SECTION IV. MECHANICAL ADJUSTMENTS AND SPECIFICATIONS

Mechanical Adjustments and Specifications are discussed in the order in which they would be done if the projector had been completely disassembled and reassembled. Adjustments which are done as part of Reassembly procedure are not discussed here but are covered in SECTION III, DISASSEMBLY AND REASSEMBLY PROCEDURES.

Before attempting any adjustments, manually rotate the inching knob to make sure the Claw Arm Pins do not strike the sides of the Aperture Plate Claw Slot. At the top of the Claw Arm Stroke, the Top Claw Arm Pin will be nearer the inside edge of the Aperture Plate Slot (Figure 4-7). At the bottom of its travel, this Pin will be nearer to the outside edge of the Aperture Plate Slot. Loosen Screw (5) and adjust Bushing (8) (Figure 4-8) so these two distances are equal. (Removing Lamphouse Cover and viewing Pins from behind the Aperture Plate aids in this adjustment.)

Main Shaft Adjustments (Figure 4-1)

1. Position Safety Shutter to avoid striking either the Shutter and Cam Assembly or the Lamp Chimney. Secure Safety Shutter in position with Setscrew. Make sure Safety Shutter Link is hooked under tab on Safety Shutter. Link and Spring must not strike Shutter and Cam Assembly. Adjust Shutter Stop Bracket so Safety Shutter Link does not hang up on it either in Forward or Reverse Operation of the Projector.

2. Main Shaft Pulley (Motor Drive Belt Tracking) (All models except 1030N) - Loosen two setscrews in Main Shaft Pulley and move Pulley so Motor Drive Belt rides on crown of both the Main Shaft Pulley and the Motor Pulley, about 1/16" from the flanged edge of both Pulleys. The Projector must be run in the Forward mode, Sound speed to check this adjustment.

   NOTE: The visible screws in the Main Shaft Pulley may be jam screws. If loosening them will not allow the Pulley to move, remove them and loosen the setscrews under them. Be sure to tighten setscrews securely after adjustment and replace jam screws if removed. If there is a flat on the Main Drive Shaft the Setscrews must be tightened on the flat.

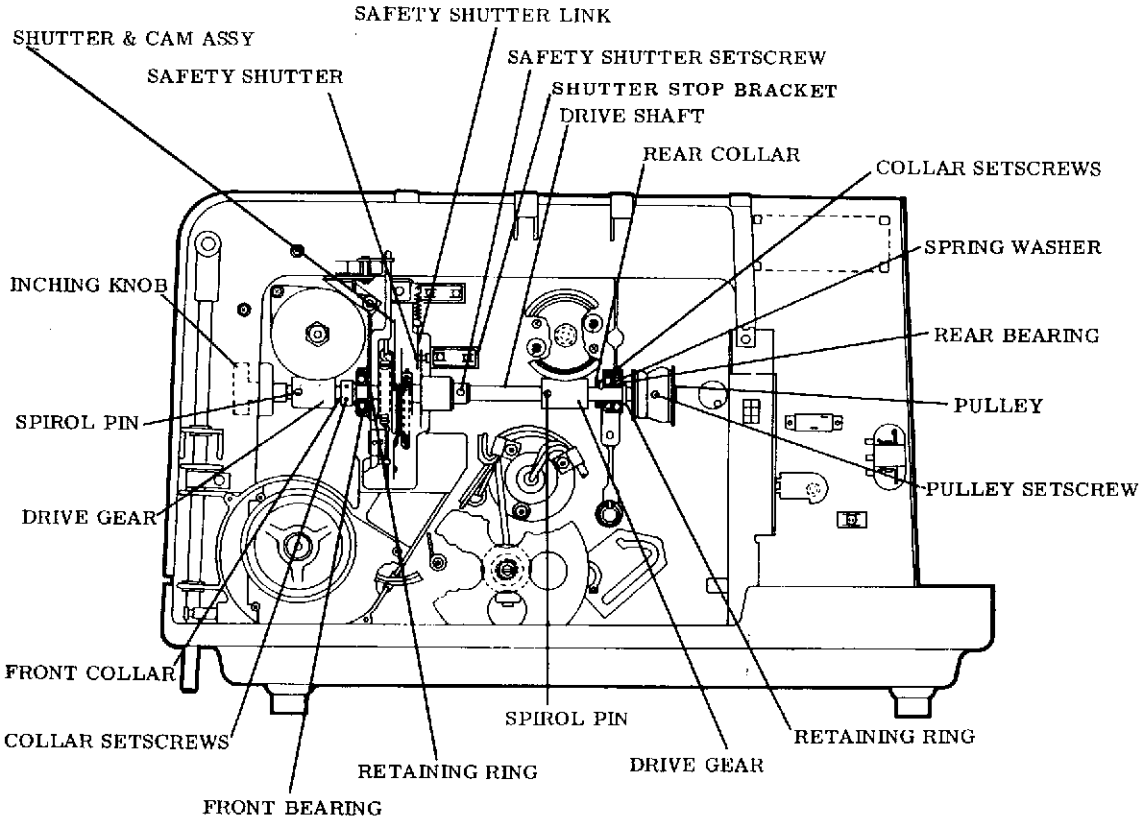


Figure 4-1. DRIVE SHAFT

Drive Belt Shift Forks

1. Bend Shift Forks slightly to maintain a clearance of 1/8" minimum between the Drive Belt and the Shift Forks in both Sound and Silent speeds.

2. Move Sound/Silent lever back and forth between Sound and Silent and check that Drive Belt shifts properly between the two steps on both the Main Shaft Pulley and the Motor Pulley. If this requirement cannot be met, recheck adjustment of Main Shaft Pulley and Shift Forks. Also check Grommets in Motor Plate for wear causing Motor to sag.

Motor Adjustments—1030N (Figures 4-3 and 4-4)

1. Start adjustments of Motor mounting with one each of Washers (6) (35473-63X) and (4) (35473-46X) on each mounting screw of the Motor Mounting Plate (11). (Washer (2) is shown on drawing as reference only: see Step 5 below).

2. Thread Nut (9) all the way down to Motor Mounting Plate (11).

3. Loosen Nut (7) and turn Screw (1) counterclockwise (using screwdriver slot) to relax tension on Motor Belt. (Figure 4- 3)

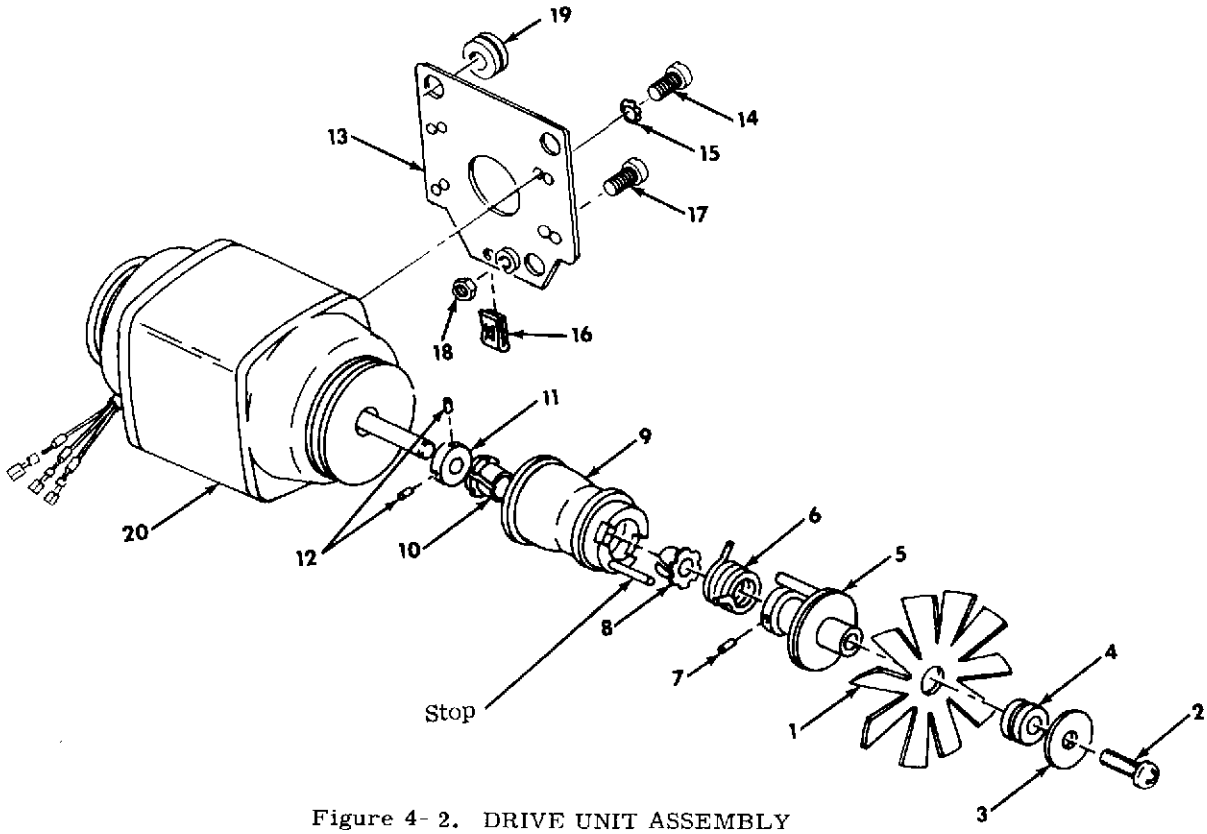


Figure 4- 2. DRIVE UNIT ASSEMBLY

Motor Damper (All models except 1030N) (Figure 4-2)

1. With Projector running in Forward/Sound speed, adjust Screw (17) until rubber pad on Screw (17) just contacts Motor Mounting Plate. Tighten Nut (18) to lock adjustment.

2. DO NOT OVER-TIGHTEN. DO NOT make this adjustment to establish belt tracking. This adjustment is made to reduce Motor vibrations and Projector noise.

4. Align Main Shaft Pulley laterally with Motor Pulley (14).

5. Add or subtract Washers (6) and/or (4) to obtain best Belt (13) tracking (Motor Shaft parallel with Main Drive Shaft). Keep Motor Plate (12) and Motor Mounting Plate (11) as parallel as possible.

6. Belt (13) must not rub sides of Motor Pulley. If necessary, move Main Drive Shaft Pulley so that its flange guides the belt.

7. Adjust Nut (5) for .030" end play on Screw (1).

8. Turn Screw (1) clockwise (using screwdriver slot) until there is approximately .015" clearance each side of Grommet (3). Tighten Nut (7) against Weld Nut (8) while maintaining this clearance.

9. Vary tension on Spring (10) by adjusting Nut (9) until Drive Belt meshes with Pulley Teeth without excessive whine.

10. Recheck clearance requirement in Step 8. Loosen Nut (7) and readjust if necessary. If readjustment is made, recheck Step 9. Continue performing Steps 8 and 9 alternately until both requirements are met.

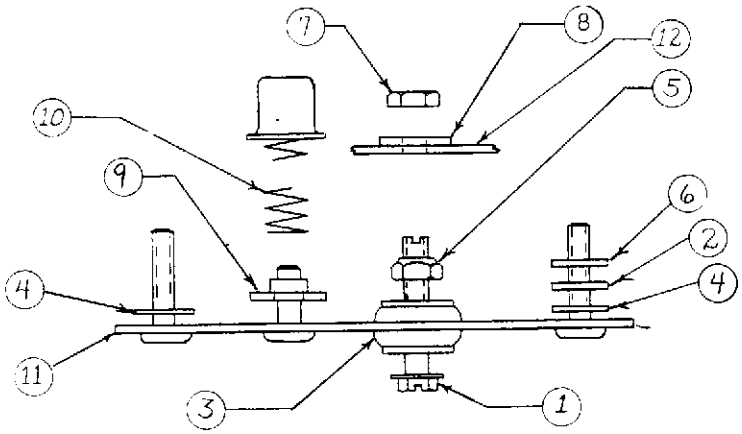


Figure 4-3. 1030N MOTOR MOUNT ADJUSTMENTS

Reel Arm Belt (Take-up and Supply)

If ends of belts were disconnected, close gaps between hook ends and body of belt by bending hooks slightly. The two ends of the belt must appear to be in line with each other when belt is held taut.

Claw Arm Adjustments

Before attempting any adjustments, manually rotate the inching knob to make sure the Claw Arm Pins do not strike the sides of the Aperture Plate Claw Slot. At the top of the Claw Arm Stroke, the Top Claw Arm Pin will be nearer the inside edge of the Aperture Plate Slot(Figure 4-7).At the bottom of its travel, this Pin will be nearer to the outside edge of the Aperture Plate Slot. Loosen Screw (5) and adjust Bushing (8) (Figure 4-8) so these two distances are equal. (Removing Lamphouse Cover and viewing Pins from behind the Aperture Plate aids in this adjustment.)

1. Pin Protrusion - One of the most critical adjustments on all Singer 16 mm Projectors is Claw Pin Protrusion. If Protrusion is not correct, the operation of the machine will be very erratic even though all other adjustments are correct.

a. Open Film Gate. Remove Lamphouse Cover and rotate Inching Knob until the Claw Arm moves back away from the aperture plate.

b. Insert Protrusion Gauge G-10-38000 in channel between Pressure Shoe and Aperture Plate with stepped surface of metal gauge end facing aperture plate (see Figure 4-5). Push the Gauge well down into the channel.

c. Gently close Film Gate to hold Gauge in place - be careful not to exert too much pressure on Film Gate Lever or Pressure Shoe may be bent.

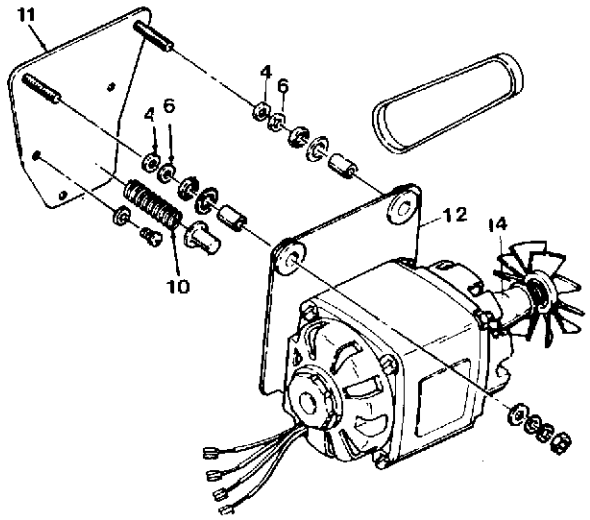


Figure 4-4. 1030N MOTOR MOUNT ADJUSTMENTS

d. Pull Gauge up until an imaginary line drawn across the top of the Lamphouse Cover intersects the red tape approximately at its center.

e. Connect one lead of an Ohmmeter or Continuity tester to the brass screw on the Gauge. Connect the other lead to the chassis of the Projector (Connecting point must be free from paint, dirt or grease).

f. Rotate Inching Knob clockwise to cause the Claw Arm to move up and toward the Aperture Plate. Stop rotating Inching Knob when Claw Arm Pins enter slot in Aperture Plate and start down. (Edge of Shutter Blade will be just below Aperture.)

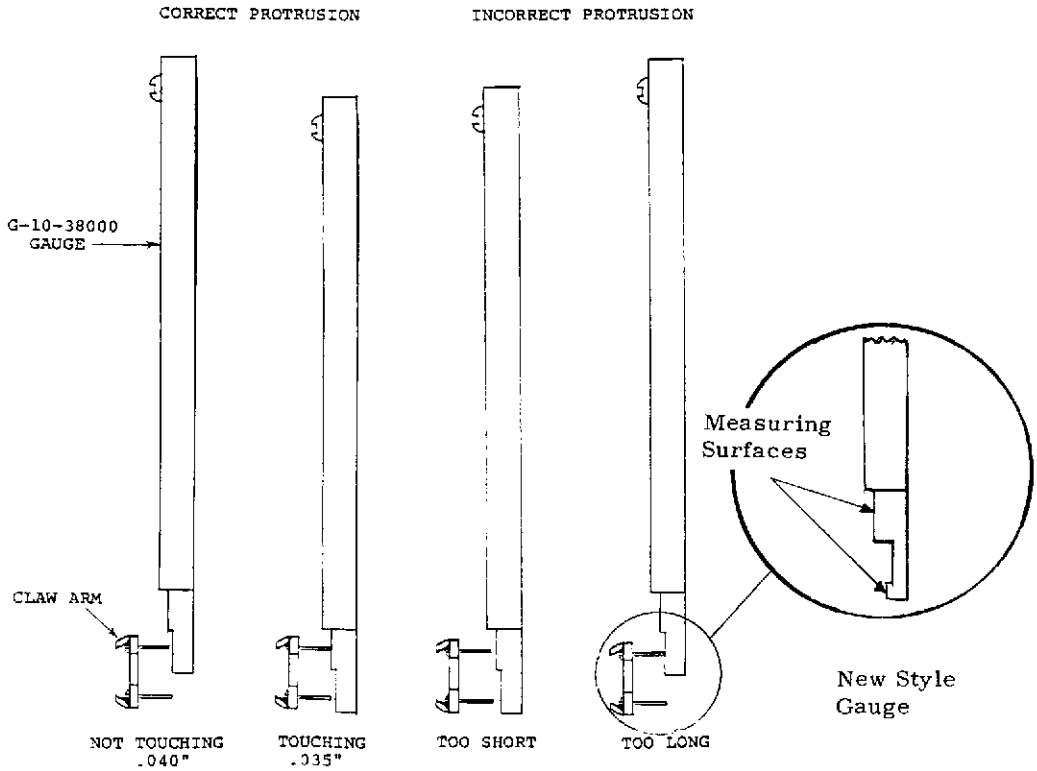


Figure 4-5. CLAW PIN PROTRUSION

g. Push Claw Arm toward Aperture Plate with finger and gently push Gauge down until bottom of Gauge touches top pin of Claw Arm. (Ohmmeter or Continuity Tester will show continuity reading).

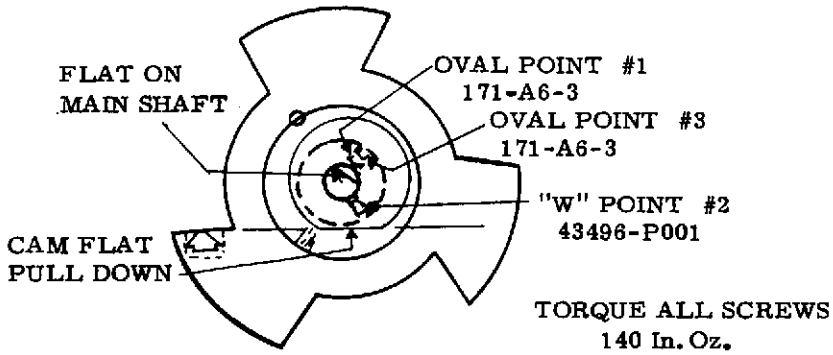
h. Release Claw Arm and observe position of red and yellow reference tapes. Slide Gauge down 1/2 width (1/4 width with new style gauge) of either tape. (An imaginary line drawn across the top of the Lamphouse Cover generally intersects the yellow reference tape at its center when this step is completed). The imaginary line intersects the yellow tape on the new style gauge about 1/4 of the way up from the bottom.

j. If Meter or Tester shows continuity, Protrusion is too much (more than .040") and should be adjusted. If no continuity is shown, gently push gauge down one width of tape. Continuity indicates correct protrusion between .035" and .040". No Continuity indicates Protrusion is too little (less than .035") and should be adjusted. (Figure 4-5)

k. To Adjust - Remove Jam Screw (3) and loosen Screw (2), (Figure 4-6) Position Gauge with bottom step aligned with top pin of Claw (Claw must be positioned as in Step (f) above). Grasp Shutter and loosen Screw (1). Move Shutter on Main Drive Shaft while observing meter or tester. When continuity is established, allow Shutter to move back to the point of just breaking continuity and tighten Screw (1). (Screw (1) must always be tightened on the flat of the shaft. This may be accomplished by rocking the Shutter slightly during the initial tightening). Push Gauge down as in Step (h) above and check for continuity. If no continuity exists, repeat this entire process until no continuity exists on the lower step of the Gauge but continuity does exist on the upper step. (See (Figure 4-5)

l. Tighten Screw (2) and recheck requirements of Step (k) above. If tightening Screw (2) results in failure to meet those requirements, repeat Step (k) until tightening Screw (2) no longer causes failure.

FRONT VIEW



SHUTTER / CAM POSITION
WHEN ADJUSTING CLAW
ARM PIN PROTRUSION

SHUTTER & SHAFT ALIGNMENT

Figure 4-6. SHUTTER AND SHAFT ALIGNMENT

m. Tighten Screws (1) and (2) to 140-inch/ounces of torque (very tight) and replace Screw (3) and tighten securely.

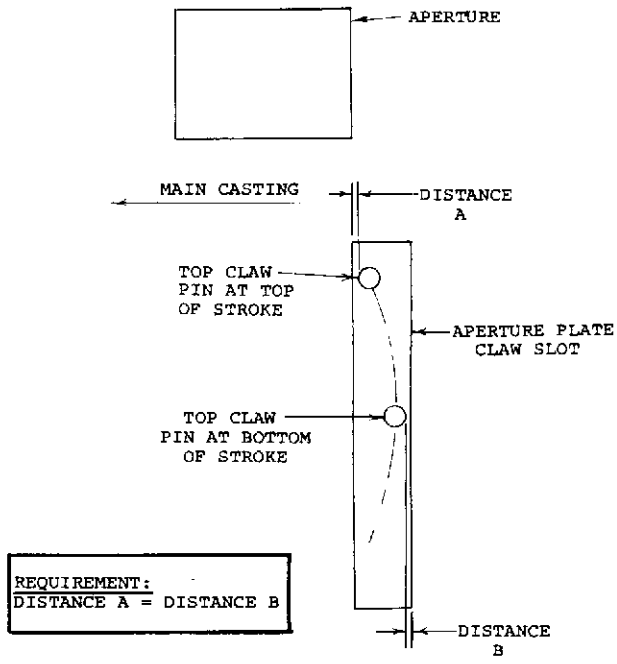
2. Claw Pull Down Stroke and Side Clearance (Figures 4-7 / 4-11) These Two Adjustments are interdependent and must be adjusted at the same time. If either one is adjusted, the other must be checked and adjusted as necessary until requirements for both can be met.

(See Step 3 for adjustments to Model 1040).

A good starting position for the Pivot (9) (Figure 4-8) places its Eccentric Pin at about 7 O'Clock when viewed from front of Projector (See Figure 4-11). The notch in Bushing (8) (Figure 4-8) should be slightly below the notch in Pivot (9) so an imaginary line drawn across the top of Bushing notch lines up with bottom of Pivot notch.

Before attempting any adjustments, manually rotate the inching knob to make sure the Claw Arm Pins do not strike the sides of the Aperture Plate Claw Slot. At the top of the Claw Arm Stroke, the Top Claw Arm Pin will be nearer the inside edge of the Aperture Plate Slot (Figure 4-7). At the bottom of its travel, this Pin will be nearer to the outside edge of the Aperture Plate Slot. Loosen Screw (5) and adjust Bushing (8) (Figure 4-8) so these two distances are equal. (Removing Lamphouse Cover and viewing Pins from behind the Aperture Plate aids in this adjustment.)

a. Thread an old film in the Projector (do not use a good film for this adjustment) and adjust Framing Knob to eliminate any frame lines at top or bottom of projected image with the Projector running in Forward. If excessive noise results when framing knob is moved, stop machine and check location of Claw Arm Pins in sprocket



VIEWED FROM BEHIND

Figure 4-7. SIDE CLEARANCE

holes of film. When Framing is correct, the Top Claw Arm Pin should be the same distance from the inside edge of the sprocket hole at the top of its stroke as it is from the outside edge of the sprocket hole at the bottom ot its stroke (Figure 4-7). Loosen Screw (5) and adjust Bushing (8) (Figure 4-8) so these two distances are equal. Remove film from Projector after proper Framing and Side Clearance are established.

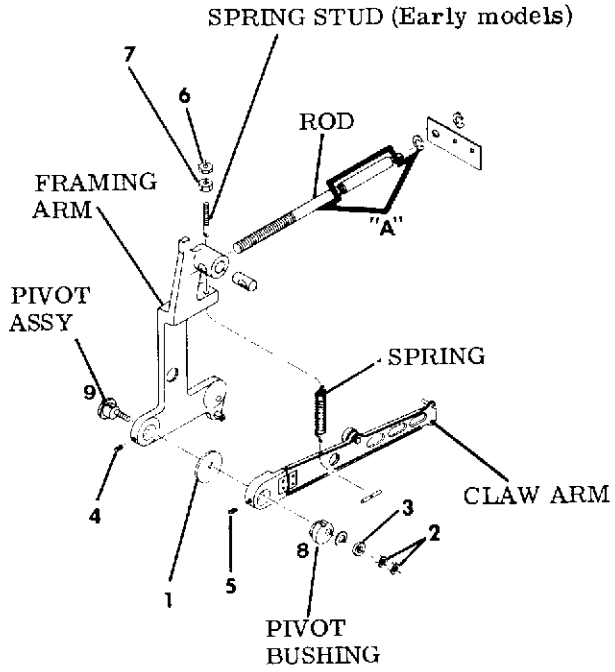


Figure 4-8. CLAW ARM

b. Remove Motor Drive Belt or disconnect Motor wires so Main Drive Shaft will not turn during next adjustments. Be careful not to disconnect blower wires.

(As an alternative, Still Button may be depressed on models having that feature).

c. Rotate Inching Knob clockwise until Claw Arm Pins are in the Aperture Plate Slot at the bottom of their travel. Insert Stroke Setting Gauge (ST-5880) into Aperture Plate Film Channel. Close Film Gate. Make sure Pressure Shoe seats properly. Push Gauge down until it hits Claw Arm Pins.

d. Rotate Inching Knob clockwise through enough cycles of the Claw Arm to draw the target in the Gauge into the aperture. Be careful not to allow the Claw Arm to move up at any time when the Pins are engaged in the sprocket holes. The Pins must pull the Gauge down smoothly for measurement to be valid.

e. After Gauge Target has been moved into Aperture, continue turning Inching Knob clockwise so Claw Arm Pins withdraw at bottom of stroke and raise to top of stroke. STOP turning Inching Knob when Pins reenter sprocket holes BEFORE they start moving down. (The Shutter Blade will be even with bottom edge of Aperture.) NOTE: If you go too far, go back to Step (c) and repeat.

f. Turn on lamp and project image at least 8" wide (a wide angle lens will help achieve this width at a shorter projection distance), raise elevation approximately 1" (this will get you set up (in case stroke is in need of adjustment), and draw a reference line full width of Target on bottom step. (Figure 4-9).

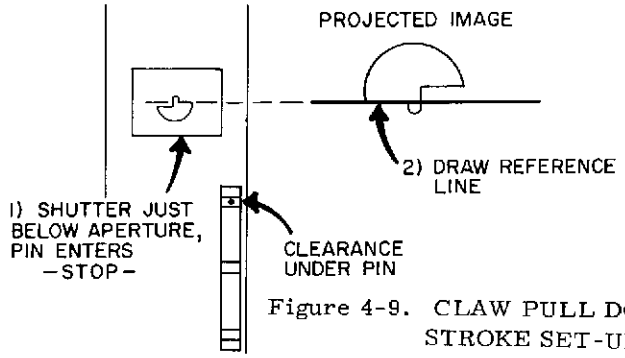


Figure 4-9. CLAW PULL DOWN STROKE SET-UP

g. Lift or push Gauge up. Projected Target will move down. Upper Target step must touch reference line drawn in Step (f) for correct stroke. (Figure 4-10).

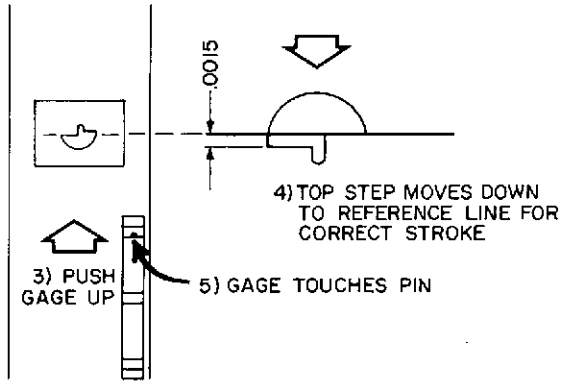


Figure 4-10. CLAW PULL DOWN STROKE

h. Adjust by placing Shuttle Cam Adjusting Tool (ST-5884) on Claw Arm Pivot (9) (Figure 4-8), loosening Screws (4) and (5) and rotating Pivot (9) and Bushing (8) the same amount in the same direction simultaneously. Turn counterclockwise (as viewed from front of projector) to shorten stroke and clockwise to lengthen stroke. (Figure 4-11)

Requirement:

The Top Claw Arm Pin should be the same distance from the inside edge of the Gauge sprocket hole at the top of its stroke as it is from the outside edge of the Gauge sprocket hole at the bottom of its stroke (Figure 4-7).

Loosen Screw (5) and adjust Bushing (8) (Figure 4-8) So these two distances are equal.

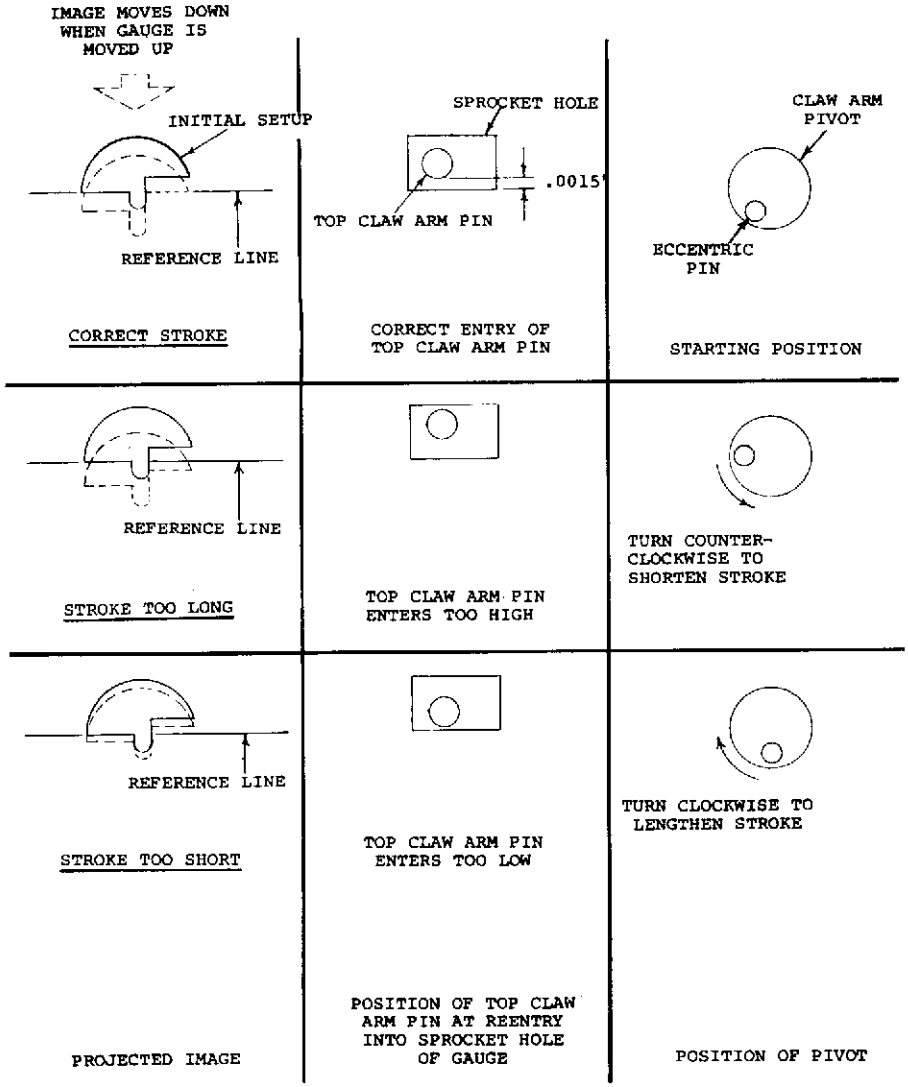


Figure 4-11. CLAW PULL DOWN STROKE ADJUSTMENT

NOTE: Theoretically, turning Pivot (9) and Bushing (8) equally will change Pull Down Stroke but not side clearance. However, side clearance should be checked.

WHEN ADJUSTMENTS ARE COMPLETE, THE ECCENTRIC PIN IN FRONT PIVOT MUST ALWAYS BE BETWEEN 6 and 9 O'CLOCK AS VIEWED FROM FRONT OF PROJECTOR. IF NOT, the cam follower on the Claw Arm may be severely worn requiring replacement of Claw Arm.

j. If Stroke was adjusted, repeat Steps (c) through (h). When performing Step (f), it is quite probable that the bottom step of projected Target no longer rests on the reference line. ADJUST ELEVATION to line up bottom step of projected Target with reference line and then proceed with Steps (g) and (h). It may be necessary to repeat this sequence of steps several times until correct stroke and side clearance are obtained.

k. A final, dynamic check for proper Side Clearance is made during the Framing Adjustment which follows.

3. **Claw Pull Down Stroke and Side Clearance**

(Figures 4-7 thru 4-11)

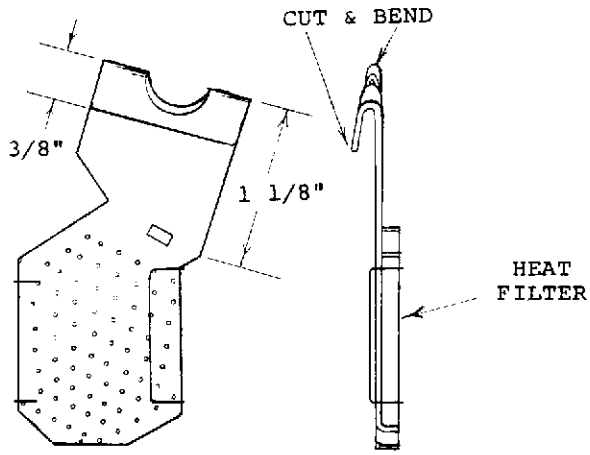


Figure 4-12. MODIFIED SAFETY SHUTTER (42994-G1)

CAUTION: When working on Model 1040 Projectors, NEVER LOOK AT THE LAMP! It is advisable to wear dark or tinted glasses (preferably safety glasses) when working on these projectors.

Claw Pull Down Stroke and Side Clearance Adjustments are interdependent and must be adjusted at the same time. If either one is adjusted, the other must be checked and adjusted as necessary until requirements for both can be met.

A good starting position for the Pivot (9) (Figure 8) places its Eccentric Pin at about 7 O'Clock when viewed from front of Projector (See Figure 4-11). The notch in Bushing (8) (Fig. 4-8) should be slightly below the notch in Pivot (9) so an imaginary line drawn across the top of Bushing notch lines up with bottom of Pivot notch.

Before attempting any adjustments, manually rotate the inching knob to make sure the Claw Arm Pins do not strike the sides of the Aperture Plate Claw Slot. At the top of the Claw Arm Stroke the Top Claw Arm Pin will be nearer the inside edge of the Aperture Plate Slot (Figure 4-7). At the bottom of its travel, this Pin will be nearer to the outside edge of the Aperture Plate Slot. Loosen Screw (5) and adjust Bushing (8) (Figure 4-8) So these two Distances are equal. (Removing Lamphouse Cover and viewing Pins from behind the Aperture Plate aids in this adjustment.)

a. Thread an old film in the Projector (do not use a good film for this adjustment) and adjust Framing Knob to eliminate any frame lines at top or bottom of projected image with the Projector running in Forward. If excessive noise results when framing knob is moved, stop machine and check location of Claw Arm Pins in sprocket holes of film. When framing is correct, the Top Claw Arm Pin should be the same distance from the inside edge of the sprocket hole at the top of its stroke as it is from the outside edge of the sprocket hole at the bottom of its stroke (Figure 4-7). Loosen Screw (5) and adjust Bushing (8) (Figure 4-8) so these two distances are equal. Remove film from Projector after proper Framing and Side Clearance are established.

b. Rotate Inching Knob clockwise until Claw Arm Pins are in the Aperture Plate Slot at the bottom of their travel. Insert Stroke Setting Gauge (ST-5880) into Aperture Plate Film Channel. Close Film Gate. Make sure Pressure Shoe seats properly. Push Gauge down until it hits Claw Arm Pins.

c. Rotate Inching Knob clockwise through enough cycles of the Claw Arm to draw the target in the Gauge into the aperture. Be careful not to allow the Claw Arm to move up at any time when the Pins are engaged in

the sprocket holes. The Pins must pull the Gauge down smoothly for measurement to be valid.

d. After Gauge Target has been moved into Aperture, continue turning Inching Knob clockwise so Claw Arm Pins withdraw at bottom of stroke and raise to top of stroke. STOP turning Inching Knob when Pins re-enter sprocket holes BEFORE they start moving down. (The Shutter Blade will be even with bottom edge of Aperture.) NOTE: If you go too far, go back to Step (b) and repeat.

e. Modify a discarded 42994-G1 Safety Shutter as shown in (Figure 4-12). (A Similar heat filter may be used).

f. Hang this Heat Filter on the front of the Arc Lamp Mounting Bracket so it is between the Lamp and Aperture. Make sure there is enough clearance so the Dowser does not hit the Filter when the Dowser is raised.

g. Operate OFF-ON-LAMP Switch to LAMP. Leave RUN Switch OFF. It is suggested that the Lamp be left ON during the remaining tests. If the Lamp is turned OFF, it must be allowed to cool before it will strike again.

h. Manually raise Dowser and project image at least 8" wide (a wide angle lens will help achieve this width at a shorter projection distance), raise elevation approximately 1" (this will get you set up in case stroke is in need of adjustment), and draw a reference line full width of Target on bottom step. (Figure 4-9).

j. Lift or push Gauge up. Projected Target will move down. Upper Target step must touch reference line drawn in Step (h) for correct stroke. (Figure 4-10).

k. Adjust by placing Shuttle Cam Adjusting Tool (ST-5884) on Claw Arm Pivot (9) (Figure 4-8), loosening Screws (4) and (5) and rotating Pivot (9) and Bushing (8) the same amount in the same direction simultaneously. Turn counterclockwise (as viewed from front of projector) to shorten stroke and clockwise to lengthen stroke. (Figure 4-11).

NOTE: Theoretically, turning Pivot (9) and Bushing (8) equally will change Pull Down Stroke but not side clearance. However side clearance should be checked.

Requirement:

The Top Claw Arm Pin should be the same distance from the inside edge of the Gauge sprocket hole at the top of its stroke as it is from the outside edge of the Gauge sprocket hole at the bottom of its stroke (Figure 4-7). Loosen Screw (5) and adjust Bushing (8) (Figure 4-8) So these two distances are equal.

WHEN ADJUSTMENTS ARE COMPLETE, THE ECCENTRIC PIN IN FRONT PIVOT MUST ALWAYS LAY BETWEEN 6 AND 9 O'CLOCK AS VIEWED FROM FRONT OF PROJECTOR. IF NOT, the cam follower on the Claw Arm may be severely worn requiring replacement of Claw Arm.

l. If Stroke was adjusted, repeat Steps (b) through (k). When performing Step (h), it is quite probable that the bottom step of projected Target no longer rests on the reference line. ADJUST ELEVATION to line up bottom step of projected Target with reference line and then proceed with Steps (j) and (k). It may be necessary to repeat this sequence of steps several times until correct stroke and side clearance are obtained.

Framing Adjustment (Figure 4-13)

1. After Claw Arm Adjustments have been checked and/or made, the Framing Limit Plate can be adjusted.

2. Thread film in Projector and run in Forward. Adjust Framing Knob to eliminate any frame lines at top or bottom of projected image.

3. Loosen two Screws (30) and slide Framing Limit Plate (28) so top of Framing Arm (34) is centered in notch of Framing Limit Plate (28). BE CAREFUL not to move Rewind Lever Stop (29) when making this adjustment. Tighten two Screws (30).

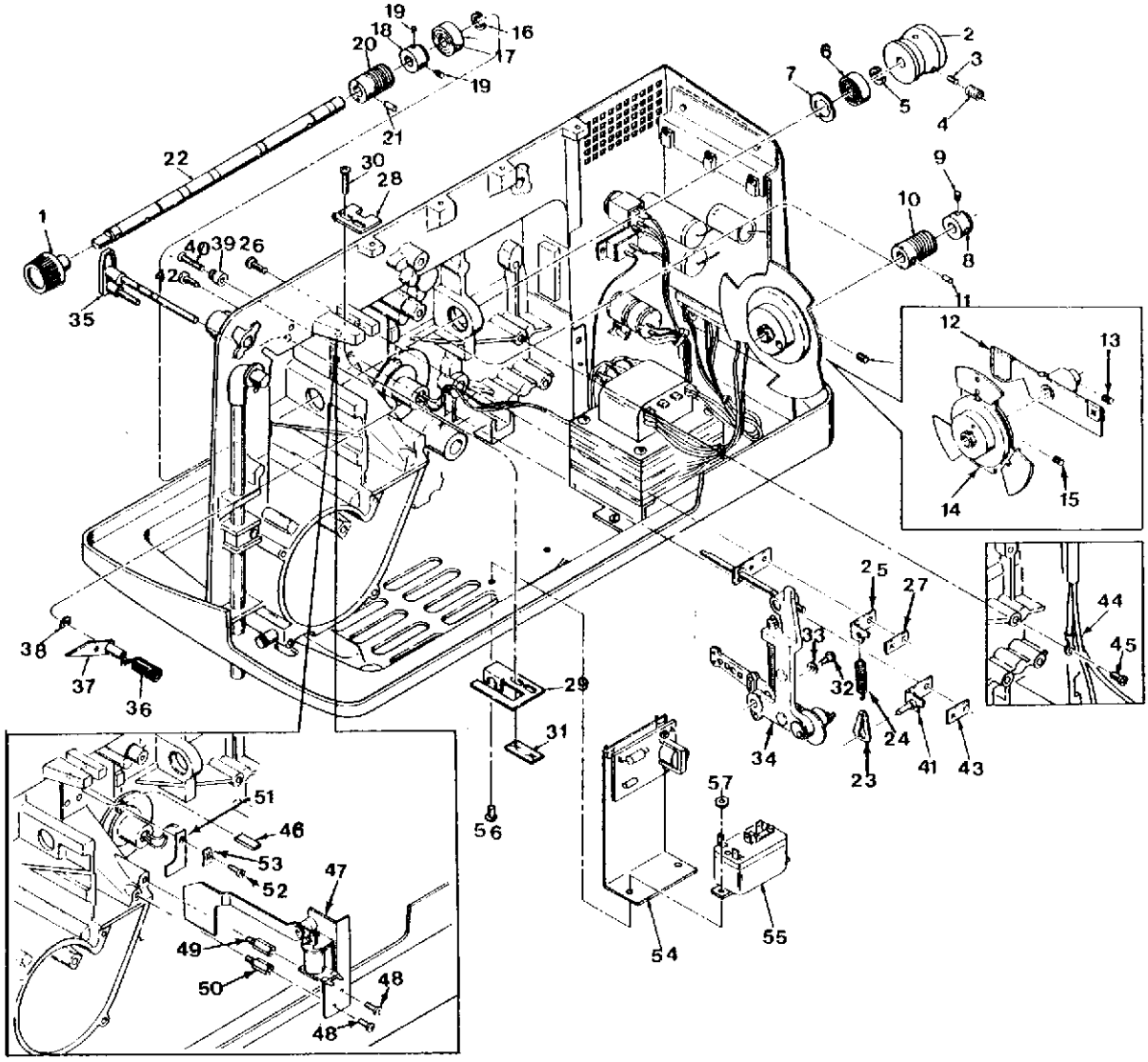


Figure 4-13. FRAMING ADJUSTMENT

4. Run film in Projector in Forward mode and adjust Framing Knob maximum in both directions. A frame line should move into the projected picture an equal amount on both top and bottom. Readjust Framing Limit Plate (28) until this requirement can be met.

NOTE: If Projector becomes noisy when the Framing Knob is rotated maximum in either direction, the Side Clearance is not correct and must be adjusted. (See Claw Arm Adjustments).

Film Pressure (Figure 4-14)

1. Open Film Gate, remove Projection Lens and insert Film Pressure Gauge G8-38000 into Lens Holder. Seat contact button of gauge against pressure shoe. Needle should move slightly. Set dial of gauge to 0. Thread a piece of black and white film in film channel and close gate. Deflection must measure 0 to 4 (0.000" to 0.004") with film pressure adjusting lever in the LO position and 25 to 35 (0.025" to 0.035") with lever in the HI position.

2. To adjust, remove Screw and pry Film Pressure Lever off of Pressure Lever Eccentric (be careful not to chip paint on Lens Holder). Rotate Pressure Lever Eccentric until dial indicator on Gauge reads 30 (0.030"). Replace Pressure Lever, orienting it so Stop Pin on Lens Holder prevents it from being rotated any further in a clockwise direction (Pressure Lever will be stopped in HI position).

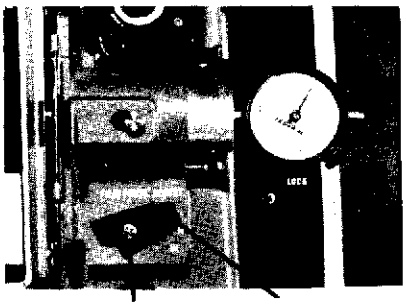


Figure 4-14. FILM PRESSURE ADJUSTMENT

3. Move Pressure Lever back and forth from HI to LO several times. The dial indicator will vary from 0 to 4 (0.000" to 0.004") in the LO position to 25 to 35 (0.025" to 0.035") in the HI position.

Film Pressure Shoe Seating (Figure 4-15)

1. Thread film in Projector, close Film Gate, run in Forward and adjust Film Pressure Lever for quietest operation. The projected picture should be steady--no jump-in or jittering--and the Projector should run quietly in the Gate area.

2. Run the Projector in Reverse. The projected picture should be steady and the Projector should run quietly in the Gate area

3. To a ust, loosen two Screws (11) just enough to permit slight movement of Plate (10) with Projector running in Forward and allow Pressure Shoe (3) to seat itself. Move Plate (10) while film is running through Projector for quietest operation with steadiest picture (These two requirements will generally be met simultaneously).

4. Run Projector in Reverse. If necessary, readjust Plate (10) for quietest, steadiest picture.

5. When Film Pressure Shoe is properly adjusted, the projected picture will be steady and the Projector will run quietly in both Forward and Reverse.

6. Tighten two Screws (11).

7. Open and close Film Gate several times and make sure Pressure Shoe seats properly in Aperture Plate Channel. If not, perform Steps 1 through 6 again.

8. Apply small drop of Clear Glyptal 1276 to heads of Screws (11).

Take-up Clutch Adjustments (Figures 4-16 and 4-17)

1. Mount an EMPTY 400' Reel on Take-up Arm and run Projector in Forward.

2. If 400' Reel turns, turn both Lift Off Nuts (1) and (2) counterclockwise (as viewed from top of Projector), keeping Bracket (4) snugly trapped between them, until the Reel just STOPS turning.

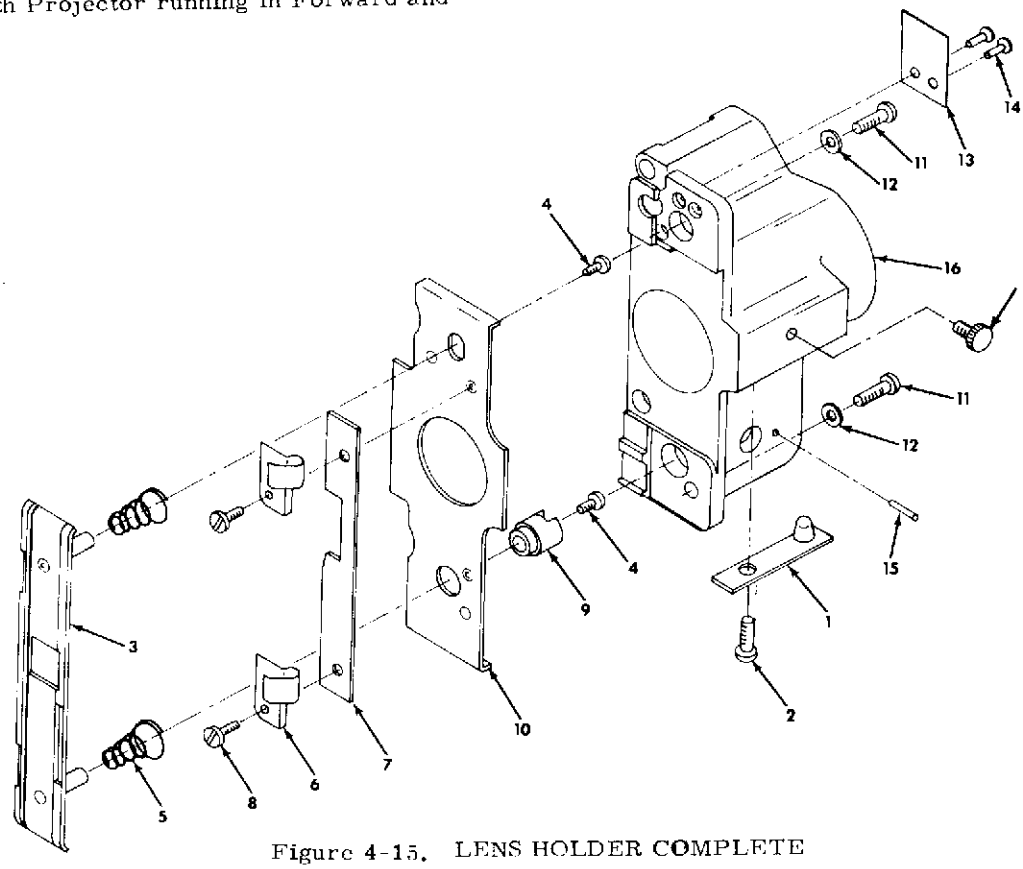


Figure 4-15. LENS HOLDER COMPLETE

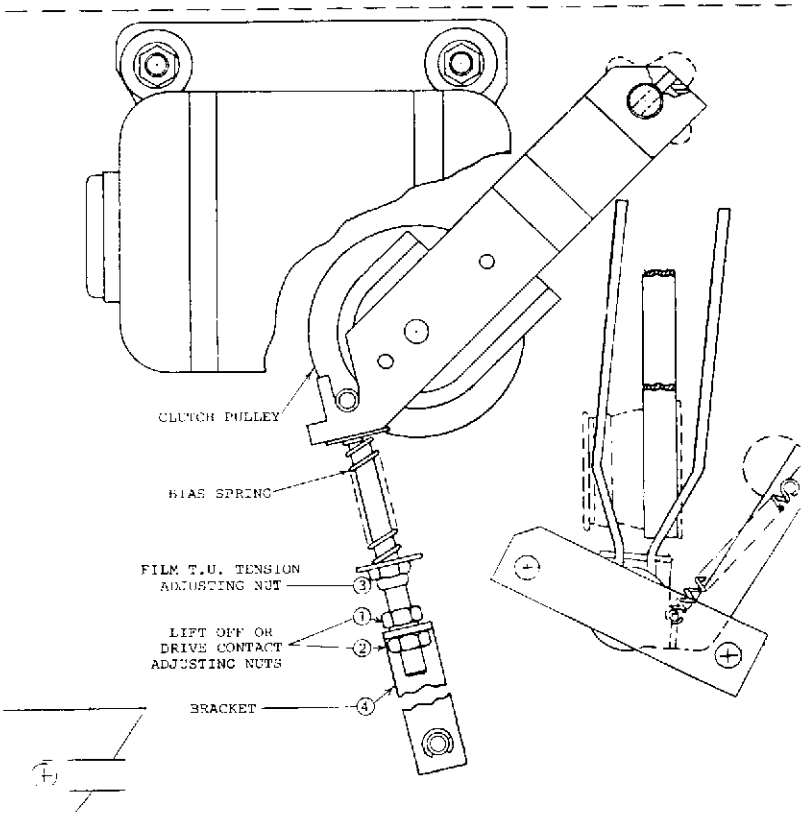


Figure 4-16. TAKE-UP CLUTCH ADJUSTMENTS

3. If 400' Reel does not turn, turn both Lift Off Nuts (1) and (2) clockwise (as viewed from top of Projector), keeping Bracket (4) snugly trapped between them, until the Reel just STARTS turning.

4. With a felt tip pen, mark one face of Nut (2) and turn this Nut down $2\frac{1}{2}$ turns. Now turn Nut (1) down against Bracket (4) and tighten it securely. This establishes Lift Off or the Drive Contact point.

5. Leave empty 400' Reel on Take-up Arm, thread film in Projector and run in Forward until 10' to 25' of film is on Take-up Reel. Measure Film Tension by holding Film Tension Gauge T-38000-S as shown in Figure 17. The Gauge Roller must be directly above the Reel Tension Arm Roller as illustrated.

6. Adjust Film Take-up Tension Adjusting Nut (3) for a reading of 4 to 6 ounces on the Gauge. Rewind film.

7. Place a full 2000' reel on Supply Arm and run about 1800' onto Take-up Reel. Thread film through Projector and manually rotate Inching Knob to insure proper movement of film through Projector.

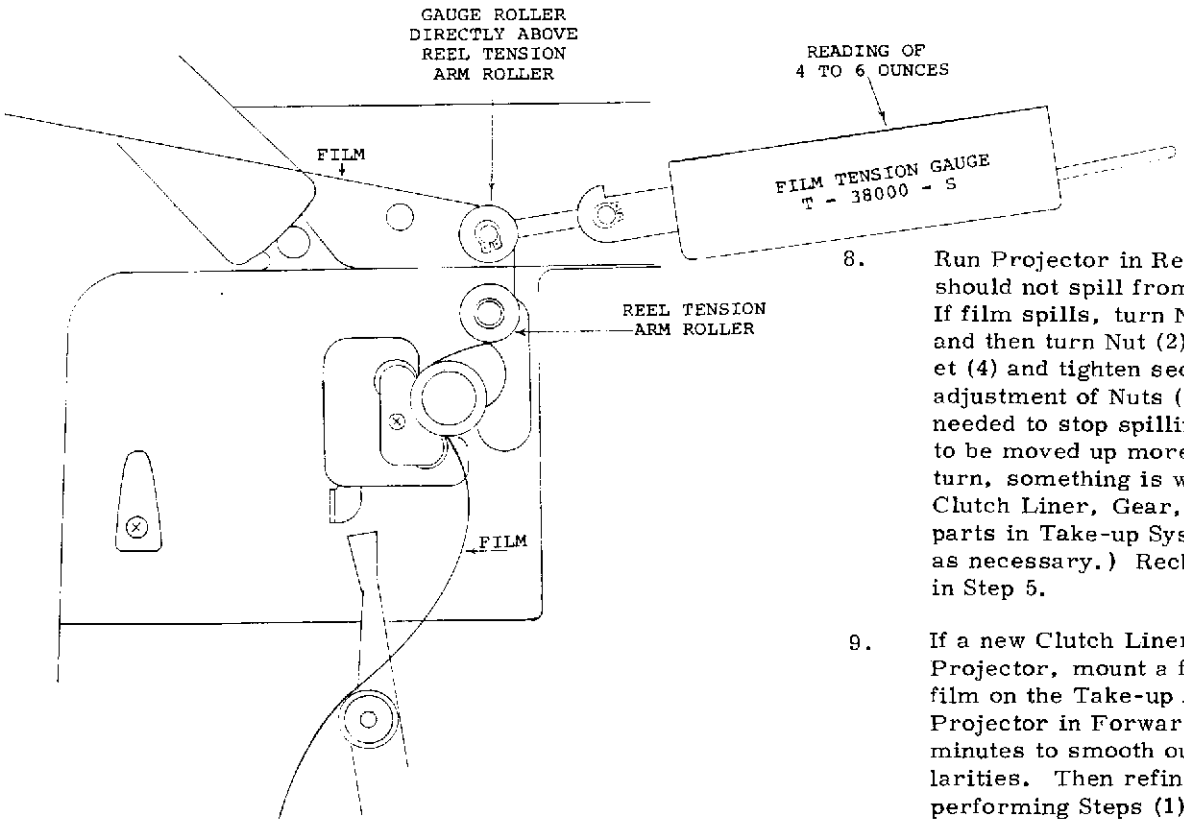


Figure 4-17. TAKE-UP TENSION MEASUREMENTS

8. Run Projector in Reverse. Film should not spill from Take-Up Reel. If film spills, turn Nut (1) up 1/2 turn and then turn Nut (2) up against bracket (4) and tighten securely. (Further adjustment of Nuts (1) and (2) may be needed to stop spilling. If they have to be moved up more than one full turn, something is wrong. Check Clutch Liner, Gear, Pulley and other parts in Take-up System and replace as necessary.) Recheck requirement in Step 5.

9. If a new Clutch Liner was installed in Projector, mount a full 2000' reel of film on the Take-up Arm and run the Projector in Forward for at least 20 minutes to smooth out Liner irregularities. Then refine adjustments by performing Steps (1) through (8) again.

Sound Drum Adjustments (Figures 4-18 thru 4-20).

1. Loosen Sound Optics Setscrew and remove Sound Optics Cartridge. (This Cartridge may be very difficult to remove due to the wedging action of the nylon plug used to lock in in place. Rotating it back and forth while pushing up on it will aid in its removal. DO NOT pry up on bottom of Cartridge as this will damage bottom lens.) Inspect bottom element for damage.

2. Insert Sound Drum Locating Plug T-38001-G in place of Cartridge. Push Plug down until the small Pin in its end is just above the Photo Diode in the Sound Drum Support (Pin should not touch Diode) Figure 4-18)

3. Loosen Sound Drum Support Retaining Screws (Figure 4-20) and rotate Support until Photo Diode Notch of Support is centered on the Pin in end of Locating Plug Figure 4-18.

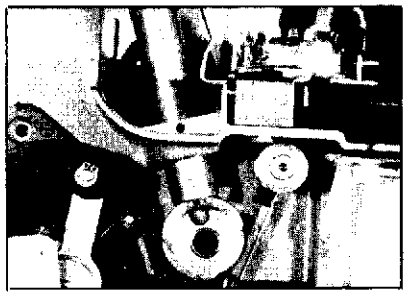


Figure 18. SOUND DRUM SUPPORT ADJUSTMENT

4. Insert Sound Drum in Sound Drum Support and push this entire assembly toward Main Casting until back edge of Sound Drum just touches Pin on Locating Plug (Figure 4-19). Be sure to maintain centering accomplished in Step 3 while making this adjustment.

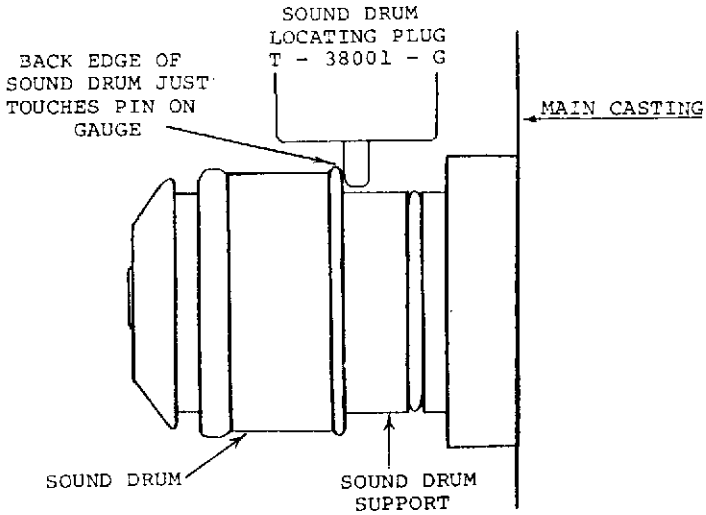


Figure 4-19. SOUND DRUM LATERAL POSITIONING

NOTE: Be sure Sound Drum is butted against end of Sound Drum Support during this adjustment. Having the Flywheel attached during this adjustment will help in holding these parts together in proper orientation.

Sound Optic Focusing (Figures 4-21 thru 4-23)

1. Connect AC Voltmeter across speaker terminals and set meter range switch to read 50 Volts Full scale minimum.

2. Cut two strips of 7000Hz sound focusing film about 40" long. 'SMPTE P16-SF-A, Singer P/N 45191G2). Splice them together to form a closed loop with the emulsion side of one strip on the outside circumference of the loop and the emulsion side of the other strip on the inside circumference of the closed loop. Thread this loop in Projector and adjust Tone Control for maximum treble output.

3. Run Projector Forward and adjust Volume Control for comfortable listening level. Adjust Voltmeter range switch for a reading between 1/2 scale and Full scale.

   Requirement 1: Meter readings from both sections of loop must be within 3db of each other.

   If meter used does not have db scales, set Volume Control so one section of loop produces one of the Set Value voltage readings shown in chart below, and check that other section of loop meets Allowable Deviation Requirement.

   Requirement 2: Each section of loop must produce a minimum of 19db (7.0 VAC) output with Volume Control set at maximum while maintaining maximum 3db difference specified in Requirement 1 above.

   If both requirements cannot be met proceed to Step 4.

Loop Section 1 Set Value	Loop Section 2 Allowable Deviation	
	Maximum Reading	Minimum Reading
.775 VAC	1.10 VAC	.54 VAC
2.450 VAC	3.45 VAC	1.73 VAC
7.750 VAC	10.95 VAC	5.40 VAC

4. Loosen Sound Optics Setscrew and remove Sound Optics Cartridge. (This Cartridge may be very difficult to remove due to the wedging action of the nylon plug used to lock it in place. Rotating it back and forth while pushing up on it will aid in its removal. DO NOT pry up on bottom of Cartridge as this will damage bottom lens.) Inspect bottom element for damage.

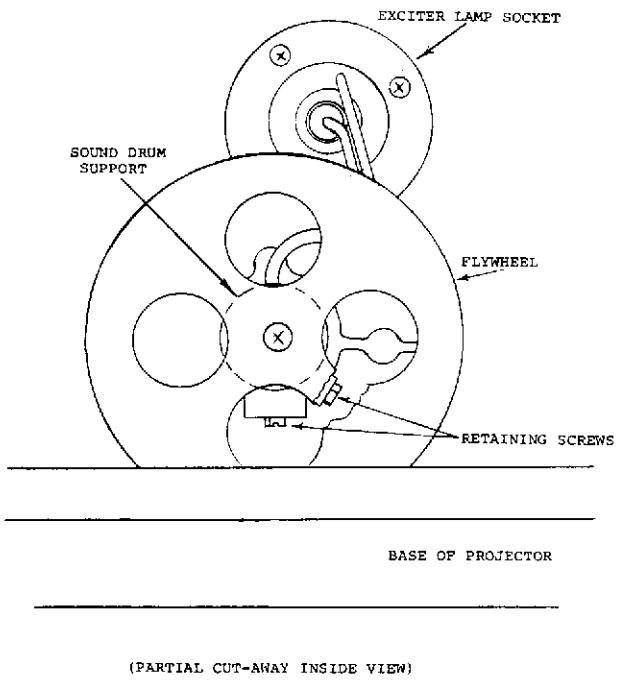


Figure 4-20. SOUND DRUM SUPPORT RETAINING SCREWS.

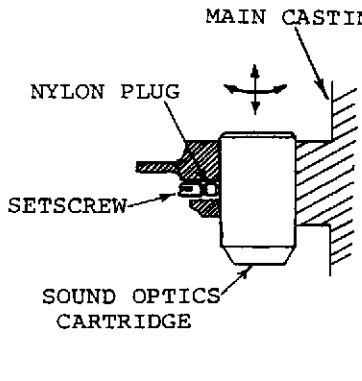
5. Turn Setscrew as though tightening. This will force the Nylon Plug out of the hole. Be careful to prevent Plug from falling down into Projector.

6. Back Setscrew out and remove it. Insert a NEW Nylon Plug (38162-P1) and start Setscrew back into threads. Reinsert Sound Optics Cartridge and continue tightening Setscrew until Cartridge is held in place but can be turned or moved up and down with a relative degree of ease. BE CAREFUL not to allow Sound Optics Cartridge to drop onto Sound Drum and damage bottom lens.

NOTE: You may find it more convenient to replace the Nylon Plug and Setscrew with a new Nylon Tip Setscrew (45209-P1).

7. Run Projector in Forward and focus Sound Optics Cartridge by moving it up or down while rotating it back and forth until both requirements of Step 3 above are met. Tighten Setscrew VERY tight when adjustments are complete.

NOTE: No attempt should be made to remove Lens Elements. If difficulty is encountered meeting above requirement and the Sound Optics Cartridge is suspected, replace entire Cartridge.



FOCUSING SOUND OPTICS CARTRIDGE

Figure 4-21. FOCUSING SOUND OPTICS CARTRIDGE.

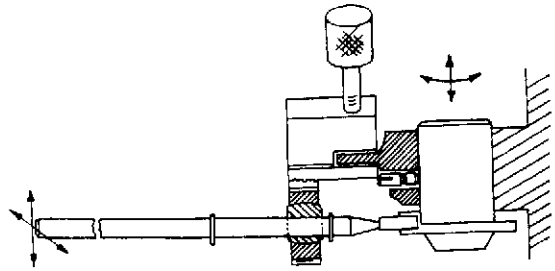


Figure 4-22. FOCUSING SOUND OPTICS CARTRIDGE #T-43680-G1-G

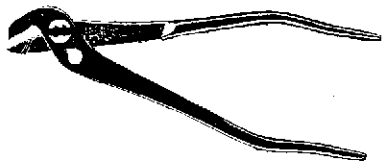


Figure 4-23. OPTIONAL SOUND OPTICS ADJUSTING TOOL

8. The following suggestions are offered as various methods of adjusting Sound Optics Cartridge.

a. Use Tool T-43680-G1-G by attaching Ring portion to Cartridge and clamping Adjusting Rod portion to Lamphouse Platform of Main Casting (Figure 4-22). Focus Optics by moving Adjusting Rod up or down or Back and Forth to achieve Requirements of Step 3 above.

b. Use a small pair of slip joint pliers such as the 5" pliers shown in Figure 23. (These pliers should be modified to remove jaw teeth or to add a padded surface such as leather or rubber to the jaws to prevent scratching or gouging of Sound Optics Cartridge Barrel.)

c. Grasp Cartridge with index fingers of both hands and rotate and move up or down to achieve Requirements of Step 3

Pressure Roller Arm Adjustment (Figures 24 and 25)

1. Place Master Control Lever in Forward position and observe axis of Film Guide Roller to be parallel to axis of Sound Drum (Figure 4-24). Twist Leaf Spring to establish this relationship. The outside flange of Guide Roller must also seat in groove of Sound Drum. Adjust Buzz Adjusting Nut to insure this. (When this adjustment has been properly made, the outside edge of the Guide Roller will contact the Sound Drum just an instant before the inside edge does when the Master Control Lever is moved from Thread to Forward).

2. Gently form Leaf Spring at point where it is fastened to Pressure Roller Arm to increase or decrease Guide Roller pressure on Sound Drum (Figure 4-25) so it exerts 3.2 to 4.8 ounces of pressure on Drum with the Master Control Lever in Forward.

3. A good dynamic check can be made of these adjustments by threading an old film (do not use an expensive test film for this check) in Projector and running in Forward. When Projector is first turned on, the Sound Drum should come up to speed quickly as evidenced by only 3 to 5 seconds of sound distortion (sound will be garbled or sound like someone gargling). If garbled sound persists for more than 3 to 5 seconds, there may be Too Little pressure on Guide Roller. Before making further adjustments, however, remove Sound Drum by removing Flywheel and sliding Sound Drum out of Sound Drum Support, and clean Sound Drum Shaft and Sound Drum Support Bearing with a cotton swab or pipe cleaner moistened with Instrument Oil, N-75. Reassemble Sound Drum and check starting reaction time again.

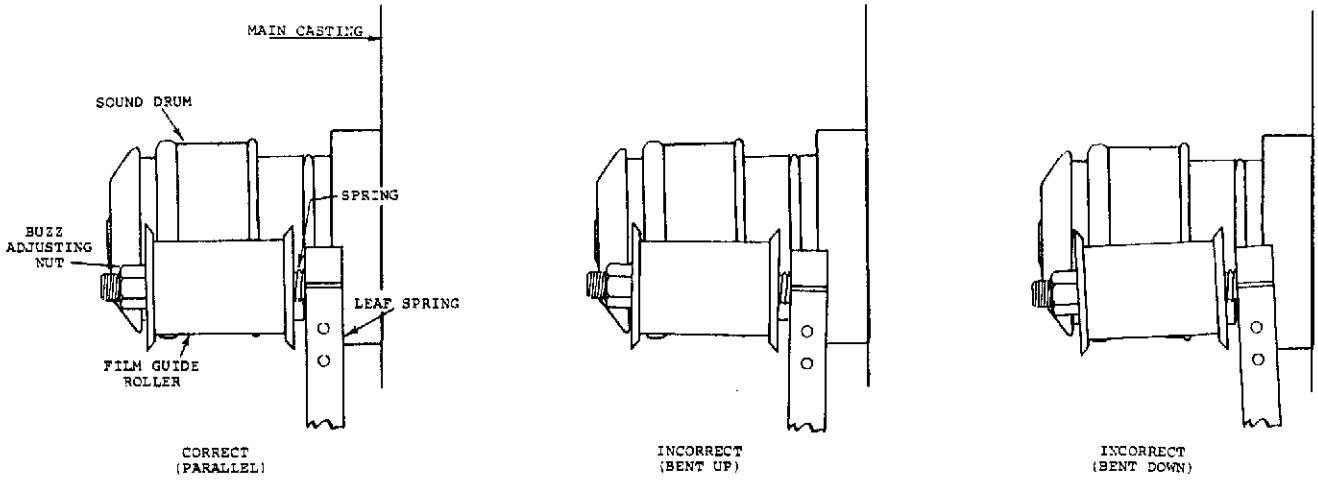


Figure 4-24. FILM GUIDE ROLLER ADJUSTMENT

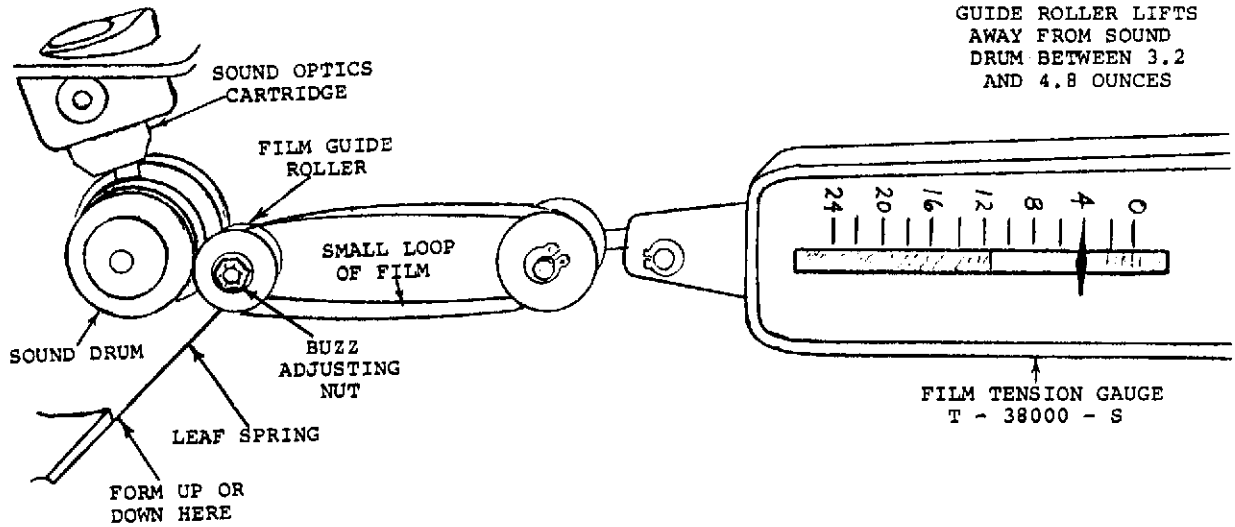


Figure 4-25. PRESSURE ROLLER ARM ADJUSTMENT

If sound wavers continually (commonly called "WOW") either the Sound Drum Shaft is dirty (see above), there is Too Much pressure on Guide Roller, or Film Tension Arm needs adjustment (see procedure below).

After above checks have been completed, with the machine running in Forward, gently nudge the film from between the Guide Roller and Sound Drum by pushing in on the edge of the film. When pushing force is removed, the film should re-seat itself between the Guide Roller and Sound Drum.

Reach between the film and Main Casting and push film from between the Guide Roller and Sound Drum by pushing out on the edge of the film. When pushing force is removed, the film should reseat itself between the Guide Roller and Sound Drum.

If film does not reseat itself in above two tests, check Guide Roller Axis and Pressure adjustments until this test can be passed.

4. Thread a continuous loop of "Buzz Track" film (SMPTE P16-BT) Singer P/N 45191-G3 in Projector and set Tone Control for maximum treble output; Volume Control for comfortable listening.

5. Run Projector Forward and adjust Buzz Adjusting Nut until no sound is heard or until high and low frequencies are heard with equal volume. (There is a "Buzz Track" included as part of the Jiffy Test Film Described in OPERATIONAL CHECK, Section II of this manual. This "Buzz Track" may be used for this adjustment.)

Film Tension Arm (Figure 4-26)

1. Place Master Control Lever in Forward Position.

2. Rotate Film Tension Arm fully counterclockwise and release. Arm should return to original position within 3 to 8 seconds. Bend Return Spring up or down to make this adjustment. BE VERY CAREFUL not to overstress and break this spring.

3. If above requirement cannot be met by bending Return Spring, disassemble Film Tension Arm and clean and lubricate it. Apply DC200 Dampening Fluid (39479-P5) to inside diameter of Hub, outside diameter of Film Tension Arm Drum which fits into Hub and Film Tension Arm Pivot (3). Too much DC200 will result in sluggish

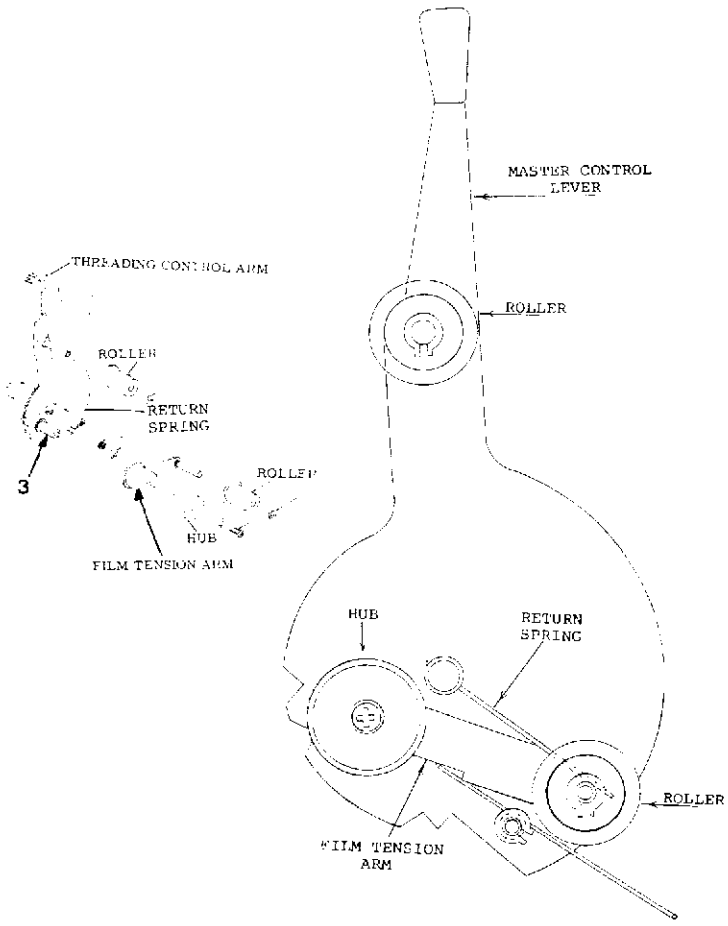


Figure 4-26. FILM TENSION ARM ADJUSTMENT

movement of Film Tension Arm. Too little DC200 will result in Film Tension Arm moving too rapidly. A balance between the amount of DC200 and Return Spring tension will achieve the 3 to 8 second return time.

Rewind Engagement (Figure 4-27—Shown in Reverse Position)

1. Pull Rewind Lever OUT (located just above lens holder) and manually rotate Inching Knob counterclockwise. Rewind Lever Assembly should line up with inside Portion (Hook Portion of Pawl Assembly so Pawl Assembly strikes it and is pushed down far enough that the Toggle Spring will force it down the remaining distance. The distance between bottom edge of Rewind Lever Assembly and highest point of (Inside Portion of) Pawl Assembly should be .020" minimum.

2. Push Rewind Lever IN and continue rotating Inching Knob counterclockwise. Rewind Lever Assembly should line up with Outside Portion of Pawl Assembly so Pawl Assembly strikes it and is pushed down far enough that the Toggle Spring will force it down the remaining distance. The distance between bottom edge of Rewind Lever Assembly

and highest poin of outside portion of Pawl Assembly should be .020" minimum.

3. Loosen two Screws and move Rewind Lever Stop in or out so Rewind Lever Assembly lines up properly above each part of the Pawl Assembly, when the Rewind Lever is pulled out or pushed in. BE CAREFUL not to disturb Framing Limit Plate while making this adjustment unless Framing Limit Plate is also in need of adjustment (see procedure).

4. Bend Tab up or down to achieve the .020" dimension.

5. Put an empty 400' Reel on Feed and Rewind Arm and run Projector in Reverse. Hold Reel to prevent it from turning. The Film Feed Clutch should slip providing no drive to the Reel. Release Reel -- it should turn.

6. Hold Reel again and pull Rewind Lever Out. Film Feed Clutch should go into positive drive and try to force Reel to turn. Reel Arm Belt will probably drive and slip on pulleys. DO NOT hold Reel for more than a moment. Just long enough to verify that Projector goes into Rewind. Projector should rewind a full 2000' reel of film with only minor slow down at the very end of rewind cycle.

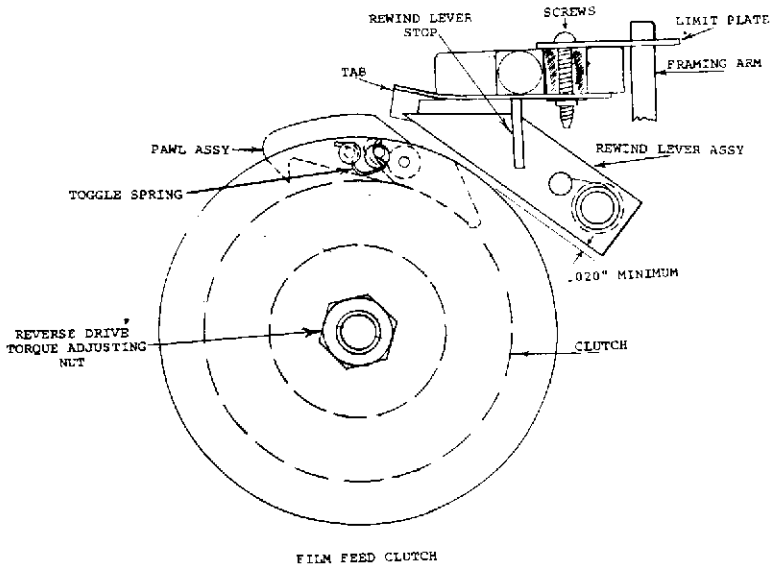


Figure 4-27. REWIND AND REVERSE ENGAGEMENT.

7. If clicking noise is heard in either Rewind or Reverse, the Rewind Lever Assembly is probably hitting the Pawl Assembly during each revolution of the Film Feed Clutch. Check requirement in Steps 2 and 4.

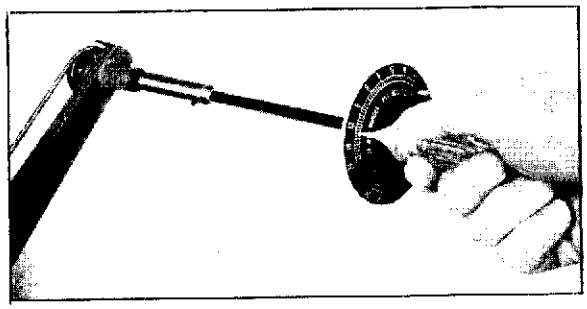


Figure 4-28. REVERSE DRIVE TORQUE MEASUREMENT.

Reverse Drive Torque (Figure 4-28)

1. Run Projector in Reverse for a few seconds. Move Master Control Lever to Thread, hold Supply Reel Spindle Torque Gauge (G17-38000) on Feed Reel Arm Spindle and move Master Control Lever back to Reverse. Gradually release your grip until handle of Gauge just begins to slip (this is the point where the torque at the Spindle is just enough to start to overcome the pressure of your holding the Gauge).

   With the Gauge just barely turning in your grip, the reading on the Gauge should be 14 ± 2 inch ounces.

Inrease torque by turning Reverse Drive Torque Adjusting Nut (Figure 4-27) clock - wise (as viewed from the back of the Projector).

Decrease torque by turning Reverse Drive Torque Adjusting Nub (Figure 4-27) counterclockwise (as viewed from the back of Projector).

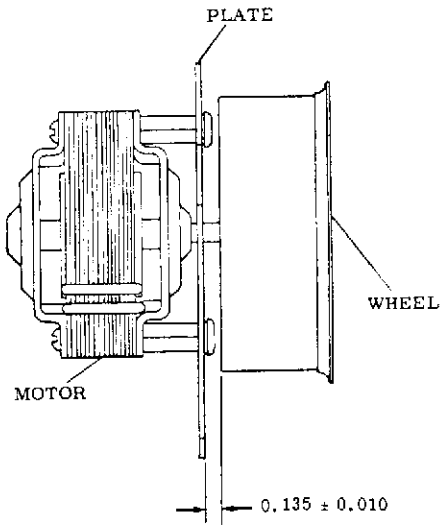


Figure 4-29. MOTOR MOUNTING PLATE ASSEMBLY.

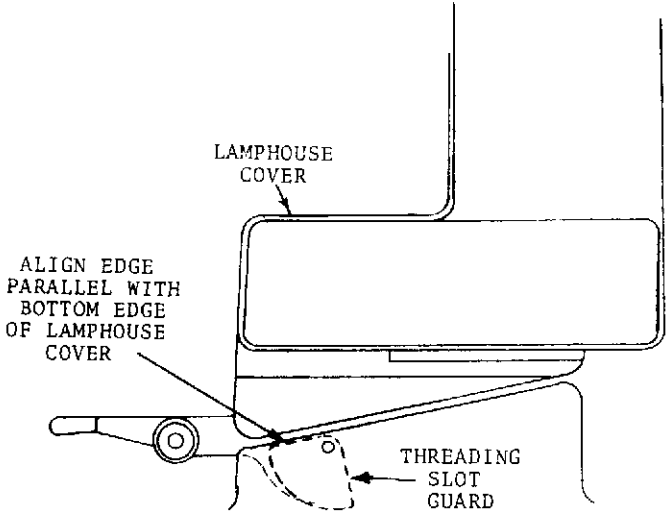
Motor Mounting Plate Assembly (Figure 4-29)

With motor shaft play taken up toward Motor, the following dimensions must be set:

1. The distance between the Wheel and Plate must be 0.135 ⊥ .010 and the Wheel must clear the screw heads while rotating.

Threading Slot Guard

Visually align left side of guard with bottom edge of lamphouse cover assembly. Apply Clear Glyptal 1276 (Singer P/N 39490P2) to threads of attaching screw and part interfaces.



Threading Slot Guard (Figure 4-30)

SECTION V. ELECTRONIC ADJUSTMENTS AND SPECIFICATIONS

Semi-Conductor Testing

1. Transistors

An effective but simple transistor test for leakage, amplification and short circuit conditions may be performed using Simpson Model 260/270 Multimeters or equivalent. Connect the transistor under test in the circuit shown, observing polarity (Fig. 5-1).

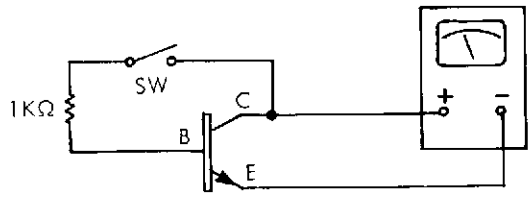


Figure 5-1. TEST CIRCUIT

Use the X100 scale for regular small-signal devices and X10 scale for power types. All readings are referred to the X1 scale.

With base switch open, the reading should be above 200 ohms. A lower reading indicates excessive leakage or a shorted transistor.

With the base switch closed, the reading should be less than 50 ohms. A higher reading indicates low gain and a very high reading indicates an open device.

Polarity is shown for NPN transistors with ohmmeter voltage selector switch on +dc. (PNP types may be checked by reversing VOM polarity.) Observe opposite polarity of terminal voltage when using Weston or Triplet instruments.

2. Diodes

Front-to-back resistance ratio will indicate silicon and germanium diode defects. Using the RX100 multimeter scale, a diode should measure a very low resistance with one lead (test probe) polarity and very high resistance with leads reversed.

3. Zener Diodes

Depending on voltage rating, Zener diodes will exhibit lower reverse resistance than regular diodes but a marked front-to-back ratio should be evident.

Operational Tests

1. <u>10 Watt Amplifier (42738 Pre Amp and 43957 Power Amp Combination) (Figure 5-3)</u>

   a. Connect an 8 Ohm, 15 Watt Dummy Load in place of Loudspeaker.

   b. Connect an Oscilloscope and an AC VTVM across the 8 Ohm Load.

   c. Remove both Projection and Exciter Lamps.

   d. With Volume control fully counterclockwise and no film in Projector, run the Projector in Forward mode. The Oscilloscope waveform should appear as a straight line having no hum or noise as in Fig. 5-2A. Now start and stop the machine several times. There should be no evidence of high frequency oscillation on the waveform during switching.

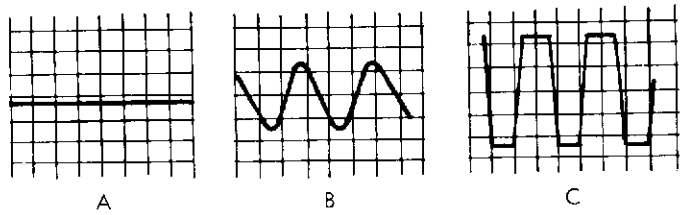


Figure 5-2. WAVEFORMS

   e. Set both Volume and Tone Controls maximum clockwise and repeat above on-off switching. Except for a slight increase in random noise, there should be no oscillation tendency evident.

   f. Thread a continuous loop of 400 Hz Signal Level Test Film (SMPTE P16-SL; Singer P/N 45191G7) in Projector and run Projector in Forward.

   g. With Volume Control fully clockwise (maximum volume) adjust (VR-3) for 8 Volts R.M.S. on AC VTVM (22.5 Volts Peak-to-Peak on Oscilloscope). The Oscilloscope waveform should be a relatively undistorted Sine Wave with a minimum of clipping (Figure 5-2B). Severe clipping (Figure 5-2C) indicates amplifier trouble.

2. <u>15 Watt Amplifier (43477 Amplifier)(Figure 5-4)</u>

   a. Connect an 8 Ohm, 15 Watt Dummy Load in place of Loudspeaker.

   b. Connect an Oscilloscope and an AC VTVM across the 8 Ohm Load.

   c. Remove both Projection and Exciter Lamps.

d. With Volume control fully counterclockwise and no film in Projector, run the Projector in Forward mode. The Oscilloscope waveform should appear as a straight line having no hum or noise as in Fig. 5-2A. Now start and stop the machine several times. There should be no evidence of high frequency oscillation on the waveform during switching.

e. Set both Volume and Tone Controls maximum clockwise and repeat above on-off switching. Except for a slight increase in random noise, there should be no oscillation tendency evident.

f. Thread a continuous loop of 400 Hz Signal Level Test Film (SMPTE P16-SL; Singer P/N 45191G7) in Projector and run Projector in Forward.

g. With Volume Control fully clockwise (Maximum volume) adjust (VR-2) for 11 Volts R.M.S. on AC VTVM (31 Volts Peak-to-Peak on Oscilloscope). The Oscilloscope waveform should be a relatively undistorted Sine Wave with a minimum of clipping (Figure 5-2B). Severe clipping (Figure 5-2C) indicates amplifier trouble.

Circuit Tests

CAUTION: In making Circuit Tests, the technician will be injecting his own signals into the Amplifier of the 1000 Series Projectors. Care should be taken that stray signals which could cause erroneous results are not picked up on input leads and fed into the amplifier. Lead positioning and placement are often critical.

Proper grounding of all test equipment is also very critical to prevent this from happening.

1. 10 Watt Amplifier (42738 Pre Amp and 43957 Power Amp Combination) (Figure 5-3)

   a. Connect an 8 Ohm, 15 Watt Dummy Load in place of the Loudspeaker.

   b. Connect an Audio Oscillator through a 40 db pad to test input jacks J-7 and J-8 (J-8 common ground) of Preamp Board 42738. The Audio Oscillator ground must be "floating" i.e., not common to other test equipment.

   c. Connect the AC-coupled vertical sweep of an Oscilloscope and an AC VTVM across the 8 Ohm Load.

   d. Remove both projection and exciter lamps.

   With Volume Control fully counterclockwise and no audio signal input, run the Projector in Forward mode. The Oscilloscope waveform should appear as a straight line having no hum or noise as in Fig. 5-2A. Now start and stop the machine several times. There should be no evidence of high frequency oscillation on the waveform during switching.

   Set both Volume and Tone Controls maximum clockwise and repeat above on-off switching. Except for a slight increase in random noise, there should be no oscillation tendency evident.

   Apply a 1000 Hz signal from the Audio Oscillator to the test input terminals J-7 and J-8. Adjust oscillator output to obtain approximately 25 mv at this input. With Tone Control at mid-position, increase the Projector Volume Control to obtain a pure sine wave as shown in Fig. 5-2B. Increasing volume (CW rotation) further should produce a summetrically clipped wave as in Fig. 5-2C. Reduce signal input to the point where the output signal is just under the level of clipping. It should be possible to obtain 22.5 volts peak-to-peak (8V RMS) at this level. Severe non-symmetry or high-frequency ringing indicates a circuit problem. Operate the Amplifier only for short periods under the above test conditions.

2. 15 Watt Amplifier (43477 Amplifier) (Figure 5-4)

   a. Connect an 8 Ohm, 15 Watt Dummy Load in place of the Loudspeaker.

   b. Connect an Audio Oscillator through a 40 db pad to the open end of (R-1) and ground (P-16 and P-11).

   c. Connect the AC-coupled vertical sweep of an Oscilloscope and an AC VTVM across the 8 Ohm Load.

   d. Remove both projection and exciter lamps.

   With Volume Control fully counterclockwise and no audio signal input, run the Projector in Forward mode. The Oscilloscope waveform should appear as a straight line having no hum or noise as in Fig. 5-2A. Now start and stop the machine several times. There should be no evidence of high frequency oscillation on the waveform during switching.

   Set both Volume and Tone Controls maximum clockwise and repeat above on-off switching. Except for a slight increase in random noise, there should be no oscillation tendency evident.

Apply a 1000 Hz signal from the Audio Oscillator to (P-16) and (P-11). Adjust Oscillator output to obtain approximately 25 mv at this input. With Tone Control at mid-position, increase the Projector Volume Control to obtain a pure sine wave as shown in Fig. 5-2B. Increasing volume (CW rotation) further should produce a symmetrically clipped wave as in Fig. 5-2C. Reduce signal input to the point where the output signal is just under the level of clipping. It should be possible to obtain 22.5 volts peak-to-peak (8V RMS) at this level. Severe non-symmetry or high-frequency ringing indicates a circuit problem. Operation the Amplifier only for short periods under the above test conditions.

0 dbm Adjustment (Figure 5-5)

1. Adjust (VR-3) on 42738 Amplifier Board or (VR-2) on 43477 Amplifier Board per Operational Tests.

2. With the 400 Hz Signal Level Test Film (SMPTE P16-SL; Singer P/N 45191G7) running, in Forward through Projector, plug a 600 Ohm, 1 Watt resistor into the 0dbm Jack (J-7) and connect an AC VTVM across the resistor. Adjust VR-3 on 0dbm Circuit Board for 0dbm reading on AC VTVM (.775 Volts).

Exciter Lamp Voltage

Exciter Lamp voltage on all 1000 Series Projectors should be 6.7 Volts DC WITH THE EXCITER LAMP IN THE CIRCUIT. With the Exciter Lamp removed from the circuit, the open circuit voltage is 16 Volts DC.

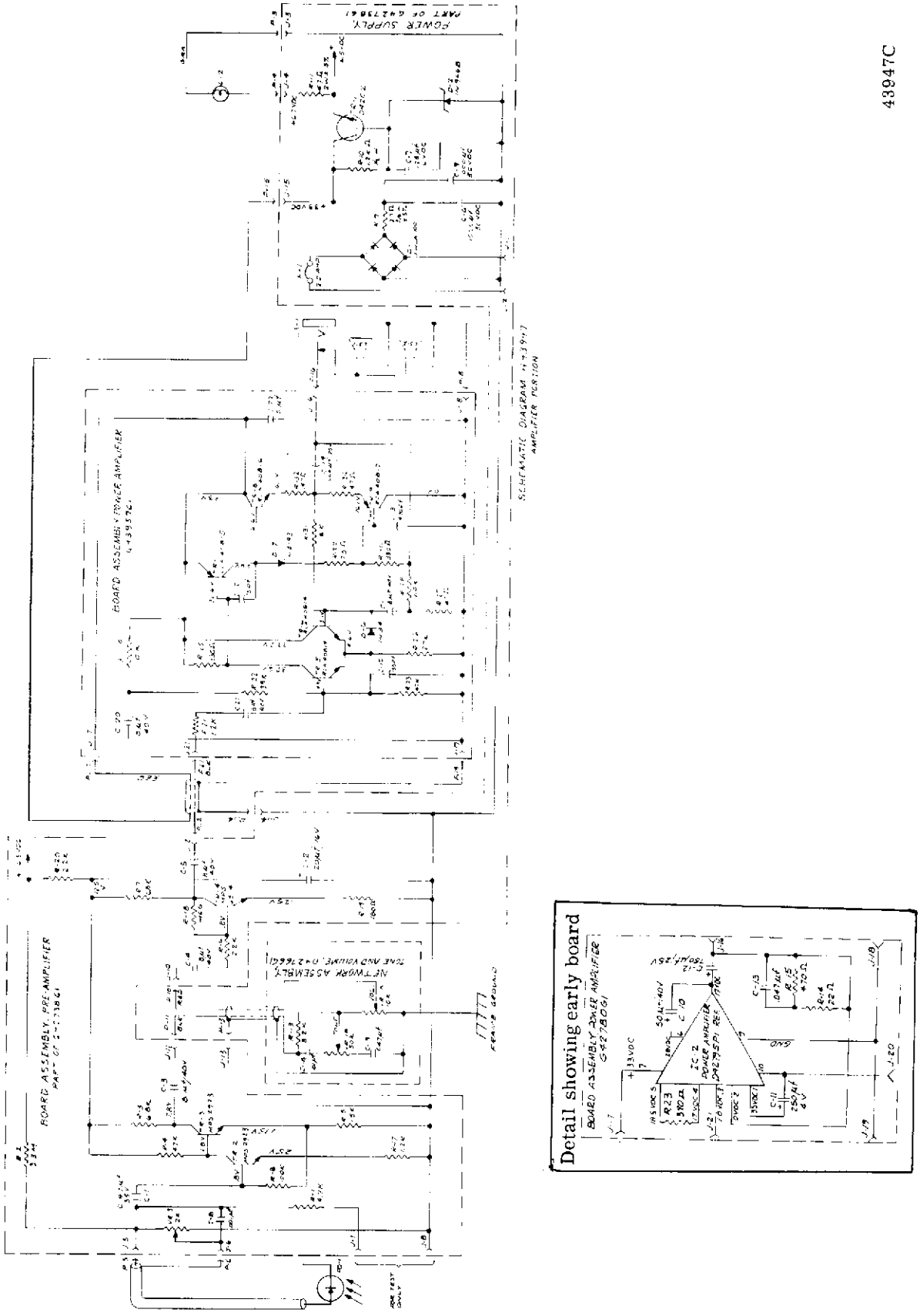


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Figure 5-3. PROJECTOR SCHEMATIC DIAGRAM (10 Watt)

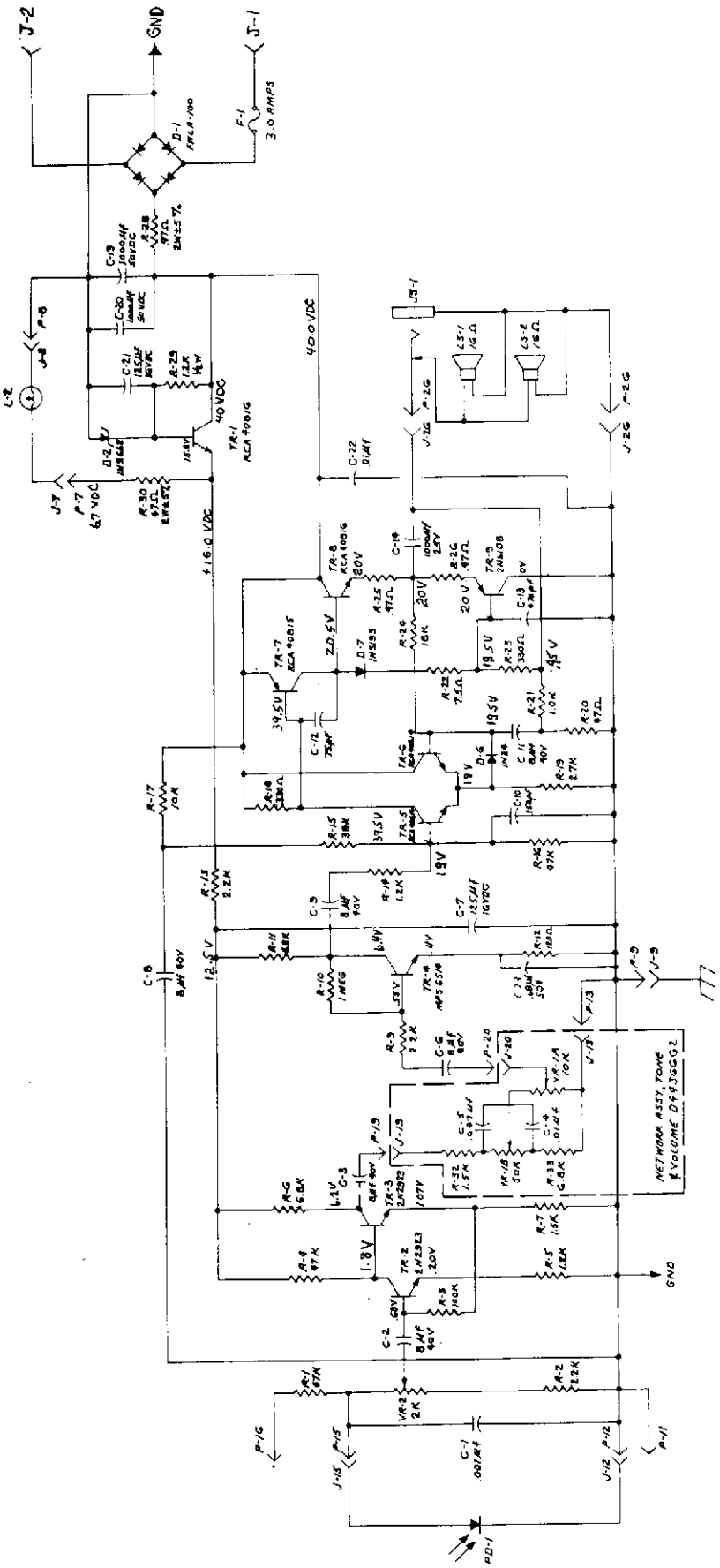

Figure 5-4. PROJECTOR SCHEMATIC DIAGRAM, (Stage II, (15 Watt)

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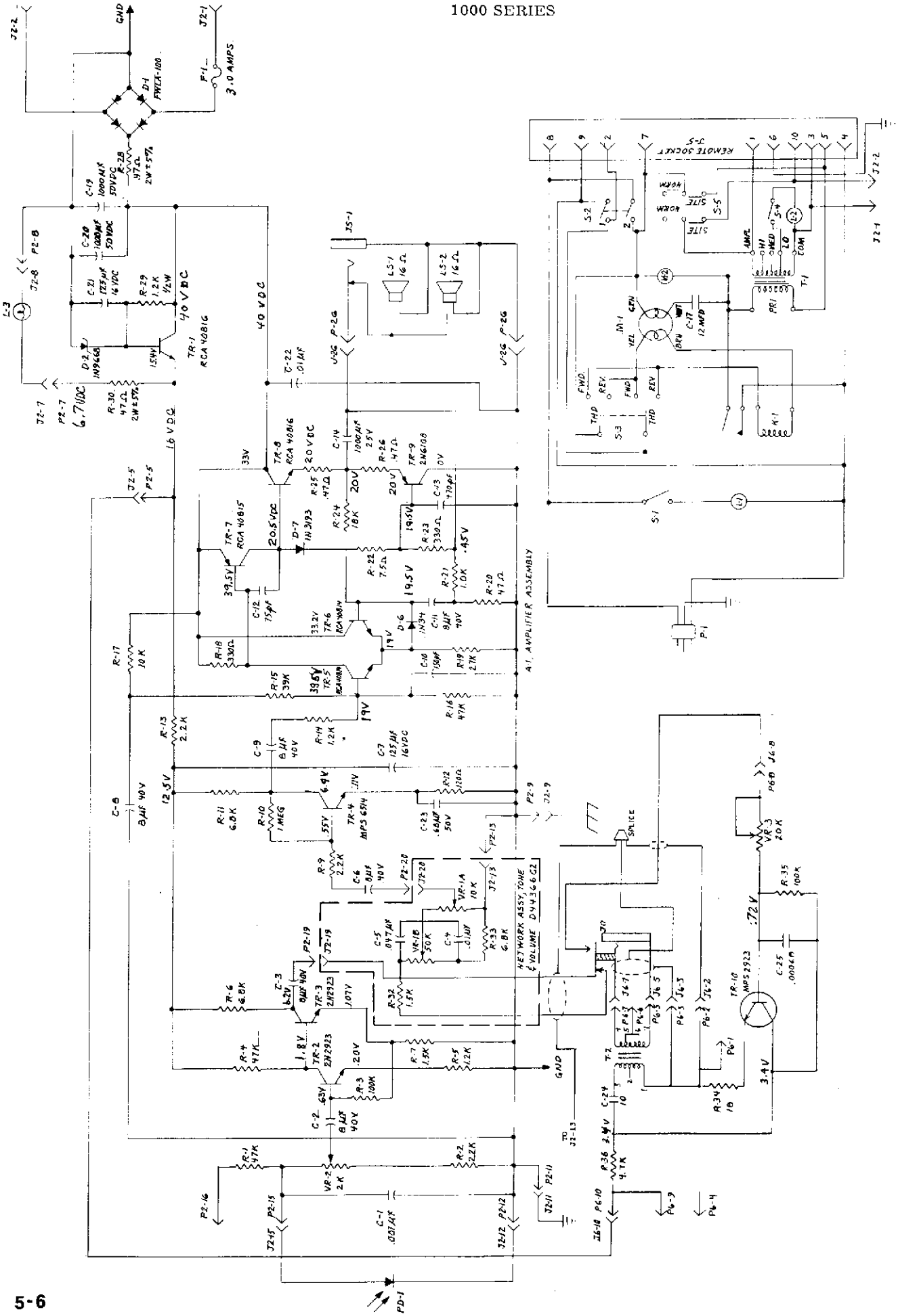

Figure 5-5. PROJECTOR SCHEMATIC DIAGRAM (Model: 1030N)

46063 C

SECTION VI. TROUBLESHOOTING

The purpose of the following tables is to list commonly encountered troubles and to indicate corrective repairs and adjustments. Generally, troubles caused by operational error are not listed as it is assumed the repairman is familiar with the operation of the Projector and can advise the customer in such cases.

Disassemble only as needed for repair. Before disassembly, check for loose or missing screws, or parts that are binding because of misalignment or lack of lubrication. Electrical troubleshooting will be facilitated by referring to the wiring and schematic diagrams following this table.

TROUBLE	PROBABLE CAUSE	REMEDY
1. Main Drive		
a. Motor runs but drive shaft does not rotate	Pulleys dirty	Clean
	Pulleys out of alignment	Align Pulleys
	Drive Belt worn or damaged	Replace Belt
	Pulleys Polished	Replace Pulley
	Broken Kick Spring on Motor Hub	Replace Spring
	Broken Stop Pin on Motor Pulley	Replace Pulley
b. Fails to start on low power	Motor pulley spring on drive unit assembly not functioning properly	Check as follows: (1) Hold pulley without binding motor shaft. Wind spring to full tight position by rotating fan clockwise (2) Release fan. Spring must throw fan 180°. If less, clean & lubricate
	Motor Windings shorted or open	Replace Motor
c. Loss of power or speed	Bearing for shaft of take-up or supply sprocket gear assembly dirty	Clean and lubricate
	Main Shaft Bearings defective	Replace Bearings
	Adjusting screw on drive unit out of adjustment	Adjust
d. Projector drive system does not shift from Sound to Silent speed when in forward operation	Motor Grommets worn or cut	Replace Grommets
	Drive belt worn or damaged	Replace
	Pulleys out of alignment	Align Pulleys
	Belt shift forks out of adjustment	Adjust
	Pulleys polished	Replace Pulley
e. Film burns when in still operation	Safety Shutter binding on lamp chimney	Seat chimney. Visually align safety shutter midway between lamp chimney and closest moving part on shutter and cam assembly. Safety shutter spring and link must clear shutter and cam assembly by 1/8". Adjust by bending safety shutter spring bracket.
	Safety Shutter Return Spring broken or disconnected	Replace or reconnect Spring

TROUBLE	PROBABLE CAUSE	REMEDY
2. Feed and Rewind		
a. Clicking sound when in rewind operation	Pawl assembly on film feed clutch striking ramp on rewind lever	Adjust
b. Film damage at feed sprocket (reverse operation)	Feed clutch torque too high	Adjust
c. Film spills at supply reel (reverse operation)	Feed clutch torque too low	Adjust
d. Rewind stall part way through reel	Ramp on rewind lever stop assembly does not throw the Pawl assembly fully into direct drive	Adjust
	Supply Arm Pulley Shafts and Bearings dirty or scored	Clean or replace Reel Arm Pulleys
	Reel Arm Pulley Brakes dirty or scored	Clean or replace Brakes and/or Pulleys
e. Loose rewind (film loose on reel.	Supply or take-up reel bent	Replace
f. No rewind	Film feed clutch defective	Replace defective component in clutch
3. Gate and Lens Mount		
a. Picture jumps (Possible loss of loop)	Claw Arm Pin protrusion or pull-down stroke out of adjustment	Adjust
	Aperture Plate or pressure shoe dirty	Clean
	Film pressure out of adjustment	Adjust
	Claw Arm out of adjustment or damaged. (Face of claw arm must be visibly parallel to adjacent face of casting)	Adjust, or if claw arm is replaced, follow adjustment procedure
	Film Pressure Shoe not seating properly in Aperture Plate	Adjust
b. Picture moves side to side	Film edge guide spring out of adjustment	Adjust
c. Picture goes in and out of focus at random	Aperture plate or pressure shoe damaged	Replace
	Film pressure in gate out of adjustment	Adjust
d. Picture "streams" vertically	Pressure shoe not aligned	Align
	Film edge spring out of adjustment	Adjust
	Incorrect threading	Thread correctly
e. Loss of upper loop	Feed sprocket loose on shaft, or sprocket teeth damaged	Tighten screw Replace sprocket
	Follower assembly rollers on feed sprocket shoe not rotating freely	Clean

TROUBLE	PROBABLE CAUSE	REMEDY
f. Loss of lower loop	Claw arm pin protrusion or stroke out of adjustment.	Adjust
	Pressure shoe not seated properly	Check position of shoe. If necessary, realign
g. Loss of both upper and lower loop	Take-up sprocket loose on shaft	Tighten screw
4. Sound Drum and Optic		
a. Pitch of sound changes rapidly	Sound Drum support bearing dirty or worn	Clean or replace sound drum as required
b. Sound flutters or chatters	Guide Roller pressure too low	Adjust Pressure Roller Arm
	Sound Drum shaft or support Bearing dirty or worn	Clean or replace Sound Drum and Bearing as required
	Loose Flywheel	Tighten Flywheel
c. Pitch of sound varies slowly-Exhibits "WOW"	Sound Drum shaft or support Bearing dirty or worn	Clean or replace Sound Drum and Bearing as required
	Guide Roller pressure too high	Adjust Pressure Roller Arm
	Film Tension Arm out of adjustment	Adjust Film Tension Arm
d. Sound is "basey" or muffled (Poor high frequency response)	Sound Optic out of adjustment	Adjust Sound Optic (See information on Unstable Sound Optics following Trouble/Remedy Chart)
	Photo Diode in Sound Support defective	Replace Sound Support
e. Sound is weak (Amplifier has been checked o.k.)	Sound Optic out of adjustment	Adjust Sound Optic (See information on Unstable Sound Optics following Trouble/Remedy Chart)
	Photo Diode in Sound Support defective	Replace Sound Support
5. Take-up		
a. Little or no take-up	Take-up reel belt damaged	Replace Belt
	Take-up clutch film tension too low	Adjust Take-up tension
	Take-up clutch lift-off linkage too short	Adjust lift-off linkage
b. Take-up belt squeal	Take-up clutch film tension too high	Adjust Take-up tension
c. Damaged film at take-up sprocket	Take-up clutch film tension too high	Adjust Take-up tension
	Worn or dry film	Replace film
	Incorrect threading	Thread correctly
d. Erratic take-up	Brake surface of take-up reel arm pulley dirty	Wipe inner surface of pulley
	Clutch liner worn	Replace Clutch liner

TROUBLE	PROBABLE CAUSE	REMEDY
e. Film spills at take-up reel when moving master control lever from forward to reverse	Take-up clutch lift-off linkage too long	Adjust lift-off linkage
f. Film very noisy in Gate - Loss of lower loop - All Gate adjustments check O. K.	Take-Up Clutch film tension too high	Adjust Take-up tension
6. Sound System		
a. Short exciter lamp life	Transistor (TR-1) shorted. Diode (D-2) and Capacitor (C-7), (42738-G1 Board) or C21) (43477 Boards) open	Replace defective component. Check 16v level at (TR-1) emitter
b. No sound from film. Exciter lamp O. K. Speaker hiss increases with volume control	Photo diode (PD-1) open or shorted. Shorted or open shielded cable from sound drum support. Capacitor (C-8) shorted. (42738-G1 Board). Capacitor (C-1) 42738-G1 Board) or (C-2) (43477 Boards) open. Bad connection at (J-5 & 6) (42738-G1 Board) or (J-12 & 15) (43477 Boards)	Replace defective component or restore connections
c. Exciter lamp will not light. Speaker hiss increases with volume control.	Defective Exciter Lamp. Exciter lamp socket defective, or leads to socket open. Resistor (R-11) (42738-G1 Board) or (R-30) (43477 Boards) open	Repair or replace as required
d. No sound from film. Exciter lamp O. K. Speaker hiss but volume control has no effect	(42738-G1 Board) - Capacitor (C-2) shorted. Capacitors (C-4) or (C-5) open. Transistor (TR-4) defective Bad connection between Preamp Board and Power Amp Board (43477 Boards)-Capacitor (C-7) shorted. Capacitors (C-6) or (C-9) open. Transistor (TR-4) defective	Replace defective component or restore connections
e. No sound (hum or hiss) Exciter lamp O. K. No excessive component heating	Open or loose connection on shielded interconnection cable or speaker leads. Speaker jack N.C. Contact oxidized or bent	Repair or replace as required
f. Excessive hum with sound	(42738-G1 Board)-Capacitor (C-2), (C-6), (C-7) or (C-9) defective. Shielded cable grounded at Sound Support. Ground connection on Amplifier open. Volume control (VR-1) defective (43477 Boards) - Capacitor (C-7) (C-19), (C-20) or (C-21) defective. Ground connection on Amplifier open	Replace defective component. Repair cable or replace sound support. Restore connections.
g. No sound or exciter lamp	Fuse F-1 blown	Replace fuse and check for proper sound system operation. Check Diode (D-1) and Output Transistors (TR-8) and (TR-9)

TROUBLE	PROBABLE CAUSE	REMEDY
h. Fuses blow immediately when replaced and power is applied. Resistor (R-9) (42738-G1 Board) or (R-28) (43477 Boards) O.K.	Shorted diode D-1	Replace component and check Output Transistors (TR-8) and (TR-9). Check also (D-7)
i. Distorted Sound. Exciter Lamp Circuit O.K.	Sound Optic out of adjustment	Adjust Sound Optic (See information on Unstable Sound Optics following Trouble/Remedy Chart)
	(42738-G1 Board) - Transistor (TR-2), (TR-3) or (TR-4) defective. Capacitor (C-1), (C-2), (C-3), (C-4), or (C-5) defective.	Replace defective component
	(42780-G1 Board) - (IC-2) defective	Replace Circuit Board with 43957-G1 Circuit Board
	(43957-G1 Board) - Transistor (TR-5), (TR-6), (TR-7), (TR-8) or (TR-9) defective. Capacitor (C-11), (C-14), (C-20) or (C-21) defective.	Replace defective component
	(43477 Boards) - Transistor (TR-2), (TR-3), (TR-4), (TR-5), (TR-6), (TR-7), (TR-8), or (TR-9) defective. Capacitor (C-2), (C-3), (C-6), (C-7), (C-8), (C-9), (C-11) or (C-14) defective.	Replace defective component
	Photo Diode (PD-1) defective	Replace defective component
	Speaker (LS-1) or (LS-2) defective	Replace defective speaker
j. Fuse blows after power is applied	(42738-G1) - Capacitor (C-6) or (C-9) defective. Transistor (TR-1) defective. Diode (D-2) defective.	Replace defective component. Check Diode (D-1)
	(42780-G1 Board) - (IC-2) defective	Replace Circuit Board with 43957-G1 Circuit Board
j. (cont) Fuse blows after power is applied	(43957-G1 Board) - Transistor (TR-8), (TR-9), (T-7), (TR-6) or (TR-5) defectove. Diode (D-7) defective Capacitor (C-14) defective	Replace defective component. Check Diode (D-1)
k. Microphonic noise	Defective Exciter Lamp	Replace Exciter Lamp
7. Miscellaneous		
a. Intensity of light on screen same in Forward or Reverse as it is in still	Safety Shutter not operating	Locate counterweight (speed nut) flush with rear end of safety shutter blade. If failure continues apply 3 drops DC-550R fluid. (See lube diagram). Do not substitute any other fluid. Replace Safety Shutter as last resort.
b. Light output low at Sound speed (on applicable automatic shutter models).	Automatic 2-3 blade Shutter locked in 3 blade position	Pull plastic slide lock out over detent on fixed blade assembly
	Automatic 2-3 blade Shutter dirty (Oil on blades)	Clean with alcohol until blades operate freely

TROUBLE	PROBABLE CAUSE	REMEDY
c. Film scratch	Aperture plate or pressure shoe dirty	Clean. Take care to avoid scratching polished surfaces
	Film handling rollers stuck	Clean and lubricate
d. Clicking noise (film picking)	Teeth of feed sprocket damaged	Replace Feed sprocket
	Teeth of take-up sprocket damaged	Replace take-up sprocket
	Teeth on claw arm worn or damaged	Replace claw arm

Unstable Sound Optics

In rare occasions, we have encountered Projectors which have a tendency to constantly lose high frequency response producing basey, muffled sound; this problem being easily corrected by readjustment of the Sound Optic.

We have traced this trouble to the Sound Optic itself. The Lens Cell becomes loose inside the Barrel and rotates slightly causing the scanning beam to strike the film sound track at an angle.

To correct for this, remove the Sound Optic from the Projector and carefully drill a hole at 90° to the long dimension of the rectangular aperture of the Sound Optic, (Figure 1). Put one drop of Blue Glyptal (P/N 39490-P1) in the hole to fasten the Lens Cell to the Barrel.

When reassembling Sound Optic to Projector, you may wish to replace the existing Set Screw and Nylon Plug with a new Nylon Tip Setscrew (P/N 45209-P1) for convenience.

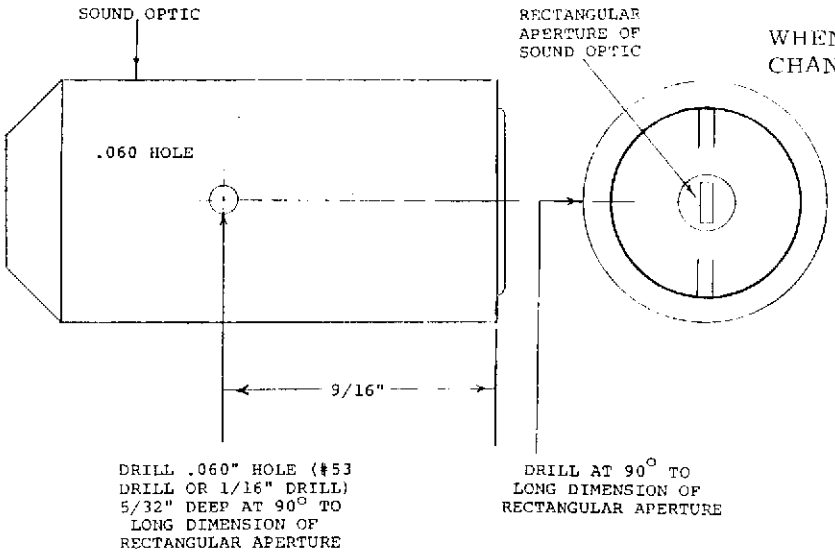

Figure 6-1. UNSTABLE SOUND OPTICS.

3. Clutch (Bias) Spring - Changed from 39164-P1 to 45223-P1.

The liner, gear, and clutch spring are available in a kit for converting or changing to the latest improved system. Use kit #45924-G1.

Take-up Improvements

To provide a more consistent, longer-lived and reliable Take-up system, the following parts were changed (Starting Code H7G)

1. Liner - Changed from P/N 39203-P1 to 45219-P2 (Blue in color)
2. Take-Up Gear - Changed from 39169-G1 to 45222-G1
3. Clutch (Bias) Spring - Changed from 39164-P1 to 45223-P1
4. Pulley - changed from 39159-G1 to 39159-G2.

WHEN CONVERTING, THESE PARTS MUST BE CHANGED AS A SET, NOT SEPARATELY.

Motor Run Capacitors

Motor Run Capacitors (C15) and (C16) have been eliminated from all Projectors manufactured after L4 Code. If these Capacitors go bad in other machines, it is not necessary to replace them. Simply remove them both. See Figures 6-3 and 6-7.