Film-Tech

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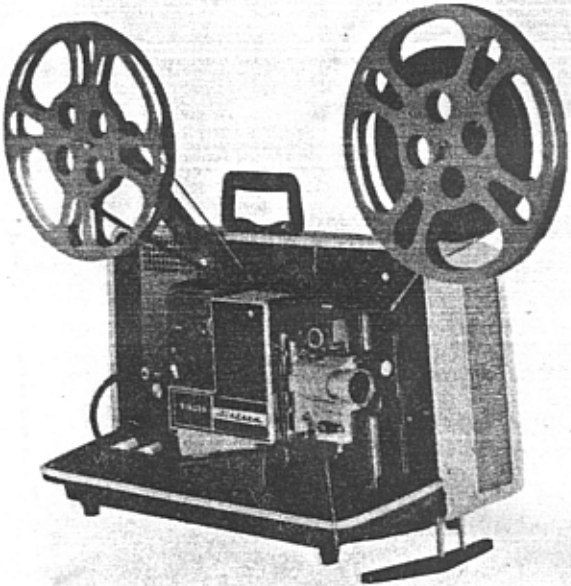


1000 SERIES

Sixteen

Guidebook

SINGER
EDUCATION DIVISION

16MM Feature Films
512-288-4901
8704 El Rey Blvd.
Austin, TX 78737-1327

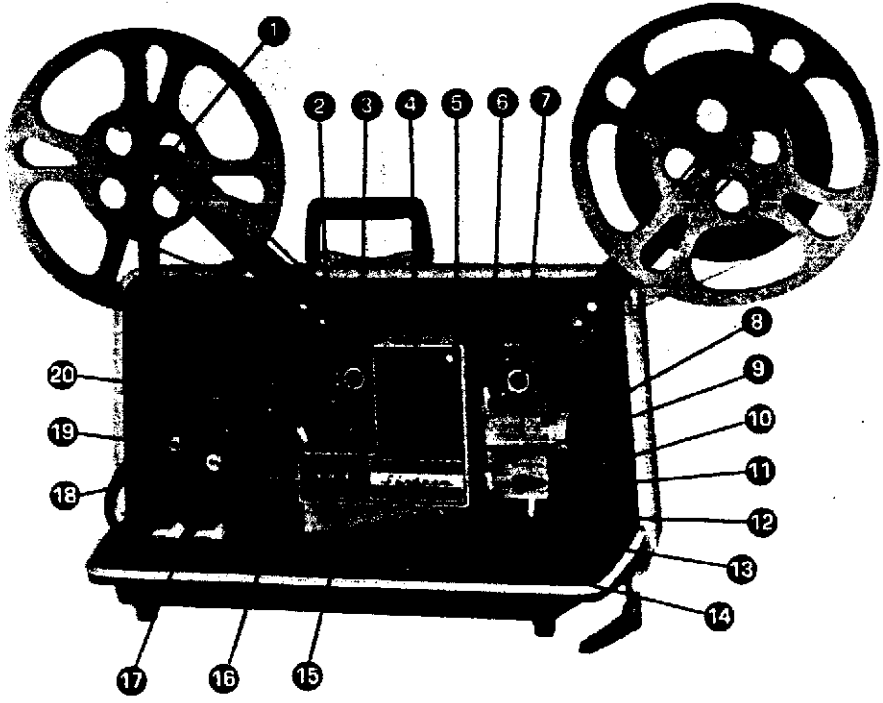
Table of Contents

This is your new Projector . . .

The Singer Sixteen, a fine precision built instrument with the most advanced features in the field. It will make movie showing a pleasure and will give you, with proper care and maintenance, many years of trouble-free performance.

Before You Start . . .

Know the features of your projector.
The chart on page 23 of this booklet will show you which features apply to your model. Take the time to read this guidebook carefully and follow the step-by-step operating instructions.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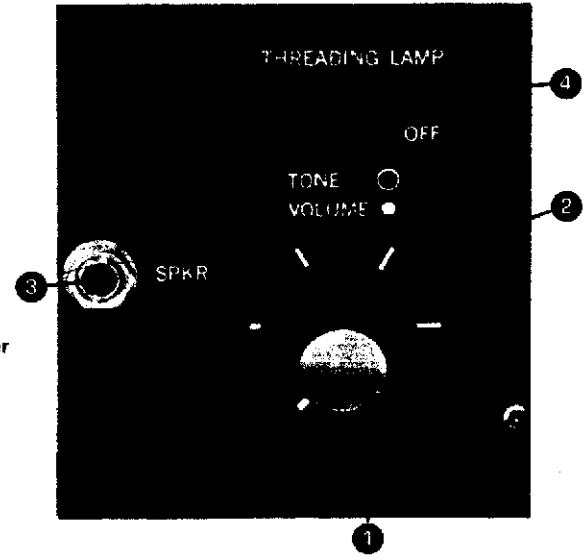
Reference Guide

1. Reel Spindle Lock Lever
2. Reel Arm Lock
3. Take-up Sprocket
4. Lamphouse Cover
5. Framing Knob
6. Rewind Control
7. Feed Sprocket
8. Manual Advance Knob
9. Film Pressure Shoe
10. Elevation Lock Lever
11. Film Pressure Adjustment Lever
12. Film Gate Lever
13. Sound Loop Synchronizer
14. Soundhead (loading) slot
15. Lamphouse Cover Release
16. Master Control Lever
17. Control Switch
18. Volume & Tone Control
19. Speaker Jack
20. Take-up Sprocket Shoe Lever



1. Volume Control
2. Tone Control
3. External Speaker Jack
4. Threading Lamp Switch

Setting Up

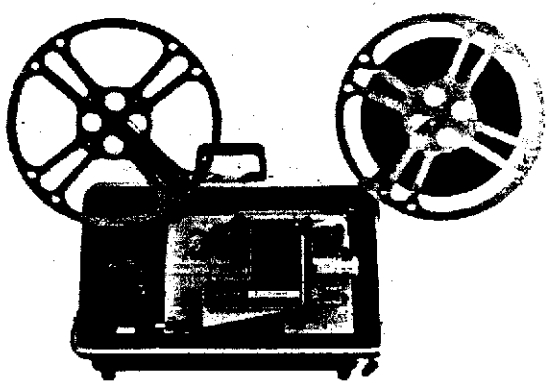
1. Position the projector about 5 screen widths from the screen. Place it high enough to allow the image to be centered without having to tilt the projector more than 12 degrees. Pictures projected at greater angles will produce a distorted image.

2. Check projector data plate for power requirements, then plug cord into grounded outlet.

3. Swing the Supply and Take-up reel arms up until locked in place.

4. Place full reel of film on Supply Arm Spindle so that leader can be pulled downward from the front of the reel. Place an empty reel of suitable capacity on Take-up Spindle (Fig. 1).

5. Turn both Reel Lock Levers back to secure reels.



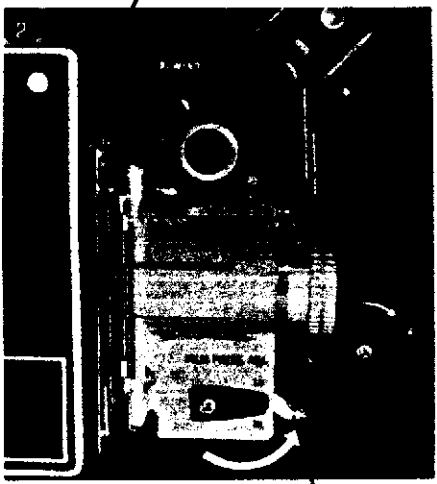
Threading Film

1. Swing the Film Gate Lever to the right to open Feed Sprocket and film channel (Fig. 2).

2. Set Master Control Lever at "Thread", push Rewind Lever in and open Take-up (rear) Sprocket Shoe (Fig. 3).

3. Unwind approximately five feet of film.

REWIND LEVER



FILM GATE LEVER

TAKE-UP (REAR) SPROCKET SHOE

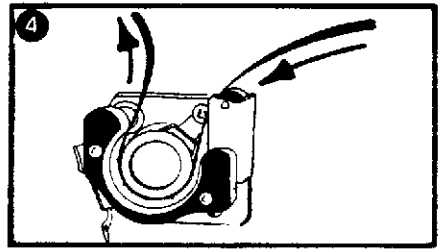
MASTER CONTROL

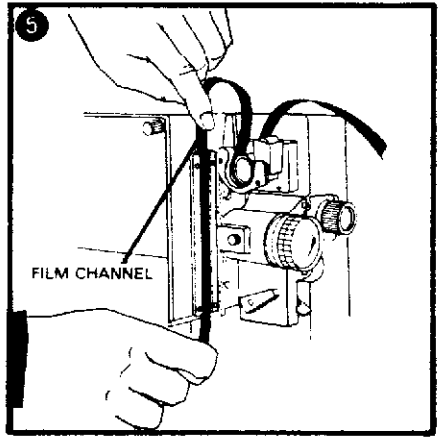
4. Insert film under Feed Sprocket, engaging film perforations with sprocket teeth (Fig. 4).

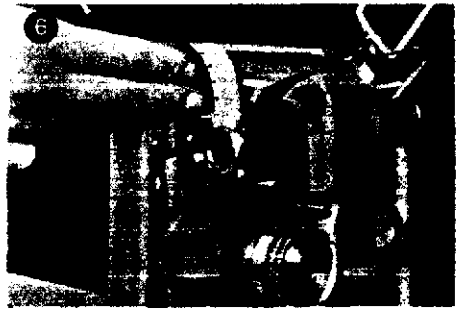
5. The following is the recommended method for inserting film into film channel:

a. Hold film between thumb and index finger of each hand, either hand at top or bottom (Fig. 5).

b. Position film to fit flat in film channel.



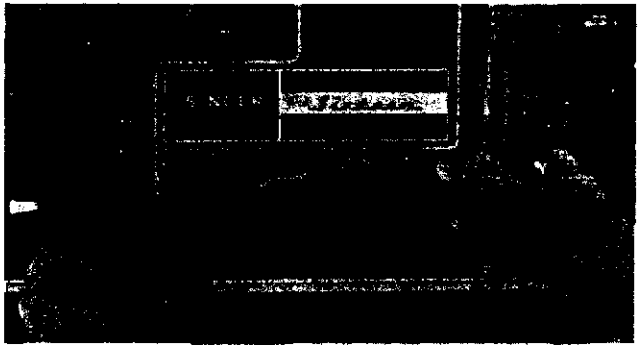




c. Allow enough film to form an upper loop, approximately 1½" high, over two fingers (Fig. 6).

d. Close Film Gate Lever.

6. Insert film into Sound Head Loading Slot and bring under Idler Roller (Fig. 7).



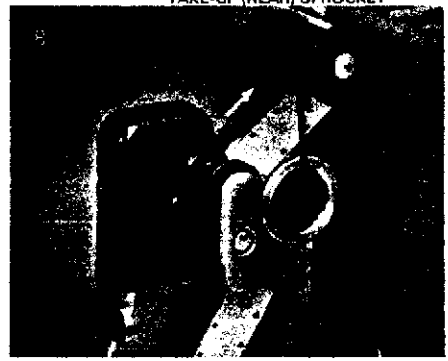
7. Pass film between Take-up Sprocket Shoe and Sprocket, engaging film perforations with sprocket teeth, then guide film around roller. Close rear Sprocket Shoe (Fig. 8).

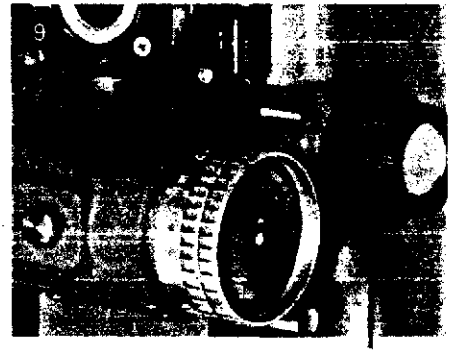
8. Insert end of film in slot of Take-up Reel and turn reel clockwise to take up slack.

9. Test threading by rotating the Manual Advance Knob located next to lens (Fig. 9).

NOTE:
As a safety feature to prevent film damage, the drive mechanism is off on all models when the Master Control Lever is at "THREAD". On models with standard three-blade shutters the lamp is also off at this position.

TAKE-UP (REAR) SPROCKET





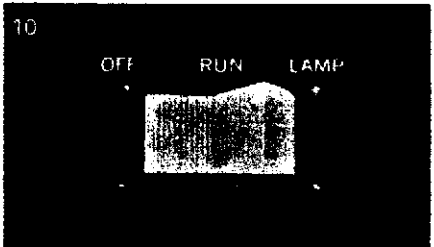
Projecting Sound Film

1. Set the Master Control at "Forward".

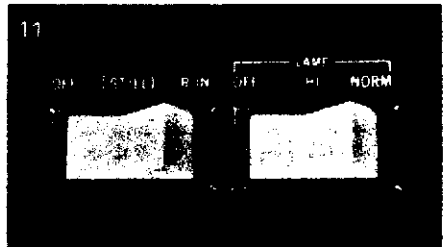
2. SINGLE SWITCH MODEL: Press the three-position Control Switch to "LAMP" pausing briefly at the "RUN" (center) position to allow fan to operate before lamp turns on (Fig. 10).

ALL OTHER MODELS: For longest lamp life set the three-position Lamp Control Switch at "NORM" when lighting conditions are normal. If greater screen brightness is desired switch to the "HIGH" position. Set other switch at "RUN" (Fig. 11).

SINGLE SWITCH



DOUBLE SWITCH

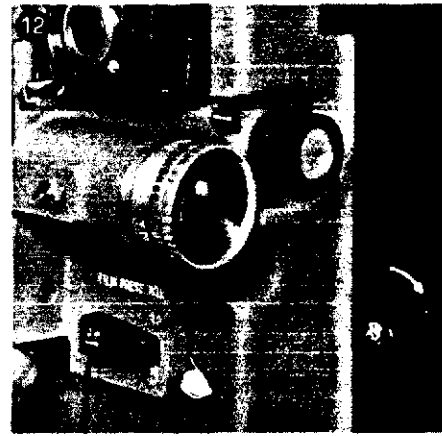


3. To raise or lower picture on screen, turn the elevation lock lever counter clockwise to unlock. (Fig. 12). Raise or lower front of projector as required. When picture is "centered," lock projector in position by turning Lock Lever in direction of arrow.

4. Adjust Film Pressure Lever to eliminate any distracting sounds made by film as it moves through projector. (Fig. 12).

5. Turn lens in or out until image on screen is sharp and clear. If a black strip (frame line) appears at the top or bottom of the picture on screen, turn the framing knob on lamphouse cover, until picture is properly framed. (Fig. 13).

Picture size. To adjust size of picture, vary distance between projector and screen, or use lens of a different focal length.



FILM PRESSURE LEVER ELEVATION LOCK LEVER

FRAMING KNOB

6. When picture has been properly aimed, framed and focused, set Master Control Lever at "Reverse" and run film back to beginning. Press Control Switch to "OFF" as soon as blank film ahead of opening title appears.

7. Set Master Control Lever at "Forward" Film is now ready for showing.

8. Press Control Switch to "RUN". Set Speed Control at "SOUND" (all models except SINGLE SWITCH MODEL) and begin film projection. Adjust volume and tone for best quality.

NOTE:
If lower loop is lost during projection, swing the Sound Loop Synchronizer down slowly and release. (Fig. 14)

9. When "The End" appears on screen . . .
SINGLE SWITCH MODEL: Turn lamp off by pressing the Control Switch to the "RUN" position.
ALL OTHER MODELS: turn lamp off by pressing the Lamp Control Switch to the "OFF" position.

Turn down volume control to avoid distracting noise at tail end of film. Move Control Switch to "OFF" when film has completely passed through projector.

LOOP RE-SET LEVER

Rewinding

1. Attach loose end of film to the empty reel. Do not change position of the reels. This is another convenience.

2. Set the Master Control Lever at the "Reverse/Rewind" position. Pull the Rewind Control out. (Fig. 15). Press Control Switch to "Run". Keep hands away from revolving reels.

3. When film is rewound, press switch to "OFF" and push the Rewind Control in. Put the Master Control Lever into the "Thread" Position ready for the next reel of film.

Threading Lamp

The Threading Lamp will allow you to thread film without turning on the room lights. The ON-OFF switch is located above the Sound Control Knob.

Projecting Silent Film

To project silent film, follow the same instructions given for sound film projection except set Speed Control (Fig. 16) at "SILENT". Move this lever only when projector is operating in "FORWARD".

Projecting Still Pictures

(Applies to models with "still" control)

While film is being shown, switch to "still" to stop the film and project a single frame as a still picture.

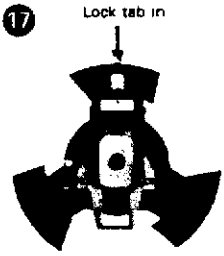
If only part of a picture appears on the screen, rotate the Manual Advance Knob until a full picture appears.

Picture brightness will be reduced, because the safety shutter holds back some light. It may be necessary to focus on the still picture to regain maximum sharpness.

To continue the film, push control button to "Run" and refocus.

Automatic Shutter

All models equipped with Still Control have a 2-3 blade shutter that changes automatically with the film speed unless it is locked (Fig. 17). This assures maximum brilliance and minimum flicker.



At sound speed, the shutter will operate as a 2-blade shutter to get the fullest output of the projection lamp. If, however, the intensity of the light projected is considered too great (on "Norm" or "High"), it can be easily reduced. Simply lock the shutter in the 3-blade position as follows:

1. To stop the projector, press the control switch to "Off"; remove the Lamp House Cover. (See page 18.)

2. Turn Manual Advance Knob to locate shutter blade with white lock tab. Hold knob to prevent shutter from rotating, and with the tip of the finger, slide the white tab in fully toward the hub of the shutter. Replace the Lamp House Cover.

NOTE:
To restore shutter to automatic 2-3 blade operation, merely unlock shutter by pulling white lock tab out fully toward end of shutter blade.

After the Show

Release Elevation Lock Lever and lower front of the projector. Depress Reel Arm Locks and fold arms down. Wind power cord up and store in compartment. Replace the cover.

CTURE SIZE CHART

UPPER DIMENSION IS HEIGHT OF PICTURE
LOWER DIMENSION IS WIDTH OF PICTURE

roj. ens ocal ngth	PROJECTOR-TO-SCREEN DISTANCE (IN FEET)															
	2′	3′	4′	6′	8′	10′	15′	20′	25′	30′	35′	40′	50′	75′	100′	125′
¾″	0′9″ 1′0″	1′ 2″ 1′ 6″	1′6″ 2′0″	2′3″ 3′0″	3′0″ 4′0″	3′ 9″ 5′ 0″	5′ 7″ 7′ 6″	7′ 6″ 10′ 0″	9′ 4″ 12′ 6″							
″	0′7″ 0′9″	0′10″ 1′ 2″	1′1″ 1′6″	1′8″ 2′3″	2′3″ 3′0″	2′10″ 3′ 9″	4′ 3″ 5′ 8″	5′ 7″ 7′ 6″	7′ 0″ 9′ 4″	8′ 6″ 11′ 4″	9′ 9″ 13′ 1″					
½″		0′ 7″ 0′ 9″	0′9″ 1′0″	1′1″ 1′6″	1′6″ 2′0″	1′10″ 2′ 6″	2′10″ 3′ 9″	3′ 9″ 5′ 0″	4′ 8″ 6′ 3″	5′ 7″ 7′ 6″	6′ 7″ 8′ 9″	7′ 6″ 10′ 0″	9′4″ 12′6″			
″						1′ 4″ 1′10″	2′ 1″ 2′10″	2′10″ 3′ 9″	3′ 6″ 4′ 8″	4′ 1″ 5′ 6″	4′10″ 6′ 6″	5′ 6″ 7′ 5″	7′0″ 9′4″	10′5″ 14′0″	14′ 0″ 18′ 9″	17′10″ 23′ 5″
1½″						1′ 2″ 1′ 6″	1′ 7″ 2′ 1″	2′ 3″ 3′ 0″	2′10″ 3′ 9″	3′ 4″ 4′ 6″	3′11″ 5′ 3″	4′ 6″ 6′ 0″	5′7″ 7′6″	8′5″ 11′3″	11 ′2″ 15′ 0″	14′ 8″ 19′ 8″
″									2′ 4″ 3′ 1″	2′10″ 3′ 9″	3′ 3″ 4′ 4″	3′ 9″ 5′ 0″	4′8″ 6′3″	7′0″ 9′4″	9′ 4″ 12′ 6″	11′ 7″ 15′ 7″
1½″									2′ 0″ 2′ 8″	2′ 4″ 3′ 2″	2′10″ 2′ 9″	3′ 2″ 4′ 3″	4′0″ 5′4″	6′0″ 8′0″	7′11″ 10′ 8″	9′11″ 13′ 4″
″									1′ 9″ 2′ 4″	2′ 1″ 2′10″	2′ 2″ 3′ 3″	2′10″ 3′ 9″	3′6″ 4′8″	5′3″ 7′0″	7′ 0″ 9′ 4″	8′ 8″ 11′ 8″

ROJECTION TIME TABLE

SOUND SPEED: 24 frames per second (36′ per minute)
SILENT SPEED: 18 frames per second (27′ per minute)

LENGTH OF FILM	AT SOUND SPEED FILM WILL RUN:		AT SILENT SPEED FILM WILL RUN:		LENGTH OF FILM	AT SOUND SPEED FILM WILL RUN:		AT SILENT SPEED FILM WILL RUN:	
	Minutes	Seconds	Minutes	Seconds		Minutes	Seconds	Minutes	Seconds
50′	1	24	1	51	600′	16	40	22	13
100′	2	47	3	42	700′	19	26	25	55
200′	5	34	7	24	800′	22	14	29	37
300′	8	20	11	6	900′	25	0	33	20
400′	11	7	14	40	1000′	27′	46	37	2
500′	13	54	18	31	1600′	44	44	59	15
					2000′	55	34	74	4

e above chart at 10 ft. will help you plan more ective use of time by determining in advance how g a film will require for showing. For example, a 400′ sound film takes 11 minutes, 7 seconds to run, while a silent film of the same length requires 14 minutes and 40 seconds.

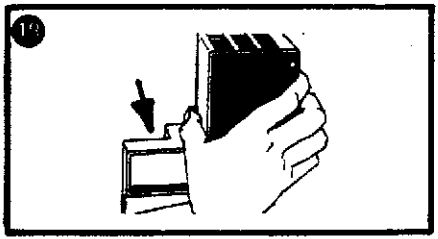
Lamp and Belt Replacement

Removing Lamp House Cover

1. Disconnect power cord.

2. Press Lamp house Release Button with thumb of right hand while grasping cover between thumb and fingers, and pull straight away from projector (Fig. 18).

3. To replace, push cover straight in until release catch engages. (NOTE: It may be necessary to rotate the Framing Knob to align knob groove with the shaft.)



PROJECTION LAMP

Replacing Projection Lamp

Remove Lamp House Cover

Remove chimney by lifting straight up. Remove lamp in same manner.

To replace lamp, align ridge on center pin of lamp with groove in socket. Push down firmly until it seats with a click. Wipe lamp free of fingerprints and dust (Fig. 19).

Replace lamp chimney by aligning the notch on chimney with guide pin, and press firmly. Replace Lamp House Cover. (Use replacement lamp designated by ASA ordering code DLR or DKM only.) DKM should be used for maximum life at normal line voltages or maximum light output at high line voltages. DLR should be used for maximum light output at normal line voltages.

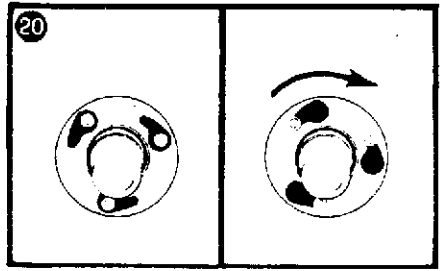
Replacing Exciter Lamp

Remove lamp house cover (Fig. 18).

To remove exciter lamp, turn lamp counterclockwise. It will turn more easily if the lamp is rocked or wiggled rapidly from side to side. Use replacement lamp BSW. Align the three slots in new lamp with pins in the socket and turn clockwise when replacing lamp. (Figs. 19, 20). Replace lamphouse cover.

Replacing Threading Lamp

Remove two retaining screws and lift off sound head cover located below lamphouse cover (Fig. 21). Unscrew lamp and replace with No. 6S6 threading lamp. Replace cover.



Reel Belt Replacement

Open one end loop of old belt, disconnect hooked ends, and remove belt. Note that take-up and rewind belts are of different length, the latter being the longer. Push new belt through lower opening (Fig. 22). Interlock both end loops. Open one end if necessary, but close both loops tightly after connection.

Projector Care

Before each showing, swing the Film Gate Lever forward to open the film channel. Turn the lens forward. Insert the Aperture Brush into the top of the channel and move it vigorously up and down. Use care to keep the shaft of the brush away from the pressure shoe or the film track. If necessary, dampen the brush with solvent to loosen and remove any hardened substance.

Film Care

Never pull film tight on a reel; the emulsion may become scratched with "cinch marks." Your Singer Sixteen rewinds film with just the right amount of snugness. For storage, secure loose end of film with a length of masking tape. Fold it under and stick masking tape against itself about ½" from end. This forms a tab for easier removal. Protect film from dust by replacing in storage can promptly after showing. Store cans away from heat.

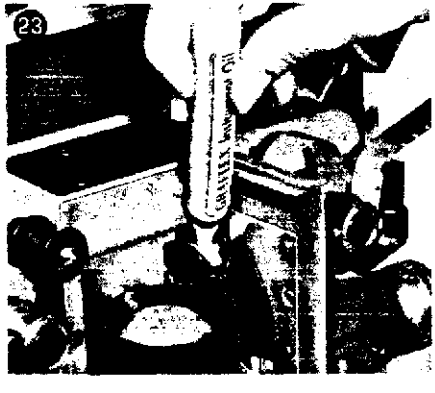
Lubrication

Your Singer Sixteen is permanently lubricated and should not be oiled except as noted here. To insure optimum performance apply 16 drops of Instrument Oil (p/n 39479P8) to the felt oiler pad after each 500 hours of operation or once every 12 months. (Fig. 23). It is available in convenient applicator tubes from your Singer AV Dealer or Service Station.

Cleaning the Lens

Remove lens. Remove dust from front and rear exposed lens surfaces by brushing gently with a soft brush. Then wipe lens gently with a clean lens tissue (slightly moistened with lens cleaner if necessary).

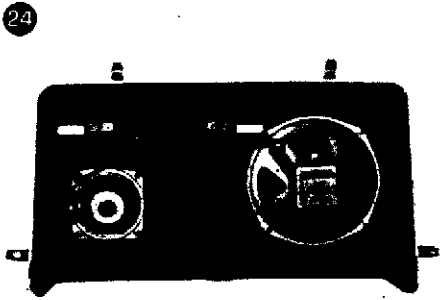
CAUTION: Never pour lens cleaner or other solvents on the lens elements.



ACCESSORIES

External Speaker

An External lift-off speaker cover is available which is matched to the amplifier of your projector. If an external speaker is used, place it near the screen. Plug cable into SPKR. jack. Speaker output is 9 ohm impedance and will operate with 6 ohm to 16 ohm speaker systems. The built-in twin 5 in. oval speakers are automatically by-passed when an external speaker is used.



Projection Lenses

Finest quality lenses with a wide range of focal lengths to adapt the Singer Sixteen to every projection distance and screen size. (See "Picture Size Chart," page 16.)

Focal Length	f No.	Catalog No.
⅝"	f/2.0	3610
1"	f/1.9	3602
1½"	f/1.6	3603
2"	f/1.6	3609*
2"	f/1.6	3604
2½"	f/1.8	3605
3"	f/2.0	3606
3½"	f/2.5	3607
4"	f/2.8	3608

*Field Flattener Lens

Feature Chart

FEATURE	MODEL NUMBER						
	1000	1015	1016	1020	1021	1022	1050
Single Switch							●
Double Switch	●	●	●	●	●	●	
Speed Control	●	●	●	●	●	●	
Still Control				●	●	●	
Automatic Shutter				●	●	●	
Standard Shutter	●	●	●				●
Threading Lamp	●	●	●	●	●	●	
117 Volt, 60 Hertz	●	●		●			●
117 Volt, 50 Hertz						●	
230 Volt, 50 Hertz			●		●		

SERVICE DEPARTMENTS:

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Rochester, New York 14603

Midwest Region:
2444 Oakton Street
Arlington Heights Illinois 60005

Eastern Region:
1406 Bergen Blvd.
Ft. Lee, New Jersey 07024

Singer Audiovisual Ltd.
550 Hopewell Avenue
Toronto M6E-2S6
Ontario, Canada

YOUR EDUCATION SYSTEMS WARRANTY

Education Systems merchandise is warranted to the initial purchaser by Education Systems and the Education Systems dealer to be free from manufacturing defects in material and workmanship under normal use and service for a period of one year after sale (Lamps are not included) (90 days in case of electronic components). This warranty does not apply to any Education Systems equipment which has been tampered with or repaired by persons other than authorized Education Systems service stations, or which has been subjected to misuse or abuse or which has not been registered with Education Systems by means of a registration card within 60 days from date of purchase. Liability under this warranty is limited to repair or replacement of defective part or merchandise. Return for servicing should be made through your Education Systems dealer. Transportation charges are payable by the owner and Education Systems is not responsible for damage in shipment.

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SINGER
EDUCATION DIVISION

EDUCATION SYSTEMS, ROCHESTER, NEW YORK, 14603

SERVICE MANUAL

16 mm Projector Series 1000

Service Instructions

TELEX®

TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.

VOL1000A Litho U.S.A. November, 1983

16 mm PROJECTORS
1000 SERIES

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16 mm PROJECTORS
1000 SERIES

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SECTION I.
PRINCIPLES OF OPERATION

All Singer 16mm projectors may be divided into six (6) basic functions:

1. The Main Drive System
2. The Feed & Rewind System
3. The Gate & Lens Mount
4. The Sound Drum and Optic
5. The Take-up System
6. The Electrical System

A thorough understanding of each function and its relationship with the other functions will be a great assistance in servicing these projectors.

THE MAIN DRIVE SYSTEM

All functions are driven from a single drive shaft which is turned by a reversible motor through a drive belt (Figure 1-1). Two worm gears (drive gears), pinned to the shaft, drive the Take-Up Clutch gear and the Film Feed Clutch gear. The Shutter and Safety Shutter (in models which have the still feature) are also mounted on this same drive shaft. Forward and Reverse operation of the projector is produced by changing the direction of rotation of the drive shaft by changing the direction of rotation of the drive motor. (See Power Supply and Motor Drive Circuits).

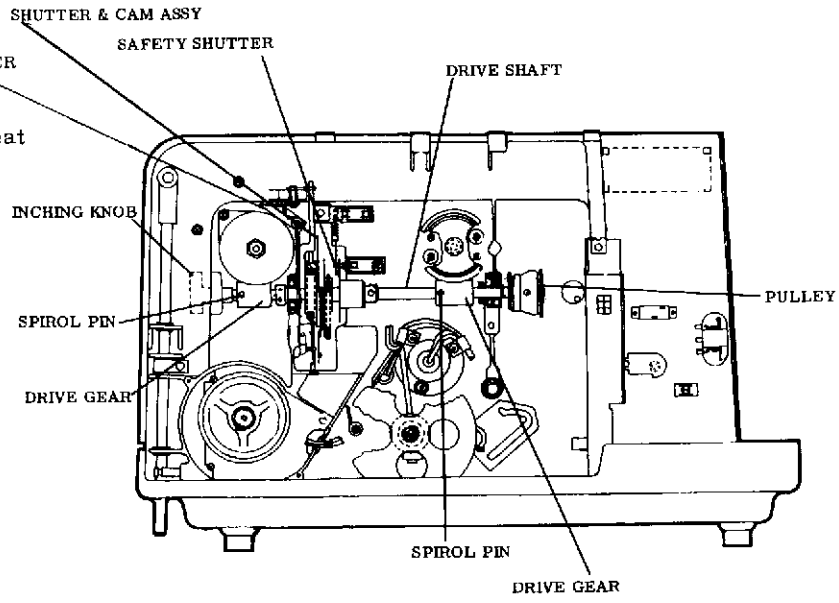


Figure 1-1. MAIN DRIVE SYSTEM

FEED AND REWIND SYSTEM

The Film Feed Clutch gear is driven by the front worm gear on the main drive shaft (Figure 1-1). The Feed Clutch gear is moulded permanently on a shaft, one end of which fits through a bearing in the main casting and supports the Film Feed Sprocket (Figure 1-2). The other end of the shaft supports the entire clutch mechanism which produces the clutching action and the direct drive for retrieving film on the supply reel when the projector is run in the Reverse or Rewind modes. (Figure 1-3). The Feed Clutch Pulley drives the supply reel in Reverse and Rewind by means of the supply reel arm belt (Figure 1-2). The pulley is clutched in the Reverse mode, driven directly in the Rewind mode and not driven in the Forward mode.

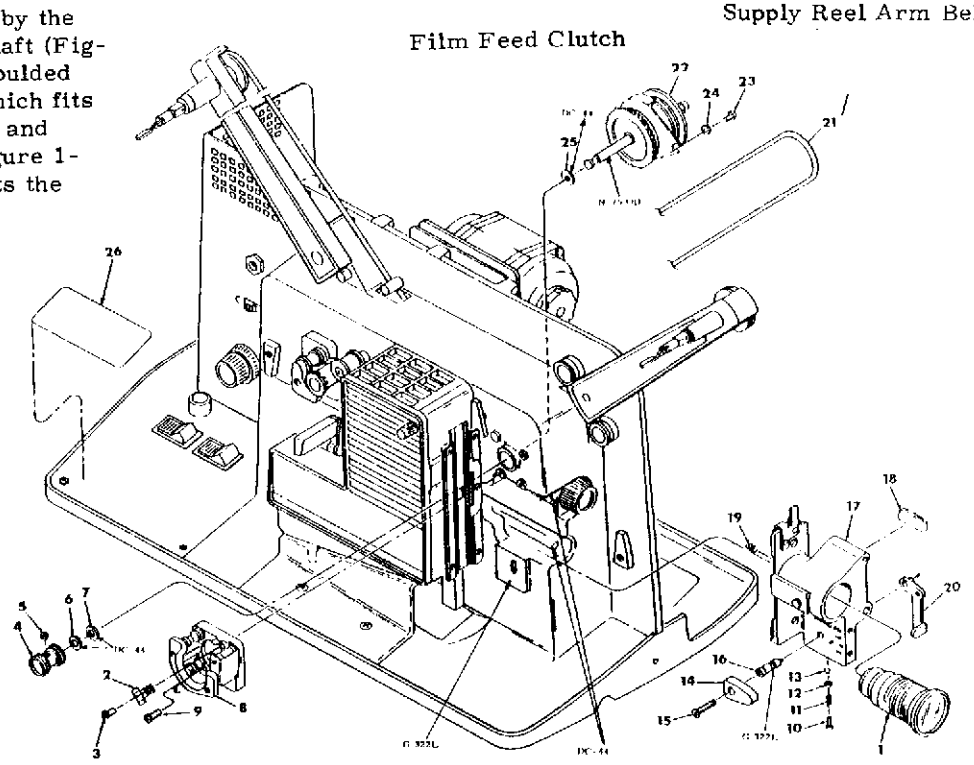
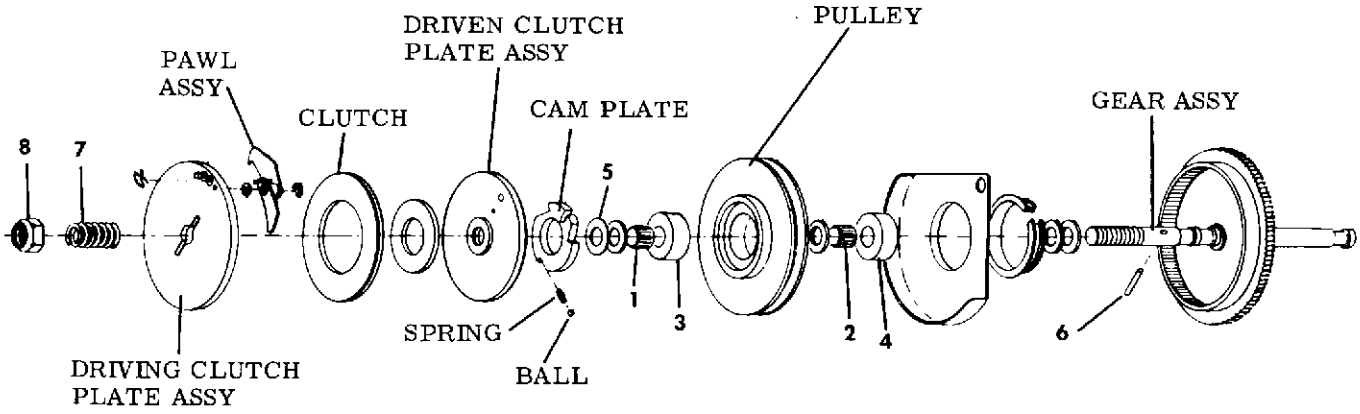


Figure 1-2. FILM FEED CLUTCH ASSEMBLY



(Figure 1-3). FILM FEED CLUTCH ASSEMBLY

The action of the Balls, Springs and Cam Plate (Fig 1-3 & 1-4), determines whether the pulley is driven or not. The action of the Nut (8), Spring (7), Driving Clutch Plate, Pawl Assembly, Clutch and Driven Clutch Plate determines whether the driving force delivered to the pulley is clutched or connected directly to the pulley.

FORWARD

The Cam Plate rotates counterclockwise (Figure 1-4). pushing the Balls down the ramp of the Cam, compressing the Springs. The Cam turns freely inside the recess of the pulley and the pulley is not driven.

REWIND

The Cam Plate rotates clockwise, forcing the Balls up the ramp (these also now being pushed by the Springs) causing them to lodge between the Cam Plate and the wall of the recess in the pulley. This locks the Cam Plate together with the pulley and causes the pulley to rotate when the Cam Plate rotates.

The Cam Plate rotates when the Driven Clutch Plate rotates because the two are connected together by a pin protruding from the Driven Clutch Plate into the notch in the Cam Plate.

The Driven Clutch Plate rotates because it is connected directly to the Driving Clutch Plate by the Pawl Assembly, the hooked end of which has been pushed down by the Rewind Lever (Figure 1-1) to engage the outer pin of the Driven Clutch Plate.

The Driving Clutch Plate rotates because it is pinned to the shaft of the Gear Assembly by pin (6).

Thus the driving force from the Feed Gear is coupled directly to the pulley in the Rewind mode.

REVERSE

The Cam Plate and Driven Clutch Plate function identically in Reverse as they do in Rewind. However, the driving force supplied to the pulley is now clutched rather than direct.

The position of the rewind lever is moved to cause the hooked end of the Pawl Assembly to raise up and disengage from the pin on the Driven Clutch Plate. Drive is now transmitted from the Driving Clutch Plate to the Driven Clutch Plate by the Clutch. The amount of drive supplied by the clutch is determined by the pressure exerted against the Driving Clutch Plate by the Spring (7) which can be compressed or relaxed by adjusting Nut (8).

A clutched mechanism is necessary in reverse since the film is fed to the supply reel by the feed sprocket at a constant rate, but the supply reel will try to take up film at a progressively faster rate as film builds up on it and increases its diameter.

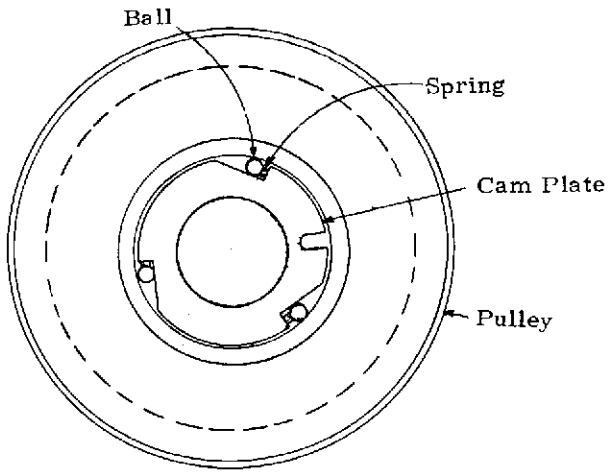


Figure 1-4. FEED CLUTCH CAM PLATE

GATE AND LENS MOUNT

The film is held securely in place against the aperture plate by the film pressure shoe (Figure 1-5). It is fed into this channel from the feed sprocket which is just above the lens mount. The pins on the claw arm enter the sprocket holes from behind the aperture plate and pull the film down through the channel one frame at a time (Figure 1-6).When the framing adjustment is properly made, each picture frame will line up exactly in front of the hole in the aperture plate through which the projection lamp shines. The light shines through the film and the image is projected onto a screen and focused by means of the projection lens.

The film is moved through the film gate at a rate of 24 frames/second. This is accomplished by moving the claw arm first into the sprocket holes, then down, then back out of the sprocket holes and up again to start the cycle over. While the film is being pulled through the gate area by the claw arm, a shutter moves between the lamp and film to prevent light from passing through the film and projecting an image on the screen. As soon as the claw arm has moved the film into position in front of the hole in the aperture plate, the shutter moves out of the way and the light is again allowed to pass through the film. The momentary interruption of the light by the shutter is necessary to prevent what would appear to be a streaming of the picture. However, the interruption of the light is at such a rapid rate that only a small amount of flicker is discernible by the human eye. The claw arm and shutter are synchonized by a cam which is part of the shutter assembly and turns at the same rate of speed as the main shaft.

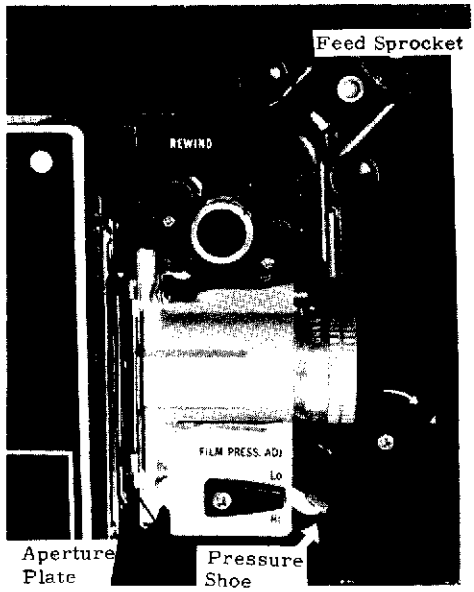


Figure 1-5. GATE AND LENS MOUNT

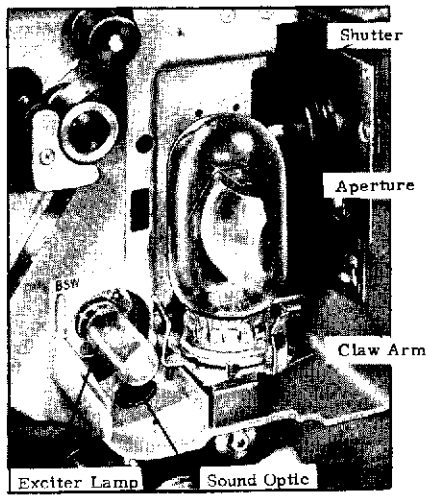


Figure 1-6. CLAW ARM AND SHUTTER

SOUND DRUM AND OPTIC

After leaving the gate and lens mount area, the film passes over the sound drum. It is here that the sound information recorded on the sound track portion of the film is detected.

Sound information is recorded on the film by causing an audio signal to vary the intensity of a beam of light which is focused on the sound track portion of the film. The varying intensity of the light exposes the film in varying degrees corresponding to the frequency and amplitude of the audio signal itself.

To replay the audio track a beam of light from an exciter lamp is passed through this exposed part of the film and onto a light sensitive device which transforms it into electrical energy (Figure 1-7). The electrical energy will then vary at the same rate and with the same amplitude as the exposed portions on the film sound track. These electrical variations are fed into the audio amplifier where they are amplified and eventually drive the speakers to reproduce the original sound.

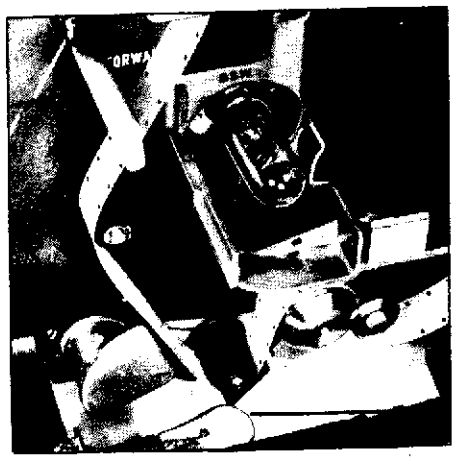


Figure 1-7. SOUND DRUM AND OPTIC

A pressure roller in front of the sound drum holds the film firmly against the sound drum and a dampening roller behind the sound drum maintains a constant film speed over the sound drum for maximum fidelity of sound reproduction.

The movement of film over the sound drum causes the sound drum to rotate. A balanced flywheel mounted on the end of the sound drum shaft, maintains a constant rotational speed of the sound drum which also insures maximum fidelity of sound reproduction.

TAKE UP SYSTEM

Film is drawn through the sound drum portion of the projector by the take-up sprocket, then passes over the reel tension arm pulley and is gathered on the take-up reel (Figure 1-8). The take-up sprocket turns at a constant rate of speed since it is attached to the shaft of the take-up gear which is driven by the rear worm gear on the main drive shaft. Film is

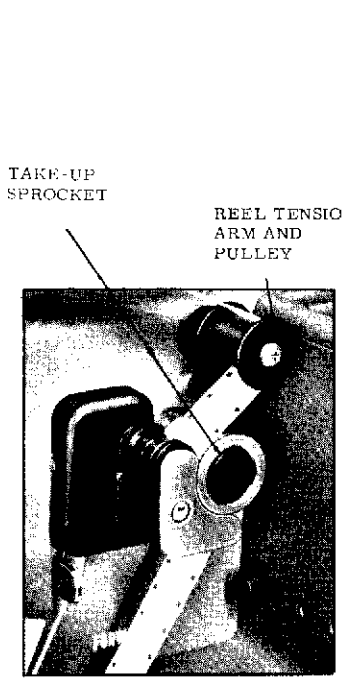


Figure 1-8. TAKE UP SPROCKET AND TENSION ROLLER

thus fed to the take-up reel at a constant rate of speed. However, the take up reel must be able to turn at a variable speed since the diameter of its take-up surface varies continuously as film is gathered on it. The drive mechanism which drives the take-up reel with the reel arm belt is, therefore, continuously clutched and self-adjusting to compensate for the increased diameter and weight of the take-up reel.

The clutching action is provided by the interaction of the take-up clutch arm and pulley (20), the take-up clutch liner (31), and the take-up clutch gear (29), (Figure 1-9). The liner fits snugly inside the gear and the pulley fits inside the liner.

The clutch is adjusted so the top part of the pulley contacts the liner when the projector is run in the forward mode. The gear is driven by the worm gear on the main shaft and rotates continuously while the machine is running. The liner rotates along with the gear and turns the pulley. The pulley drives the reel arm pulley by means of the reel arm belt. The surface of the clutch pulley is polished and can slip on the liner if necessary.

The system is designed so the take-up reel is capable of taking the film much faster than the film is fed to it by the take-up sprocket, so film will not be spilled when the clutch is working properly. Since the take-up reel tries to take up film faster than the film is being fed to it, the

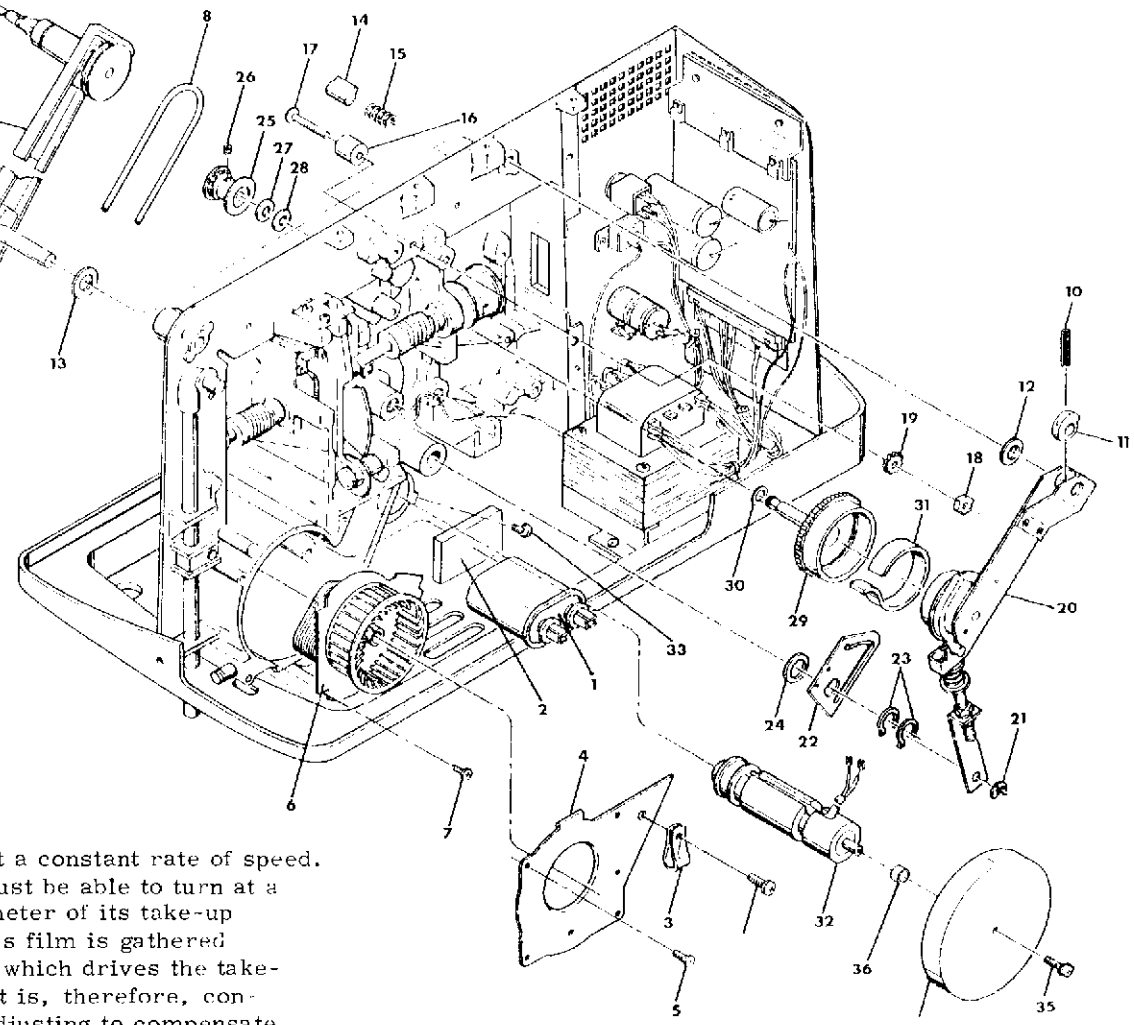


Figure 1-9. TAKE-UP CLUTCH

mechanism which drives it must provide a sufficient amount of drive while at the same time being able to slip to prevent film from being pulled through the take-up sprocket. The fact that the take-up clutch pulley can slip inside the take-up clutch liner allows for this to happen.

The mechanism is self-adjusting during the entire take-up cycle of any given film because of the way the take-up reel arm (9) is attached to the take-up clutch arm (20). (Figure 1-9). The shaft of the take-up reel arm passes through a hole in the upper portion of the take-up clutch arm. A roll pin(10)is inserted in a hole in the reel arm shaft and pushes down on the upper end of the clutch arm when the reel arm is allowed to rest in its normal upright position. Since the roll pin pushes down on the upper portion of the clutch arm, it causes the clutch arm to pivot and push up on the lower portion. This means that the lower portion or the pulley is forced up against the liner which is inside the clutch gear. The more weight placed on the reel arm, the more downward pressure is exerted on the roll pin and upper portion of the clutch arm, resulting in more upward pressure on the clutch pulley forcing it to press harder against the liner. This results in more friction between the clutch liner and the pulley producting a greater amount of drive. Thus, when the film take-up reel gets heavier because it is taking on more film, it forces the clutch pulley against the clutch liner producing the increased torque needed to drive the heavier reel. (Figure 1-10).

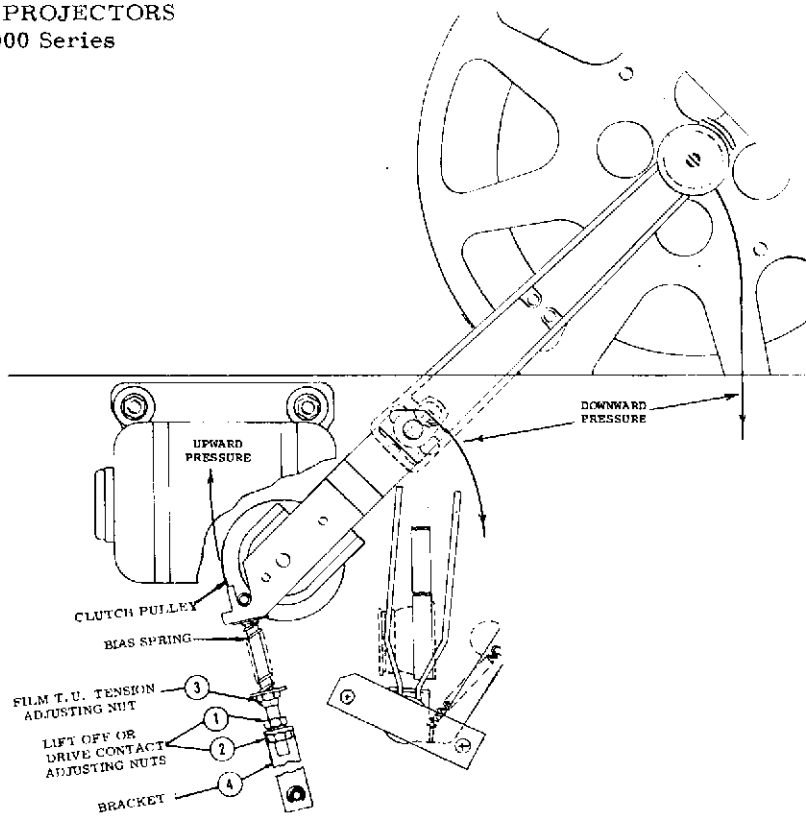


Figure 1-10. TAKE-UP CLUTCH WEIGHT COMPENSATION.

ELECTRICAL AND ELECTRONIC CIRCUITS

The electrical and electronic circuits in the 1000 Series projectors are divided into two sections.

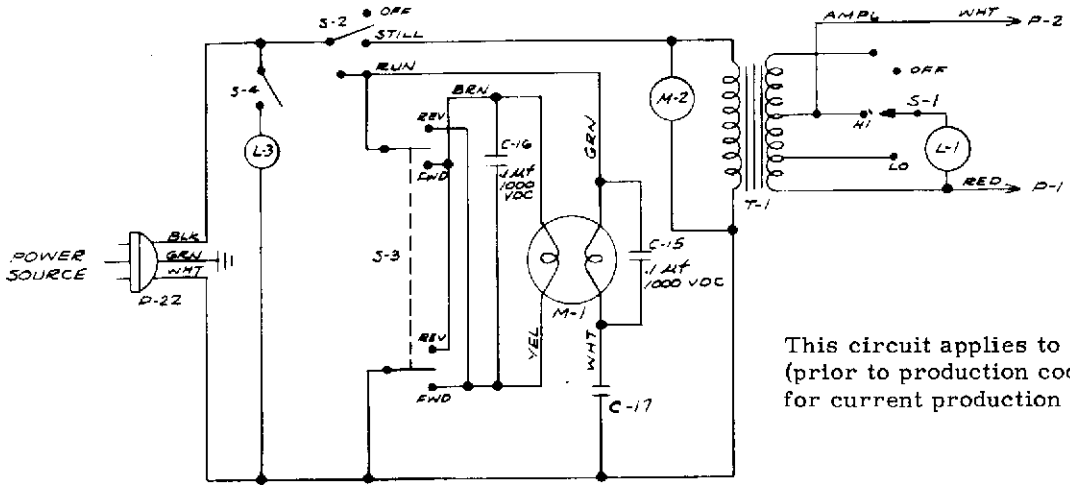
1. Power Supply and Motor Drive Circuits
2. Audio Amplifier and Miscellaneous Circuits.

POWER SUPPLY AND MOTOR DRIVE CIRCUITS

are basically the same in all machines. For the purpose of discussion, we will use the circuit for the Model 1020 shown in Figure 1-11.

SWITCH (S2) This switch supplies power to all functions of the machine with the exception of the threading lamp. In the Still position, power is supplied to the blower motor (M2) and the step down transformer (T1). In the Run position, power continues to be supplied to the blower motor and the step-down transformer, and in addition to the start winding of the main drive motor (M1) as well as the Forward/ Reverse switch (S3).

When the main function lever is in the Thread position, no power is supplied to the run winding (brown-yellow) of the main drive motor. Moving the function lever to the Forward position applies power to the brown wire which is in phase with the power applied to the green wire of the start winding. The motor now runs in the direction to move film forward through the machine.



This circuit applies to early production projectors (prior to production code L4). Refer to Figure 6-7 for current production schematics.

Figure 1-11. POWER SUPPLY AND MOTOR DRIVE CIRCUIT - Model 1020

When the main function lever is moved to the Reverse position, power is supplied to the yellow lead of the run winding in phase with power on the green wire of the start winding. In this condition, the motor runs in a direction to move film through the projector in reverse. Thus forward and reverse operation are achieved by changing the input voltage phase relationship between the start winding and the run winding of the main drive motor.

BLOWER MOTOR (M2). The blower motor's function is to provide a constant flow of air over the projection lamp (L1) to prevent the lamp from overheating.

TRANSFORMER (T1). This transformer takes the line voltage applied to its primary and steps it down to 21.75v for use by the amplifier and the high intensity setting for the projection lamp. A 17.5v tap is provided for low intensity operation of the projection lamp.

SWITCH (S1). This switch is used to select either high or low intensity for the projection lamp (L1). It applies the 21.75v from the secondary of transformer (T1) to the lamp when it is in the high position, and the 17.5v when it is in the low position.

SWITCH (S4). This switch supplies power for the threading lamp.

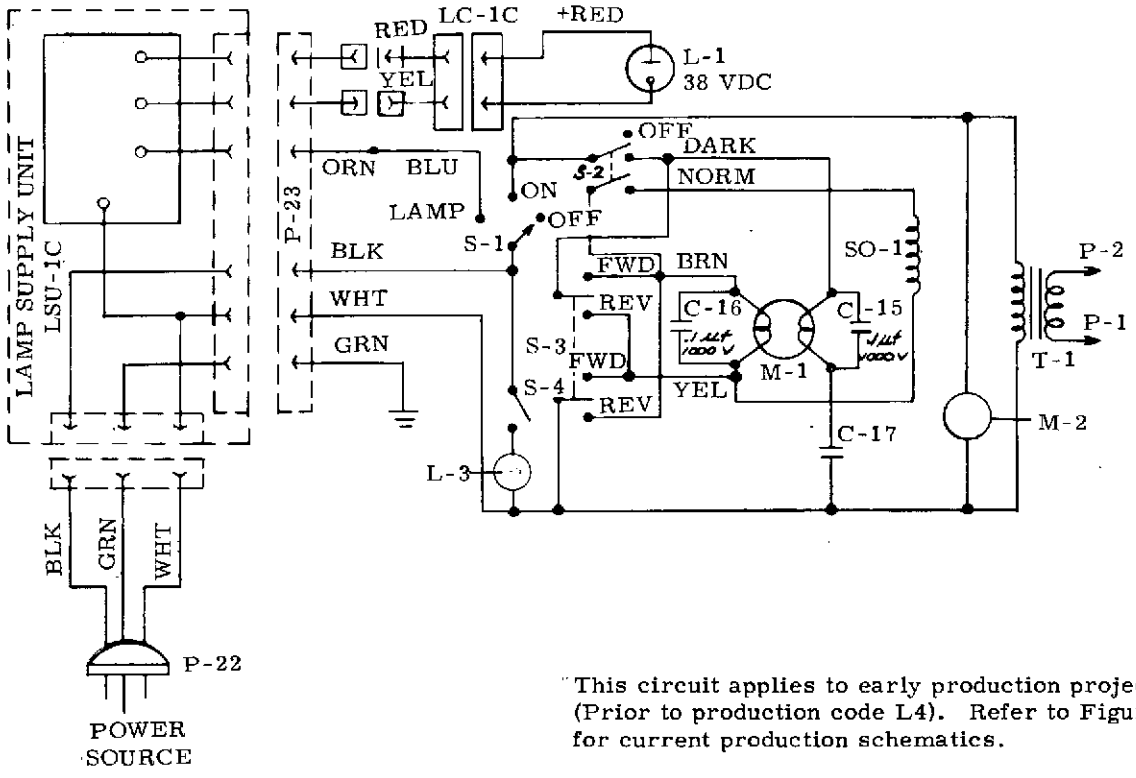
POWER SUPPLY AND MOTOR DRIVE CIRCUITS—MODEL 1040. When the projector is plugged into the lamp power supply by means of (P23), AC line voltage is supplied to the projector on the black wire of the interconnecting cable (Figure 1-12).

SWITCH (S1). This switch is the OFF-ON-LAMP switch. In the On position it applies power to the blower motor (M2), the transformer (T1), and the Off-Dark-Normal switch (S2). The blower motor will run continuously when the switch is in this position, and the transformer will step the line voltage down to the correct voltage for the audio amplifier. When (S1) is in the lamp position, it continues to supply power to the previously mentioned circuits, and it also supplies power back through the orange wire in the interconnecting cable to the lamp supply itself.

SWITCH (S2). In the Dark position, this switch supplies power for the start winding of the main drive motor (M1), and the Forward/Reverse switch (S3). In the Normal position, this switch continues to supply power to the above-mentioned circuits, and in addition, it connects the dowser solenoid (SO1) to the Forward/Reverse switch (S3).

SWITCH (S3). This is the Forward/Reverse switch which supplies power to the run winding of the main drive motor (M1) and through the contacts on switch (S2), to the dowser solenoid (SO1). The function of the motor circuit is identical to that described above for the Model 1020 projector.

SWITCH (S4). This switch applies power to the threading lamp.



This circuit applies to early production projectors (Prior to production code L4). Refer to Figure 6-7 for current production schematics.

Figure 1-12. POWER SUPPLY AND MOTOR DRIVE CIRCUIT - Model 1040

POWER SUPPLY AND MOTOR CIRCUITS—MODEL 1030N Figure 1-13).

SWITCH (S1). This switch applies power to the threading lamp (L1).

SWITCH (S2). This switch applies power to one side of the start winding of the main drive motor (M1), one side of the blower motor (M2), the forward/reverse switch (S3), and the Site/Normal switch (S5).

SWITCH (S3). This Forward/Reverse switch performs the same function as the Forward/Reverse switch previously described under POWER SUPPLY AND MOTOR DRIVE CIRCUITS - MODEL 1020.

RELAY (K1). This relay is added to the circuit to remove AC power from the start winding of the main drive motor (M1) when the main function lever is moved from either Forward or Reverse to the Thread position. This is necessary because the synchronous motor in the 1030N will sustain itself if power is maintained on its start winding after power is removed from its run winding.

The relay winding is in series with the run winding of the main drive motor and its contacts are in series with the start winding. With switch (S2) in the Run position, placing the Forward/Reverse switch (S3) in either Forward or Reverse applies power to the run winding of the main drive motor through the relay coil. The relay operates and its contacts close to complete the other half of the start winding circuit.

When the main fuction lever is moved to Thread, power is removed from the run winding and the relay coil. The relay releases and its contacts open to remove power from the start winding.

SWITCH (S4). This switch supplies power to the projection lamp (L2). It must be turned on for the lamp to light when the machine is operated with the Site/Normal switch (S5) in either position.

SWITCH (S5). This is the Site/Normal switch which determines the source of power supplied to the primary of transformer (T1) as well as to the amplifier. In the Normal position, this switch supplies power from within the machine to these circuits. In the Site position, power must be supplied to these circuits through the remote socket (J5).

REMOTE SOCKET (J5). This socket provides remote access to all circuits except the threading lamp circuit.

Connecting one set of contacts of a double pole, single throw switch to pins 2 and 9 and the other set of contacts to pins 7 and 8 simulates the Off/Run switch.

Connecting a single pole, single throw switch to pins 5 and 7 (with the Site/Normal switch in the Site position) permits control of power to the primary of the transformer (T1). This allows for simultaneous control of the Projection Lamp and Amplifier from the remote position.

Connecting a single pole, single throw switch to pins 1 and 10 (with the Site/Normal switch in the Site position) permits control of power to the Amplifier independent from the Projection Lamp. (Pins 5 and 7 must

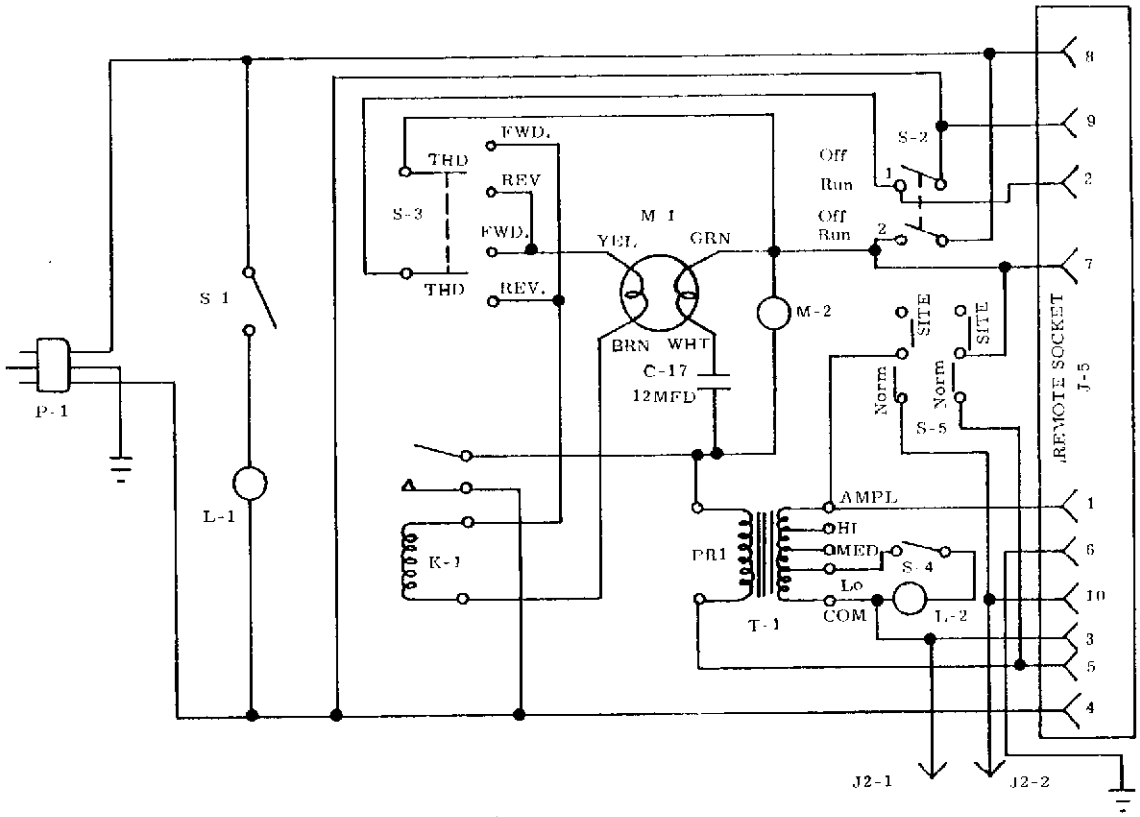


Figure 1-13. POWER SUPPLY AND MOTOR DRIVE CIRCUIT - Model 1030N

be connected together to provide the source of power for the Amplifier.)

Connecting a 250 Watt rheostat or standard 250 Watt dimmer control to pins 5 and 7 provides a continuously variable control of projection lamp intensity. (If this option is exercised, an auxiliary power source should be supplied for amplifier operation - see discussion below.)

With the Site/Normal switch in the Site position, power may also be supplied to the Amplifier by connecting an auxiliary 24 Volt AC supply to pins 3 and 10. Pins 5 and 7 do not need to be connected together for amplifier operation in this configuration.

AUDIO AMPLIFIERS. The audio amplifiers used in all 1000 Series projectors are basic audio amplifiers and need very little explanation. For the purpose of our brief discussion, we will refer to the 43477G6 amplifier. (Figure 1-14).

The variations of light intensity produced by the exciter lamp shining through the sound track on the film are picked up by a photo-sensitive diode (PD-1) and converted to electrical variations. These electrical variations are fed into the preamplifier portion of the audio amplifier (TR-2) and (TR-3) where they are amplified and fed to the volume/tone control (VR-1A) and (VR-1B). From there they pass into the voltage amplifier (TR-4) and then into the output amplifier (TR5-9). The output amplifier then drives the speakers mounted in the projector. A standard 1/4" audio jack (JS-1) is provided for connecting an external apeaker to the projector. The external speaker plug opens the normally closed contacts of this jack and removes the internal speakers (LS-1) and (LS-2) from the circuit.

AMPLIFIER POWER SUPPLY. All amplifiers are supplied DC power from a full wave bridge rectifier (D-1) which is connected to the secondary of the lamp-amplifier transformer. The bridge supplies an unregulated DC voltage which powers the output stages of the audio amplifier and a voltage regulating circuit.

The voltage regulator supplies a regulated voltage for the preamplifier as well as the exciter lamp circuit. The zener diode (D2) holds the base of the transistor (TR-1) at a constant voltage. The

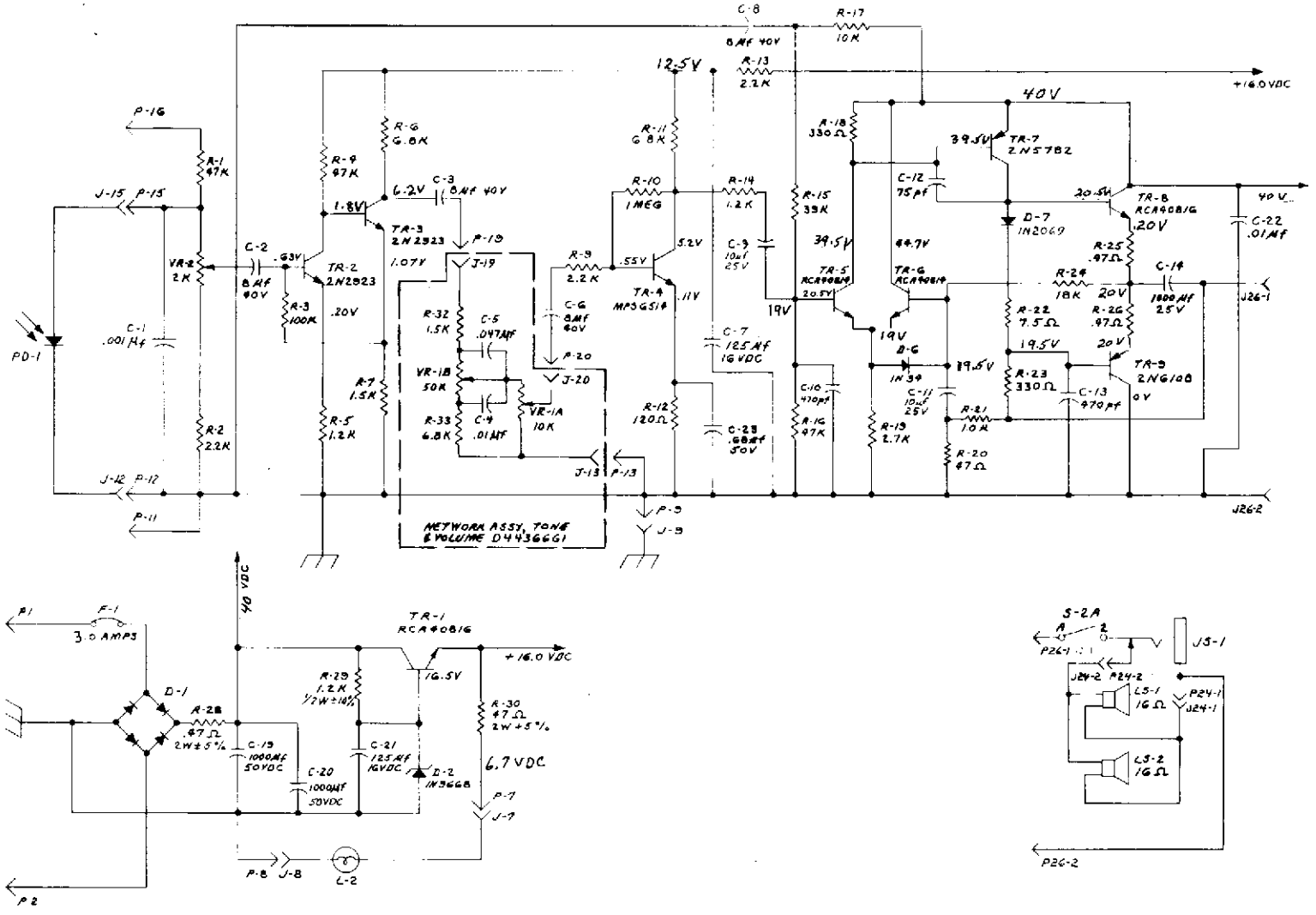


Figure 1-14. AMPLIFIER SCHEMATIC DIAGRAM

capacitor across the zener diode (C21) helps to stabilize this regulated voltage. Resistor (R29) in series with the diode/capacitor circuit is a voltage dropping resistor which develops the remaining DC unregulated voltage supplied to the voltage regulating circuit.

Transistor (TR1) does the regulating in this circuit. When the DC voltage to the circuit increases because of a line voltage increase, the DC output voltage from the emitter of the transistor tries to increase. However, since the base is held at a constant voltage by the zener diode, an increase in emitter voltage will be recognized as an increase in reverse bias and the transistor conducts less to maintain a constant voltage at the emitter. When the input DC voltage drops due to a drop in line voltage, the voltage at the emitter tries to drop. With the base still held at a constant voltage by the zener diode, this drop in voltage at the emitter causes greater forward bias, the transistor conducts more, and the output at its emitter will remain the same.

The regulated voltage output from the transistor is supplied to the pre-amplifier to improve the signal to noise ratio of the amplifier. It is used in the exciter lamp circuit to prevent any variations in sound which would occur if the brightness of the exciter lamp were to vary. Resistor (R30) is in series with the exciter lamp (L2) to reduce the 16 volt regulated supply to 6.7 volts for the exciter lamp. When the exciter lamp is removed from the circuit, the voltage measured between P7 and P8 will be 16V. This is an open circuit voltage since no current is flowing in the circuit with the exciter lamp removed.

0 dbm CIRCUIT. The 0 dbm circuit is supplied as a standard part of the 1030N projector and can be added to any 1000 Series Projector (Figure 1-15). It provides for a balanced 600 ohm output, adjustable for 0 dbm.

When the projector is not being used in the 0 dbm mode, the output signal from the pre-amplifier is fed through a normally closed set of contacts on the 0 dbm jack to the volume control and through the remaining portion of the amplifier to the speakers. Inserting a standard 1/4" phone plug into the 0 dbm jack (J7) opens the normally closed set of contacts and closes the normally open set of contacts so the signal from the pre-amplifier is fed into the 0 dbm circuit. Transistor (TR10) amplifies the signal and delivers it through C24 to transformer (T2). The transformer couples the signal to the 0 dbm jack. Potentiometer (VR3) is used to adjust the output at this jack for 0 dbm. The jack must be terminated with 600 ohms when making this adjustment.

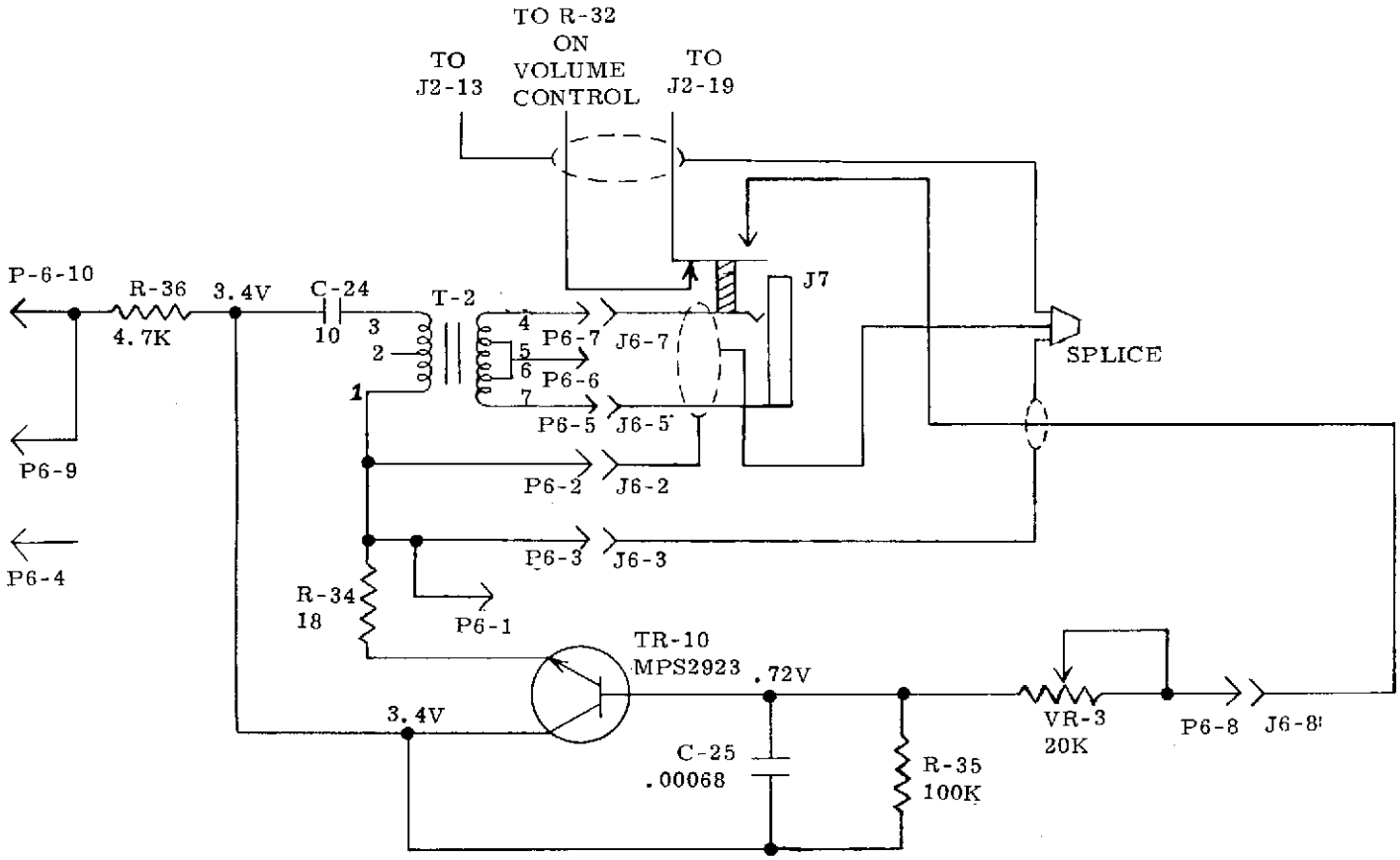


Figure 1-15. 0-dbm Circuit Diagram

ADHESIVES

39490-P2	Glyptal No. 1276; Clear (General Electric Co., Schenectady, New York) 3 oz.
39490-P1	Glyptal No. 7526; Blue (General Electric Co., Schenectady, New York) 3 oz.
LP	A-963-B Cement (W. J. Ruscoe Co., Akron, Ohio)
LP	Hysol R9-2039 Resin (Hysol Corp., Olean, New York)
LP	Hysol H2-3404 Hardener (Hysol Corp., Olean, New York)

LUBRICANTS

39479-P4	FS-1290 Fluorosilicone Grease (Dow-Corning Corp., Midland, Michigan) 1/2 oz.
39479-P5	DC-200 Silicone Fluid; 200,000 Centistroke Viscosity (Dow-Corning Corp., Midland, Michigan) - 1/2 oz.
39479-P6	DC-550R Silicone Fluid; 115 Centistroke Viscosity (Dow-Corning Corp., Midland, Michigan) - 1/2 oz.
39479-P7	009 Lubricant (Keystone Carbon Co., St. Mary's, Pa.) - 1/2 oz.
39479-P8	Instrument Oil N-75 - 2 oz.
39479-P9	DC-44 Silicone Grease; Light Consistency (Dow-Corning Corp., Midland, Michigan) - 2 oz.
39479-P15	Vischem #352 (Ultra Chem Inc., Wilmington, Del.) - 2 oz.

MISCELLANEOUS

39490-P12	Tan Touch-up Paint - 4 oz.
39490-P13	Brown Touch-up Paint - 4 oz.
39490-P4	Glyptal Thinner 1511M, - 8 oz.
LP	8101-S Silicone Compound (General Cement, Rockford, Ill.)
LP	Chlorothene (Dow Chemical Co., Midland, Michigan)
LP	Methyl Alcohol

TEST FILMS

* 40478-P3	TV16AS 16mm Television Test Film (Alignment & Resolution) 40" Loop
* 45191-G2	P16-SF-A 7000 Hz Film (PH 22.42-7) - 12'
* 45191-G3	P16-B.T. Buzz Track Film (PH 22.57) - 12'
* 45191-G6	16-RT 16mm Registration Test Film - 12'
* 45191-G7	P16-SL, Signal Level Test Film, Optical 400 Hz, -12'
**	P16-PP SMPTE Jiffy Test Film

* Available in 100' Roll from: Test Film Dept.
Society of Motion Picture and Television Engineers
862 Scarsdale Ave., Scarsdale, NY 10583

** Also available through above source.

TOOLS

G8-38000	FILM PRESSURE ADJUSTING GAUGE
G10-38000	CLAW ARM PROTRUSION GAUGE
G17-38000	SUPPLY REEL SPINDLE TORQUE GAUGE
ST-5880	STROKE SETTING GAUGE
ST-5884	SHUTTLE CAM ADJUSTING TOOL
T-38000-N	ROLLPIN-INSERTING AND EXTRACTING TOOL
T-38000-N1	REPLACEMENT PIN
T-38000-S	FILM TENSION GAUGE
T-38000-U	WALDES TRU-ARC NO. 52 APPLICATOR
T-38000-V	WALDES TRU-ARC NO. 54 APPLICATOR
T-38000-X	WALDES TRU-ARC NO. CR-31 APPLICATOR
T-38001-G	SOUND DRUM LOCATING PLUG

SPECIFICATIONS

Feature	Model Number									
	1000	1015	1016	1020	1021	1022	1030N	1040	1042	1050
Single Switch										x
Double Switch	x	x	x	x	x	x	x	x	x	
Speed Control	x	x	x	x	x	x				
Still Control				x	x	x				
Automatic Shutter (2-3 Blade)				x	x	x				
Standard Shutter (3 Blade)	x	x	x							x
5 Blade Shutter							x			
2 Blade Shutter								x	x	
Threading Lamp	x	x	x	x	x	x	x	x	x	
117V, 60Hz	x	x		x			x	x		x
117V, 50Hz						x			x	
230V, 50Hz			x		x					
LAMP, DLR Or DKM	x	x	x	x	x	x	x *			x
LAMP, DJP							x *			
LAMP, Marc 300								x	x	

*Generally, the DKM lamp is used in multiplex applications while the DJP lamp is used in uniplex applications.

Height: 14" (356mm) Width: 20¼" (514mm) Depth: 11" (279mm)

Weight: 40lb (18.1 Kg) Marc 300 Power Pack: 15lb (6.8 Kg) Optics: 2" (50mm) f/1.6)

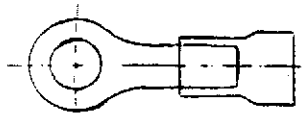
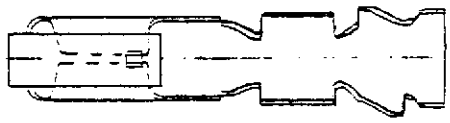
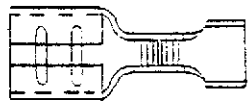
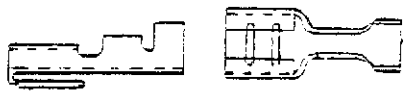
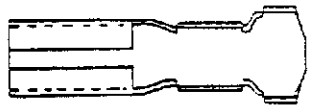
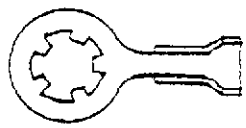
Amplifier: Early Models - 10 Watts; Current Production - 15 Watts

Speakers: Two 3" x 5" Oval 16Ohm Connected In Parallel

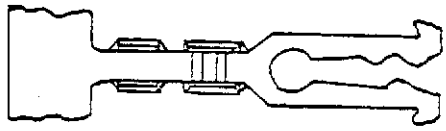
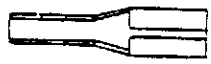
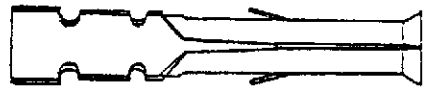
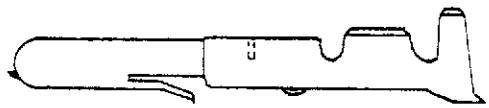
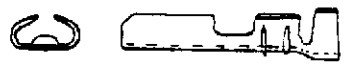
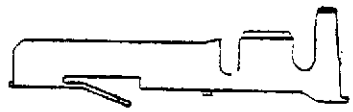
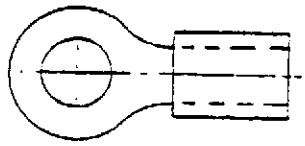
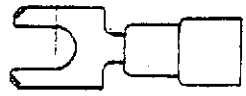
Film Speed:Sound 24 Frames/Second; Silent 18 Frames/Second

Accessories	Catalog Number
Extension Speaker	3220
Dust Cover	3737
Lift-off cover speaker	3722-1
Aperture Cleaning Brush	3694
Lenses: 5/8", f/2.0	3610
1", f/1.9	3602
1½", f/1.6	3603
2", f/1.6	3604
2½", f/1.8	3605
3", f/2.0	3606
3½", f/2.5	3607
4", f/2.8	3608
Zoom Lens f/1.5	3601
Microphone Set	41087G1
16C Anamorphic Lens	19-503
16D Anamorphic Lens	19-521
16C Lens Bracket for Anamorphic Lens	19-531
16D Lens Bracket for Anamorphic Lens	19-526
Buhl Rear Projection Lens Bracket	19-505
Rear Projection Mirror	19-506

TERMINALS

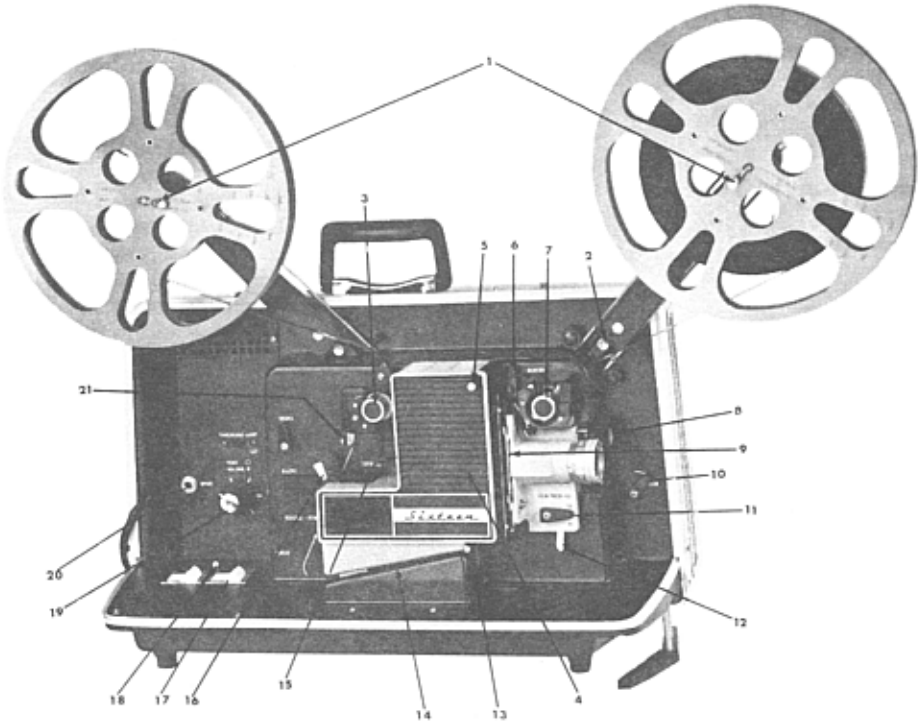
PART NUMBER	WIRE SIZE	INSULATION	STRIPPING	TAB SIZE	ILLUSTRATION
				SCREW	
39338	16-22 AWG	140 max	.155-.215	#8	
41004	16-22 AWG	140 max	.155-.215	#6	
38298	18-22 AWG	.050-.115	.125-.185		
39321	20-24 AWG	.048-.071	1/8"		
38998	18-22 AWG	.90-.132	1/4"	.250	
42423	20-22 AWG	.075 max	.125-.185		
42752	20-24 AWG	.016 max	.125-.155		
43042	14-18 AWG	.120-.170	.210-.240	.250	
42717	18-22 AWG	.060-.100	.195-.225	.250	
44513	22-30 AWG	.062 max	.100-.125		
43457	18-24 AWG	.100 max	.125-.155		
41338	18-20 AWG	.080-.120	.156-.219	.103	
43965P1	14-18 AWG	.105-.145	.220-.280		

16 mm PROJECTORS
1000 SERIES

PART NUMBER	WIRE SIZE	INSULATION	STRIPPING	TAB SIZE	ILLUSTRATION
45144P1	20-26 AWG	.035-.060	.125-.185		
44549P1	20-22 AWG	.060-.100	.155-.185	.100	
41098P1	18-22 AWG	.060-.100	.155-.185	.110	
38994P1	16-20 AWG	.090-.130	.125-.185	.187	
44508P1	24-30 AWG		.100-.125		
44360P1	18-24 AWG	.060-.120	.125-.155		
44360P2	18-24 AWG	.060-.120	.125-.155		
41438	14-18 AWG	.100-.130	.140-.170		
43225	20-22 AWG	.080-.100	.125-.185		
41440	14-18 AWG	.100-.130	.140-.170		
37593	16-22 AWG		7/32	#3 or #4 Screw	
43497	18-22	.136 max	.250-.280	#6 Screw	

SECTION II. PREVENTIVE MAINTENANCE

To insure proper operation of Singer Model 1000 Projectors, preventive maintenance should be performed every 500 hours or once a year, whichever occurs first. The Projector should be thoroughly cleaned and then checked for proper operation before any parts replacement or adjustments are attempted.



Reference Guide

1. Reel Spindle Lock Lever
2. Reel Arm Lock
3. Take-up Sprocket
4. Lamphouse Cover
5. Framing Knob
6. Rewind Control
7. Feed Sprocket
8. Manual Advance Knob
9. Film Pressure Shoe
10. Elevation Lock Lever
11. Film Pressure Adjustment Lever
12. Film Gate Lever
13. Sound Loop Synchronizer
14. Soundhead (loading) slot
15. Lamphouse Cover Release
16. Master Control Lever
17. Master Control Switch
18. Fuse Reset Button
19. On-Off Volume Control
20. Speaker Jack
21. Take-up Sprocket Shoe Lever

Figure 2-1. CLEANING REFERENCE GUIDE

Cleaning

1. All dust and grime should be removed from external surfaces of covers, main casting, etc. Any good household detergent should be sufficient.

2. Projection lens - Remove lens. Remove dust from front and rear exposed lens surfaces by brushing gently with a soft brush. Then wipe lens gently with a clean lens tissue (slightly moistened with lens cleaner if necessary).

   CAUTION: Never pour lens cleaner or other solvents on the lens elements. DO NOT use silicone impregnated lens tissue.

3. Projection Lamp and Exciter Lamp. Remove dust by brushing gently with a soft brush. Then wipe gently with a clean lens tissue (slightly moistened with lens cleaner if necessary).

4. Aperture Plate and Film Pressure Shoe - Swing the Film Gate Lever forward to open the film channel. Turn the lens forward. Insert the Aperture Brush (Cat. 3694) into the top of the channel and move it vigorously up and down. Use care to keep the shaft of the brush away from the pressure shoe or the film track. If necessary, dampen the brush with solvent to loosen and remove any hardened substance.

5. Claw Arm - Remove all lint and dirt from pins on Claw Arm with a soft bristled brush. Examine pins for looseness or grooves cut in them by film. (Solvents may be used for this cleaning).

6. Film Rollers - For proper cleaning, Rollers should be removed and wiped thoroughly with clean, dry rag. Remove stubborn dirt from plastic Rollers with detergent and warm water. Dry thoroughly. Shaft holes may be cleaned with cotton swabs or a pipe cleaner moistened with instrument oil N-75. Roller end play should be .005" to .015".

7. Sprockets - Wipe with clean, dry cloth. (Cloth may be moistened with alcohol or chlorothene if necessary.)

8. Reel Arm Pulleys - Clean grooves with cotton swabs moistened with alcohol or chlorothene. Wipe flat surfaces with clean rag moistened with alcohol or chlorothene.

9. Sound Drum - Clean grease and dirt from general area with alcohol. Moisten cotton swab with alcohol and clean Photo-diode and back edge of Sound Drum.

10. Sound Optic - Moisten cotton swab with lens cleaner or alcohol and clean upper and lower lenses.

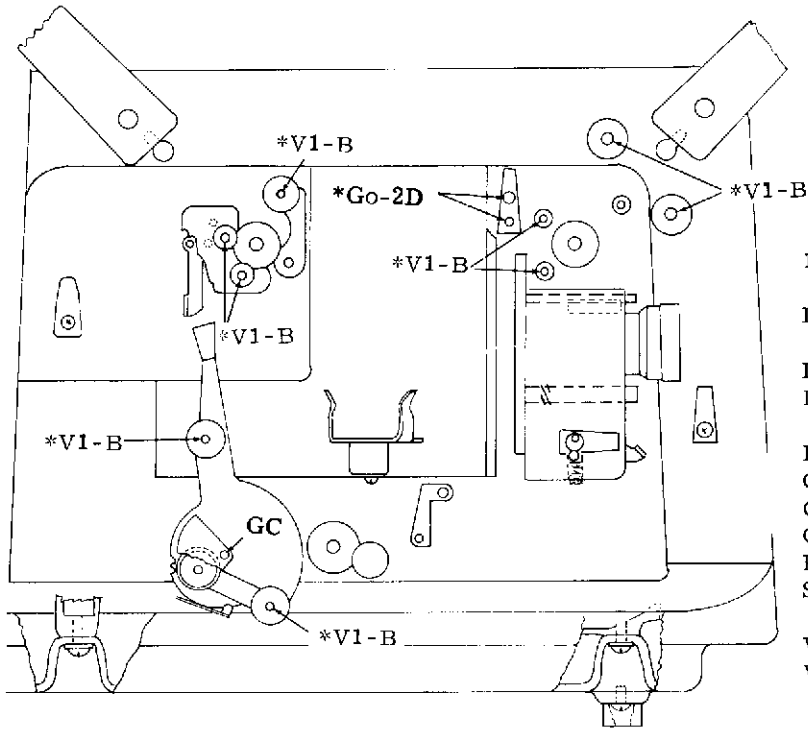
11. Motor Pulley and Main Shaft Pulley - Clean drive surfaces with clean rag moistened with alcohol or chlorothene.

12. Shutter - Wipe all visible surfaces of Shutter and Cam Assembly using a cloth dampened with chlorothene or alcohol.

13. Safety Shutter - Wipe all visible surfaces of Safety Shutter using a cloth dampened with chlorothene or alcohol.

14. Lexan Gears - (Main Drive Shaft Worm Gears, Film Feed Clutch Gear and Takeup Clutch Gear) - DO NOT clean Lexan Gears with ANY solvent. Wipe clean with clean, dry cloth or remove excess, dirty grease with toothbrush.

LUBRICATION POINTS



16 mm LUBRICATION KEY

D2	-	Dow Corning Damp. Fluid DC-200
D4	-	DC44 Grease
D5	-	Dow Corning Damp. Fluid DC-550R
FS	-	Fluorosilicone FS-1290
GC	-	Glyptal Clear (1276)
GO	-	Inst. Oil N-75
GP	-	Glyptal Blue (7256)
KA	-	Keystone 009 Oil
S	-	8101 Silicone Heat Sink Jell
V1	-	Vischem #352 Grease
V2	-	Versilube G322L Grease

AREA TREATMENT

B	-	Bearing Surface of Pivot
F	-	Interface
T	-	Teeth of Gears
XD	-	X Drops

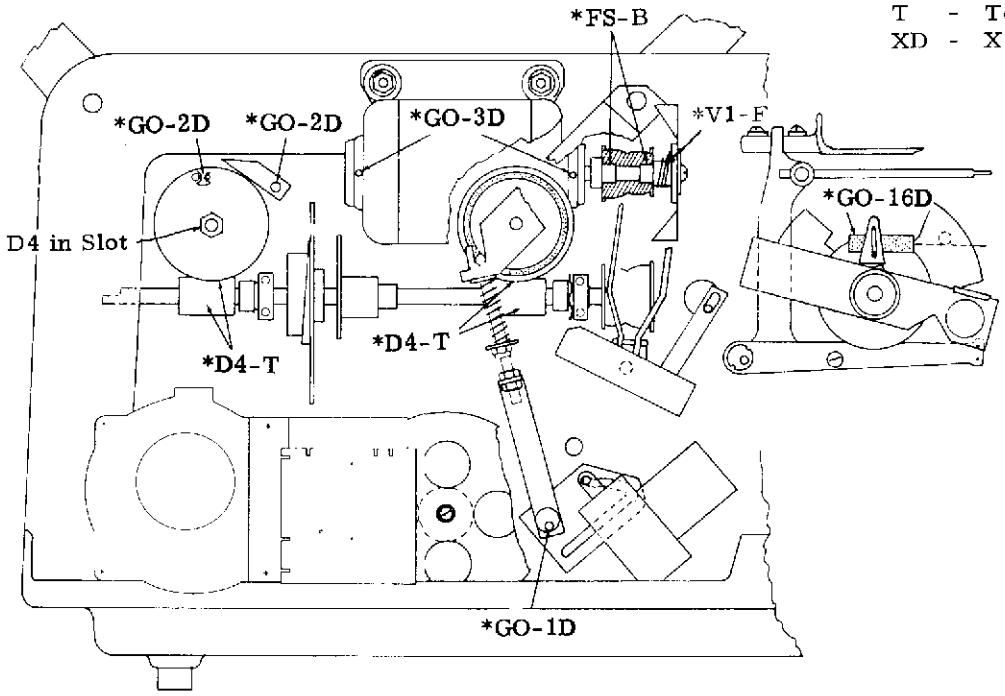
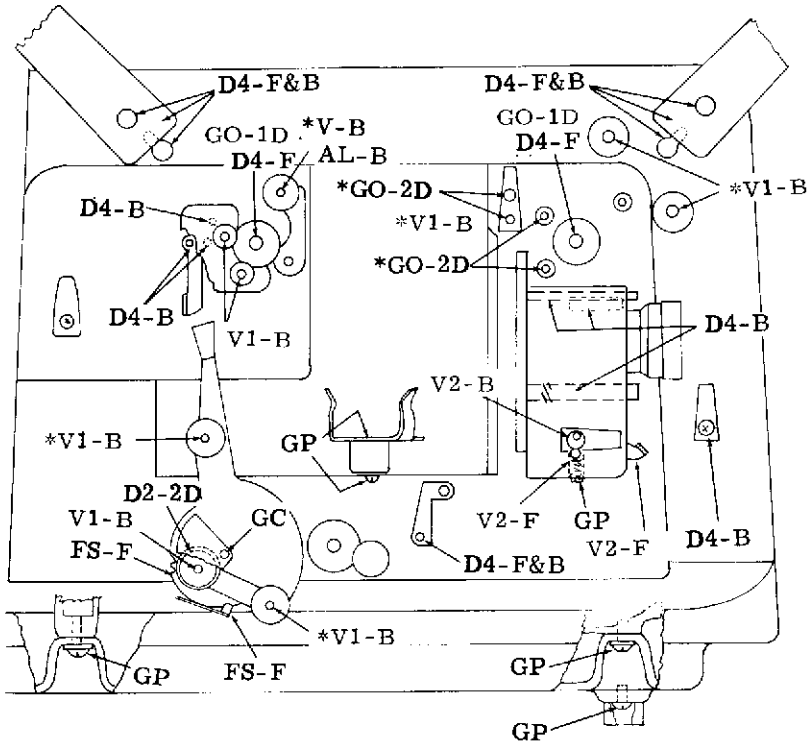


Figure 2-2. PREVENTIVE MAINTENANCE LUBRICATION, POINT DIAGRAM



16 mm LUBRICATION KEY

D2	-	Dow Corning Damp. Fluid DC-200
D4	-	DC44 Grease
D5	-	Dow Corning Damp. Fluid DC-550R
FS	-	Fluorosilicone FS-1290
GC	-	Glyptal Clear (1276)
GO	-	Inst. Oil N-75
GP	-	Glyptal Blue (7256)
KA	-	Keystone 009 Oil
S	-	8101 Silicone Heat Sink Jell
V1	-	Vischem #352 Grease
V2	-	Versilube G322L Grease

AREA TREATMENT

B	-	Bearing Surface of Pivot
F	-	Interface
T	-	Teeth of Gears
XD	-	X Drops

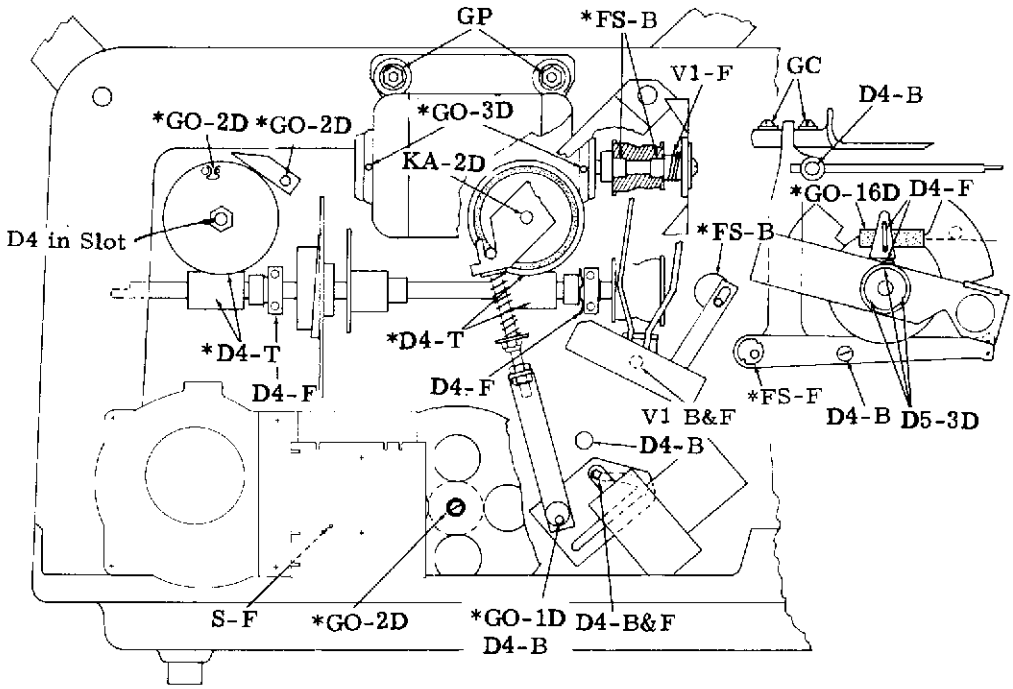


Figure 2-3. OVERHAUL MAINTENANCE LUBRICATION, POINT DIAGRAM

OPERATIONAL CHECK

It is recommended an old film be used for the initial part of this check. This will prevent damage to a valuable test film in case the projector is malfunctioning to the extent that it damages film. An SMPTE jiffy test film No. P16-PP should be used for the latter portion of this check.

1. Connect power cord to AC receptacle supplying correct line voltage and frequency. Swing reel arms up until they lock.
2. Press run button and check to see that sprockets and reel pulleys turn properly. Listen for unusual noises.
3. Press Lamp Norm button and check for screen illumination and even distribution of light. Press High button (on models having this feature); screen illumination should increase.
4. Press Still button (if projector has this feature). Illumination should decrease and motion of sprockets and reel pulleys should stop. (Screen may be partially or totally dark. If so, rotate inching knob slightly to move shutter blade away from aperture.)
5. Press Off button.
6. Turn amplifier and threading lamp switches on.
7. Move master control lever to thread position and thread an old film into projector.
8. Turn threading lamp switch off.
9. Move master control lever to Forward position.
10. Check for proper threading by manually rotating the inching knob and checking the film movement through the projector.
11. Press Run button and observe that film moves smoothly through the projector and is gathered on take-up reel. Set volume and tone controls for comfortable listening.
12. Check for proper film handling in film gate area by rotating film pressure adjustment lever from low to high. Film should run best when noise is at its lowest level.
13. Check picture for focus, double image or ghosting.
14. Adjust framing knob maximum clockwise and then maximum counterclockwise. Observe that the frame line moves an equal distance into the top and bottom of the projected image. Check for picture jump, side shake or weave, and mechanical noise at both extremities of framing.
15. Readjust framing knob to eliminate frame line from projected image.
16. Rotate speed control to silent position (sound/silent projectors only). Projector should slow down to 18 frames/sec. Shutter should shift from two-blade position to 3-blade position on automatic shutter models. Safety Shutter (on machines having Still feature) must remain up.
17. Return speed control to sound position. Projector should return to 24 frames/sec. Shutter should shift back to 2-blade position.
18. Move master control lever to Reverse position.
19. Observe that the film moves smoothly through the projector and is gathered on the supply reel. Note: At this point, the balance of the old film may be run through the projector and then rewound, or unthreaded from the projector and rewound immediately at the operator's discretion.
20. Press Off button. Move master control lever to Thread position. Thread jiffy test film into projector.
21. Move master control lever to Forward position.
22. Check for proper threading by manually rotating the inching knob and checking the film movement through the projector.
23. Press run button and observe that film moves smoothly through the projector and is gathered on take-up reel.
24. Rotate tone control and listen for change in pitch.
25. Advance volume control momentarily to a loud listening level. Check for case rattle or buzz.
26. Follow directions on jiffy test film.
27. Rewind jiffy test film when test is complete.
28. Check Elevation Lock.
29. Check Loop Restorer.

Parts Replacement

1. Takeup Reel Belt - Refer to Section IV.
2. Supply Reel Belt - Refer to Section IV.
3. Motor Drive Belt - Replace if worn or stretched. Refer to Sections III and IV.
4. Spirol Pin (Motor Fan and Hub Assembly) - Refer to Sections III and IV.

5. Cam Lubricator Pad - Refer to Section III.
6. Takeup Clutch Liner - Replace if worn or if Takeup Clutch Liftoff or Takeup Tension requirements cannot be met. Refer to Sections III and IV.

Adjustments

Be sure to check following areas and adjust if necessary.

1. Claw Arm operation - See Section IV.
2. Pressure Shoe seating - See Section IV.
3. Film Pressure - See Section IV.
4. Takeup Clutch Lift-off Linkage - See Section IV.
5. Takeup Clutch Film Tension - See Section IV.
6. Reverse Drive Film Tension - See Section IV.
7. Rewind Engagement - See Section IV.
8. Adjustments deemed necessary as a result of Operational Check above.

Miscellaneous

1. Check all clip-on terminals. If not tight, carefully crimp with pliers and reconnect.
2. Be sure that wiring is sufficient distance from moving parts to avoid entanglement.
3. Main Drive Shaft Speed - With projector operating at Sound Speed, Main Drive Shaft should rotate at minimum speed of 1420RPM. If above 1460RPM, major repair may be necessary (defective motor, etc.). If below 1400 RPM, Main Shaft may be binding due to insufficient lubrication or Motor Drive Belt may be slipping.

Miscellaneous End Play and Clearance Requirements

1. Claw Arm Pivot - Maximum clearance of 0.002". (Equivalent to 0.001" end play when claw has complete freedom.)
2. Threading Control Arm Rollers - 0.005" to 0.015" end play.
3. Drive Unit Assembly Pulley - 0.005" to 0.010" end play.
4. Reel Tension Arm Pivot - 0.005" maximum end play.
5. Takeup Shoe Pivot - 0.005" maximum end play.
6. Threading Control Arm Pivot - 0.005" maximum end play.
7. Pressure Roller Arm Assembly Pivot - 0.005" maximum end play.
8. Sprockets - 0.003" to 0.005" end play.

SECTION III. DISASSEMBLY AND REASSEMBLY PROCEDURES

Where disassembly and reassembly seems straightforward and self explanatory, no procedures are given in this service manual. However, where certain steps may not be obvious or where a definite order of steps should be followed, we would like to pass on a few tips or tricks we've learned to make your job a little easier and cut repair time.

Always clean parts thoroughly before any relubrication or reassembly is attempted. See cleaning suggestions under Preventive Maintenance, Section II.

Removal of Feed and Rewind Clutch (Figures 3-1)

1. Remove Feed Arm Drive Belt (21).
2. Remove Screw (3) and Film Stripper (2).
3. Remove three Screws (9) and remove Feed Sprocket Shoe (8).
4. Loosen Screw (5) and remove Feed Sprocket (4).
5. Remove Screw (23) and remove Feed and Rewind Clutch (22). (See cleaning instructions for Lexan Gear in Section II, Preventive Maintenance).

Reassembly of Feed and Rewind Clutch to Projector (Figure 3-1)

1. Apply DC44 lubricant to:
   a. Both sides of washers (6), (7) and (25).
   b. Gear of Feed and Rewind Clutch (22).
2. Apply one drop of Teresso Oil N-75 to shaft of Gear.
3. Assemble Feed and Rewind Clutch (22) to projector with Screw (23) and Washer (24).
4. Assemble Washers (6) and (7) and Sprocket (4) to shaft of Clutch. Hold Clutch firmly against main casting, insert a .004 shim between Washer (7) and main casting and push Sprocket (4) firmly against main casting with this shim in place. Tighten Screw (5) and remove .004 shim. End play of sprocket should be .003 to .005.
5. Assemble Feed Sprocket Shoe (8) to projector.
6. Assemble Film Stripper (2) and Screw (3) to Feed Sprocket Shoe (8).

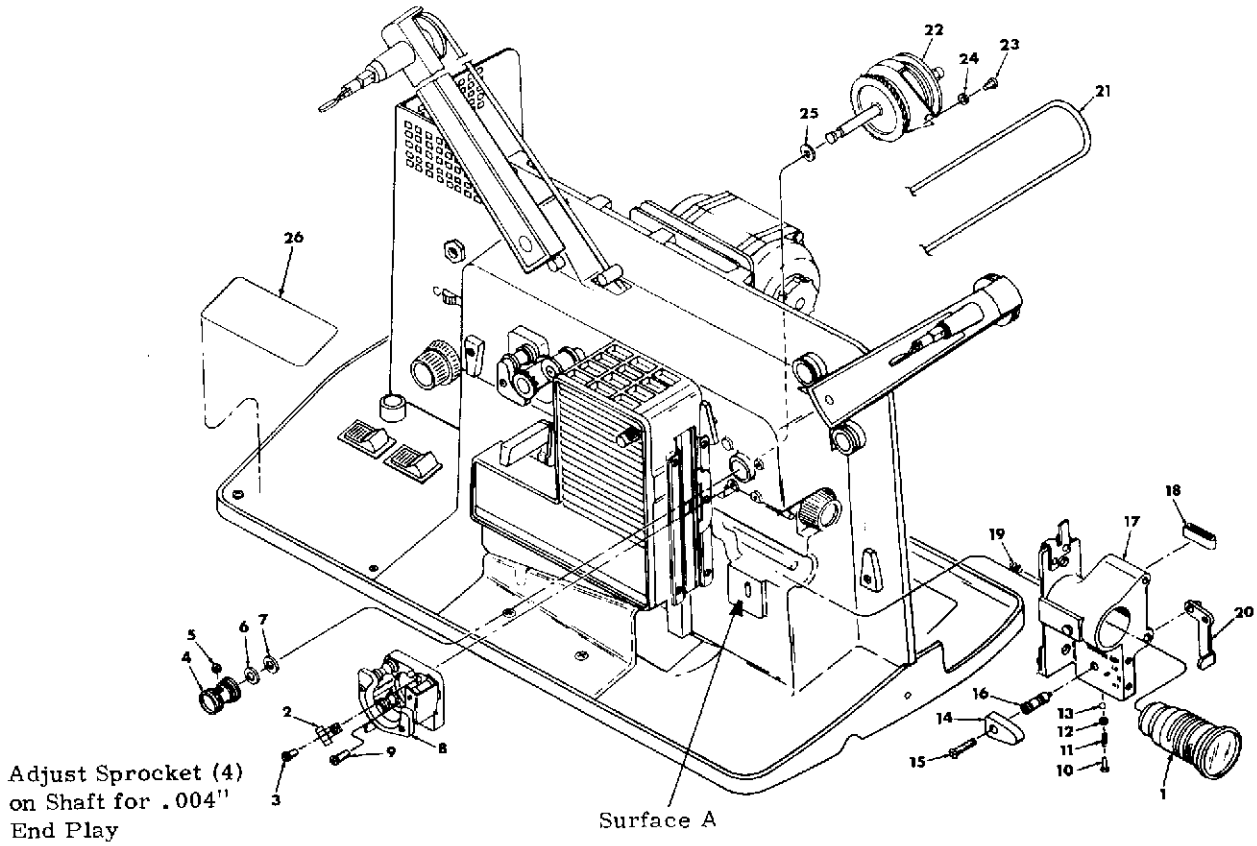


Figure 3-1. DISASSEMBLY AND REASSEMBLY FEED AND REWIND CLUTCH

Removal of Lens Holder (Figure 3-1)

1. Remove Feed and Rewind Clutch (see procedure).
2. Remove Lens (1) and store in a safe place.
3. Back out Allen Head Set Screw (10) until Film Pressure Adjustment Lever Assembly (14), (15) and (16) can be pulled out of hole. DO NOT remove the Allen Head Screw (10) from the Lens Holder (17) (care should be taken not to lose the small Spring (11), Washer (12) and Ball (13).
4. Make sure Film Gate Lever (20) is down, and slide Lens Holder (17) off of its mounting rods. Take care not to lose upper nylon Lens Holder Spring (18) and Lower Spring (19).

Reassembly of Lens Holder to Projector (Figure 3-1)

1. Apply DC44 lubricant to:
   a. Upper nylon Lens Holder Spring (18).
   b. Lens Holder mounting rods.
2. Apply Versilube G322L lubricant to:
   a. Film Gate Lever (20) pin, hole and interfacing surfaces.
   b. Slot and Surface A of main casting.
   c. Ball (13).
3. Insert pin of Film Gate Lever (20) into slot in surface A.
4. Hold upper nylon Lens Holder Spring (18) in place against Lens Holder (17) and slide Lens Holder onto mounting rods.
5. Position hole in Film Gate Lever (20) so the eccentric pin on the end of Gate Lever Eccentric (16) drops into the hole when the Film Pressure Adjustment Lever Assembly (14), (15) and (16) is inserted into its mounting hole in the Lens Holder (17). (Make sure the Spring (11), Washer (12) and Ball (13) are in place before replacing the Film Pressure Adjustment Lever Assembly.)
6. Tighten the Allen Head Set Screw (10) so the Film Pressure Adjustment Lever (14) can be moved but is snug enough that it cannot move of its own accord or by exerting pressure on the Lens Holder (17). (See MECHANICAL ADJUSTMENTS AND SPECIFICATIONS, Section IV, for remaining adjustments to Lens Holder).

Removal of Takeup Clutch (Figure 3-2)

1. Remove Main Drive Motor being careful to observe the number and position of the spacers on the mounting shafts. (It is not necessary to remove Motor wires. Simply dismount Motor and lay it in Base.)

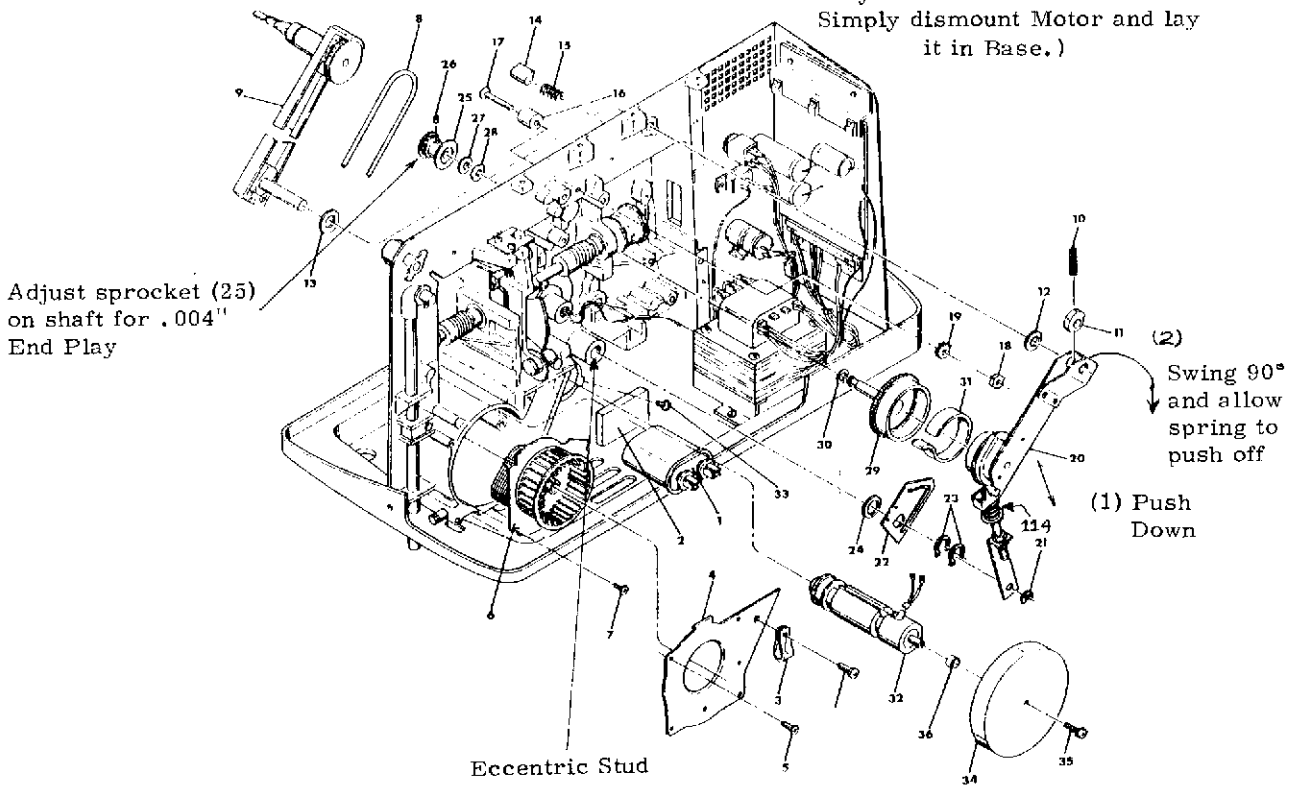


Figure 3-2. DISASSEMBLY AND REASSEMBLY TAKE-UP CLUTCH

2. Remove Main Drive Motor Plate.

3. Remove take-up reel arm Belt (8).

4. Remove Roll Pin (10). (A large pair of diagonal cutters or vise-grips generally serve well in gripping this pin sufficiently to pry it out. It may also be driven out with a 3/32" drive punch.)

5. Remove Reel Arm (9) being careful not to lose washers (12) and (13), Reel Arm Lock (14) and spring (15). (Older machines use a guide plate in place of Washer 13).

6. Pull Take-up Clutch Arm (20) away from main casting so the pulley comes out of the Take-up Gear (29) and Liner (31).

7. Push down on Take-up Clutch Arm (20) to compress the spring (114) on the adjusting rod and allow the hook on the rod to move up out of the notch in the Take-up Clutch Arm (20). Now swing the upper part of the Takeup Clutch Arm (20) toward you 90° and allow the spring (114) on the adjusting rod to push the Takeup Clutch Arm up off the rod.

Reassembly of Takeup Clutch to Projector (Figure 3-2)

1. Apply DC44 lubricant to:
   a. Reel Arm Lock (14) and Spring (15).
   b. Rod of Reel Arm (9).
   c. Washers (12 and 13).

2. Assemble Reel Arm Lock (14) and Spring (15) and hold in place while assembling Reel Arm (9).

3. Hold Take-up Clutch Arm (20) so it can be pushed down over the nook in the end of the adjusting rod. (This is the same position it was in when it was removed from the adjusting rod.)

4. Push Take-up Clutch Arm (20) down to compress the Spring (114) until the hook in the Adjusting Rod comes up over the top of the notch in the Takeup Clutch Arm (20).

5. Rotate the Take-up Clutch Arm (20) 90° back toward the main casting until the end of the hook lines up with the notch in the arm. Now allow the Spring (114) to push the arm up so the hook seats in the notch.

6. Push Take-up Clutch Arm (20) onto the Reel Arm Shaft and seat the pulley inside the takeup clutch Liner (31).

7. Install a new Roll Pin (10) making sure it is pushed far enough into hole of Reel Arm shaft to be secure and yet protrudes up above the upper end of the Takeup Clutch Arm.

Note: For the 1030N, the Roll Pin (10) should be installed so the bottom end is flush with the outside circumference of the bottom of Takeup Arm Stop Bushing (11).

8. Apply small amount of DC44 lubricant to eccentric stud (located on Master Control Lever pivot).

Removal of Takeup Gear (Figure 3-2)

1. Remove Takeup Clutch (See Procedure).

2. Open Takeup Sprocket Shoe Arm (10), Figure 3-3.

3. Loosen Screw (26) and hold Takeup Sprocket (25) while removing Takeup Gear (29).

4. See cleaning instructions for Lexan Gear.

Reassembly of Takeup Gear to Projector (Figure 3-2)

1. Apply DC44 lubricant to:
   a. Washers (27), (28) and (30).
   b. Takeup Gear (29) teeth.

2. Apply one drop of Teresso Oil N-75 to shaft of Gear (29).

3. Press Washers (27) and (28) onto Sprocket (25) (Lubricant will hold them in place).

4. Hold Sprocket (25) in place in front of main casting bearing and slide shaft of Takeup Gear (29) through bearing and into Sprocket (25).

5. Hold Takeup Gear firmly against main casting, insert a .004 shim between Washer (28) and main casting and push Sprocket (25) firmly against main casting with this shim in place. Tighten Screw (26) and remove .004 shim. End play of sprocket should be .003 to .005.

Removal of Reel Tension Arm (Figure 3-3)

1. Remove Lamphouse Cover and Projection Lamp.

2. Remove Main Drive Motor being careful to observe the number and position of the spacers on the mounting shafts.

3. Remove Takeup Clutch and Takeup Gear. (See Procedures)

4. Hold Reel Tension Arm Assembly (3), (4), (5) and (6) firmly in place and move two Grip Rings (7) out toward end of shaft as far as they will go without removing Spring (2).

5. Pull Reel Tension Arm out until it clears the molded stop on the main casting or the end of the roll pin pressed into the main casting just below the molded stop. (If necessary, remove the roll pin.)

6. Gently allow the Reel Tension Arm to rotate clockwise to release its spring tension.

7. Remove Screw (1) and Spring (2).

8. Remove two Grip Rings (7) and slide Reel Tension arm out of main casting.

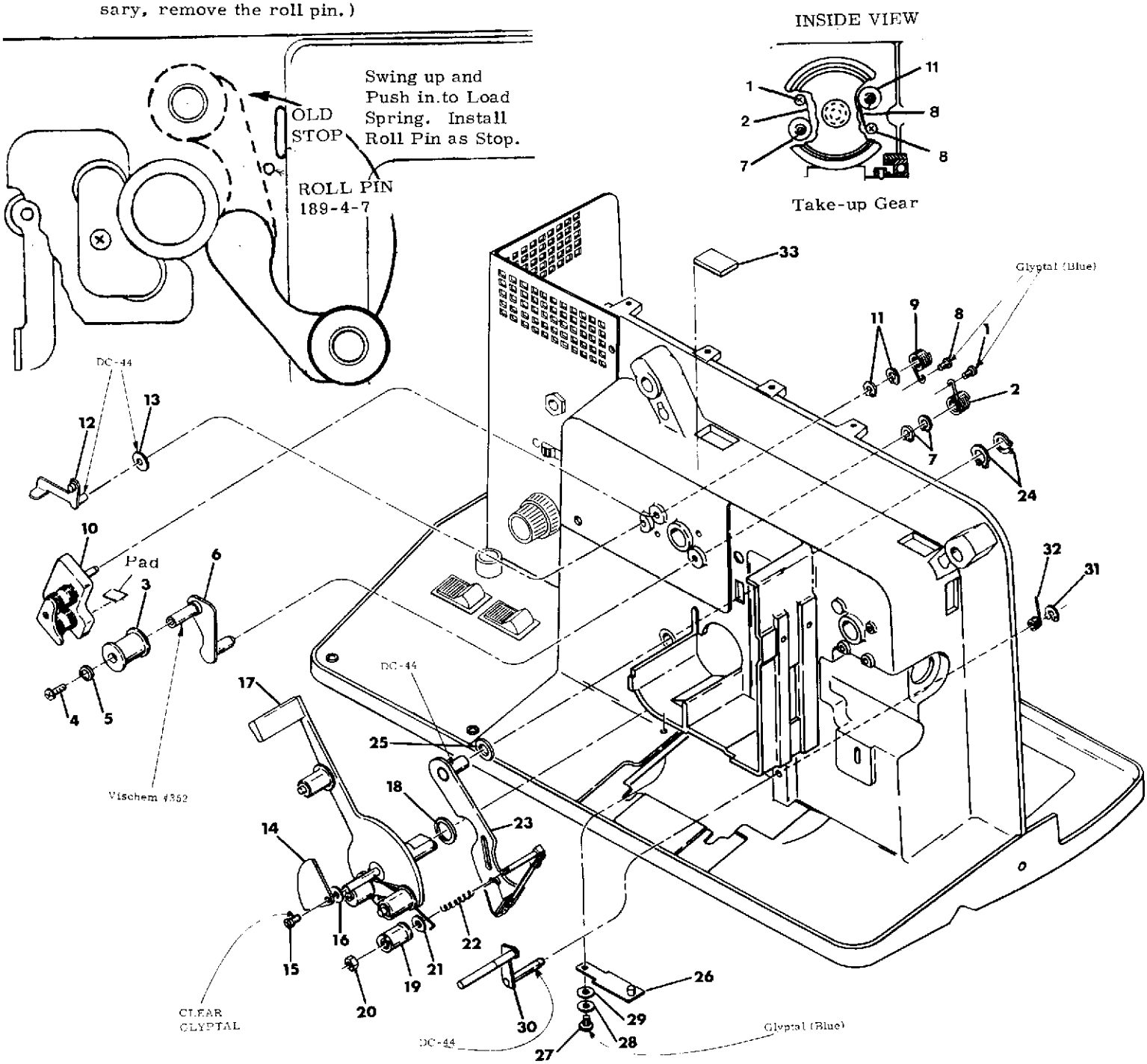


Figure 3-3. DISASSEMBLY AND REASSEMBLY REAL TENSION ARM.

Reassembly of Reel Tension Arm to Projector (Figure 3-3)

1. If the Projector is not equipped with a Roll Pin stop for the Reel Tension Arm, perform steps (a) and (b) below. Otherwise, proceed with Step 2.

   a. Use a prick punch to locate a hole just below and slightly behind the reel tension arm Stop molded as part of the main casting (note position in Figure 3-3)

   b. Drill the hole using either a 3/32" or #41 drill. DO NOT insert the roll pin at this time.

2. Apply Vischem 352 lubricant to roller shaft of Reel Tension Arm and assemble Roller (3) to arm.

3. Apply DC44 lubricant to shaft of arm which fits into main casting.

4. Assemble Reel Tension Arm to projector - allow it to hang down as shown in (Figure 3-3)

5. Assemble two new Grip Rings (7) to shaft, pushing them just past bottom of slot in end of shaft.

6. Assemble Spring (2) to main casting with Screw (1). Do not tighten screw completely.

7. Push tail of Spring (2) into slot in shaft by moving Reel Tension Arm to align slot with tail.

8. Rotate Reel Tension Arm counterclockwise to load spring.

9. Push Reel Tension Arm snugly against main casting and push Grip Rings (7) up against inside of main casting. End play of Reel Tension Arm should be about .005". (If provision was made in Step 1 for a Roll Pin Stop or if an existing Roll Pin had to be removed during this procedure, a new roll pin should be installed at this point. Hold the Reel Tension Arm back and insert a 189-4-7 Roll Pin, allowing it to protrude from front surface of casting about 5/32".)

10. Tighten Screw (1) and apply a coating of Glyptal 7526 to its head.

Reassembly of Takeup Sprocket Shoe Arm to Projector (Figure 3-3)

1. Apply Vischem 352 lubricant to roller shafts of Takeup Sprocket Shoe Arm (10) and assemble rollers.

2. Attach pad to Arm Assembly (10) with A-963-B adhesive.

3. Apply DC44 lubricant to shaft of arm which fits into main casting and to Shoe Lever (12) (both pivots) as well as slot in back side of Shoe Arm (10).

4. Assemble Shoe Lever (12) and Shoe Arm (10) to Projector, pushing shoe arm snugly against main casting.

5. Assemble two new Grip Rings (11) to shaft, pushing them snugly against inside of main casting to allow for about .005" end play.

6. Assemble Spring (9) to Projector with Screw (8).

7. Place the Shoe Arm (10) in its open position and allow the tail of the Spring (9) to drop into the slot in the shaft end. (Do not pre-load spring.)

8. Apply Glyptal 7526 to the head of Screw (8).

Removal of Main Drive Shaft (Figure 3-4)

1. Loosen both Set Screws (3) in pulley (2) so pulley will rotate freely on Main Drive Shaft (22). (The visible screws may be jam screws. If loosening them will not allow the pulley to turn, remove them and loosen the set screws under them until the pulley turns on the shaft.)

2. Loosen both Set Screws (9) in Rear Collar (8) so collar will rotate freely on Main Drive Shaft (22).

Warning:

From this point on, EXTREME CARE should be taken to insure that the pins on Claw Arm (58) are not allowed to hit the Aperture Plate or any other part of Projector, causing damage to them.

3. Remove oval point Jam Screw (#3 in Shutter and Shaft Alignment insert of Figure 3-4) and loosen remaining two Set Screws (#1 and #2 in insert) in Shutter and Cam Assembly (14) so cam assembly will rotate freely on Main Drive Shaft (22).

4. Loosen both Set Screws (19) in Front Collar (18) enough to allow Main Drive Shaft (22) to visibly move toward the rear of Projector but NOT enough to allow Collar (18) to rotate freely on Main Drive Shaft (22).

5. Loosen Set Screw (13) in Safety Shutter (12) so collar of Safety Shutter rotates freely on Main Drive Shaft (22). Unhook link (23) from Safety Shutter (12) and allow Spring (24) to pull Link (23) against pin on bracket (41). (Disregard for machines having no Safety Shutter.)

6. Exert a firm downward pressure on the Claw Arm (58) and slide the Shutter and Cam Assembly (14) toward the rear of the Projector until the cam follower on the Claw Arm no longer engages the cam surface.

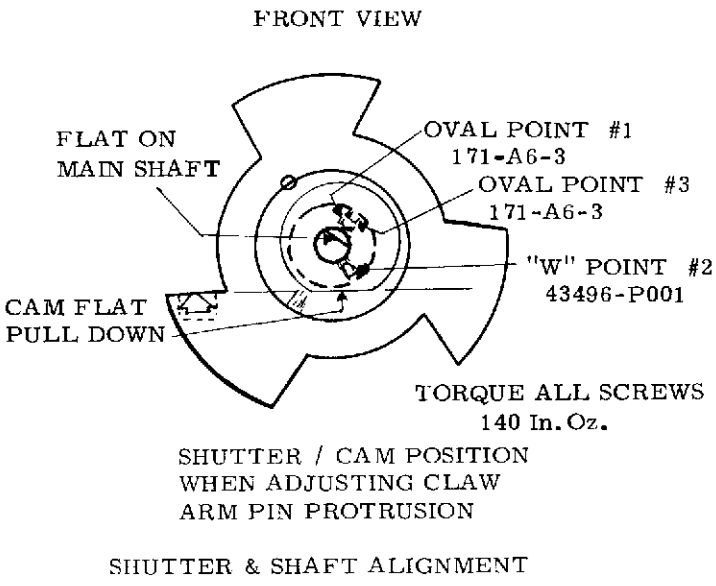
NOTE: When the Claw Arm cam follower clears the cam, gradually allow the Claw Arm Spring to pull the Claw Arm up. DO NOT let the Arm snap up or allow the Arm pins to hit the top of the aperture plate slot. Otherwise damage will result.

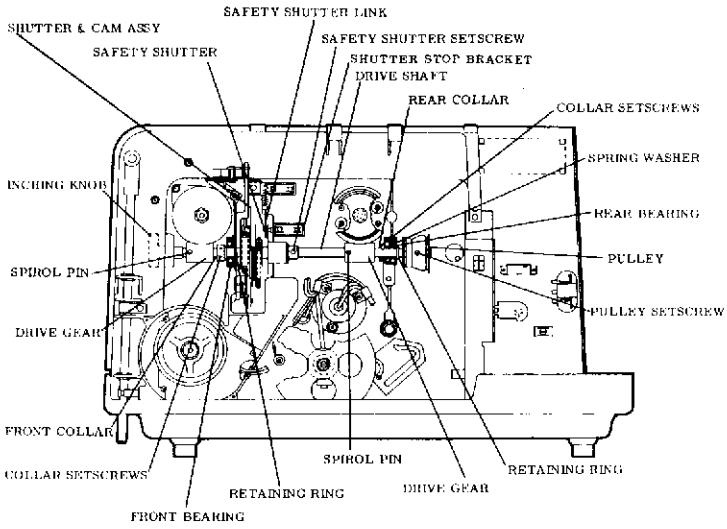
7. Tuck a cleaning cloth under the Rear Bearing (6).

8. Remove Inching Knob (1) and push Main Drive Shaft toward rear of projector as far as it will go.

9. Remove "C" Ring (5).

10. GENTLY tap out Spirol Pin (11) from Rear Worm Gear (10) with a 3/32" drive punch being very careful not to hit punch hard enough to bend Main Drive Shaft (22). Tap Pin (11) out only part way and then rotate Main Drive Shaft (22) so end of Pin (11) may be grasped with pliers and pulled out.





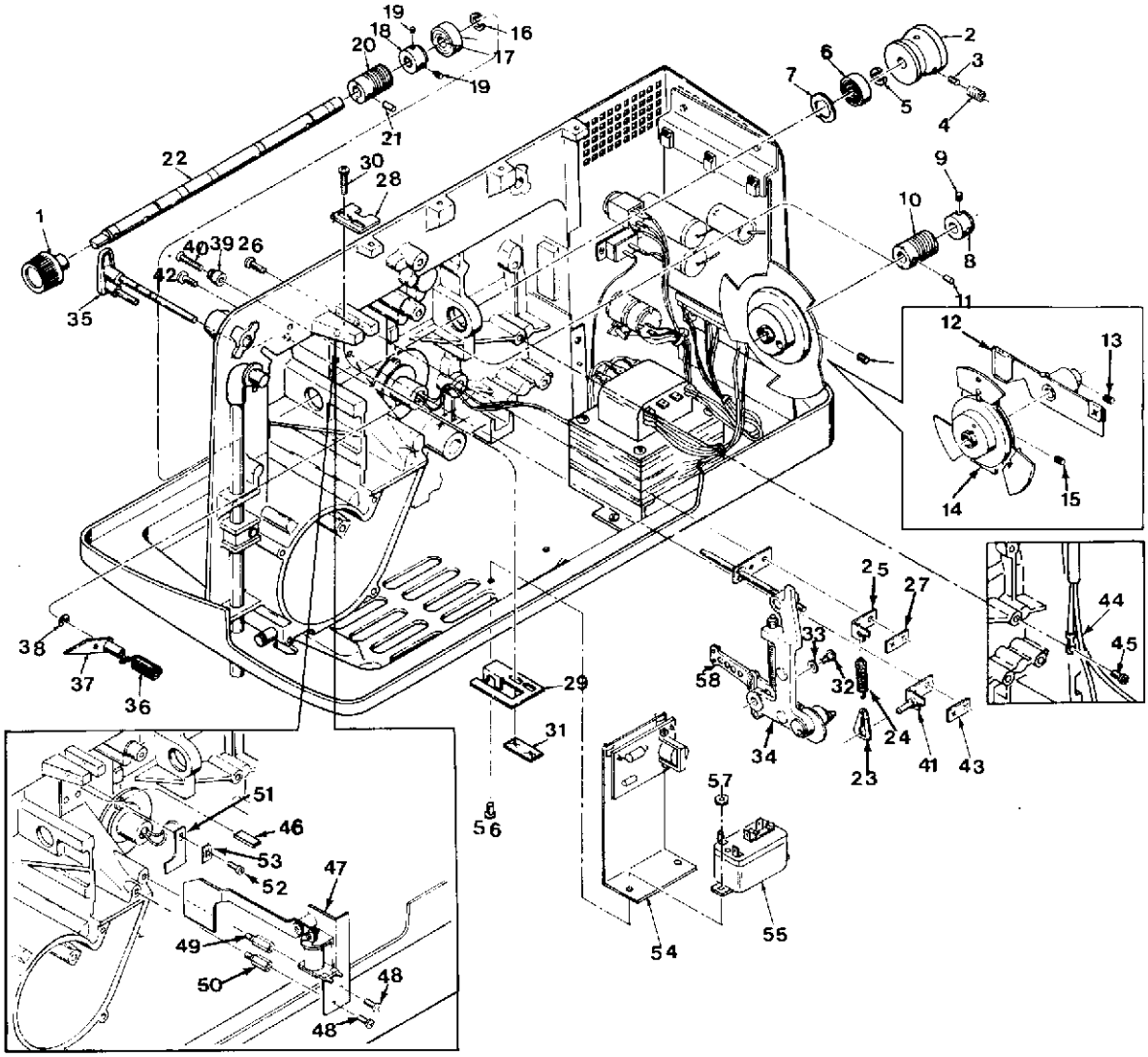


Figure 3-4. DISASSEMBLY AND REASSEMBLY
MAIN DRIVE SHAFT.

11. Replace Inching Knob (1) and pull Main Drive Shaft toward front of Projector, removing Pulley (2) and other parts in order until Shutter and Cam Assembly (14) can be removed.

    NOTE: Watch the Claw (58) and protect the pins!

12. Remove the cam lubricating pad.

13. If Front Bearing (17) is to be replaced, loosen Set Screws (19) in Front Collar (18) so Collar will rotate freely on Main Drive Shaft (22). GENTLY tap out Roll Pin (21) from Front Worm Gear (20) with 3/32" drive punch and remove Inching Knob (1), Worm Gear (20) and Bearing (21). It is not necessary to remove "C" Ring (16).

Reassembly of Main Drive Shaft to Projector (Figure 3-4)

1. Wipe all visible surfaces of Shutter and Cam Assembly, (14) Bearings, (6)and(17) and metal parts using a cloth dampened with chlorothene. Hub and cam of Shutter and Cam Assembly (14) are permanently impregnated with oil; do not immerse in cleaning solvent.

   CAUTION

   Do not use a chlorine-base solvent on plastic parts as it will cause crazing or cracking.

   Note: If Front Bearing (17) was removed from Main Drive Shaft (22) during disassembly, install new bearing. Install Collar (18) and align Set Screws (19) over recesses in Main Drive Shaft. Tighten Set Screws (19) into recesses just enough to prevent Collar (18) from rotating on Main Drive Shaft (22). Install Front Worm Gear (20) and pin to Main Drive Shaft (22) with NEW Spirol Pin (21). Install Inching Knob (1).

2. Check Pin (10) (Figure 3-5) to be sure it is in position under edge of Claw Arm (58) with its groove at the spring (Lubricate Pin (10) with DC44).

   WARNING

   From this point on, EXTREME CARE should be taken to insure that the pins on Claw Arm (58) are not allowed to hit the Aperture Plate or any other part of Projector, causing damage to them.

3. Apply DC44 lubricant on Spring Washer (7) and outside circumference of Bearings (6) and (17).

4. Start Main Drive Shaft (22) through front bearing hole in Main Casting. Hold Shutter and Cam Assembly (14) in place and push Main Drive Shaft through its center hole. Hold Safety Shutter (12) in place (if used) and push Main Drive Shaft through its hole. Slide Rear Worm Gear (10) and Rear Collar (8) onto Main Drive Shaft and push Shaft through rear bearing hole in Main Casting. Push Spring Washer (7) into bearing hole and assemble Bearing (6) and Pulley (2). Push Main Drive Shaft as far back as it will go and install NEW "C" Ring (5) with Waldes retaining ring applicator CR-310 (Singer P/N T38000X).

5. When tightening Screws (19) in Front Collar (18), be sure the points of the screws seat properly in the recesses in the Main Drive Shaft (22). Otherwise the Shaft will be burred and will not be positioned properly in Projector. It is best to tighten each one a little bit at a time and alternately with the other one until they cannot be tightened further. The Main Drive Shaft (22) should visibly move forward during the tightening process. Manually pushing the Main Drive Shaft (22) forward, while starting to tighten these screws, will help insure they are seated properly.

6. Caution should be exercised in tightening Set Screws (9) in the Rear Collar (8) as above. The Main Drive Shaft (22) will not move forward when these screws are tightened.

   WARNING

   From this point on, EXTREME CARE should be taken to insure that the pins on Claw Arm (58) are not allowed to hit the Aperture Plate or any other part of Projector, causing damage to them.

7. Rotate Main Drive Shaft (22) until flat on Shaft just behind Front Bearing (17) is at about 2 o'clock (See Shutter and Shaft Alignment insert on Figure 3-4). Rotate Shutter and Cam Assembly (14) until Set Screw (#1 in insert) lines up with flat on Shaft (22). Gently push Shutter and Cam Assembly (14) Forward while pushing down on Claw Arm (58) until cam follower on Claw Arm (58) slides under Cam. Tighten Set Screw (#1 in insert) on flat of Shaft (22). Make sure Claw Arm (58) is not hitting Aperture Plate.

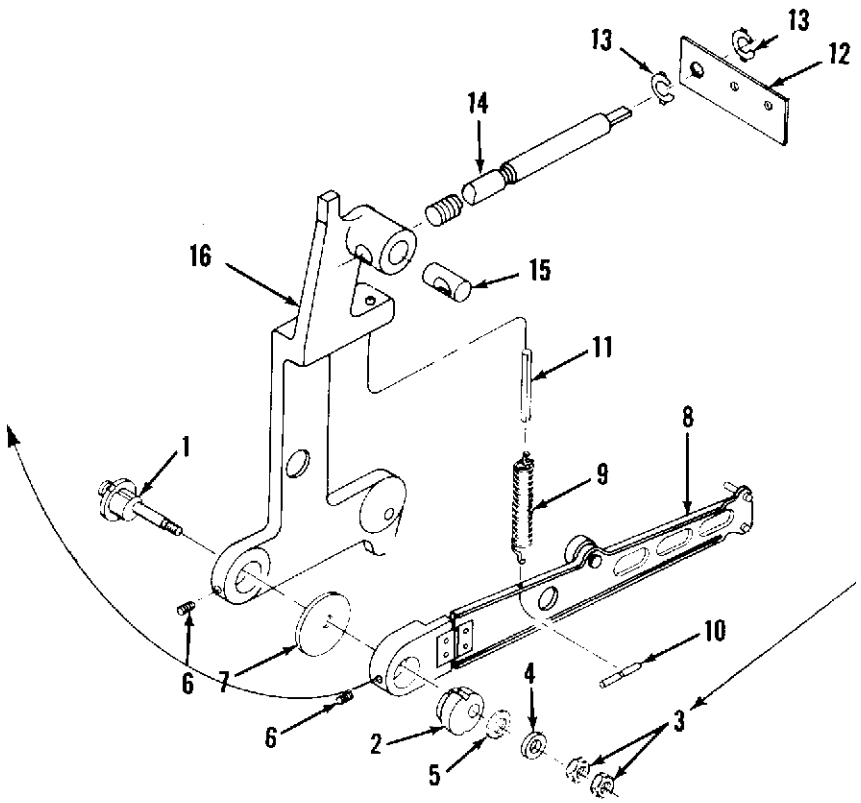


Figure 3-5. DISASSEMBLY AND REASSEMBLY CLAW ARM WITH SIDE CLEARANCE REQUIREMENT.

8. Be sure to use a new Spirol Pin (11) when reassembling Gear (10) to Main Drive Shaft (22).

9. Be sure to install a new lubricating pad (discard the old pad). Apply 16 drops of Teresso Oil N-75 to new pad.

10. Position Safety Shutter (12) to avoid striking either the Shutter and Cam Assembly (14) or the Chimney. Secure Safety Shutter in position with Set Screw (13). Hook safety shutter Link (23) under tab on Safety Shutter assembly.

Removal of Claw Arm (Figure 3-5)

WARNING

From this point on EXTREME CARE should be taken to insure that the pins on Claw Arm (8) are not allowed to hit the Aperture Plate or any other part of Projector, causing damage to them.

1. Remove oval point Jam Screw (#3 in Shutter and Shaft Alignment insert on Figure 3-4) and loosen remaining two Set Screws (#1 and #2 in insert in Shutter and Cam Assembly (14) Figure 3-4) so it can be moved back on Main Drive Shaft to make clearance for removal of Claw Arm (8). DO NOT move Shutter and Cam so far back that cam follower on Claw Arm slips off Cam surface with resulting damage to Claw Arm Pins.

2. Remove two Nuts (3) and Washers (4) and (5).

3. Loosen two Set Screws (6) and remove Bushing (2), Washer (7) and Pivot (1).

   NOTE: Wipe Pivot (1) and Bushing (2) with clean, dry rag. DO NOT clean these two parts with solvent.

4. Grasp Claw Arm (8) and pull it toward you while at the same time swinging it up in an arc-like motion (Extreme care should be taken not to damage the pins.)

5. Grasp Spring (9) and Claw Arm (8) and unhook Claw from Spring being careful not to lose Pin (10).

Reassembly of Claw Arm to Projector (Figure 3-5)

WARNING

From this point on EXTREME CARE should be taken to insure that the pins on Claw Arm (8) are not allowed to hit the Aperture Plate or any other part of Projector, causing damage to them.

1. Apply DC44 lubricant to Pin (10) and stick pin in place on the Claw Arm making sure notch lines up with hole.

2. Apply DC44 to Rod (14) threads and retaining ring notch.

3. Grasp Spring (9) and pull it back so Claw Arm (8) can be hooked onto it.

4. Position Claw Arm (8) so it may be easily hooked onto Spring (9) (usually in a vertical position) making sure Pin (10) is trapped in place by Spring (9).

5. Start pin end of Claw Arm (8) into slot between Framing Arm (16) and Shutter and Cam Assembly, and insert Claw Arm by reversing the arc-like movement described in step 4 of removal instructions.

6. Lubricate both sides of Washer (7) with FS-1290 lubricant.

7. Assemble Pivot (1), Washer (7), Claw Arm (8), Bushing (2), Washers (5) and (4) and Nuts (3).

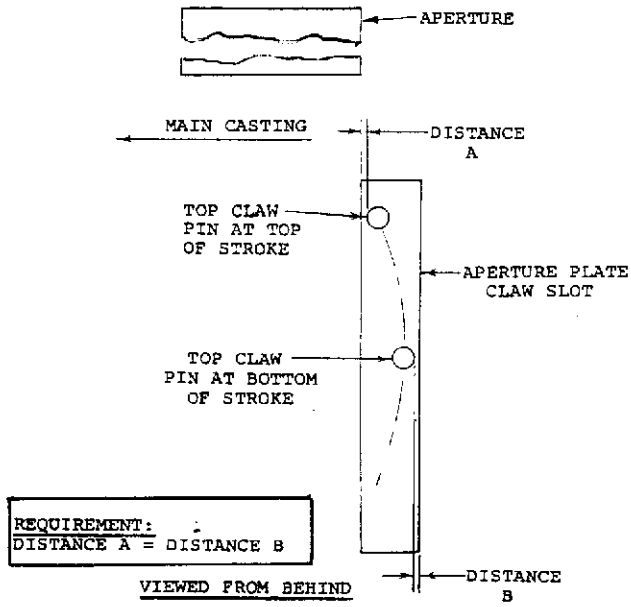
8. Tighten Nuts (3) for .001" end play and coat nuts with Blue Glyptal 7526.

9. Gently push Shutter and Cam Assembly forward while pushing down on Claw Arm (8) making sure cam follower on Claw Arm (8) slides under Cam. Tighten Set Screw (#1 in Shutter and Shaft Alignment insert of Figure 3-4) on flat of Main Drive Shaft (see step 7 under Reassembly of Main Drive Shaft to Projector). Make sure Claw Arm (8) is not hitting Aperture Plate.

10. Rotate Pivot (1) so eccentric pin is between 6 and 7 o'clock when viewed from front of machine. Tighten Pivot Set Screw (6).

11. Rotate Bushing (2) so its circumference lines up with circumference of the Pivot (1) and the groove in its side is slightly below the groove in the side of the Pivot. Tighten Claw Arm Set Screw (6).

12. Manually rotate the inching knob to make sure the Claw Arm Pins do not strike the side 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 (sketch below) 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.)



Disassembly of Supply and Take-up Reel Arms (Figure 3-6)

1. Mark one flat side of Spindle (3) with a felt marker and then mark Pulley (9) in line with the marked flat side of Spindle. (This will allow proper realignment of these parts at time of reassembly if both parts are to be reused.)

2. Press Roll Pin (4) out with Roll Pin Inserting and Extracting Tool T-38000-N. If this tool is not available, Roll Pin (4) may be removed by GENTLY tapping it out with a 1/16" drive punch. BE SURE TO SUPPORT END OF PULLEY IF ROLL PIN (4) IS DRIVEN OUT WITH DRIVE PUNCH. Otherwise, Pulley Shaft may be bent.

3. Clean Pulley (9) with Chlorothene or Alcohol. Clean Oilite Bearings in Arm (12) with a cotton swab or pipe cleaner moistened with Instrument Oil N-75 (P/N 39479-P8).

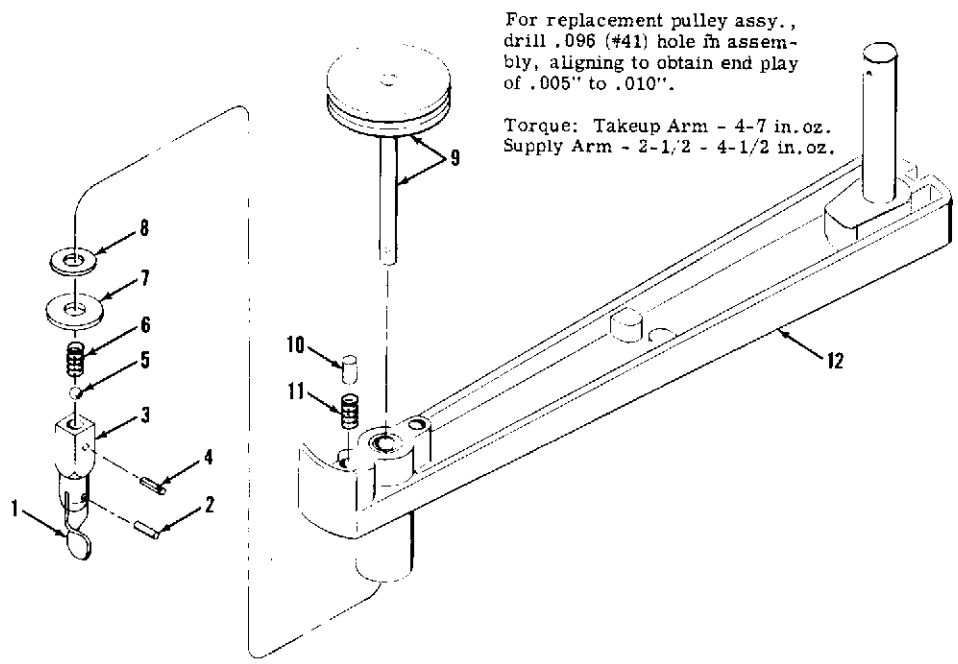


Figure 3-6. DISASSEMBLY AND REASSEMBLY OF SUPPLY AND TAKE-UP REEL ARMS COMPLETE

Assembly of New Reel Arm Pulley to Reel Arm (Figure 3-6)

Due to accumulated tolerances in machining of parts used in Reel Arms, Pulleys and Spindles are drilled at time of assembly.

1. Assemble Pulley (9) to Arm (12) making sure to hold Spring(s) (11) and Brake(s) (10)in place until Pulley is seated.
2. Assemble Spindle (3), Collar (7) (for Takeup Arm only), Washer (8) and a Washer (35473-72) (this washer is used to achieve proper end play and will be removed in step 4) to end of Pulley shaft.
3. Hold Pulley (9) and Spindle (3) firmly together and drill a .096 hole (#41 drill or 3/32" drill) in Pulley shaft using hole in Spindle (3) as a locator.
4. Remove Spindle (3) and washer (35473-72) installed in step 2.
5. Make sure Ball (5) and Spring (6) are in place inside Spindle (3) and assemble Spindle to shaft of Pulley (9).
6. Press Roll Pin (4) into hole making sure that both ends are either flush with or slightly below the surface of the Spindle.

Disassembly of Film Feed Clutch (Figure 3-7)

1. Remove Nut (1) and Spring (2) and slide Driven Clutch Plate Assembly (7) (including 3-6) off shaft.
2. Remove Clutch (8). This part may stick to either the Driving Plate (7) or the Driven Plate (11) because of a thin film of oil. Simply remove the Clutch (8) and wipe it off with a clean, dry rag. DO NOT clean with solvent.
3. Remove Pin (9) and VERY GENTLY lift Driven Plate (11) trying not to disturb the Cam (12), Balls (13) and Springs (14).
4. CAREFULLY remove Balls (13) and Springs (14) and then Cam (12) and Washers (15) and (16).
5. Grasp Pulley (19) and tap threaded end of shaft with a rubber or fiber hammer to remove Pulley (19) and Bearing (18).
6. Grasp Bearing (24) with padded pliers and tap threaded end of shaft as above to remove Bearing (24).
7. DO NOT clean Bearings (18) and (24) or Clutch (8) with solvent. Use clean, dry rag. All other metal parts may be cleaned with chlorothene. See cleaning instruction for Lexan Gear (26) in Section II, Preventive Maintenance.

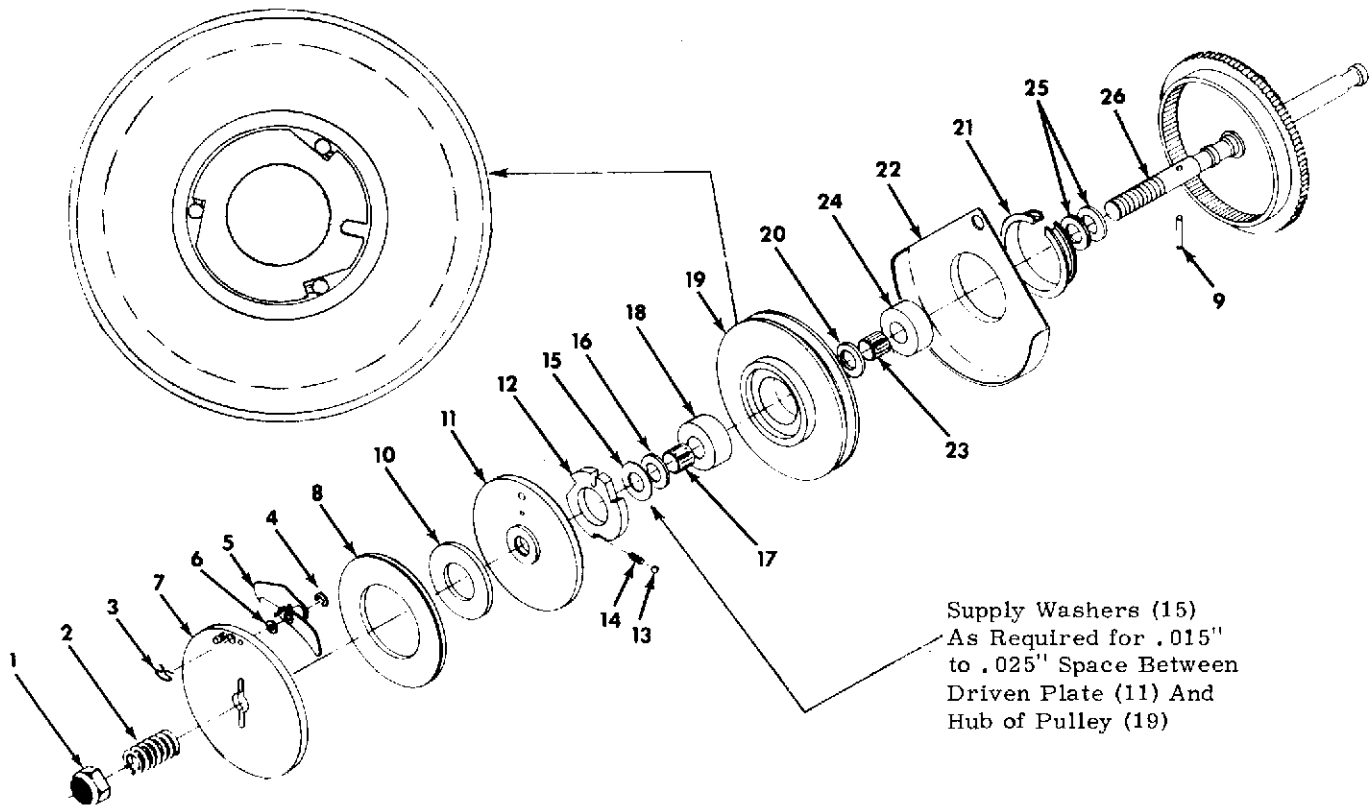


Figure 3-7. DISASSEMBLY AND REASSEMBLY OF FILM FEED CLUTCH ASSEMBLY

Reassembly of Film Feed Clutch (Figure 3-7)

1. Apply one drop of Teresso Oil N-75 to Bearings (18) and (24) and mounting post for Pawl (5) and Toggle Spring (3).

2. Apply a very thin coat of DC44 lubricant to the slot in Driving Clutch Plate (7). DO NOT get this lubricant on the surface of the Plate.

3. Make sure Cam (12), Balls (13), Springs (14) and Pulley (19) are clean and free from dirt or grease. DO NOT lubricate these parts.

4. Assemble parts in reverse order of disassembly. (See insert on Figure 3-7 for orientation of Cam (12), Balls (13) and Springs (14). See note below.)

   NOTE: A very thin, sharp, non-magnetic tool such as a dental pick is very useful in assembling Cam (12), Balls (13) and Springs (14). Assemble first Spring and Ball and rotate Cam (12) slightly counterclockwise while pushing Cam (12) toward the inside wall of hub at point where Ball is. This pushes Ball up ramp to allow maximum room for assembling next Spring and Ball.

   If the second Ball does not drop right in place, gently depress spring with sharp tool and Ball will drop.

   Use same counterclockwise motion described above to force both Balls up ramps and place third Spring and Ball in position. Gently depress spring with tool and Ball will drop.

5. Supply Washer (15) as required to achieve spacing of .015" to .025" between Driven Clutch Plate (11) and rim of hub on Pulley (19).

6. Inner pin on Driven Clutch Plate (11) must engage slot in Cam (12).

7. Apply DC44 lubricant to teeth of Gear (26).

Disassembly of Motor Drive Unit Components (Figure 3-8)

1. Remove Drive Belt by manually rotating Inching Knob while forcing Belt off back edge of Main Shaft Pulley. (Place Sound/Silent lever in Silent position if Projector has this feature.)
2. Remove Fan and Hub Assembly (1) through (6) by supporting Motor shaft and gently tapping out Spirol Pin (7).
3. Remove Pulley (9) and Bearings (8) and (10).
4. Clean Pulley (9) with Chlorothene. Wipe Motor shaft and Bearings (8) and (10) with clean, dry cloth.

Reassembly of Motor Drive Unit Components (Figure 3-8)

1. Apply FS-1290 to Motor Shaft, inside diameters and outside faces of Bearings (8) and (10), and inside diameter of Pulley (9).
2. Assemble Bearings (8) and (10) to Pulley (9) and install (Pulley (9) on Motor Shaft.
3. Apply Vischem 352 lubricant to inside diameter of Spring (6) (Between Spring (6) and Hub (5)) and install Hub Assembly (1) through (6), lining up hole in Hub Assembly with hole in Motor Shaft.
4. Support Motor shaft and gently tap NEW Spirol Pin (7) into hole.
5. Examine Drive Belt and replace if worn or stretched.
6. Make sure no lubricants are on Drive Belt or driving surfaces of Pulley (9).
7. Adjust Collar (11) for .005" to .010" end play of Pulley (9).

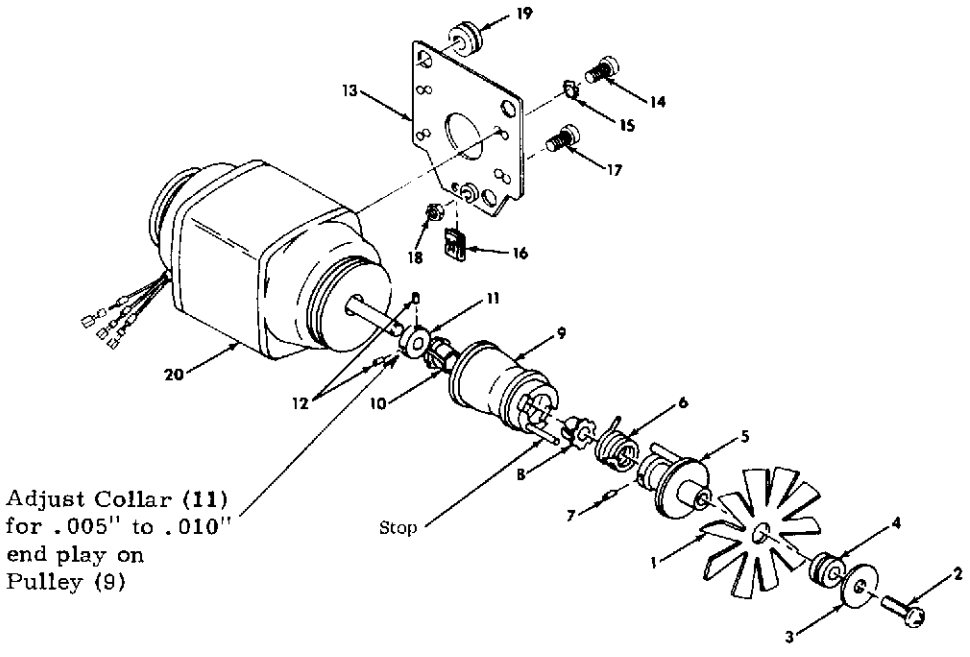


Figure 3-8. DISASSEMBLY AND REASSEMBLY OF DRIVE UNIT ASSEMBLY.

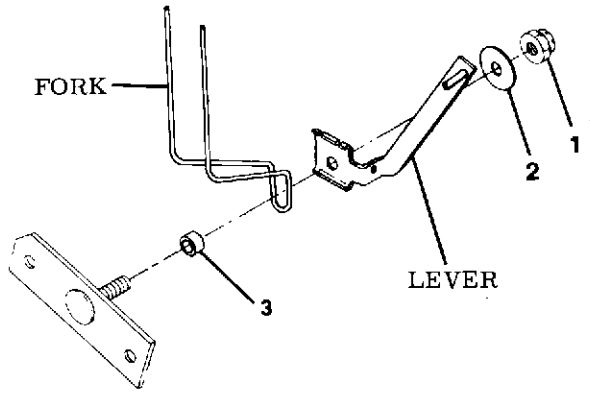


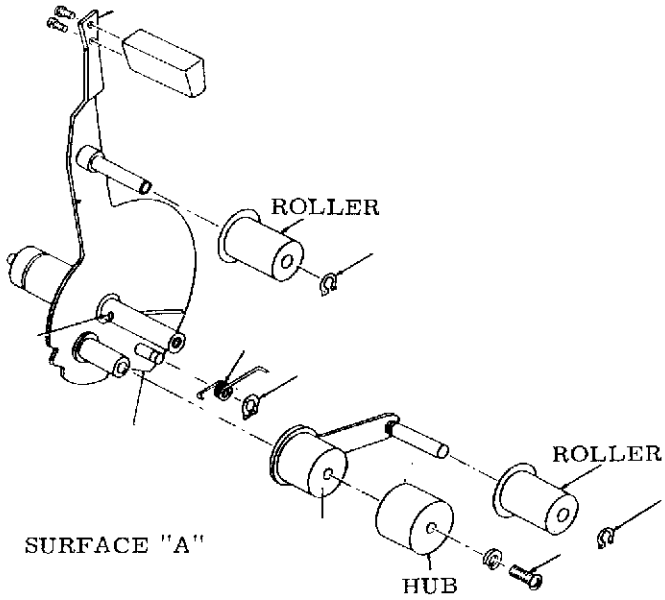
Figure 3-9. REASSEMBLY OF DRIVE BELT SHIFT FORK ASSEMBLY

Reassembly of Drive Belt Shift Fork Assembly (Figure 3-9)

1. Lubricate Spacer (3), working surfaces of Lever, and Washer (2) with Vischem 352 lubricant.
2. Tighten Nut (1) until Fork and Lever rotate freely with no perceptible end play.
3. Ring (2) must be assembled with throat parallel to bottom edge of control arm (surface "A") and facing closest edge of control arm. Spring (5) must rotate feely without end play.
4. Apply DC-200 to surface of Stud (3) and to face and inside diameter of Hub.
5. Tighten Screw (4) to 95-105 inch ounces of torque.

NOTE: When installed properly, Spring (5) hangs loose when Threading Control Arm is in Forward or Reverse position and is under tension to hold Film Tension Arm up when Threading Control Arm is in Thread position.

THREADING CONTROL ARM



FILM TENSION ARM

Figure 3-10. REASSEMBLY OF THREADING CONTROL ARM

Reassembly of Threading Control Arm (Figure 3-10)

1. Apply Vischem 352 lubricant to Roller Shafts. Clean lubricant off Roller ends.
2. Adjust Rings (1) to obtain end play of 0.005" to 0.015 between Rings (1) and Rollers.

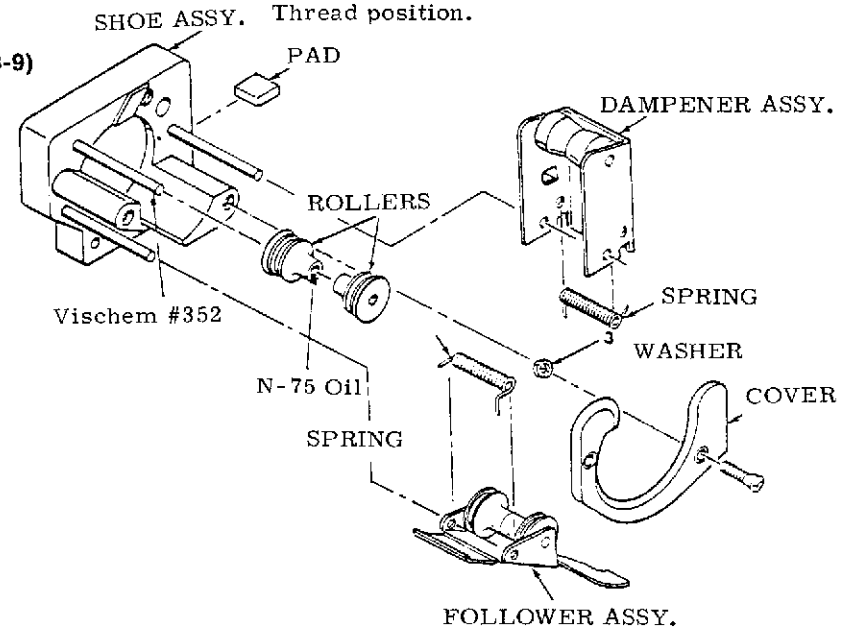


Figure 3-11. FEED SPROCKET SHOE COMPLETE

Feed Sprocket Shoe Complete (Figure 3-11)

1. Wash all parts in methyl alcohol. Inspect Rollers for wear. Apply Vischem 352 lubricant to studs on Shoe Assembly. Apply one drop of Singer Instrument Oil Teresso N-75 between halves of Roller on Follower Assembly.
2. When reassembling, load Springs with one full turn of pre-tension. Add washer(s) under cover as required to permit Follower Assembly and Dampener Assembly to be returned smoothly by spring action without binding. Wipe excess lubricant from rollers and supporting parts.
3. Fasten pad in position using A-963-B adhesive.

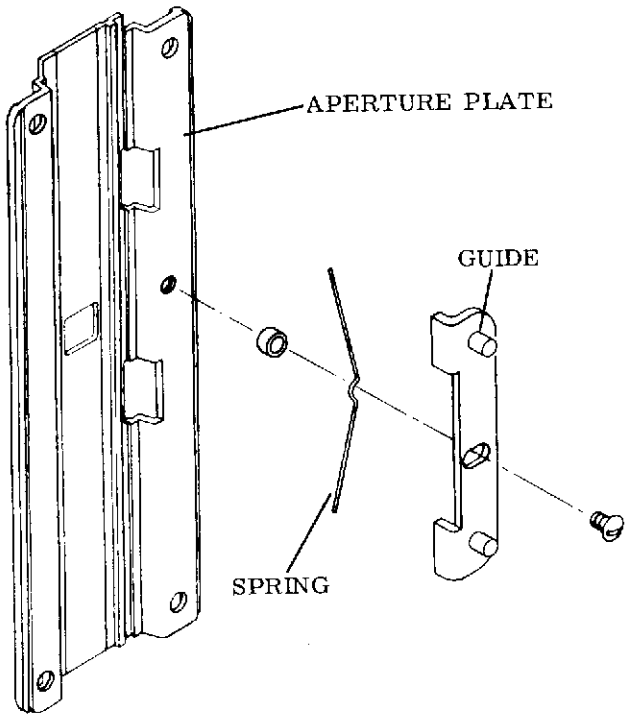


Figure 3-12. APERTURE PLATE ASSEMBLY

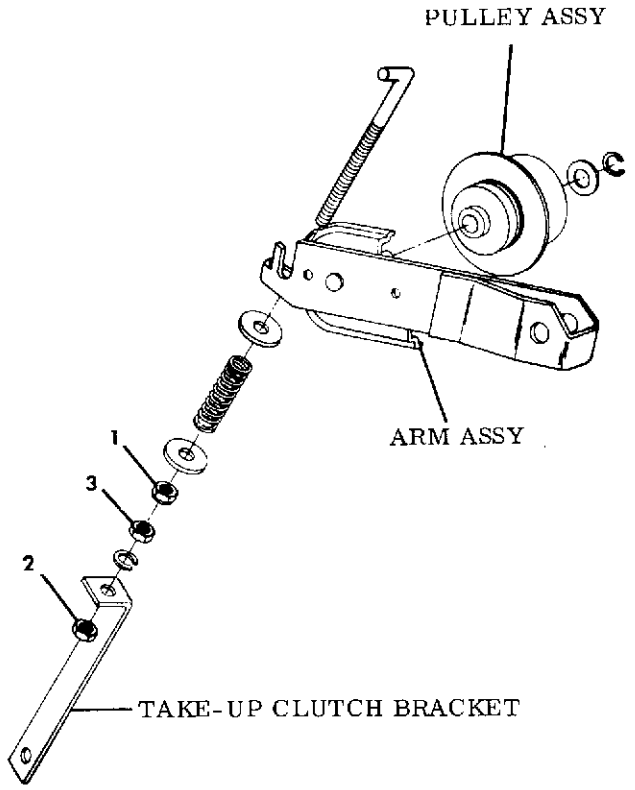


Figure 3-13. TAKE-UP CLUTCH ARM COMPLETE

Aperture Plate Assembly (Figure 3-12)

1. Clean Guide and Aperture plate using a cloth dampened with chlorothene. Use a toothpick or brush to remove deposits of dirt and emulsion. Inspect all parts for wear and damage.

NOTE: Examine Aperture Plate around claw pin slot and on narrow raised rib along other side of aperture. If chrome plating is worn off. Aperture Plate, it will appear very dull in these areas (stainless steel showing through). Replace Aperture Plate if plating is worn off.

2. When assembled, film edge Guide must move freely, smoothly, and be returned by action of the spring.

3. If Guide pressure is not within tolerance, reshape Spring to maintain 1.250 ±0.125 oz. at each pad.

4. Measure Guide pressure with Push-Pull Gage No. 516-500 or equivalent (16 oz. x $\frac{1}{4}$ oz. increment). This tool will not be supplied by Singer Education Systems, but should be ordered from John Chatillon & Son, 85 Cliff Street, New York, New York 10038

Take-up Clutch Arm Complete (Figure 3-13)

1. Wipe Pulley Assembly with cloth dampened with chlorothene. Other components of the take-up arm can be washed in chlorothene if cleaning is required.

2. Lubricate stud on Arm Assembly with 00-9 Keystone lubricant before assembling Pulley.

Cleaning of 2-3 Blade Shutter

1. Push clean, dry cloth under Shutter and flush between blades of Shutter with alcohol, manually moving Shutter from 2 to 3 blade position while flushing. Be sure to prevent alcohol from getting on Shutter Cam.

2. Run Projector and move Sound/Silent lever between its two positions. Shutter should shift freely from 2 to 3 blade position when moved from Sound to Silent and vice versa.

3. The 2-3 Blade Shutter needs no lubrication. A VERY SMALL amount of molybdenum disulfide (molycote Z) may be used if desired.

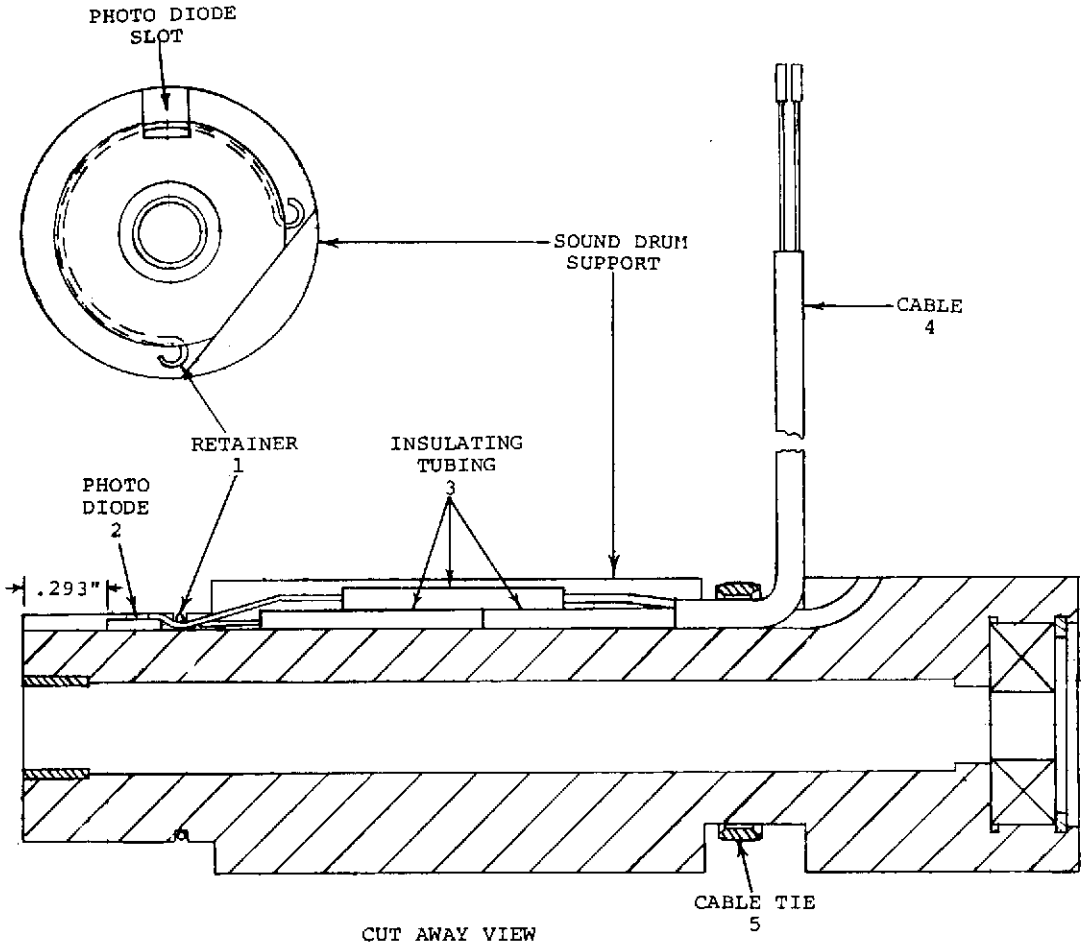


Figure 3-14. REPLACING PHOTO DIODE CHIP IN SOUND DRUM SUPPORT

Replacing Photo Diode Chip in Sound Drum Support (Figure 3-14)

1. Mark body of Sound Drum Support at outer end of Photo Diode (this establishes proper orientation for installation of new Diode).

2. Remove Retainer (1) Photo Diode (2) out of slot. Clip leads and discard Diode.

3. Remove Insulating Tubing (3) and unsolder remaining portion of Diode leads.

4. Clean residual epoxy cement from Photo Diode Slot.

5. Position new Photo Diode into Slot with shiny, black surface up (red wire) and end aligned with mark made in Step 1. Assemble Retainer (1) to hold Photo Diode in place, orienting Retainer as shown in Figure 3-14. Make sure Photo Diode is perfectly flat in slot. (End of Photo Diode should be .293"--about 9/32"--from end of Sound Drum Support.) PHOTO DIODE IS VERY FRAGILE. BE VERY CAREFUL NOT TO BREAK IT!

6. Mix 100 parts of Hysol R9-2039 Resin to 11 parts of Hysol H2-3404 Hardener (by weight). Dip a toothpick or paper clip in cement mixture and apply cement to Slot, contacting front edge of Photo Diode so cement will run under Diode. DO NOT allow cement to get on top surface of Diode. Allow cement to dry thoroughly (over night) before proceeding.

7. Slide Insulating Tubing on leads of Photo Diode and make sure that the third piece of Insulating Tubing is on Shield of Cable (4). Solder Black lead of Photo Diode to Shield of Cable and Red lead to Center Conductor of Cable. Slide tubing over solder connections (It may be helpful to cut Cable Tie (5) so Cable can be lifted out of Slot for soldering). Dress wires into Slot and replace Cable Tie if cut.

8. Measure resistance between Shield and Sound Drum Support with Ohmmeter. Resistance must be 5 Megohms MINIMUM.

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.

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.

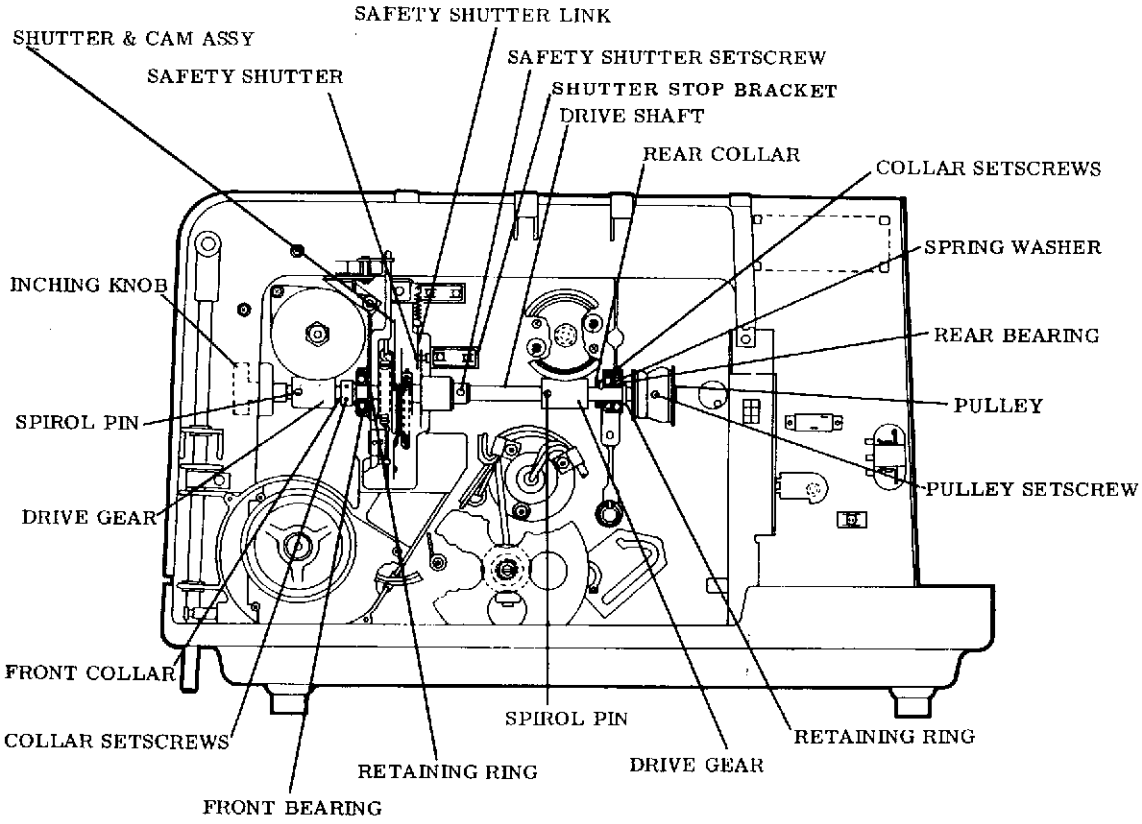


Figure 4-1. DRIVE SHAFT

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)

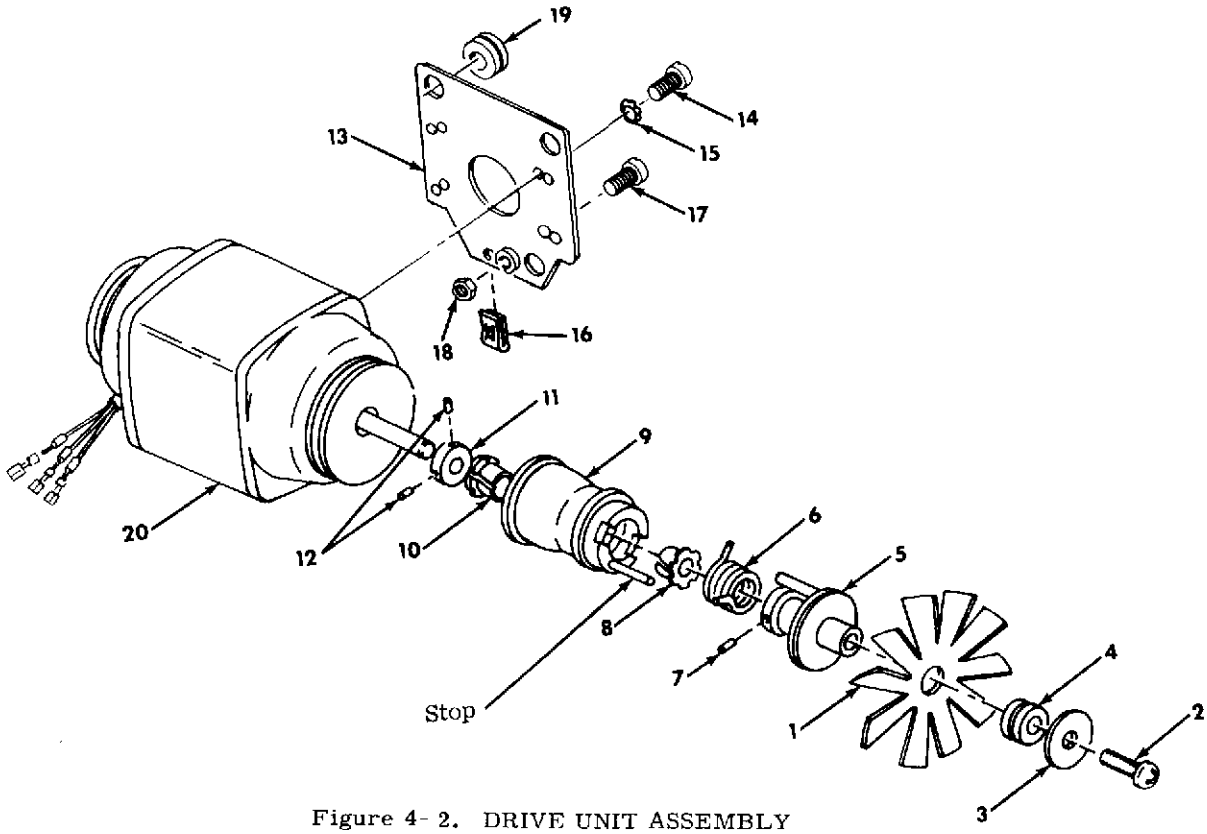


Figure 4- 2. DRIVE UNIT ASSEMBLY

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.

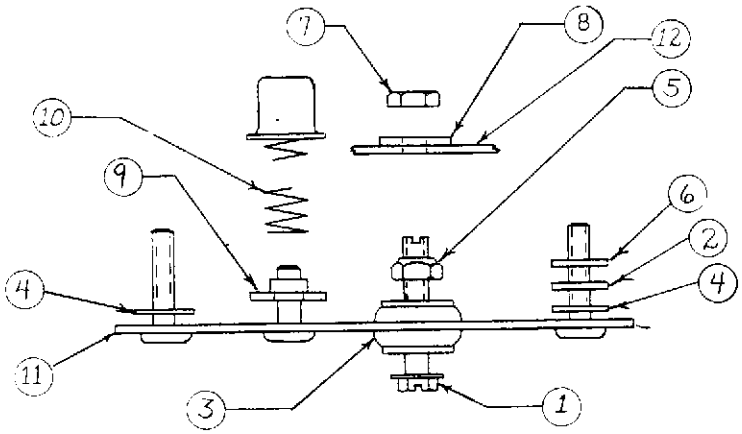


Figure 4-3. 1030N MOTOR MOUNT ADJUSTMENTS

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.

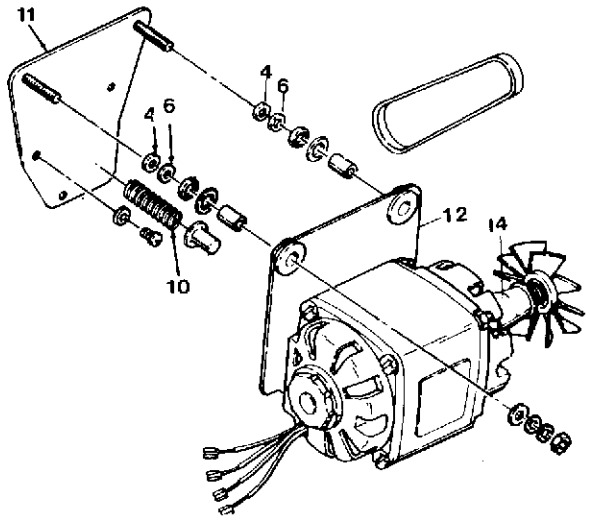


Figure 4-4. 1030N MOTOR MOUNT ADJUSTMENTS

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.)

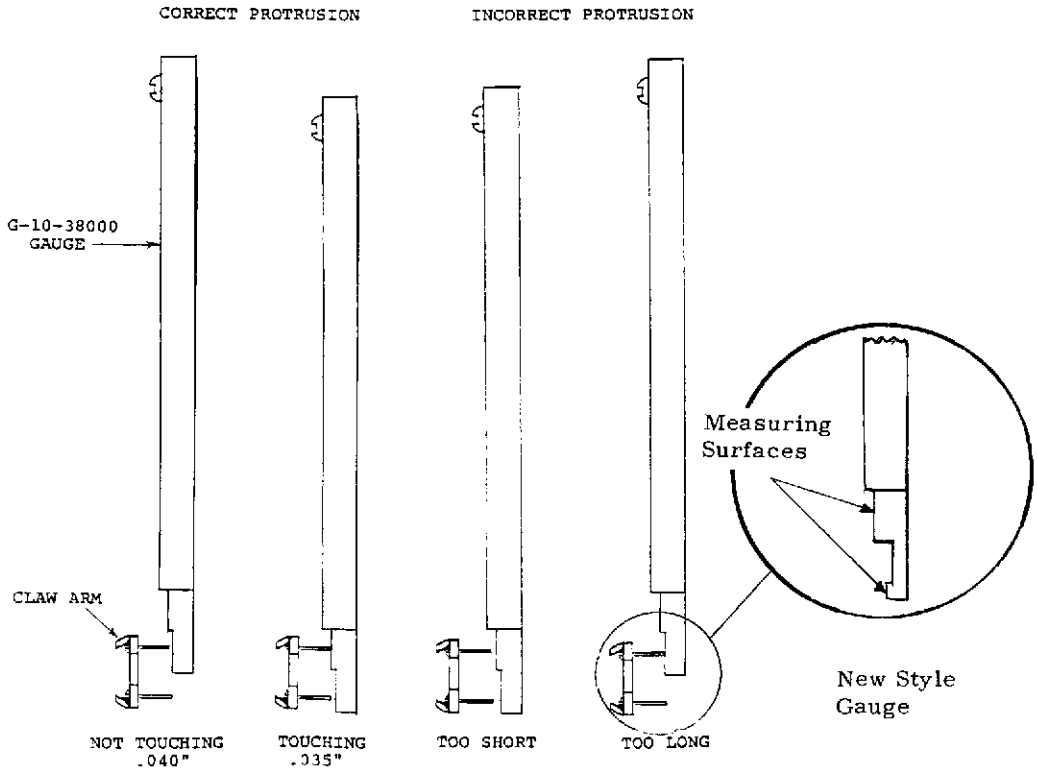


Figure 4-5. CLAW PIN PROTRUSION

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).

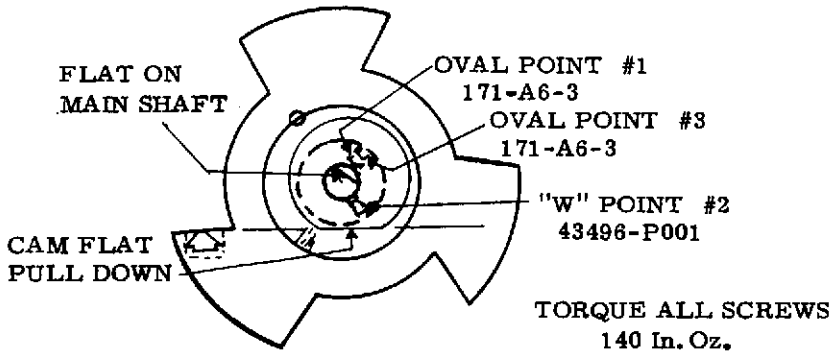
h. Release Claw Arm and observe position of red and yellow reference tapes. Slide Gauge down 1/2 width (1/4 width with new style gauge) of either tape. (An imaginary line drawn across the top of the Lamphouse Cover generally intersects the yellow reference tape at its center when this step is completed).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

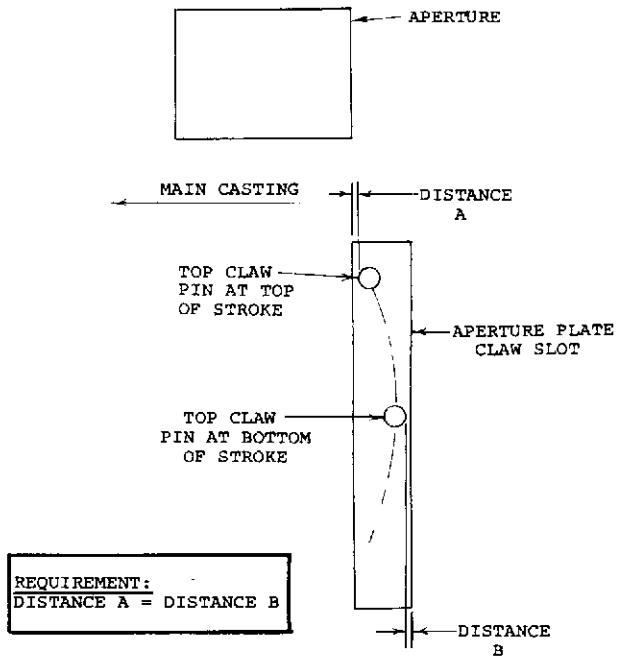
2. Claw Pull Down Stroke and Side Clearance (Figures 4-7 / 4-11) These Two Adjustments are interdependent and must be adjusted at the same time. If either one is adjusted, the other must be checked and adjusted as necessary until requirements for both can be met.

(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.

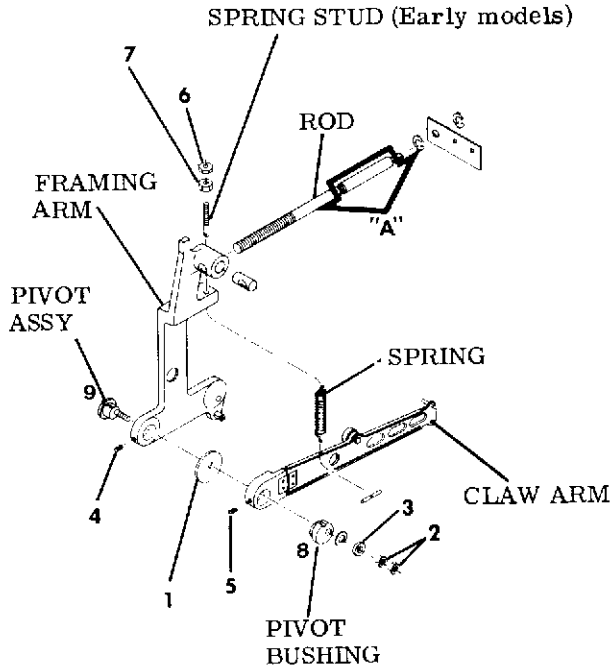


Figure 4-8. CLAW ARM

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).

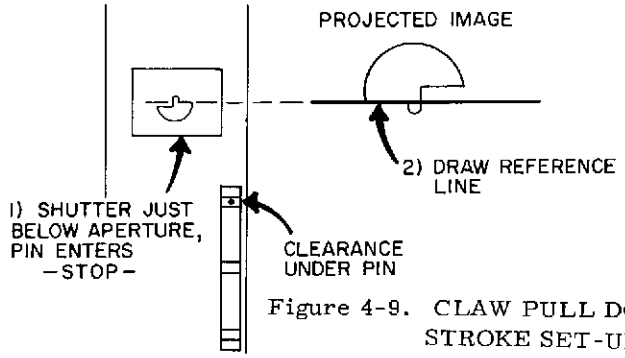


Figure 4-9. CLAW PULL DOWN STROKE SET-UP

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).

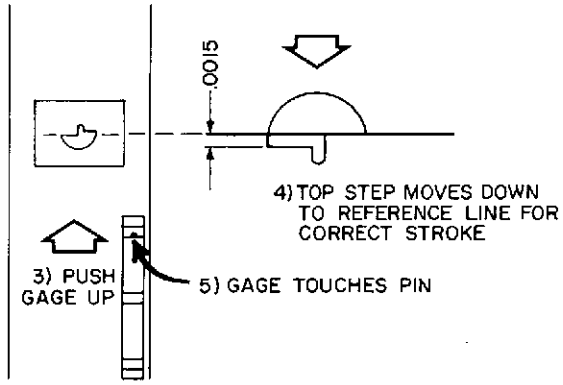


Figure 4-10. CLAW PULL DOWN STROKE

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.

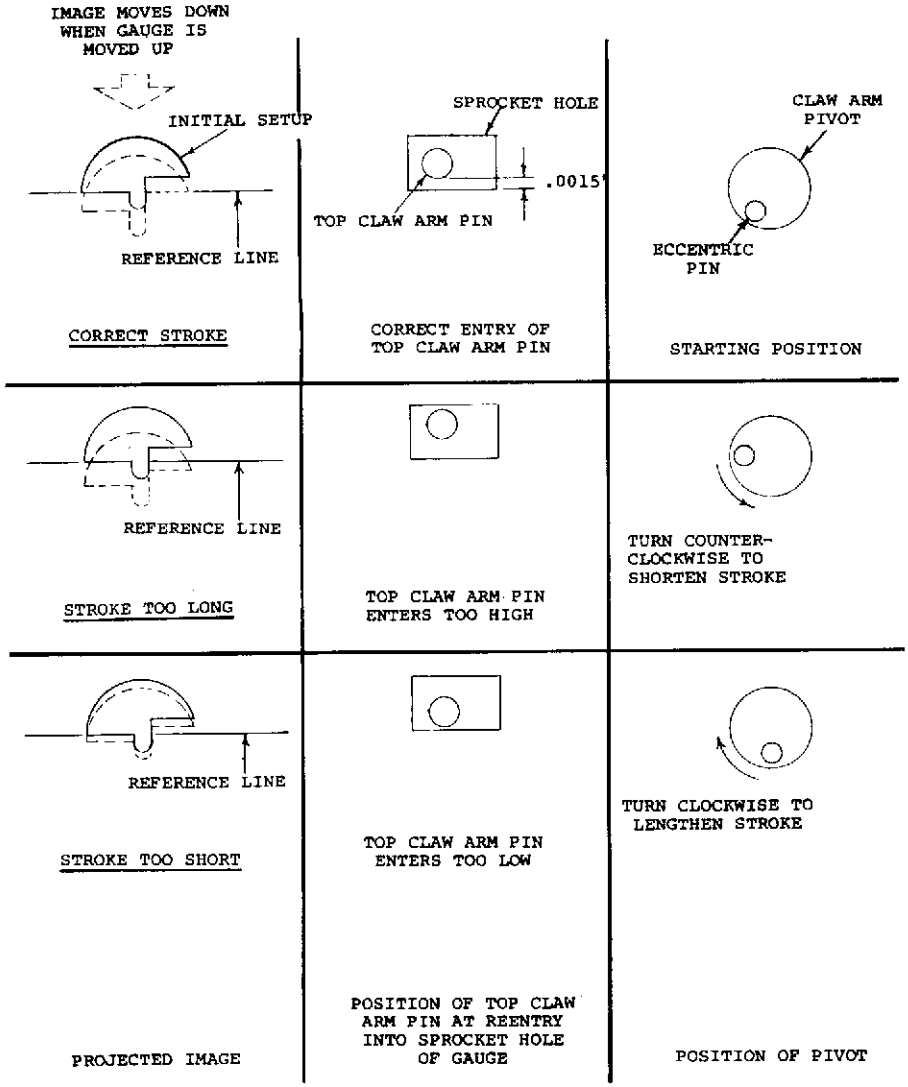


Figure 4-11. CLAW PULL DOWN STROKE ADJUSTMENT

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)

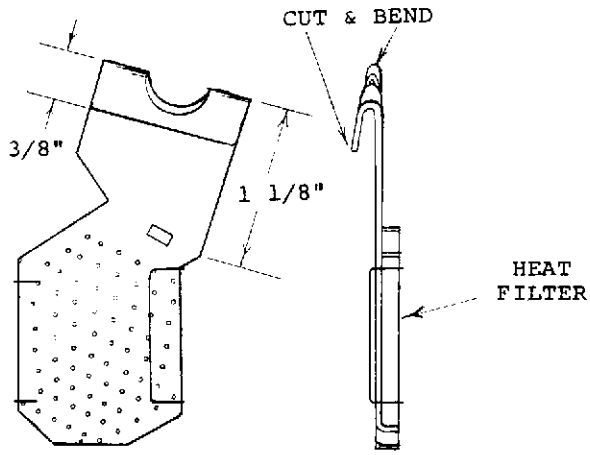


Figure 4-12. MODIFIED SAFETY SHUTTER (42994-G1)

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).

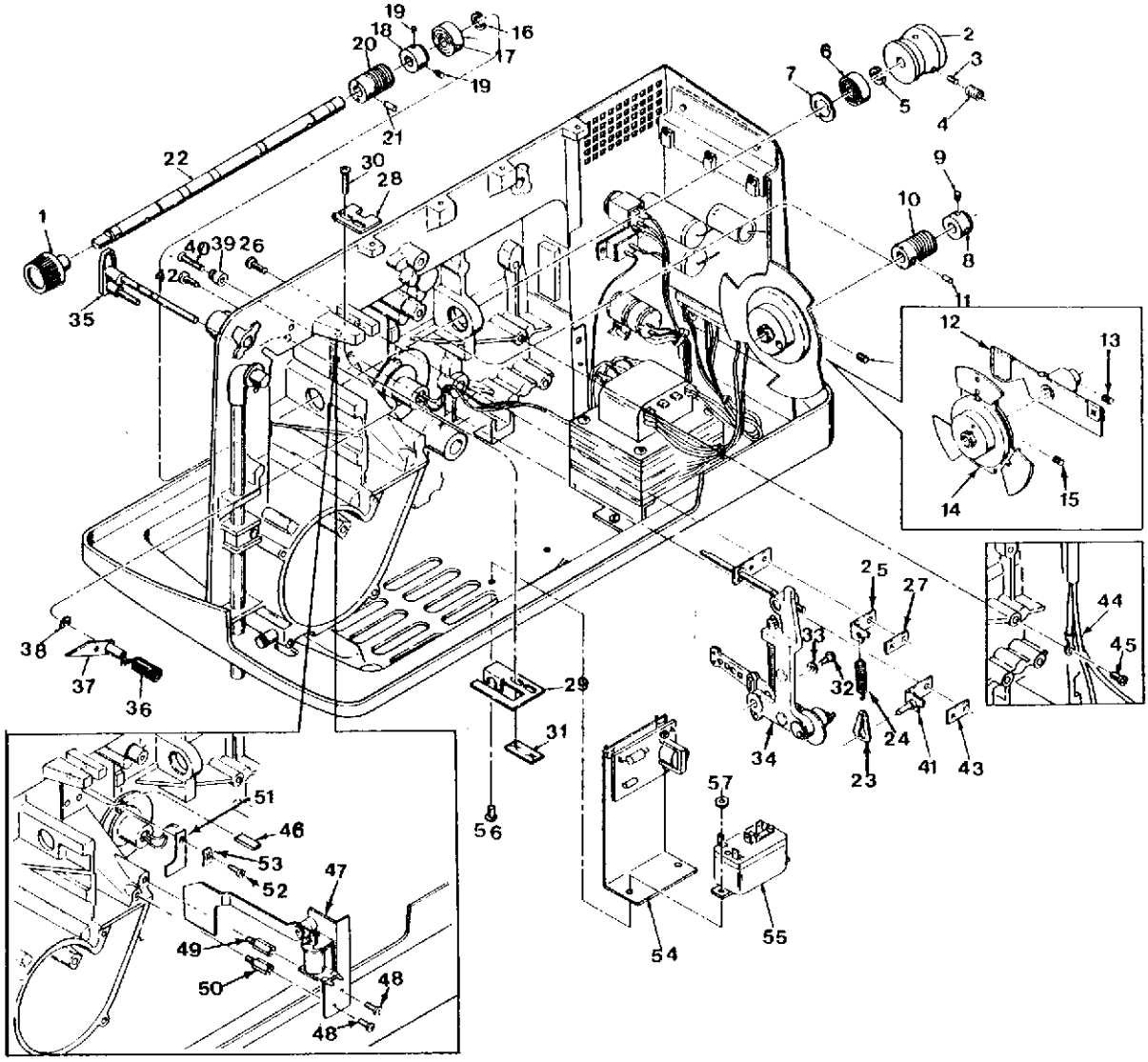


Figure 4-13. FRAMING ADJUSTMENT

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).

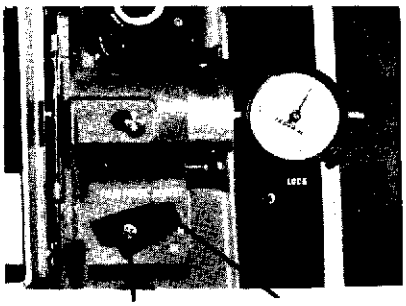


Figure 4-14. FILM PRESSURE ADJUSTMENT

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.

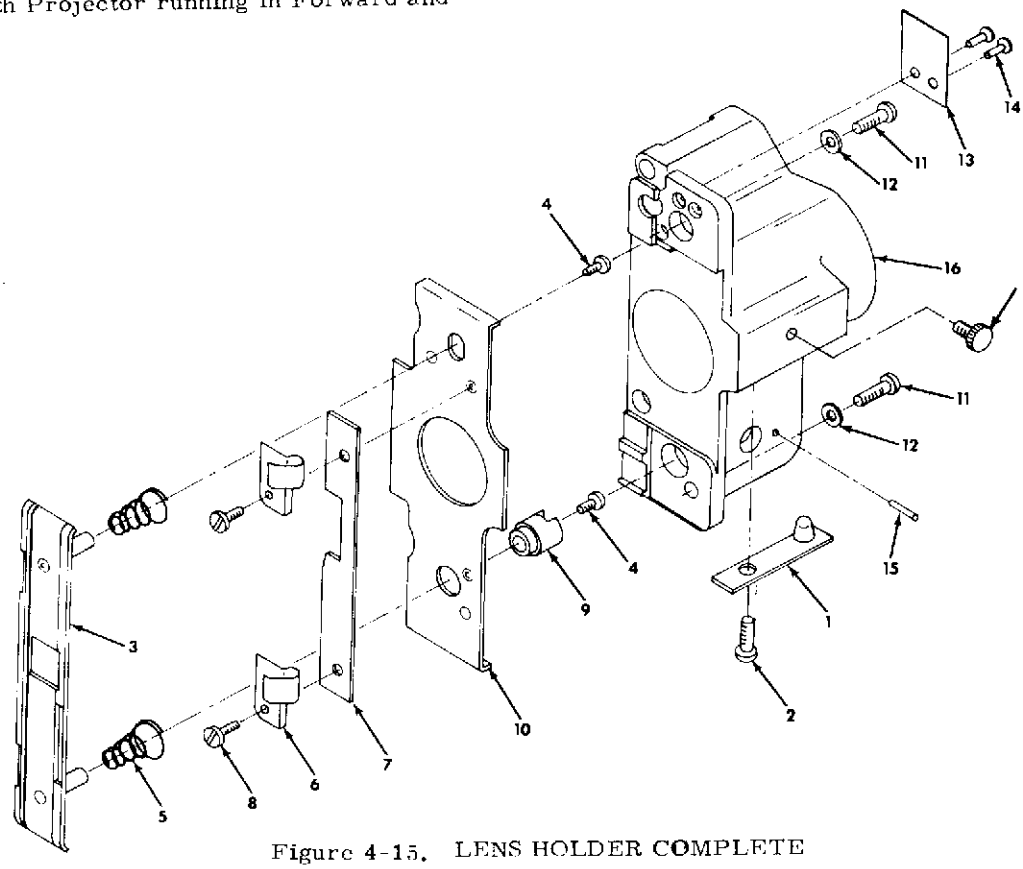


Figure 4-15. LENS HOLDER COMPLETE

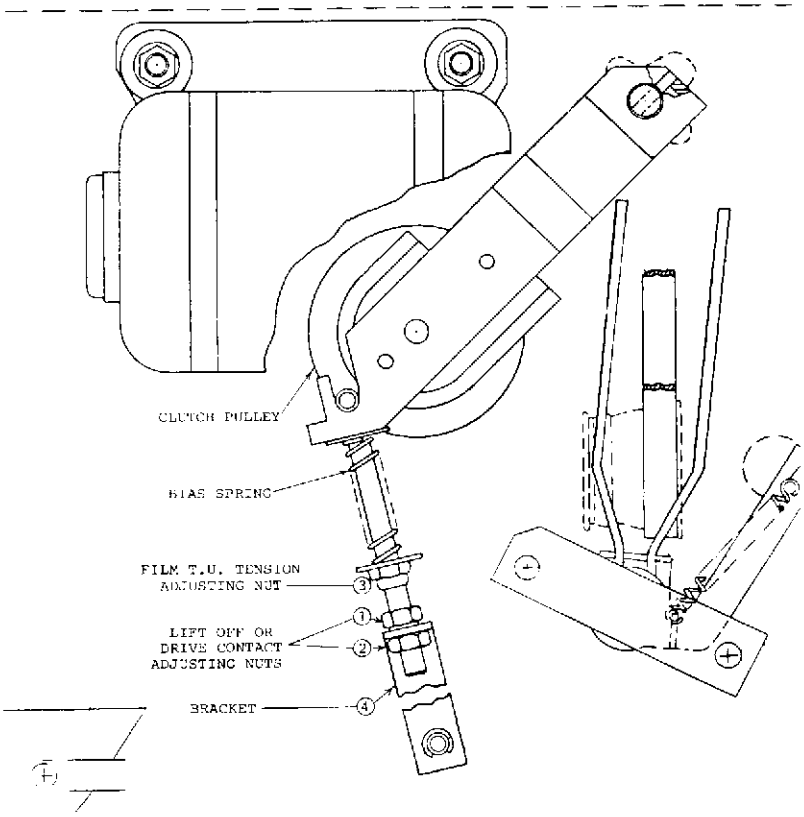


Figure 4-16. TAKE-UP CLUTCH ADJUSTMENTS

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.

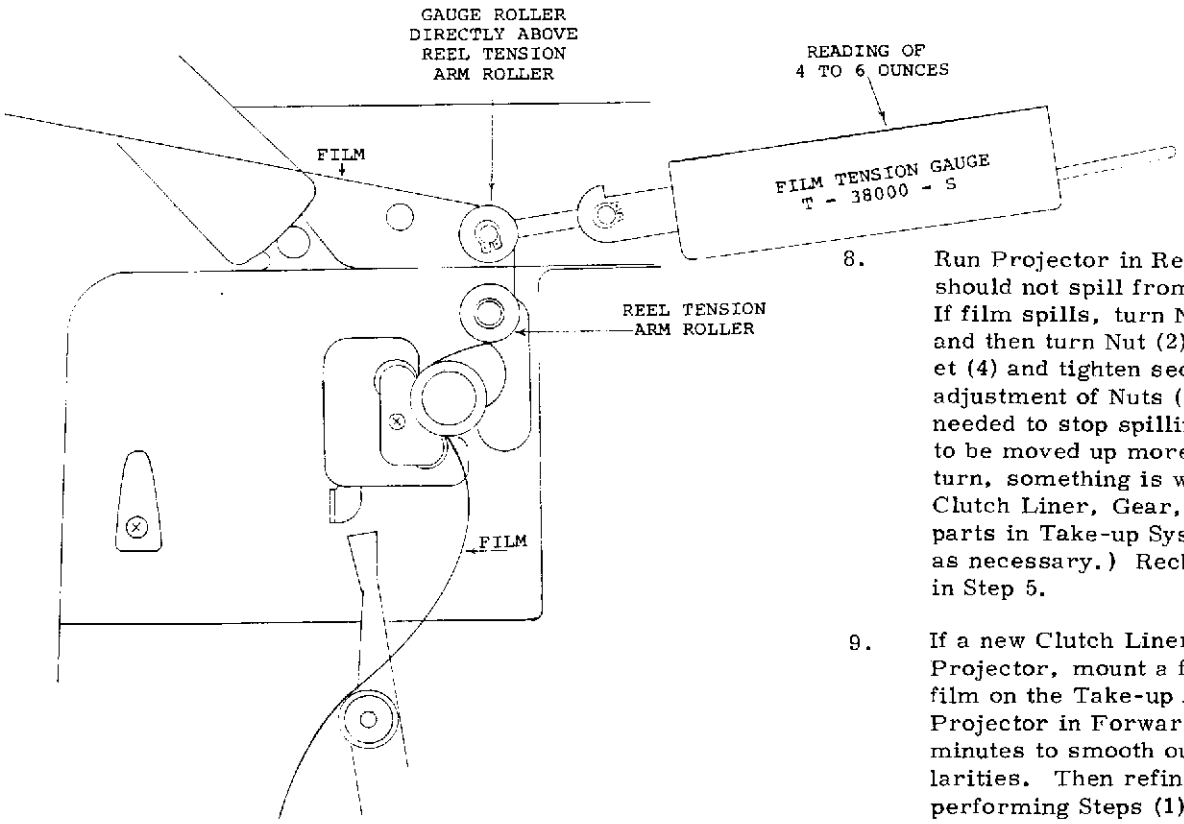


Figure 4-17. TAKE-UP TENSION MEASUREMENTS

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.

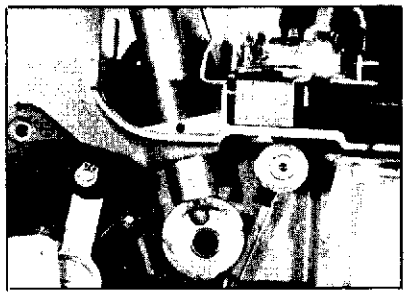


Figure 18. SOUND DRUM SUPPORT ADJUSTMENT

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.

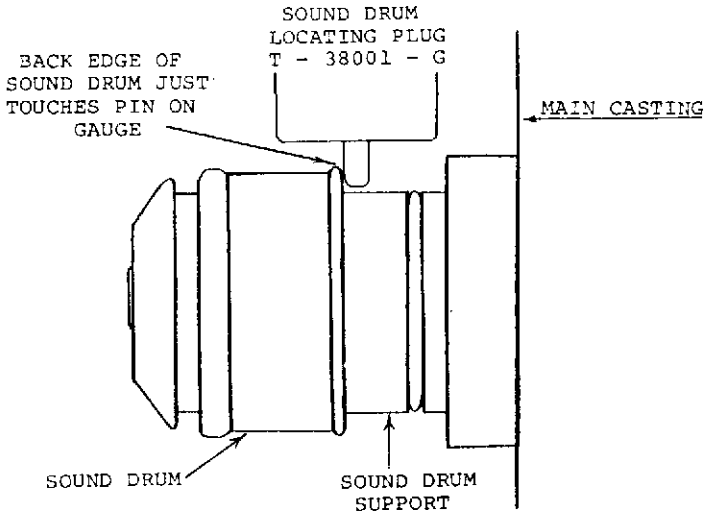


Figure 4-19. SOUND DRUM LATERAL POSITIONING

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.

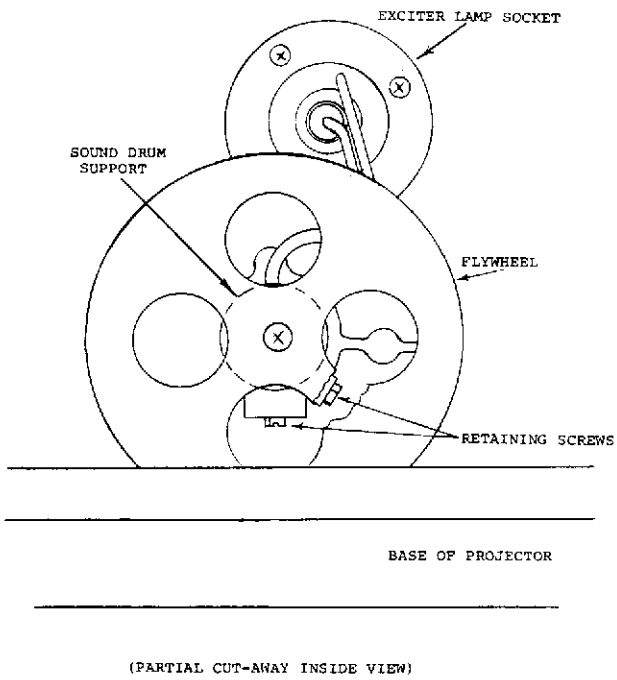


Figure 4-20. SOUND DRUM SUPPORT RETAINING SCREWS.

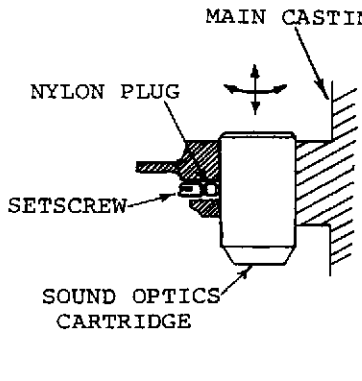
5. Turn Setscrew as though tightening. This will force the Nylon Plug out of the hole. Be careful to prevent Plug from falling down into Projector.

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.

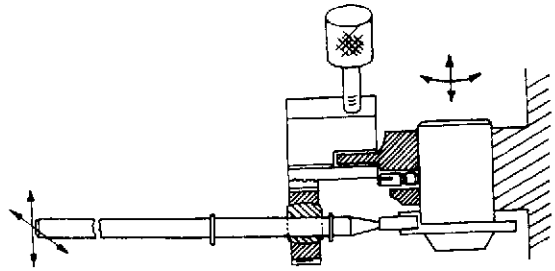


Figure 4-22. FOCUSING SOUND OPTICS CARTRIDGE #T-43680-G1-G

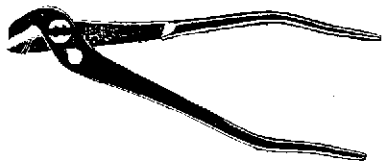


Figure 4-23. OPTIONAL SOUND OPTICS ADJUSTING TOOL

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.

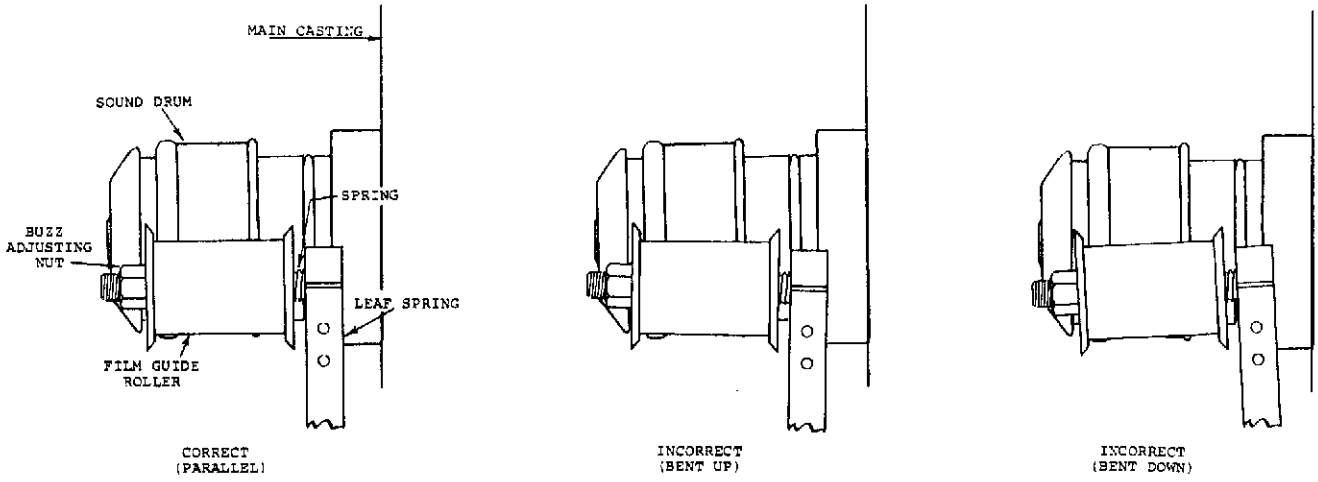


Figure 4-24. FILM GUIDE ROLLER ADJUSTMENT

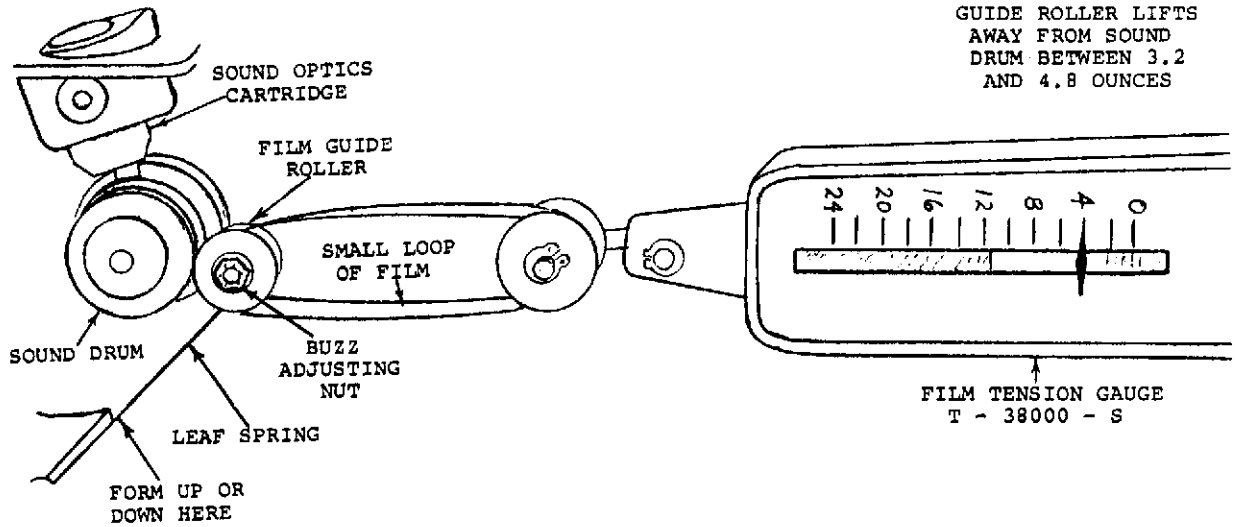


Figure 4-25. PRESSURE ROLLER ARM ADJUSTMENT

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

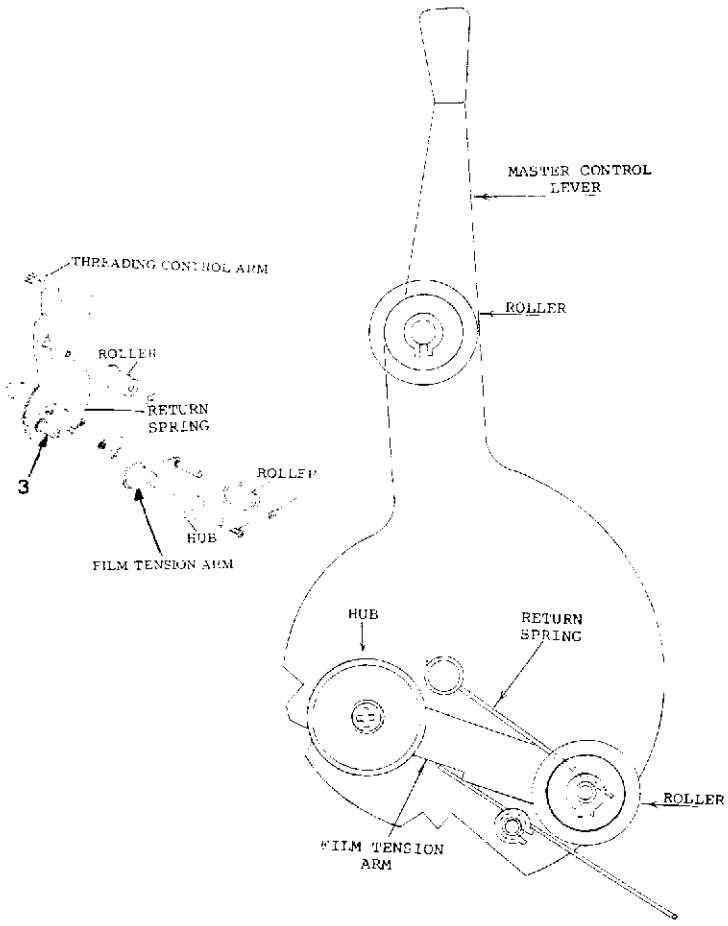


Figure 4-26. FILM TENSION ARM ADJUSTMENT

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.

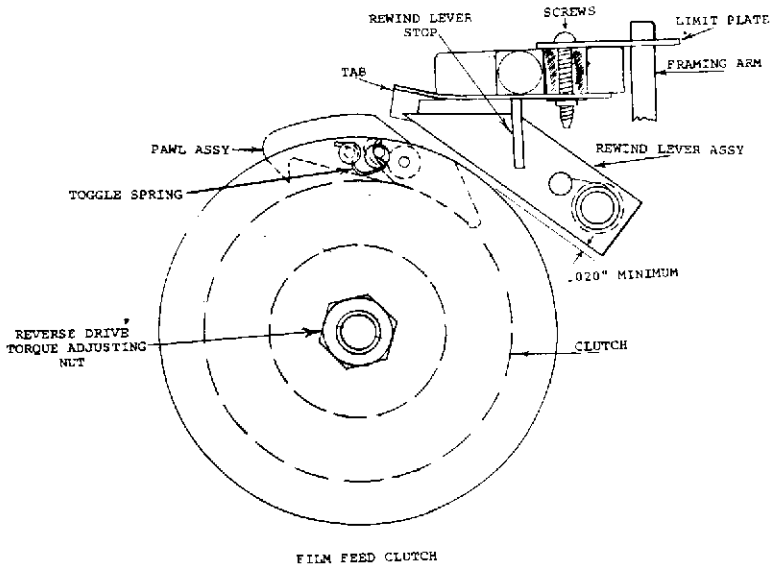


Figure 4-27. REWIND AND REVERSE ENGAGEMENT.

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.

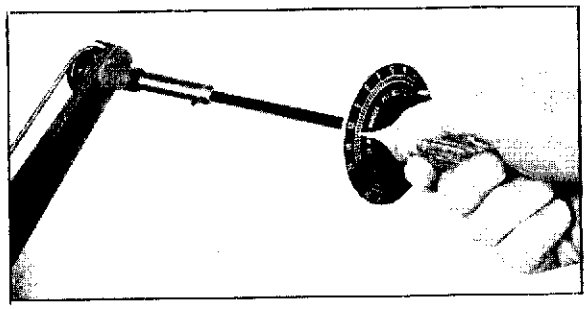


Figure 4-28. REVERSE DRIVE TORQUE MEASUREMENT.

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).

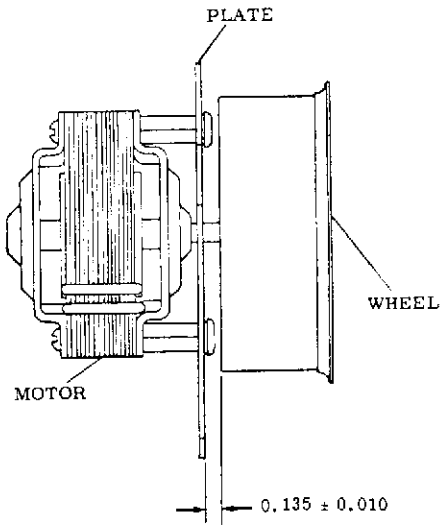


Figure 4-29. MOTOR MOUNTING PLATE ASSEMBLY.

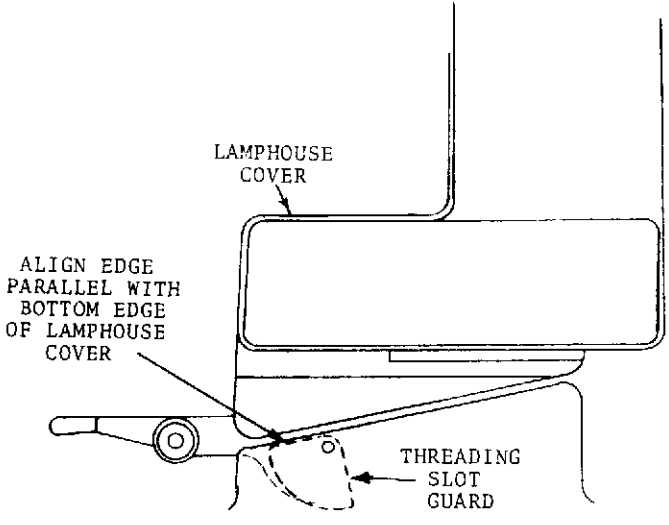
Motor Mounting Plate Assembly (Figure 4-29)

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).

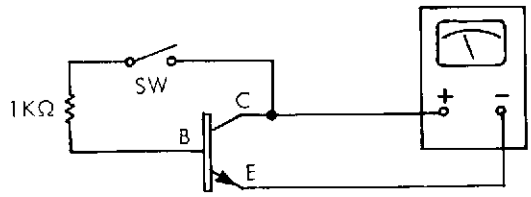


Figure 5-1. TEST CIRCUIT

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.

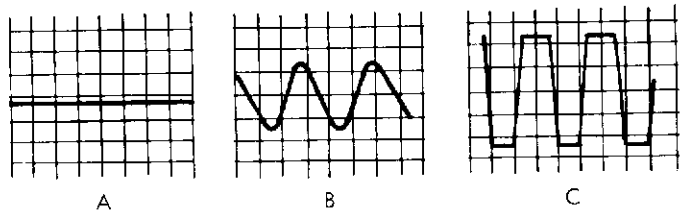


Figure 5-2. WAVEFORMS

   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.

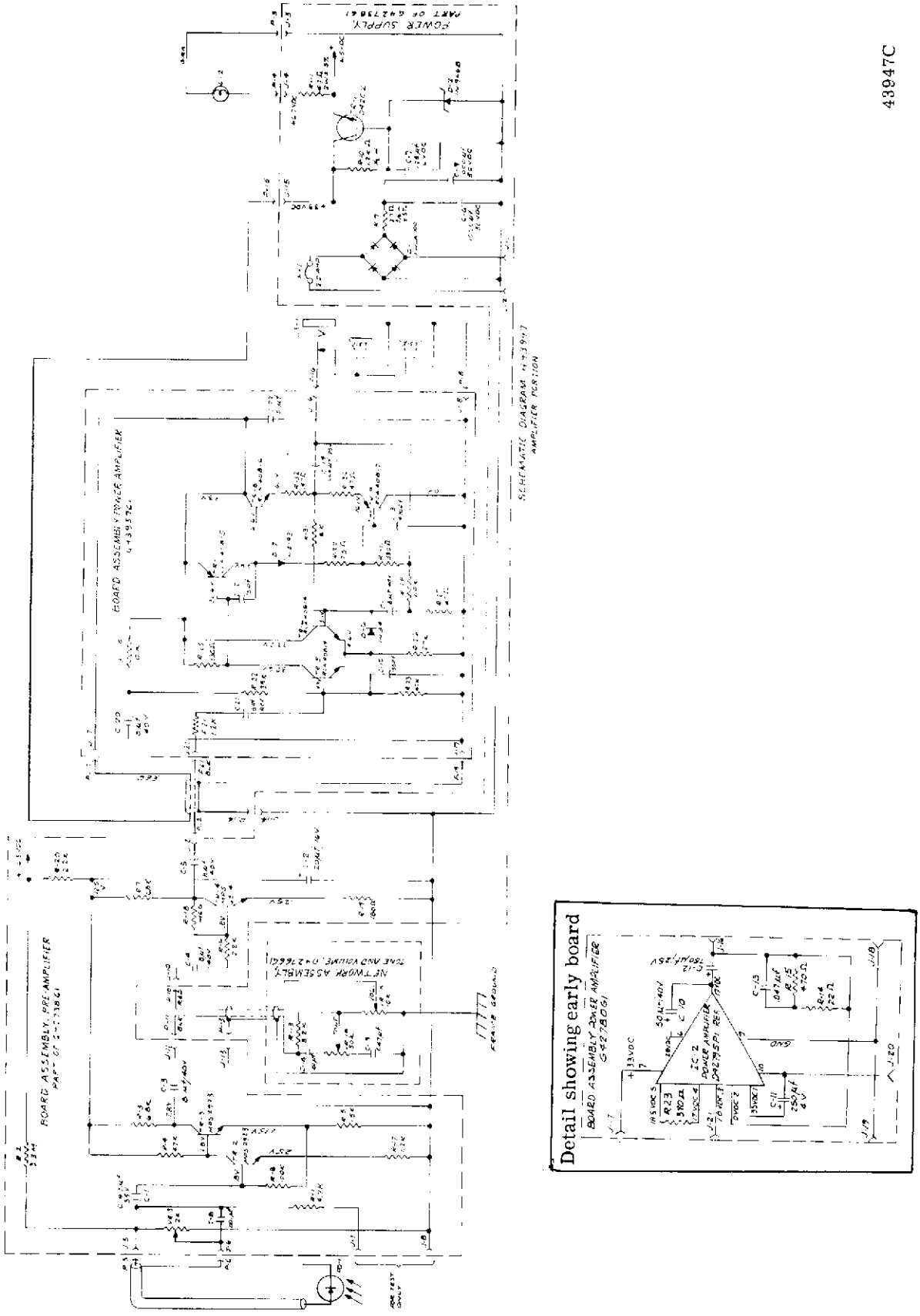
0 dbm Adjustment (Figure 5-5)

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.



43947C

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

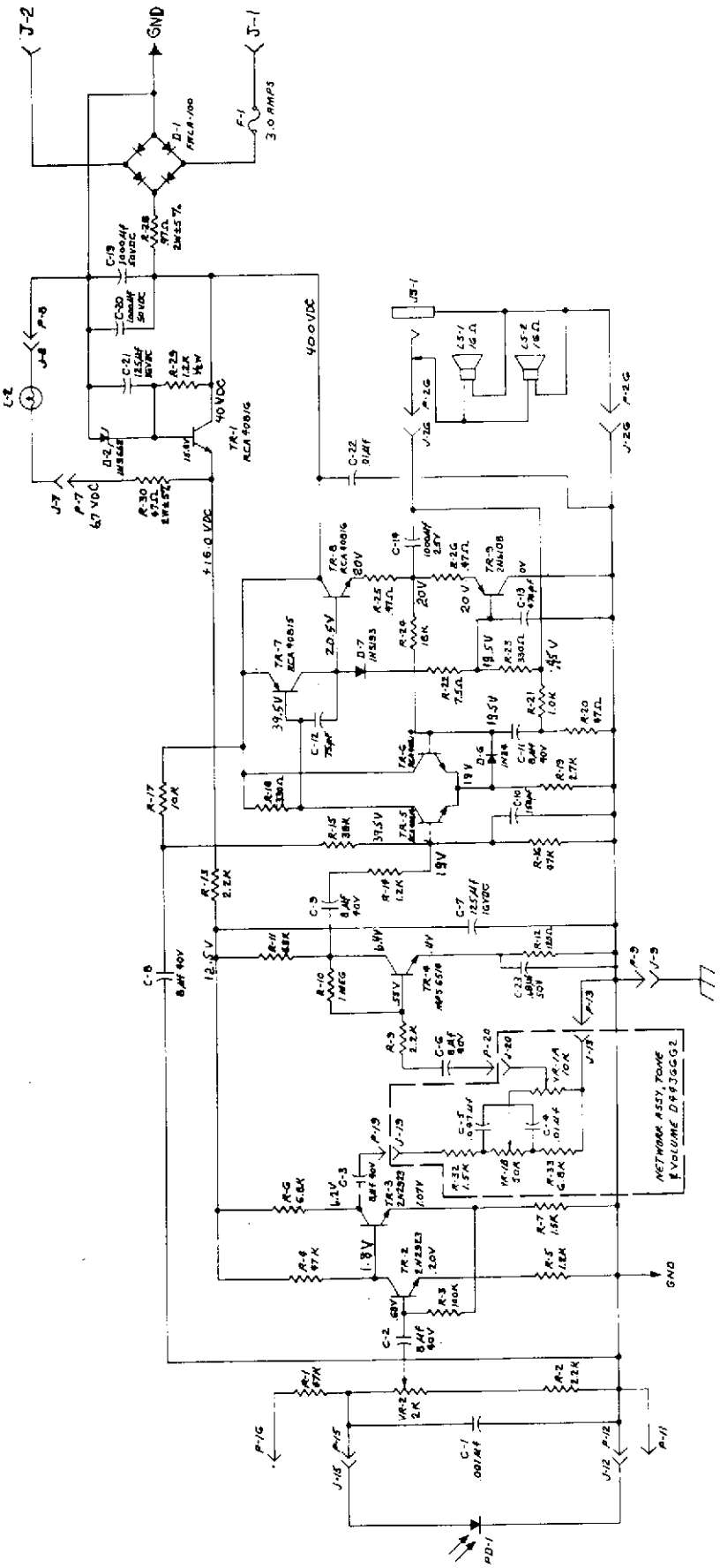


Figure 5-4. PROJECTOR SCHEMATIC DIAGRAM, (Stage II, (15 Watt)

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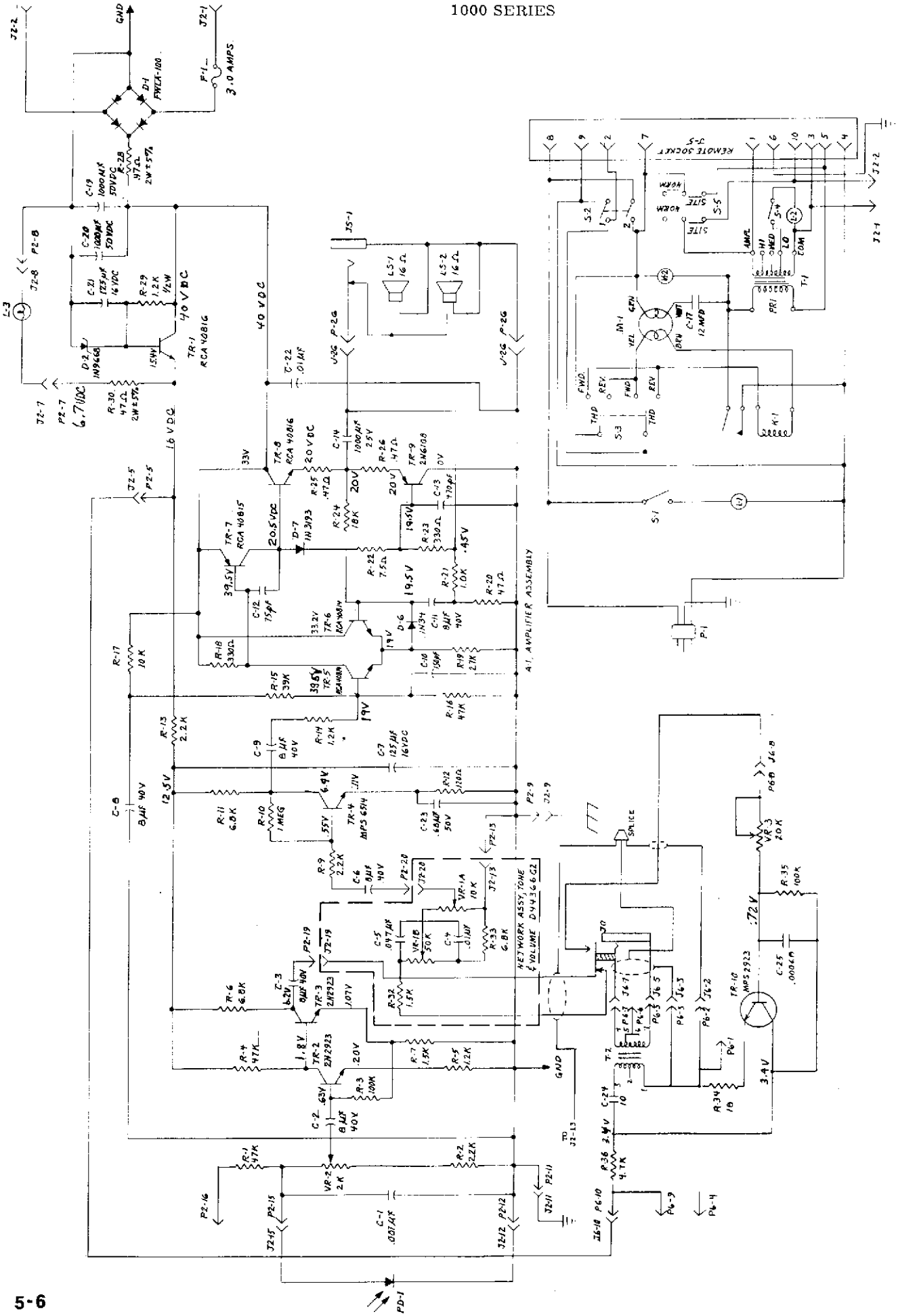

Figure 5-5. PROJECTOR SCHEMATIC DIAGRAM (Model: 1030N)

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.

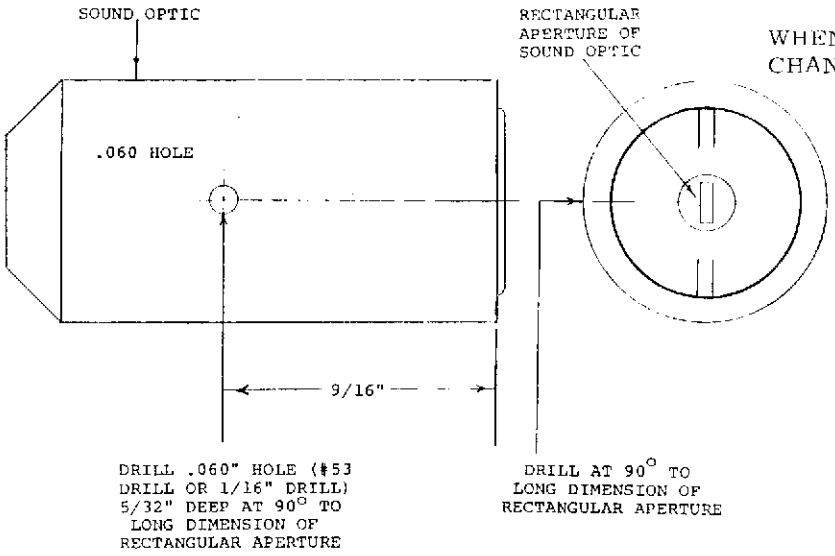

Figure 6-1. UNSTABLE SOUND OPTICS.

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.