NC	1	
-11	39186	. CLAMP, Cable	1	
-12	765253	. CORD, Remote control	1	
-13	765196	. HOUSING, Remote control, bottom	1	
-14	700814	. RIVET, 0.123 inch diameter by 1/8 inch	4	
-15	765354	. SWITCH, Pushbutton (Slide Change)	1	
-16	765355	. SWITCH, Slide (Fwd-Rev)	1	
-17	765256	. BRIDGE, Support	1	
-18	765061	GRILLE	1	AB
-18	765490	GRILLE, Charcoal	1	C
-19	765160	LAMP, Projection, 500W, DHN	1	
-20	36851	SCREW, Pan head, 8-32 by 3/4 inch	4	
-21	No Number	TOP ASSEMBLY, Projector (see Figure 3 for detail parts)	1	
-22	765155	LAMP, Miniature, DBL contact, bayonet base	1	
-23	36765	SETSCREW, Fluted socket cup pt, 6-32 by 1/4 inch	2	
-23	36760	SETSCREW, Fluted socket cup pt, 4-40 by 1/4 inch (use on early models) (NOTE A)	2	
-23A	765285	INSERT	1	
-24	765448	KNOB, Focus	1	
-24	765361	KNOB, Focus (Used on early models) (NOTE A)	1	
-25	36801	SCREW, Pan head, slotted, 6-32 by 1/4 inch	4	
-26	No Number	FOCUS ASSEMBLY (See Figure 5 for detail parts)	1	
-27	17676	RING, Retaining, external, 0.152 ID (E)	1	
-28	072408	SHUTTER ASSEMBLY (Early models)	1	
-28A	072507	SHUTTER ASSEMBLY (Current models)	1	AB
-29	17684	WASHER, Spring tension (use with item -28)	1	
-29A	765818	SPRING, Shutter return (use with item -28A)	1	AB
-30	36841	SCREW, Pan head, slotted, 6-32 by 1/4 inch	2	
-31	020614	CONDENSER, Preview	1	
-32	765393	SCREW, Hex head tapping, 6-32 by 5/16 inch	2	
-33	072444	INTERLOCK ASSEMBLY	1	
-34	765409	. LABEL, Interlock	1	
-35	39504	. SWITCH, Interlock	1	
-36	36842	SCREW, Pan head, slotted, 6-32 by 3/8 inch	1	
-37	36841	SCREW, Pan head, slotted, 6-32 by 1/4 inch	6	
-38	31585	CLAMP, Cable	1	
-39	765074	FUSE, Pigtail, 3 amp, 250 volt	1	AB
-40	765268	TERMINAL STRIP	1	
-41	765293	INSULATOR, Terminal strip	1	
-42	No Number	MECHANISM ASSEMBLY (See Figure 4 for detail parts)	1	
-43	19192	NUT, Leveling foot	1	C
-44	072392	FOOT ASSEMBLY, Leveling	1	C

NOTE A: This setscrew to be supplied until setscrew p/n 765448 is available.

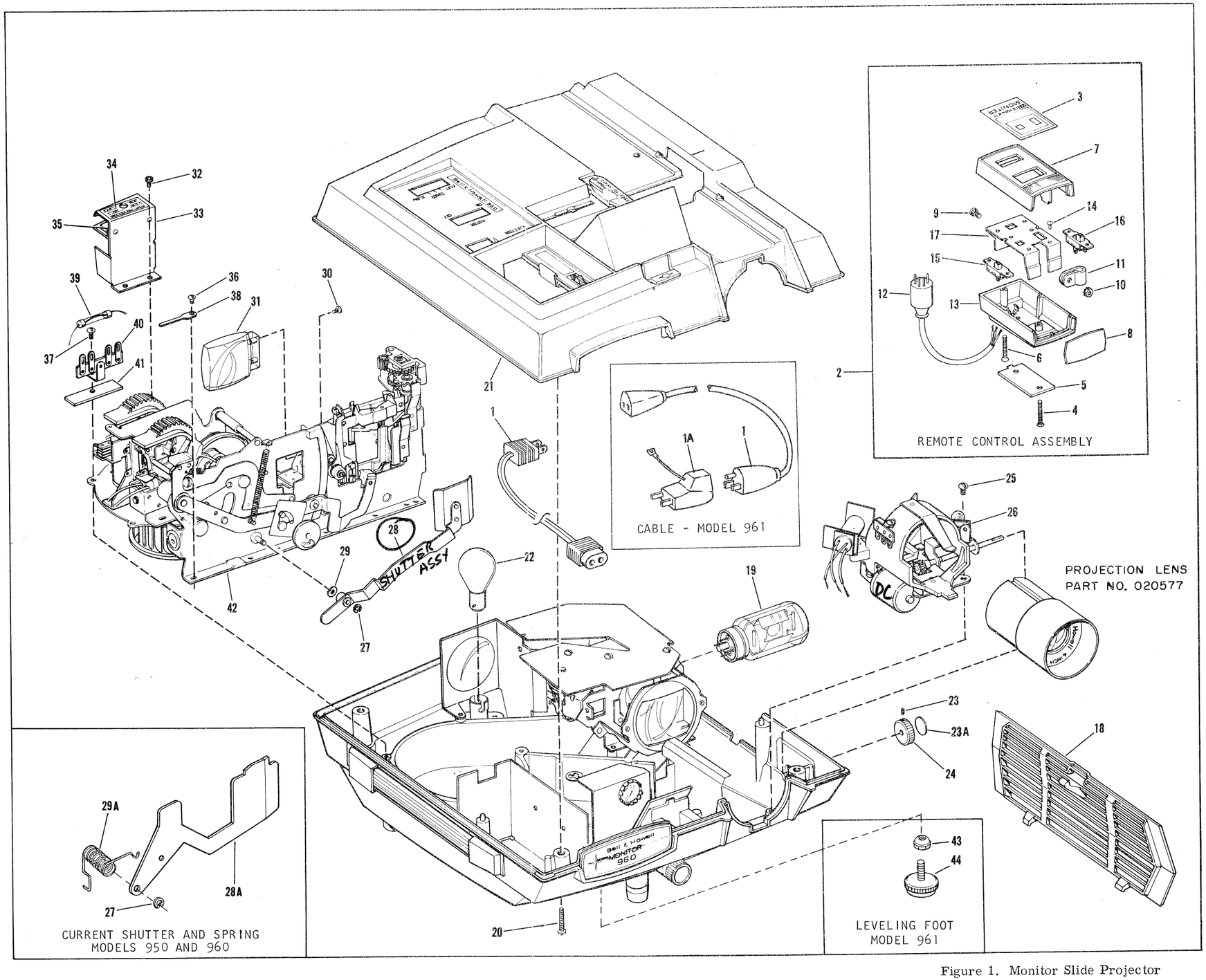


Figure 1. Monitor Slide Projector

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		PROJECTOR BASE ASSEMBLY		
2-1	765171	SPRING, Lamp eject lever	1	
-2	700097	SCREW, Binding head, slotted, 6-32 by 1/4 inch	3	
-3	706123	RING, Retaining, external, 0.188 inch	1	
-4	765115	WASHER, Camshaft, 0.195 inch ID	1	
-5	765127	LEVER, Lamp eject	1	
-6	072454	SHIELD AND PIVOT ASSEMBLY	1	
-7	072389	SHIELD ASSEMBLY, Light	1	A
-7	765470	SHIELD ASSEMBLY, Light	1	BC
-8	36841	SCREW, Pan head, slotted, 6-32 by 1/4 inch	3	
-9	No Number	SOCKET AND CONDENSER BRACKET ASSEMBLY	1	
-10	072366	. SOCKET AND BRACKET ASSEMBLY	1	
-11	700814	. . RIVET, 0.123 inch diameter by 1/8 inch (NOTE A)	2	
-12	33143	. . SOCKET ASSEMBLY	1	
-13	700814	. . RIVET, 0.123 inch diameter by 1/8 inch (NOTE A)	4	
-14	705570	. . RETAINER, Condenser	4	
-15	202087	. CONDENSER	1	
-16	200447	. CONDENSER	1	
-17	36841	SCREW, Pan head, slotted, 6-32 by 1/4 inch	2	
-18	765052	BRACKET, Preview lens barrel	1	
-19	765471	SHIELD ASSEMBLY, Light	1	
-20	020578	LENS ASSEMBLY, Previewer	1	
-21	36841	SCREW, Pan head, slotted, 6-32 by 1/4 inch	2	
-22	765156	LAMPHOLDER	1	
-22A	31523	NUT, Hex, self-locking, 8-32 (NOTE B)	1	
-22B	611409	SCREW, Pan head, slotted, 8-32 by 2.250 inch (NOTE B)	1	
-22C	706986	WASHER, Plastic, 185 I.D. (NOTE B)	1	
-22D	765438	RESISTOR, 2 ohm, 10 watt (NOTE B)	1	
-22E	765440	WASHER, Phenolic, 1.13 inch OD, 0.170 inch ID (NOTE B)	1	
-23	36841	SCREW, Pan head, slotted, 6-32 by 1/4 inch	1	
-24	765086	BRACKET, Reflector	1	
-25	765342	SCREW, Pan head, slotted, 10-32 by 1/4 inch	2	
-26	072365	REVERSE SOLENOID AND PIN ASSEMBLY	1	
-27	36841	SCREW, Pan head, slotted, 6-32 by 1/4 inch	2	
-28	072439	BRACKET AND LEVER ASSEMBLY, Reverse solenoid	1	
-29	072361	KNOB ASSEMBLY, Tilt	1	
-30	700889	RING, Retaining, external, 0.250 inch	1	
-31	072360	TILT SHAFT AND FOOT ASSEMBLY	1	
-32	765420	BUSHING (Used on earlier models)	1	
-33	765360	SCREW, Hex head, 8-32 by 5/8 inch	2	
-34	765121	FOOT, Rubber	2	
-35	36841	SCREW, Pan head, slotted, 6-32 by 1/4 inch	2	
-36	072383	BRACKET ASSEMBLY, Storage	1	A
-36	072440	BRACKET ASSEMBLY, Storage (early models)	1	BC
-36	072374	BRACKET ASSEMBLY, Storage (current models)	1	BC
-37	072433	. SOCKET AND PIN ASSEMBLY, Remote	1	
-38	765334	. RIVET, Oval head, 0.123 in. by 11/64 in. (NOTE A)	2	BC
-38A	700814	. RIVET, Oval head, 0.123 in. by 1/8 in. (NOTE A)	2	A
-38B	31585	. CLAMP, Leadwire	1	A
-39	072417	. CIRCUIT BOARD (Early models) (see Fig. 7 for parts)	1	BC
-39	072373	. CIRCUIT BOARD (Current models) (see Fig. 7 for parts)	1	BC
-40	765265	. INSULATOR, Circuit board	1	BC
-41	No Number	. BRACKET, Storage	NP	
-42	39204	SCREW, Hex head, Sems tapping, 10-32 by 0.437 inch	2	
-43	21479	WASHER, Flat, 0.2081 inch ID	2	
-44	39129	CAP, Handle end	2	
-45	765172	HANDLE	1	
-46	765173	INSERT, Handle	1	
-47	765169	NAMEPLATE	1	AB
-47	765492	NAMEPLATE	1	C
-48	202082	MIRROR	1	

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		PROJECTOR BASE ASSEMBLY (CONT)		
2-49	072364	BASE, PIN AND PAD ASSEMBLY	1	AB
-49	072390	BASE, PIN AND PAD ASSEMBLY	1	C
-50	765366	. BAFFLE, Light, long	1	
-51	765367	. BAFFLE, Light, short	2	
-52	765358	. BUMPER, Shutter arm	1	
-53	765437	. PAD, Shutter	1	
-54	24835	. RIVET, Oval head, 0.123 inch diameter by 5/16 inch (NOTE C)	2	AB
-54	115482	. RIVET, 0.123 inch diameter by 1/16 inch (NOTE C)	2	C
-55	25167	. WASHER, Flat, 0.138 inch ID	2	AB
-56	765425	. BEZEL, Socket	1	AB
-57	072471	. CONNECTOR, AC	1	AB
-57	072378	. CONNECTOR, AC	1	C
-58	19010	NUT, Hex, 3/8-32	1	C
-59	072377	CIRCUIT BREAKER ASSEMBLY	1	C
-60	19158	WASHER, Internal tooth, 3/8 inch	1	C
-61	765496	NAMEPLATE, Circuit breaker	1	C
-62	765493	GUARD, Circuit breaker (stake in place)	1	C
	30237	SCREW, Ground lead attaching, hex head, 4-40 by 1/4 inch	1	C
	706535	WASHER, Ground lead attaching, internal teeth, No. 4	1	C

NOTE A: Use screws P/N 31551 and nuts P/N 28311 in reassembly.
NOTE B: Used only with motor P/N 072443 (item 66, Figure 5).
NOTE C: Use screws P/N 31976 and nuts P/N 28311 in reassembly.
NOTE D: Early 950 and 960 models were designed for a cord storage well under the left rear corner of the base. The following parts cover this area and are not illustrated.

	36845	SCREW, Pan head, slotted, 6-32 by 3/4 inch	1	AB
	765369	NUT, Self-locking, 6-32	1	AB
	34859	WASHER, Flat, metal, 0.1485 inch ID	1	AB
	765430	COVER, Storage well	1	AB

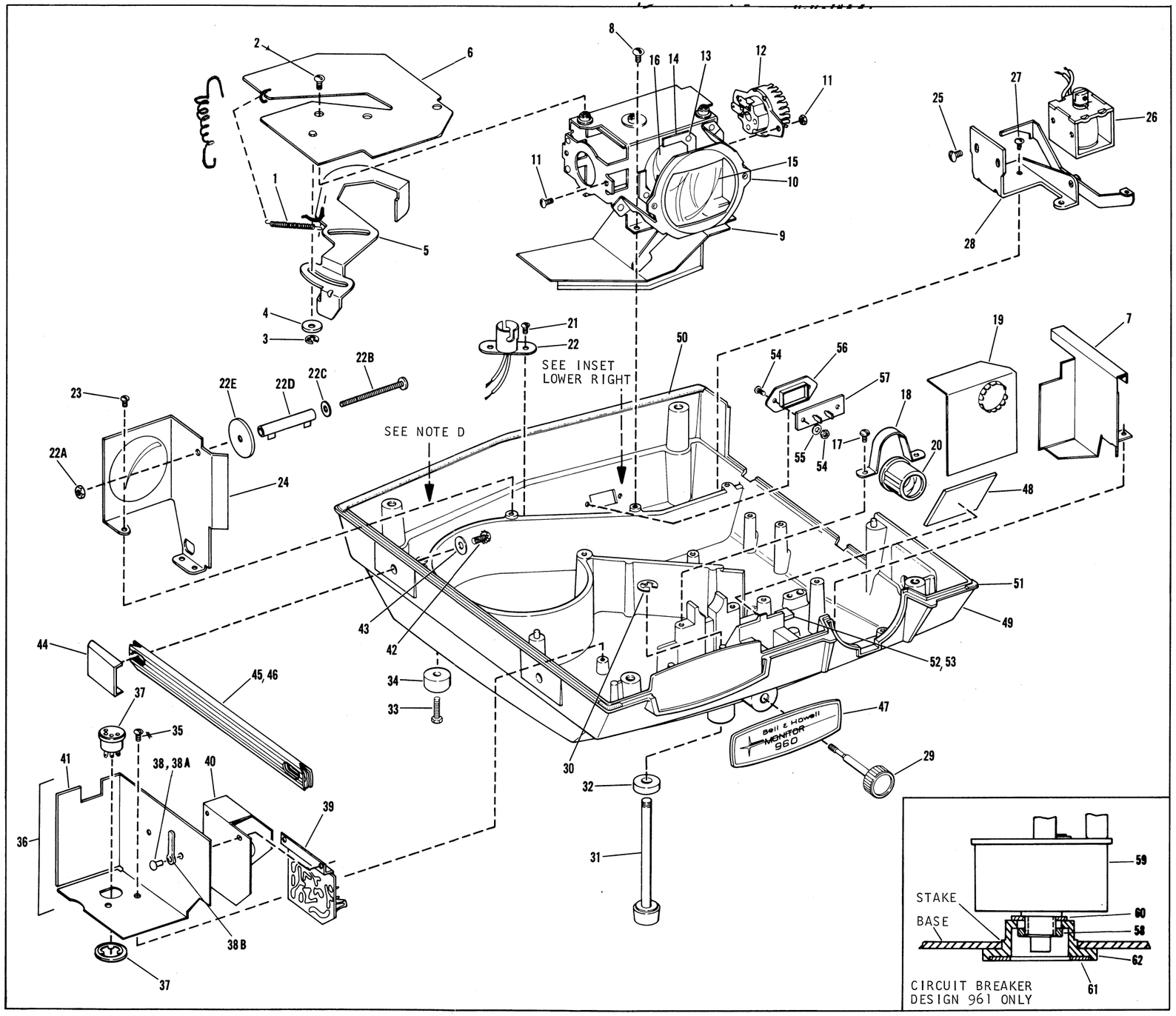


Figure 2. Projector Base Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		PROJECTOR TOP ASSEMBLY		
3-1	31245	RING, Retaining, external, 0.187 inch ID	4	
-2	765435	SPRING, Light shield	1	
-3	700710	WASHER, Flat, 0.208 inch ID	1	
-4	765766	SHIELD, Light	1	
-5	765768	SPRING, Restrictor plate	1	
-6	765765	PLATE, Restrictor	1	
-7	765363	RING, Retaining, external, 0.1875 inch ID	1	
-8	765388	SPRING, Hold-down	1	
-9	765284	SPRING, Preview housing	1	
-10	36836	SCREW, Pan head, slotted, 4-40 by 3/16 inch	2	
-11	765055	CLAMP, Spring	2	
-12	765056	SHAFT, Housing	1	
-13	765362	RING, Retaining, external, 0.250 inch ID	3	
-14	765388	SPRING, Hold-down	1	
-15	30746	RING, Retaining, external, 0.125 inch ID	1	
-16	765168	TRAY HOLD-DOWN	1	
-17	765277	LATCH, Preview screen	1	
-18	072362	PREVIEWER ASSEMBLY	1	
-19	202083	. SCREEN, Preview	1	
-20	765087	. FRAME, Preview	1	
-21	072363	TOP, SWITCH, LATCH AND NAMEPLATE ASSEMBLY	1	AB
-21	072391	TOP, SWITCH, LATCH AND NAMEPLATE ASSEMBLY	1	C
-22	765338	. RIVET, Oval head, 0.123 inch diameter by 15/64 inch ID	1	
-23	765102	. LATCH, Grille	1	
-24	765753	. NAMEPLATE , Control Panel	1	A
-24	765152	. NAMEPLATE , Control Panel	1	BC
-25	765754	. NAMEPLATE , ON-OFF-LAMP	1	A
-25	765021	. NAMEPLATE , ON-OFF-LAMP	1	B
-25	765487	. NAMEPLATE , ON-OFF-LAMP	1	C
-26	706546	. RIVET, 0.123 inch diameter by 11/64 inch	2	
-27	765166	. SWITCH, Slide	1	
-28	765787	. NAMEPLATE, Caution	1	

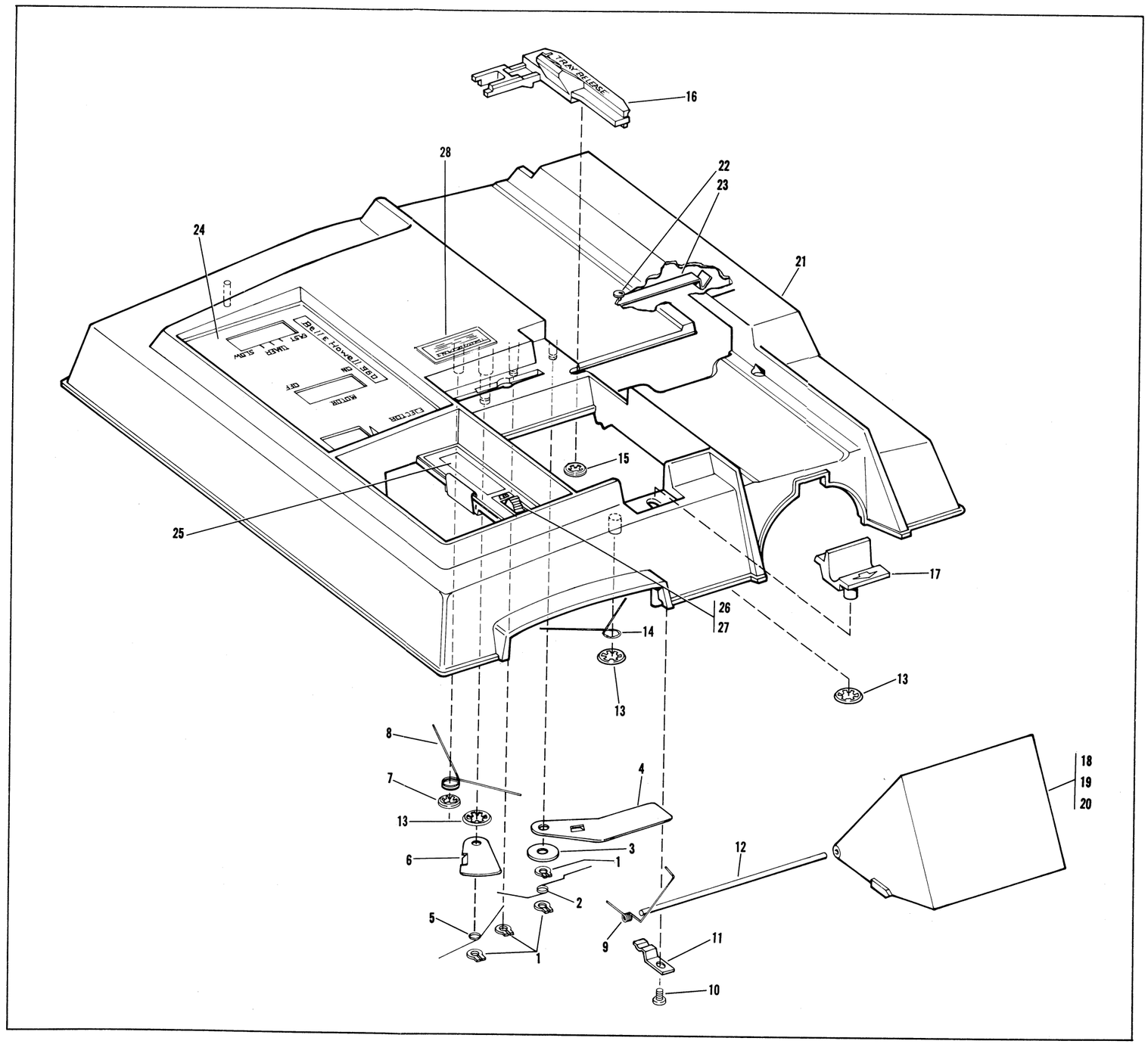


Figure 3. Projector Top Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MECHANISM ASSEMBLY		
4-1	~~*31245~~	~~RING, Retaining, external, 0.187 inch ID (NOTE A)~~	1	
-2	**765190	SPRING, Sector (NOTE A)	1	
-2A	765808	SPRING, Torsion (NOTE A)	1	AB
-3	36802	SCREW, Pan head, slotted, 6-32 by 3/8 inch	1	
-4	765394	BRIDGE, Gear sector pivot	1	
-5	700890	RING, Retaining, external, 0.188 inch ID	1	
-6	765276	WASHER, Flat, 0.194 inch ID.	1	AB
-7	706964	SCREW, Pan head, slotted, 6-32 by 3/16 inch.	2	
-8	No Number	APERTURE PLATE ASSEMBLY (See Figure 6 for detail parts)	1	
~~9~~	**072463	MASTER CAM AND SPRING ASSEMBLY (NOTE A)	1	
9A	765785	MASTER CAM AND SPRING ASSEMBLY (NOTE A)	1	AB
-10	**34878	WASHER, Flat, 0.188 inch ID (NOTE A)	2	
-10A	765786 or	BALL, Steel (NOTES A AND B)	1	AB
-10A	765828 or	BALL, Steel (NOTES A AND B)	1	AB
-10A	765829	BALL, Steel (NOTES A AND B)	1	AB
-11	**31040	SPRING, Compression (NOTE A)	1	
-11A	765827	SPACER, Clutch (NOTE A)	1	AB
-12	**072369	CLUTCH ASSEMBLY, Driven (NOTE A)	1	
-12A	765784	CLUTCH, Driven (NOTE A)	1	AB
-12B	765804	RETAINER, Clutch spring (NOTE A)	1	AB
-13	**765401	SPRING, Camshaft (NOTE A)	1	
13A	765826	SPRING, Camshaft (NOTE A)	1	AB
~~14~~	~~*765115~~	~~WASHER, Flat, 0.195 inch ID (NOTE A)~~	1	
-15	**765022	SPRING, Clutch (NOTE A)	1	
-15A	765831	SPRING, Clutch (NOTE A)	1	AB
-15B	765805	CUP, Spring retainer (NOTE A)	1	AB
-15C	765806	CUP, Spring retainer (NOTE A)	1	AB
-16	707004	RING, Retaining, external, reinforced, 0.219 inch ID	1	
-16A	34861	WASHER, Flat	1	
-17	765062	SECTOR, Carrier drive	1	
-18	765339	SCREW, Pan head, slotted, 3-48 by 7/16 inch.	2	BC
-19	765100	SWITCH, Timer	1	BC
-20	700890	RING, Retaining, external, 0.188 inch ID	1	
-21	765139	KNOB, Cycle	1	
-22	~~**765402~~	SPRING, Cycle knob (NOTE A)	1	
-22A	765801	SPRING, Cycle knob (NOTE A)	1	AB
-23	700890	RING, Retaining, external, 0.188 inch ID	1	BC
-24	765115	WASHER, Flat	1	BC
-25	36832	SCREW, Pan head, slotted, 2-56 by 3/16 inch (NOTE C)	1	BC
-26	765346	NUT, Self-locking, 2-56	1	BC
-27	82531	RIVET, Oval head, 0.089 by 1/8 inch	1	BC
-28	072358	BRACKET AND CLAMP ASSEMBLY, Timer knob	1	BC
-29	765165	KNOB, Timer	1	BC
-30	765497	SPRING, Ratchet arm	1	BC
-31	700890	RING, Retaining, external, 0.188 inch ID	1	BC
-32	32767	WASHER, Spring tension	1	BC
-33	072461	ARM ASSEMBLY, Ratchet	1	BC
-34	81847	NUT, Plain hex, 4-40	2	
-35	765347	SCREW, Flat head, slotted, 4-40 by 1/2 inch	2	
-36	765167	SWITCH, Miniature	1	
-37	765161	INSULATOR, Switch	1	
-38	765389	SPACER, Switch	2	
-39	~~**80969~~	SCREW, Binding head, slotted, 6-32 by 1/8 inch (NOTE A)	2	
-39A	31943	SCREW, Binding head, 6-32 by 0.187 inch (NOTE A)	2	AB
-39B	301521	WASHER, Flat, 0.149 inch ID (NOTE A)	2	AB

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MECHANISM ASSEMBLY (CONT)		
4-40	072359	SOLENOID AND PIN ASSEMBLY, Cycling	1	
-41	**700889	RING, Retaining, Bulk Pak, 0.250-inch ID (NOTE A)	2	
-41A	765777	RING, Retaining, Roll Pak, 0.250-inch ID (NOTE A)	2	AB
-42	**765143	SLIDER, Half cycle (NOTE A)	1	
-42A	765800	SLIDER, Half cycle (NOTE A)	1	AB
-43	36801	SCREW, Pan head, slotted, 6-32 by 1/4 inch	2	
-44	*34859	WASHER, Flat, 0.1485 inch ID (NOTE A)	2	
-45	700890	RING, Retaining, external, 0.188 inch ID	1	BC
-46	765039	GEAR, Ratchet	1	
-47	36765	SETSCREW, Fluted socket, cup point, 6-32 by 1/4 inch	2	
-48	700890	RING, Retaining, external, 0.188 inch ID	2	
-49	765404	SHAFT, Cluster gear	1	A
-49	072403	SHAFT ASSEMBLY, Timer cam and cluster gear	1	BC
-50	765200	GEAR, Cluster	1	
-51	700890	RING, Retaining, external, 0.188 inch ID	1	
-52	*765350	RING, Retaining, external, 0.438 inch ID (NOTE A)	1	
-53	**072400	GEAR AND HUB ASSEMBLY (NOTE A)	1	
-53A	072500	GEAR AND HUB ASSEMBLY (NOTE A)	1	AB
-54	765023	BEARING, Gear	1	
-55	765051	BEARING, Drive gear shaft	2	
-56	**765025	CAMSHAFT (NOTE A)	1	
-56A	765781 or	CAMSHAFT (NOTES A AND B)	1	AB
-56A	765830	CAMSHAFT (NOTES A AND B)	1	AB
-57	**072388	BRACKET ASSEMBLY, Solenoid (NOTE A)	1	A
-57A	072501	BRACKET ASSEMBLY, Solenoid (NOTE A)	1	A
-57	**072462	BRACKET ASSEMBLY, Solenoid (NOTE A)	1	BC
-57A	072508	BRACKET ASSEMBLY, Solenoid (NOTE A)	1	B
-58	No Number	MOTOR AND PLATE ASSEMBLY	1	
-59	706921	. WHEEL, Blower	1	
-60	765348	. SCREW, Pan head, slotted, 6-32 by 1-1/2 inch	2	
-60A	301521	. WASHER, Flat, 0.149 inch ID	2	
-61	072443	. MOTOR ASSEMBLY (All early models) (NOTE D)	1	
-61	072386	. MOTOR ASSEMBLY (Current Design 950 models)	1	A
-61	072370	. MOTOR ASSEMBLY (Current Design 960/961 models)	1	BC
-62	705972	. WASHER, Plain, 0.190 inch ID	1	
-63	072415	. PLATE ASSEMBLY, Motor	1	

NOTE A: All items referenced to this Note are involved in the design change which took place at Serial #3201 in Model 950 projectors and Serial #18500 in Model 960 projectors. Single asterisked (*) items were deleted by this change; double asterisked (**) items were replaced by items bearing the same index number but with a letter suffix (i.e., item 9 replaced by item 9A; item 39 replaced by items 39A and 39B).

NOTE B: Proper selection of camshaft (56A) and steel ball (10A) is necessary to provide the proper torque (see reassembly instructions).

NOTE C: Current designs use two rivets P/N 765332 in the clamp assembly (item 28) to retain the shank of the timer knob (item 29).

NOTE D: A 2 ohm, 10 watt resistor, P/N 765438 (item 2-22D) must be used with early style motor P/N 072443 (see Figure 7).

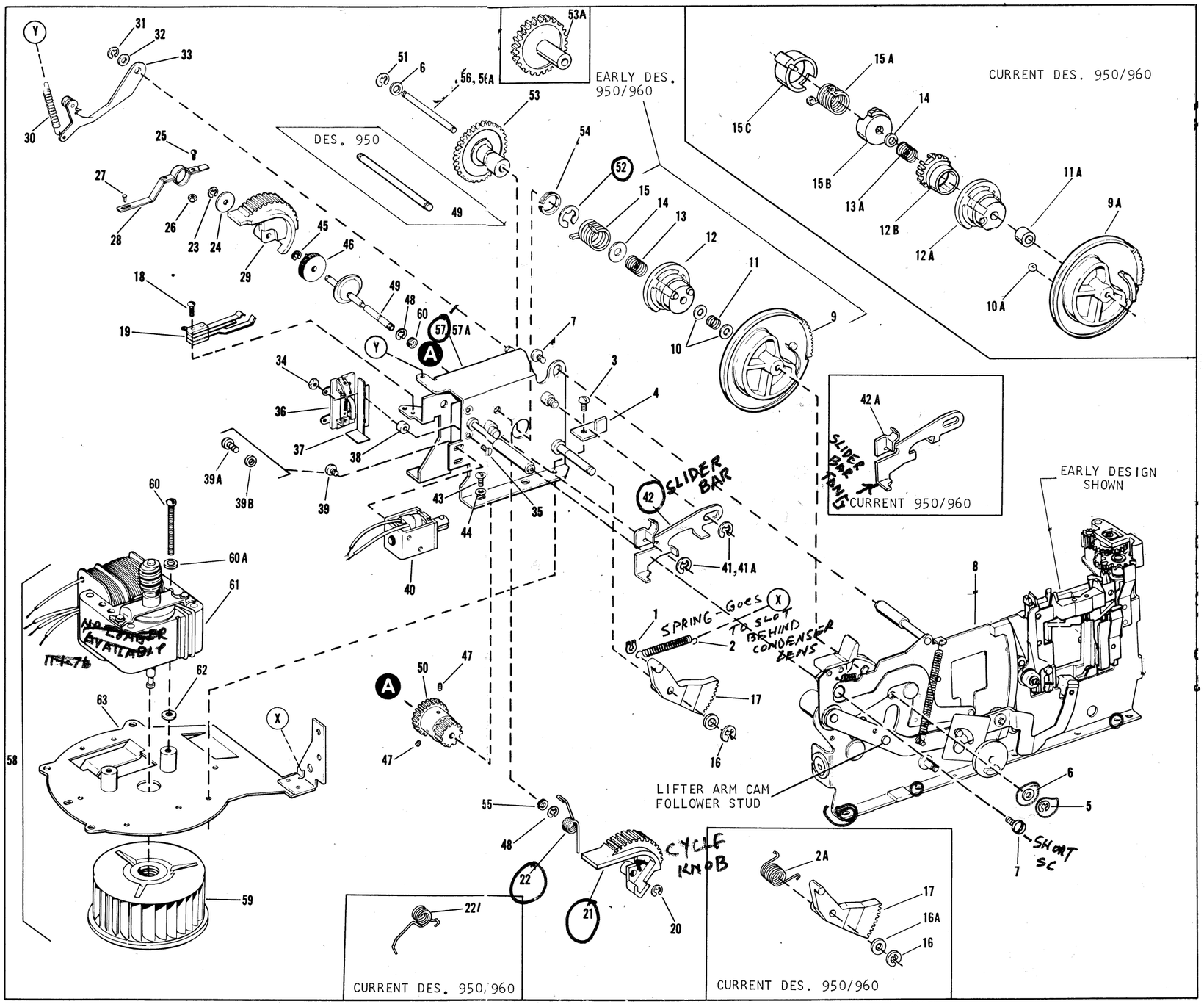


Figure 4. Mechanism Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		FOCUS ASSEMBLY		
5-1	765412	BAFFLE, Light, lens	1	BC
-2	765413	TUBE, Light shield	1	BC
-3	765469	BAFFLE, Light	1	BC
-4	020687	FILTER ASSEMBLY, Infra-red	1	BC
-5	765426	SCREW, Hex head, tapping, 6-20 by 1/4 inch	1	BC
-6	765194	TERMINAL STRIP	1	BC
-7	615925	NUT, Self-locking, 6-32	2	
-8	765185	WASHER, Flat, 0.330 inch ID	2	
-9	98837	RING, Retaining, external, 0.156 inch ID	2	
-10	072446	SHAFT AND GEAR ASSEMBLY, Focus	1	
-11	706699	SCREW, Hex head, 6-20 by 5/16 inch	2	
-12	765175	BRACKET, Gear	1	
-13	765393	SCREW, Hex head, self tapping, 6-32 by 5/16 inch	2	BC
-14	072402	MOTOR AND REDUCER, Focus	1	BC
-15	072447	PLATE ASSEMBLY, Stud and focus	1	
-16	706699	SCREW, Hex head, self tapping, 6-20 by 5/16 inch	4	BC
-17	301521	WASHER, Flat, 0.149 inch ID	1	BC
-18	765418	SHIELD, Focus lamp	1	BC
-19	072451	BRACKET ASSEMBLY, Focus lamp	1	BC
-20	765263	. LAMP, Bi-pin	1	BC
-21	23138	. RIVET, Oval head, 0.146 inch diameter by 7/32 inch	1	BC
-22	765082	. SOCKET, Lamp	1	BC
-23	202080	. LENS	1	BC
-24	765182	. BRACKET, Focus lamp	1	BC
-25	072450	BRACKET AND PHOTOCELL FOCUS ASSEMBLY	1	BC
-26	202080	. LENS	1	BC
-27	765294	. PHOTOCONDUCTIVE CELL	1	BC
-28	765180	. BRACKET, Photocell	1	BC
-29	072449	CARRIAGE ASSEMBLY, Lens	1	

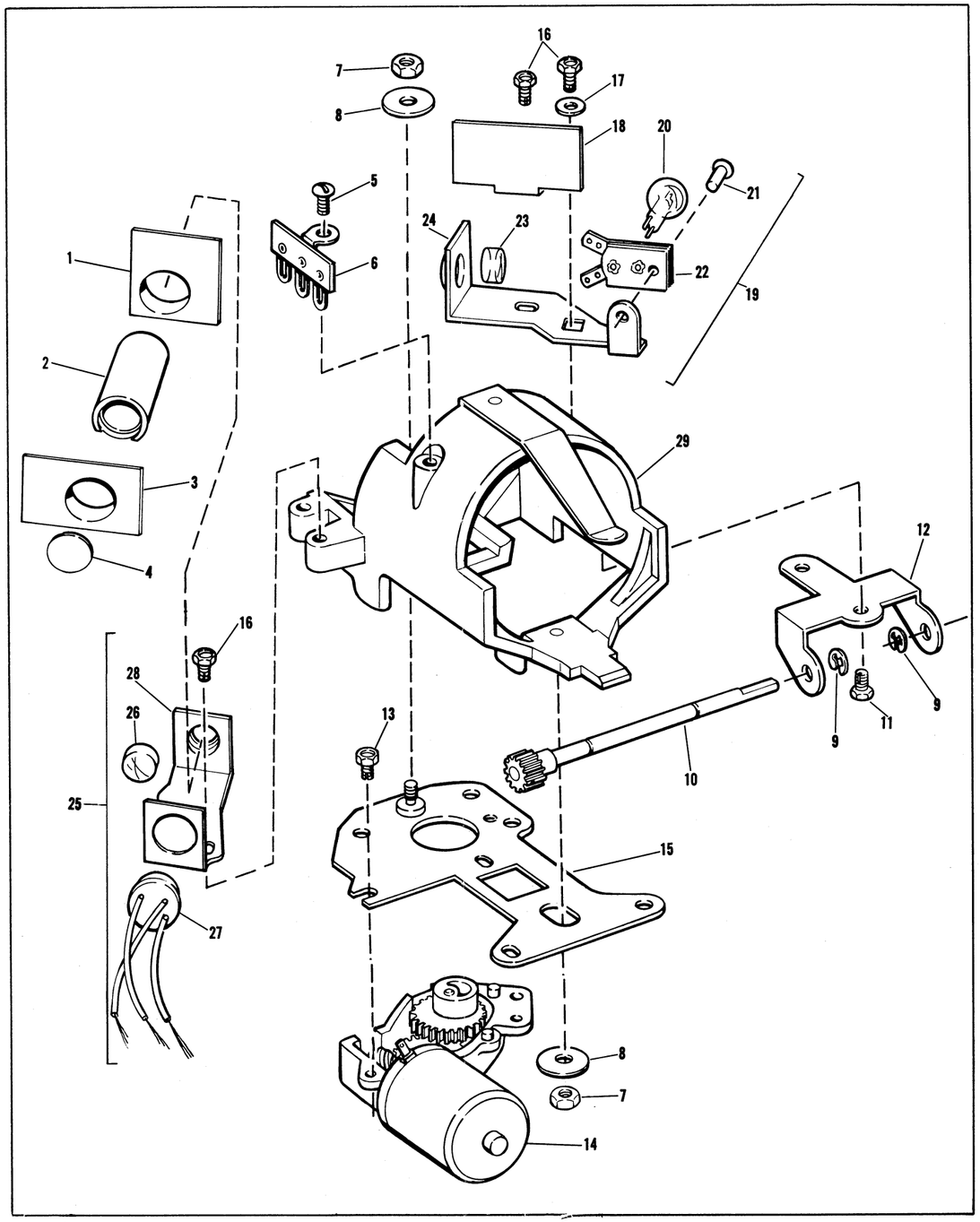


Figure 5. Focus Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		APERTURE PLATE ASSEMBLY		
6-1	765382	SPRING, Lifter arm	1	
-2	765255	SPRING, Slide eject	1	
-3	706745	RING, Retaining, external, 0.218 inch ID	1	
-4	33968	RING, Retaining, external, 0.250 inch ID	1	
-5	31015	WASHER, Flat, 0.255 inch ID	1	
-6	32767	WASHER, Spring tension	1	
-7	765035	BUTTON, Lifter arm	1	
-8	**072407	LIFTER ARM AND PREVIEW SHUTTER ASSEMBLY (NOTE A)	1	
-8A	072509	LIFTER ARM ASSEMBLY (NOTE A)	1	AB
-9	765029	WASHER, Flat, 0.255 inch ID	1	
-10	072406	LEVER ASSEMBLY, Slide eject	1	
-11	**765112	SPRING, Actuator (NOTE A)	1	
-11A	765825	SPRING, Actuator (NOTE A)	1	AB
-12	17639	RING, Retaining, external, 0.125 inch ID (E)	1	
-13	**072411	ACTUATOR ASSEMBLY, Tray spring (NOTE A)	1	
-13A	072503	ACTUATOR ASSEMBLY, Tray spring (NOTE A)	1	AB
-14	*36241	SCREW, Machine, Pan head, 6-32 by 3/16 inch (NOTE A)	1	
-15	*33866	WASHER, Flat, 0.150 inch ID (NOTE A)	1	
-16	*072410	ADJUSTING ASSEMBLY, Plate and stud (NOTE A)	1	
-17	36764	SETSCREW, Cup point, 6-32 by 3/16 inch	2	
-18	**765201	CAM, Shutter arm (NOTE A)	1	
-18A	765821	CAM, Shutter arm (NOTE A)	1	AB
-19	**072412	CLUSTER GEAR ASSEMBLY (NOTE A)	1	
-19A	072510	CLUSTER GEAR ASSEMBLY (NOTE A)	1	AB
-20	706123	RING, Retaining, external, 0.188 inch ID	2	
-21	765252	LATCH, Index	1	
-22	765008	GEAR, Index idler	2	
-23	765343	RING, Retaining, external, 0.188 inch ID	1	
-24	705972	WASHER, Flat, 0.190 inch ID	1	
-25	765444	GEAR, Locking	1	
-26	36763	SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	2	
-27	072413	GEAR AND SHAFT ASSEMBLY, Index drive	1	
-28	706123	RING, Retaining, external, 0.188 inch ID	1	
-29	**765007	GEAR, Index (NOTE A)	1	
-29A	765774	GEAR, Index (NOTE A)	1	AB
-30	765436	BUSHING	1	
-31	765186	SPRING, Reverse	1	
-32	765446	GEAR, Helical	1	
-33	765009	CLUTCH, Index	1	
-34	30252	WASHER, Spring tension, 0.261 inch ID	1	
-35	765076	WASHER, Flat, 0.260 inch ID	1	
-36	34878	WASHER, Flat, 0.188 inch ID	1	
-37	706123	RING, Retaining, external, 0.188 inch ID	1	
-38	765016	GEAR, Index drive	1	
-38A	765014	WASHER, Flat, 0.194 inch ID	1	
-39	700890	RING, Retaining, external, 0.188 inch ID	1	
-39A	32767	WASHER, Spring tension (current models only)	2	
-40	765276	WASHER, Thrust	1	
-41	765445	GEAR, Left-hand helical index	1	
-42	765047	CARRIER, Slide (Used on early models) (NOTE B)	1	
-42	**765441	CARRIER, Slide (NOTES A AND B)	1	AB
-42A	765749	CARRIER, Slide (NOTE A)	1	
-43	36763	SETSCREW, Cup point, 6-32 by 1/8 inch	2	
-44	**072445	LOCK, Septum (NOTE A)	1	
-44A	765746	LOCK, Septum (NOTE A)	1	AB

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		APERTURE PLATE ASSEMBLY (CONT)		
6-45	**072414	CARRIER, INDEX GEAR AND CAM ASSEMBLY (NOTE A) . .	1	
-45A	072504	CARRIER, INDEX GEAR AND CAM ASSEMBLY (NOTE A) . .	1	AB
-46	36763	SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	2	
-47	765066	SHAFT, Septum lock	1	
-48	**765065	BUSHING (NOTE A)	1	
-48A	765746	BUSHING (NOTE A)	1	AB
-48B	765276	WASHER, Flat (NOTE A)	2	AB
-48C	765747	WASHER, Flat (NOTE A)	1	AB
-49	706641	SPRING, Coil	1	
-50	**072409	SEPTUM LOCK AND BRIDGE ASSEMBLY (NOTE A)	1	
-50A	072505	SEPTUM LOCK AND BRIDGE ASSEMBLY (NOTE A)	1	AB
-51	765023	BEARING, Nylon	1	
-52	765187	BEARING, Nylon	1	
-53	765051	BEARING, Nylon	5	
-54	No Number	PLATE ASSEMBLY, Aperture	1	

NOTE A: All items referenced to this Note are involved in the design change which took place at Serial #3201 in Model 950 projectors and Serial #18500 in Model 960 projectors. Single asterisked (*) items were deleted by this change; double asterisked (**) items were replaced by items bearing the same index number but with a letter suffix (i.e., item 8 replaced by item 8A; item 29 replaced by item 29A).

NOTE B: When slide carrier P/N 765047 is no longer available for early model projectors, the slot guides in the top cover must be filed away as shown in Figure 6 insets to accommodate current slide carriers.

SLOT GUIDE BEFORE FILING

INSIDE TOP COVER (21, FIG. 3)

SLOT GUIDE AFTER FILING

FILING TOP COVER EJECTOR SLOT GUIDES TO ACCOMODATE 765441 SLIDE CARRIER.

765441 (42)
765749 (42A)

EARLY MODELS - SEE INSET A FOR CURRENT MODELS

EARLY MODELS SEE INSET B FOR CURRENT MODELS

39A CURRENT MODELS ONLY

EARLY MODELS - SEE INSET D FOR CURRENT MODELS

EARLY MODELS - SEE INSET C FOR CURRENT MODELS

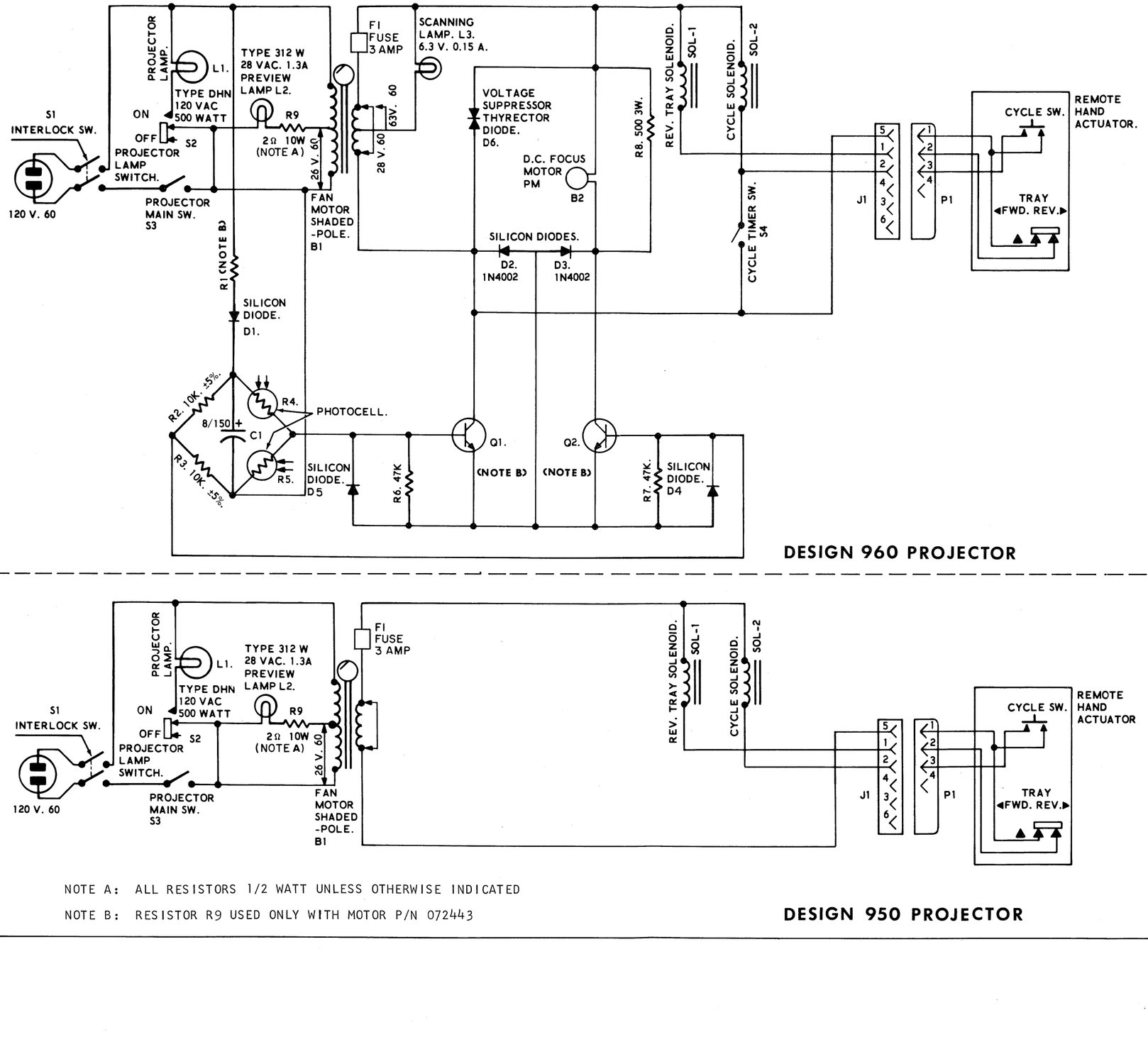
INSET A - CURRENT MODELS

INSET B - CURRENT MODELS

INSET C - CURRENT MODELS

INSET D - CURRENT MODELS

Figure 6. Aperture Plate Assembly



NOTE A: ALL RESISTORS 1/2 WATT UNLESS OTHERWISE INDICATED

NOTE B: RESISTOR R9 USED ONLY WITH MOTOR P/N 072443

BELL & HOWELL CO. CHICAGO, USA		
PROJECTOR SCHEMATIC DESIGN 950 & 960 SLIDE PROJECTOR		
DATE 5-1-68	SERVICE DATA	DRAWN: APPD: LAZ

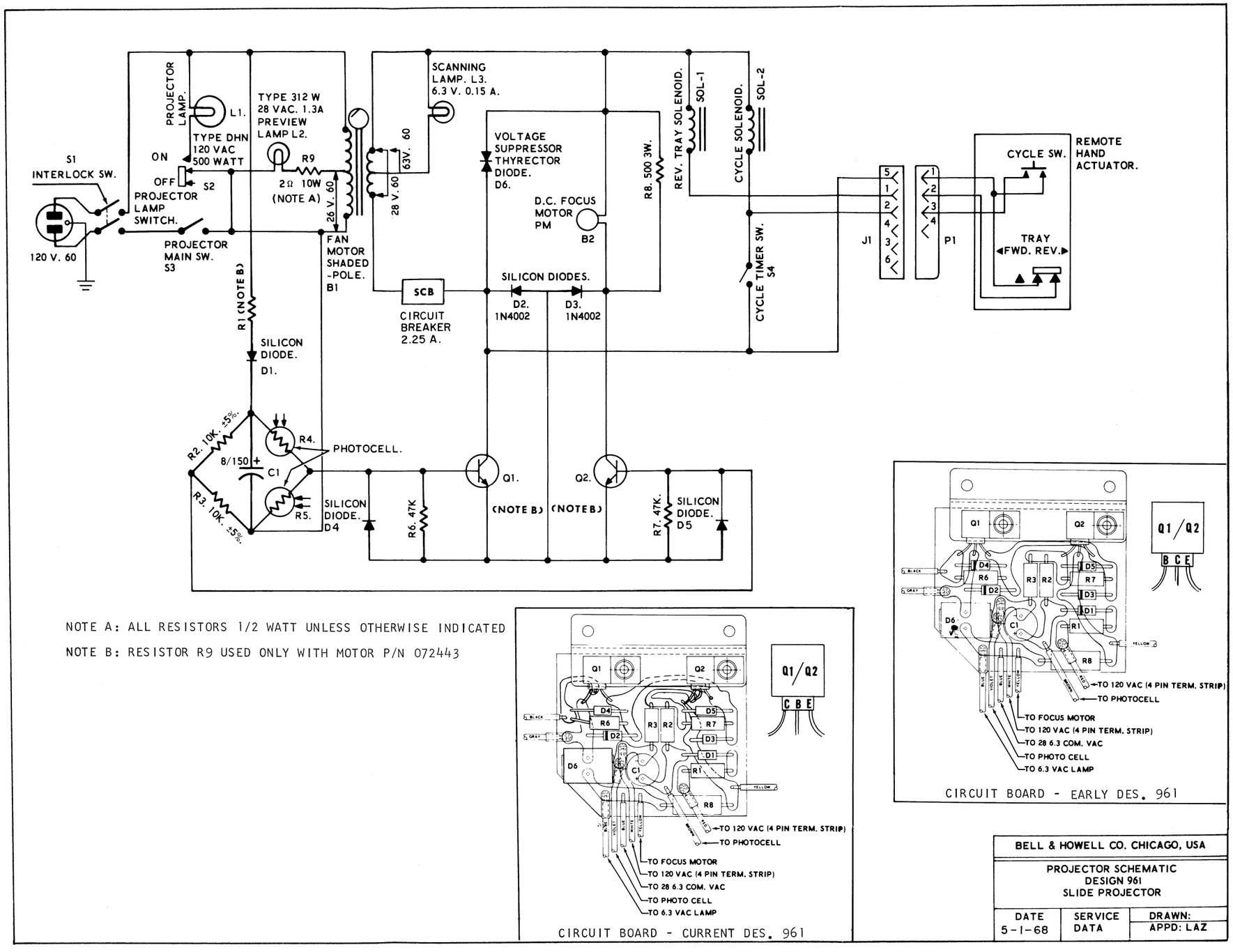
Figure 7. Schematic Wiring Diagram — Design 950 and 960 Projectors

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		PRINTED CIRCUIT BOARD AND SCHEMATIC (961 ONLY)		
8-B1	072443	MOTOR, Fan, shaded pole (NOTE A)	1	C
-B1	072370	MOTOR, Fan, shaded pole (NOTE A)	1	C
-B2	072402	MOTOR, Focus, DC	1	C
-C1	765289	CAPACITOR, Electrolytic, 8 mfd, -10 +100%, 150 vdcw	1	C
-D1	765291	RECTIFIER, Silicon (Alternate P/N 765396)	1	C
-D2	765292	RECTIFIER, Silicon (Alternate P/N 765397)	1	C
-D3	765292	RECTIFIER, Silicon (Alternate P/N 765397)	1	C
-D4	765292	RECTIFIER, Silicon (Alternate P/N 765397)	1	C
-D5	765292	RECTIFIER, Silicon (Alternate P/N 765397)	1	C
-D6	765288	SUPPRESSOR, Voltage	1	C
-F1	765074	FUSE, 3 amp	1	C
-J1	072433	CONNECTOR, Receptacle	1	C
-L1	765160	LAMP, Projection, type DHN, 120 vac, 500 w	1	C
-L2	765155	LAMP, Preview, type 312 w, 28 vac, 1.3A	1	C
-L3	765263	LAMP, Scanning, 6.3 v, 0.15A	1	C
-P1	765253	CONNECTOR, Plug	1	C
-Q1,Q2	765287	TRANSISTOR (Early models) (NOTE B)	2	C
-Q1,Q2	072380	TRANSISTOR (Current models) (NOTE B)	2	C
-R1	(NOTE B)	RESISTOR, Fixed	1	C
-R2	765286	RESISTOR, Fixed, 10 K, ±5%, 1/2 w	1	C
-R3	765286	RESISTOR, Fixed, 10 K, ±5%, 1/2 w	1	C
-R4	765294	PHOTOCELL	1	C
-R5	765294	PHOTOCELL	1	C
-R6	31745	RESISTOR, Fixed, 47 K, ± 10%, 1/2 w	1	C
-R7	31745	RESISTOR, Fixed, 47 K, ± 10%, 1/2 w	1	C
-R8	765290	RESISTOR, Fixed, 500 ohms, ± 10%, 3 w	1	C
-R9	765438	RESISTOR, Fixed, 2 ohms, ± 10%, 10 w (NOTE A)	1	C
-S1	072444	SWITCH, Interlock	1	C
-S2	765166	SWITCH, Projector lamp	1	C
-S3	765167	SWITCH, Projector main	1	C
-S4	765100	SWITCH, Cycle timer	1	C
-SOL-1	072365	SOLENOID, Reverse tray	1	C
-SOL-2	072359	SOLENOID, Cycle	1	C
-SCB	072377	CIRCUIT BREAKER	1	C

NOTE A: Early model fan motors (P/N 072443) required the addition of resistor R9 (P/N 765438). When replacing with latest motor (P/N 072370), resistor R9 must be removed from the circuit.

NOTE B: In Model 961 Projectors, both of the transistors Q1 and Q2 have been separated into Beta ranges, and color coded, for proper operation of the Auto-Focus system. Each Beta range requires a specific value for resistor R1 as noted in the following chart. Select the proper components when replacing transistors or resistor R1.

TRANSISTOR COLOR CODE	USE R1 PART NO.	RESISTOR VALUE
Green	36308	8.2 K - ohm 1/2 W
Blue	38352	6.8 K - ohm 1/2 W
Black	765758	2.7 K - ohm 2 W



NOTE A: ALL RESISTORS 1/2 WATT UNLESS OTHERWISE INDICATED

NOTE B: RESISTOR R9 USED ONLY WITH MOTOR P/N 072443

CIRCUIT BOARD - CURRENT DES. 961

CIRCUIT BOARD - EARLY DES. 961

BELL & HOWELL CO. CHICAGO, USA		
PROJECTOR SCHEMATIC DESIGN 961 SLIDE PROJECTOR		
DATE 5-1-68	SERVICE DATA	DRAWN: APPD: LAZ

Figure 8. Schematic Wiring Diagram — Design 961 Projector

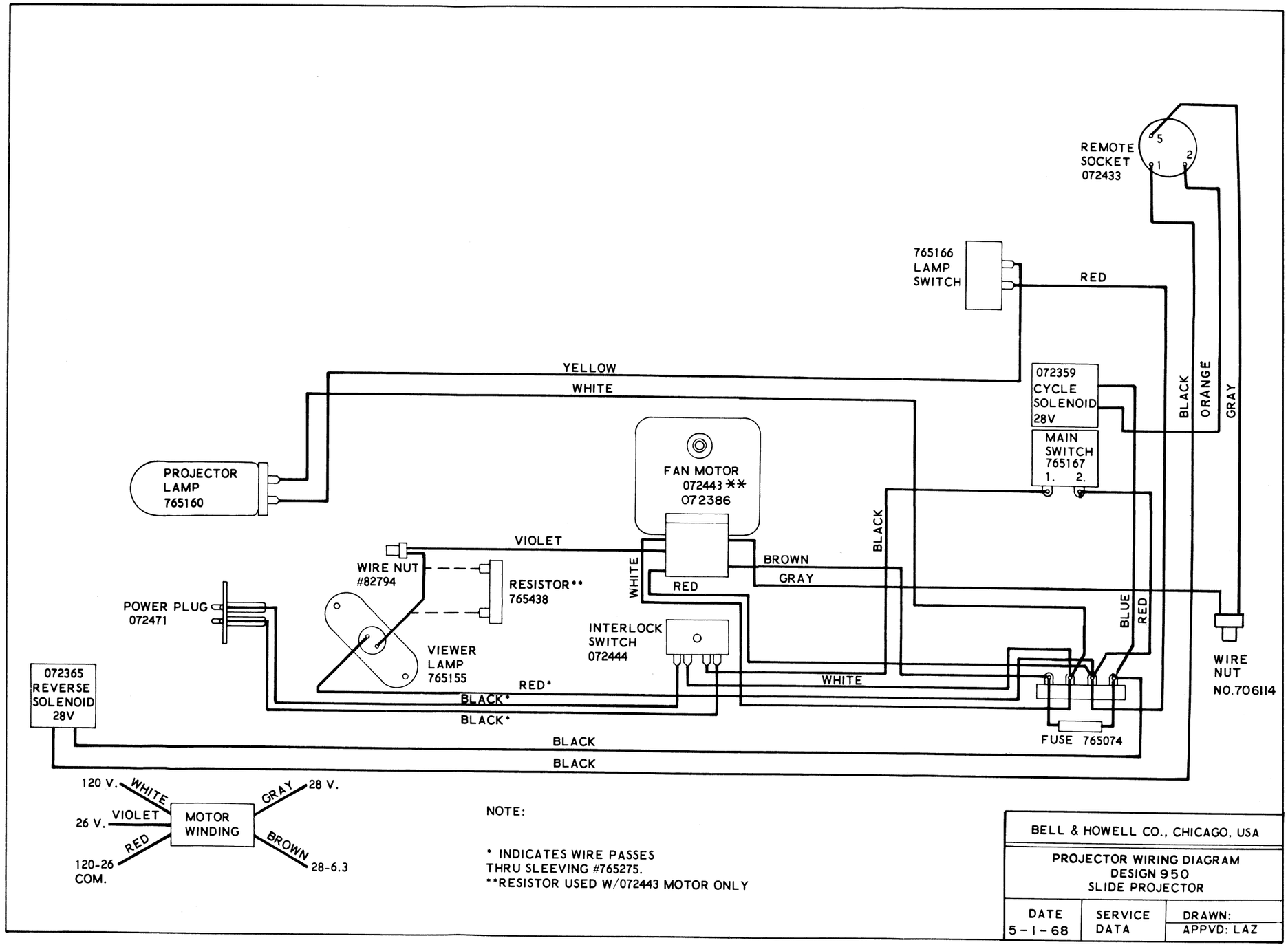
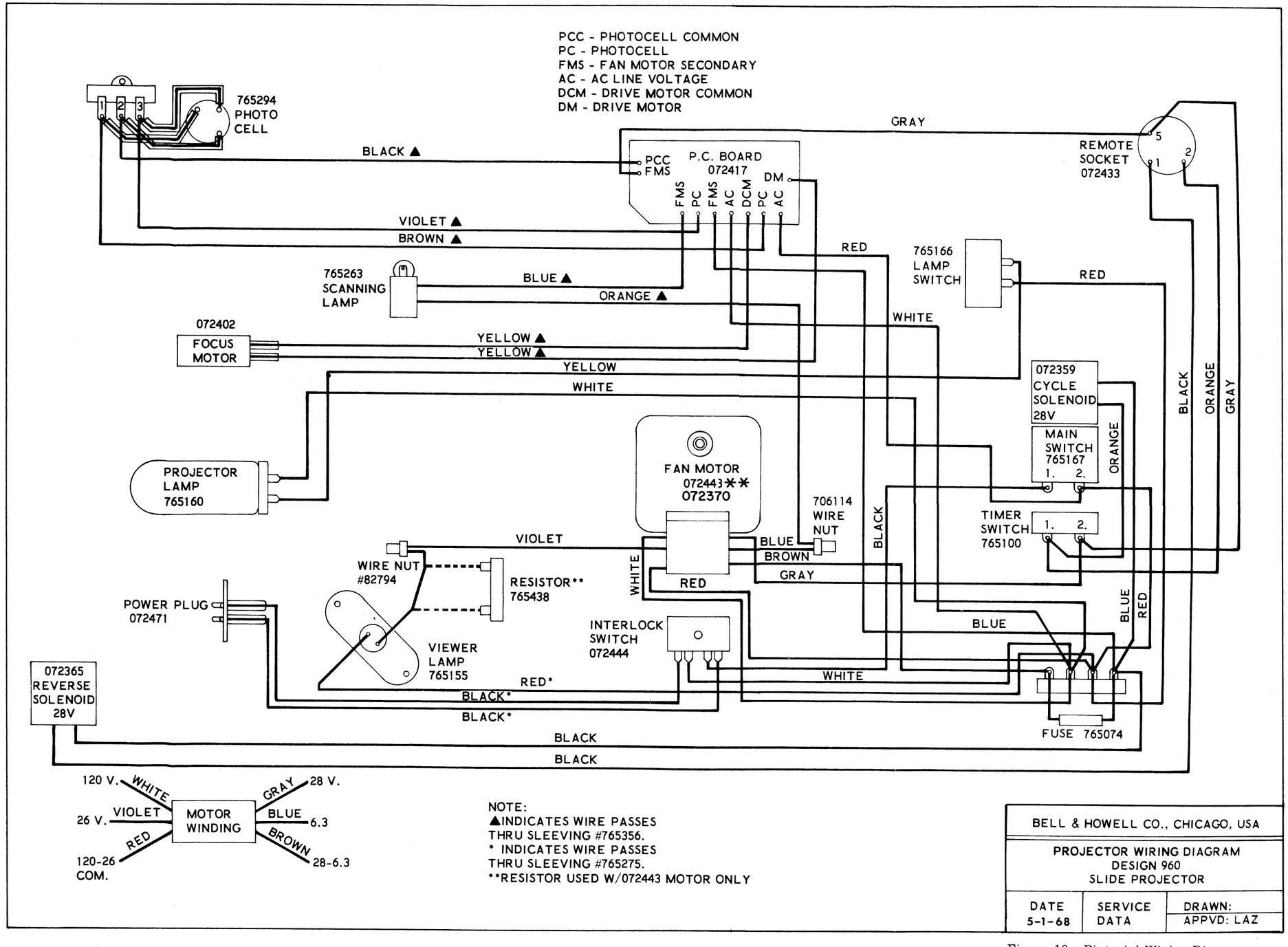


Figure 9. Pictorial Wiring Diagram — Design 950 Projector



NOTE:
▲INDICATES WIRE PASSES THRU SLEEVING #765356.
* INDICATES WIRE PASSES THRU SLEEVING #765275.
**RESISTOR USED W/072443 MOTOR ONLY

BELL & HOWELL CO., CHICAGO, USA		
PROJECTOR WIRING DIAGRAM DESIGN 960 SLIDE PROJECTOR		
DATE 5-1-68	SERVICE DATA	DRAWN: APPVD: LAZ

Figure 10. Pictorial Wiring Diagram — Design 960 Projector

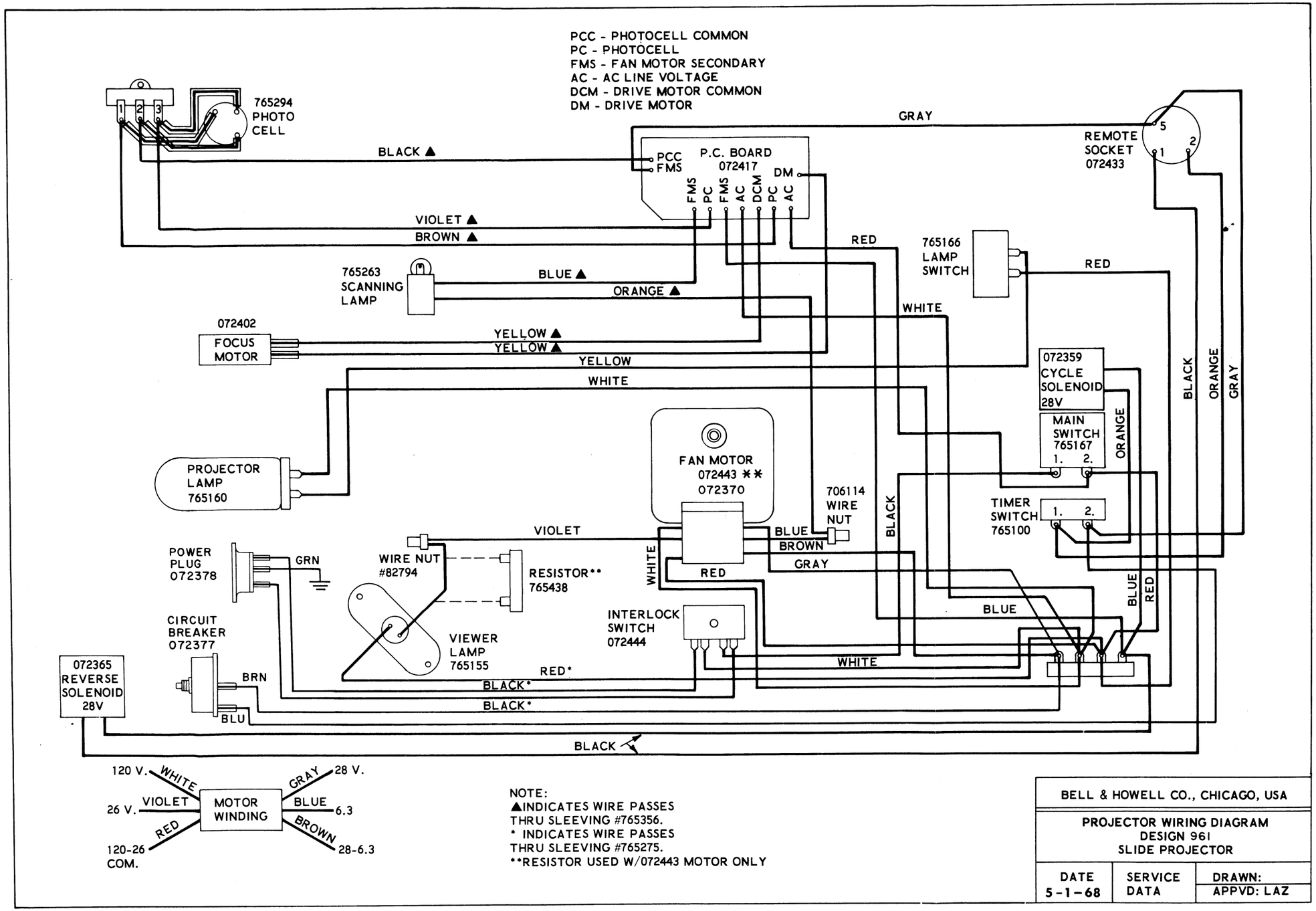


Figure 11. Pictorial Wiring Diagram — Design 961 Projector

NUMERICAL INDEX OF PARTS

PART NUMBER	FIG. & INDEX NO.
020578	2-20
020614	1-31
020687	5-4
072358	4-28
072359	4-40, 7-SOL2
072360	2-31
072361	2-29
072362	3-18
072363	3-21
072364	2-49
072365	2-26, 7-SOL1
072366	2-10
072369	4-12
072370	4-61, 6-B1
072377	2-59
072378	2-57
072386	4-61, 7-B1
072388	4-57
072389	2-7
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072392	1-44
072400	4-53
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072403	4-49
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072407	6-8
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072409	6-50
072410	6-16
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072413	6-27
072414	6-45
072415	4-63
072417	2-39
072433	2-37, 7-J1
072439	2-28
072440	2-36
072443	4-61, 7-B1
072444	1-33, 7-S1
072445	6-44
072446	5-10
072447	5-15
072449	5-29
072450	5-25
072451	5-19
072454	2-6
072461	4-33
072462	4-57
072463	4-9
072471	2-57
072500	4-53A
072501	4-57A
072503	6-13A
072504	6-45A
072505	6-50A
072507	1-28A
072508	4-57A
072509	6-8A
072510	6-19A
17639	6-12
17676	1-27
17684	1-29
19010	2-58
19158	2-60
19192	1-43
21479	2-43
23138	5-21
24835	2-54
25167	2-55
26906	1-10
30237	2-63
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31015	6-5
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31523	2-22A
31585	1-38, 2-38B
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31943	4-39A
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33143	2-12
33176	1-7
33438	1-1A
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34861	4-16A
34878	4-10, 6-36
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35157	1-6
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36802	1-9, 4-3
36832	4-25
36836	3-10
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36842	1-36
36851	1-20
38352	7-R1
39129	2-44
39186	1-11
39204	2-42
39504	1-35
80969	4-39
81847	4-34
82531	4-27
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115482	2-54
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700710	3-3
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706964	4-7
706986	2-22C
707004	4-16
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765008	6-22
765009	6-33
765014	6-38A
765016	6-38
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765022	4-15
765023	4-54, 6-51
765025	4-56
765029	6-9
765035	6-7
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765051	4-55, 6-53
765052	2-18
765055	3-11
765056	3-12
765061	1-18
765062	4-17
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765169	2-47
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765173	2-46
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765182	5-24
765185	5-8
765186	6-31
765187	6-52
765190	4-2
765194	5-6
765196	1-13
765197	1-5
765198	1-3
765200	4-50
765201	6-18
765252	6-21
765253	1-12, 7-P1
765256	1-17
765255	6-2
765258	1-1
765263	5-20, 7-L3
765265	2-40
765268	1-40
765276	4-6, 6-40, 6-48B
765277	3-17
765284	3-9
765285	1-23A
765286	7-R2, 7-R3
765287	7-Q1, 7-Q2
765288	7-D6
765289	7-C1
765290	7-R8
765291	7-D1
765292	7-D2, 7-D3, 7-D4, 7-D5
765293	1-41
765294	5-27, 7-R4, 7-R5
765334	2-38
765338	3-22
765339	4-18
765342	2-25
765343	6-23
765346	4-26
765347	4-35
765348	4-60
765350	4-52
765354	1-15
765355	1-16
765358	2-52
765360	2-33
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765363	3-7
765366	2-50
765367	2-51
765382	6-1
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765402	4-22
765404	4-49
765409	1-34
765412	5-1
765413	5-2
765418	5-18
765420	2-32
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765426	5-5
765435	3-2
765436	6-30
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765440	2-22E
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765445	6-41
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765448	1-24
765469	5-3
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765487	3-25
765490	1-18
765492	2-47
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765496	2-61
765497	4-30
765745	6-48C
765746	6-44A, 6-48A
765747	6-48D
765749	6-42A
765753	3-24
765754	3-25
765765	3-6
765766	3-4
765768	3-5
765772	1-1
765774	6-29A
765777	4-41A
765781	4-56
765784	4-12A
765785	4-9A
765786	4-10A
765787	3-28
765800	4-42A
765801	4-22A
765804	4-12B
765805	4-15B
765806	4-15C
765808	4-2A
765818	1-29A
765821	6-18A
765826	6-11A
765826	4-13A
765827	4-11A
765828	4-10A
765829	4-10A
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765831	4-15A