4-2: AMPLIFIER MODULE

Refer to the amplifier circuit diagram:

A. Specifications

1. Solid state: 3 IC's 7 transistors (9 transistors for -3 type)
2. Output power: 20 watts RMS 8 ohm load
3. Distortion: Less than 4% at 400Hz
   (measured with SMPTE 400Hz Signal Level Test Film)
   Less than 1% at 1KHz
   (measured with SMPTE Multi-Frequency Test Film)
4. Wow & Flutter: Less than 0.2% WRMS.
5. Frequency response:
   Optical 50Hz – 7000Hz ± 4db
   Magnetic 50Hz – 10000Hz ± 4db
   Magnetic Recording Range 50Hz – 10000Hz
6. S/N ratio of the amp: 60db
7. Mic input impedance: 600 ohm and up.
8. Mic input level: 10mv max (high or low impedance for –2 type and high impedance only for –3 type.)
9. Phono input level: 50mv (high impedance)
10. Speaker Jacks: 8 ohm

B. Amplifier Power Supply Circuit (see Fig. 47)

40 volts AC power to the amplifier is supplied from the transformer secondary windings through pins #1 & 2 of the 9 pin socket (MT-9).

(NOTE: NT projectors after S/N 26136 and NST after S/N 10674 are supplied with 36V AC standard and 40V AC optional. See Sec. 4-4 TRANSFORMER MODULE)

Dual diodes S1 and S2 form a bridge rectifier, filtered by capacitor C-44, providing the amplifier approximately 56V DC (or 50V DC). The 8V AC transformer secondary winding supplies AC exciter lamp voltage through pins #4 and #5 of the 9 pin socket. Dual diodes S3 and S4 form a bridge rectifier which is filtered by capacitor C14. C15 and C16 are ripple filters regulating the base input voltage to TR-1's base. R-32 is a current sense resistor serving as feedback to the base of TR-2 through R-29.

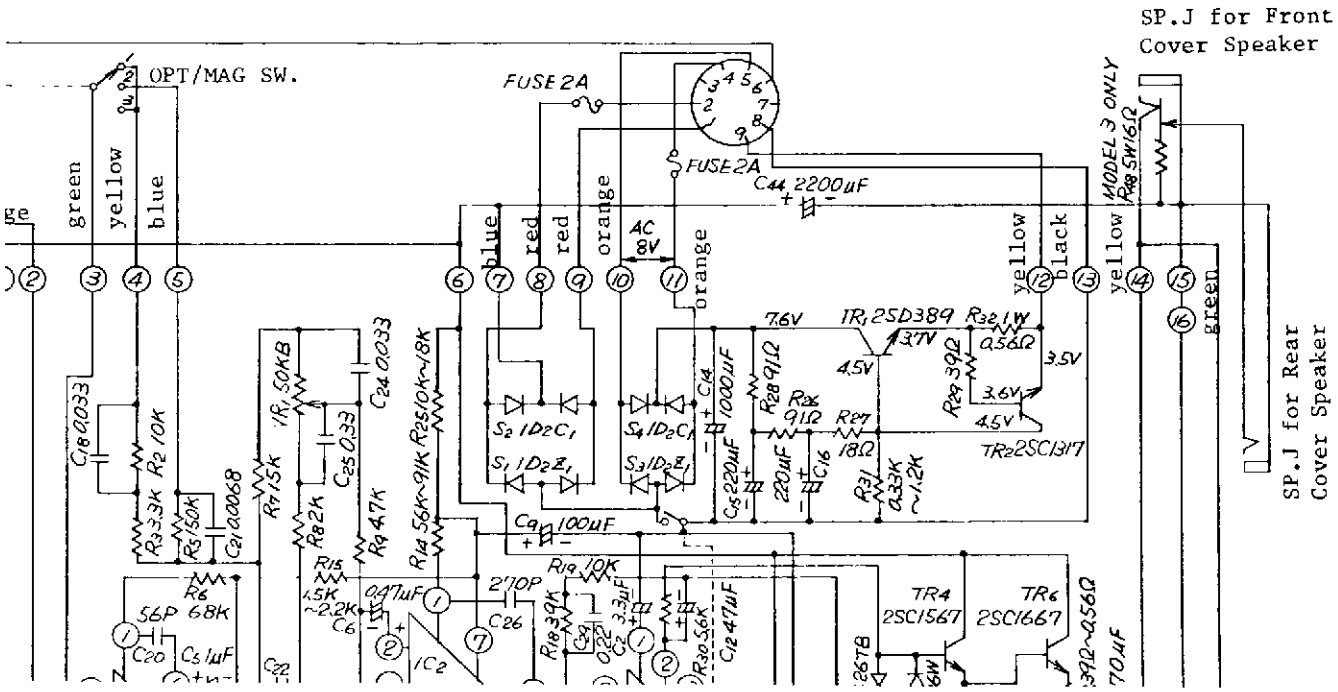
TR-2 is a protector for this regulating circuit. TR-1 is the DC regulator for the approximately 3.5 volts to the exciter lamp, routed through pins #8-9 of the 9 pin socket.

In –2 type magnetic playback the exciter lamp voltage is switched off, while in –3 type magnetic playback this switch is not provided.

C. Audio Amplifier Circuit

The input signal from the solar cell or magnetic head is accomplished through respective miniature jacks in the top of the amplifier chassis. (See Fig. #48)

Fig. #47



S-4-E0911
OSCILLATOR P.C. BOARD ASSY

R46 presents a 10K impedance load to the solar cell in optical playback. C42, R50, R54 and C48 for the input equalization network. The signal is coupled to IC1 (AN360) through capacitor C1. Feedback to IC1 is accomplished through a selectable network consisting of C18, R2, R3, R5 and C21. Position 1 and 3 of optical/magnetic selector switch provides a linear response of IC1. Position 2 switches in the magnetic playback equalization required. Bass control VR-1, R8, C25, C24 and R9 form a low frequency boost and attenuation equalization network. Treble control VR-2 and C22, C23 provide for high frequency boost and attenuation. The signal from the tone controls is fed through C6 to pin 2 of IC2. The output of IC2 is coupled through C7 to volume control VR-3, to pin 8 of IC3 through capacitor C28. Feedback for IC2 is accomplished through the network consisting of C8, R12, R10, R11, C27, and R16. From IC3 the signal is fed to TR3, TR4 and TR5. TR6 and TR7 act as complimentary final output drivers to an 8 ohm speaker through capacitor C13.

Since this is a single ended common ground output, (so called O.T.L. – Output Transformer Less-circuit), care should be taken to avoid a ground loop condition which may result in amplifier damage, when connecting the speaker ground to an external earth or electrical ground.

D. Magnetic Record Models (NST-3 & NT-3)

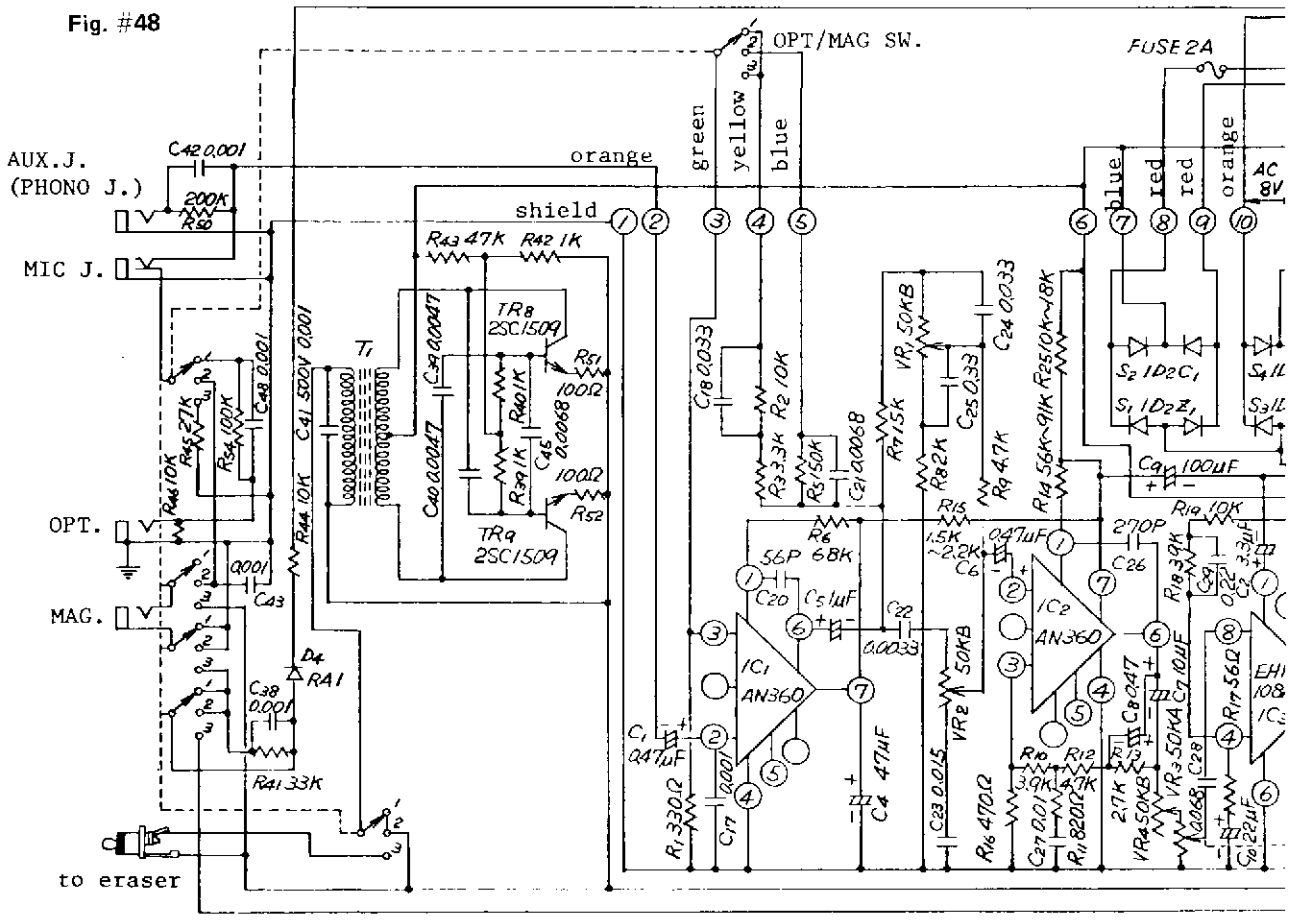
NST-3 & NT-3 models with magnetic record use a special amplifier module which include the bias and erase oscillator circuits. This circuit consists of T1 and oscillator transistors TR8 and TR9.

In magnetic record, the Mag/Rec selector switch set to the No. 3 position. Audio from the speaker jack (14) is routed through the capacitor resistor network C-38 and R-41 to the magnetic record head. At the same time bias and erase current is supplied from the bias oscillator to the combination magnetic playback/record and erase head.

E. Amplifier Circuit Diagrams

1. "N" series Amplifier Diagram (See the end of this manual) P. 73 and P. 74
2. "N" series Amp. P.C. Board Block Diagram (See the end of this manual) P. 79
3. "N" series Amp. Frequency Response (See next page)

Fig. #48



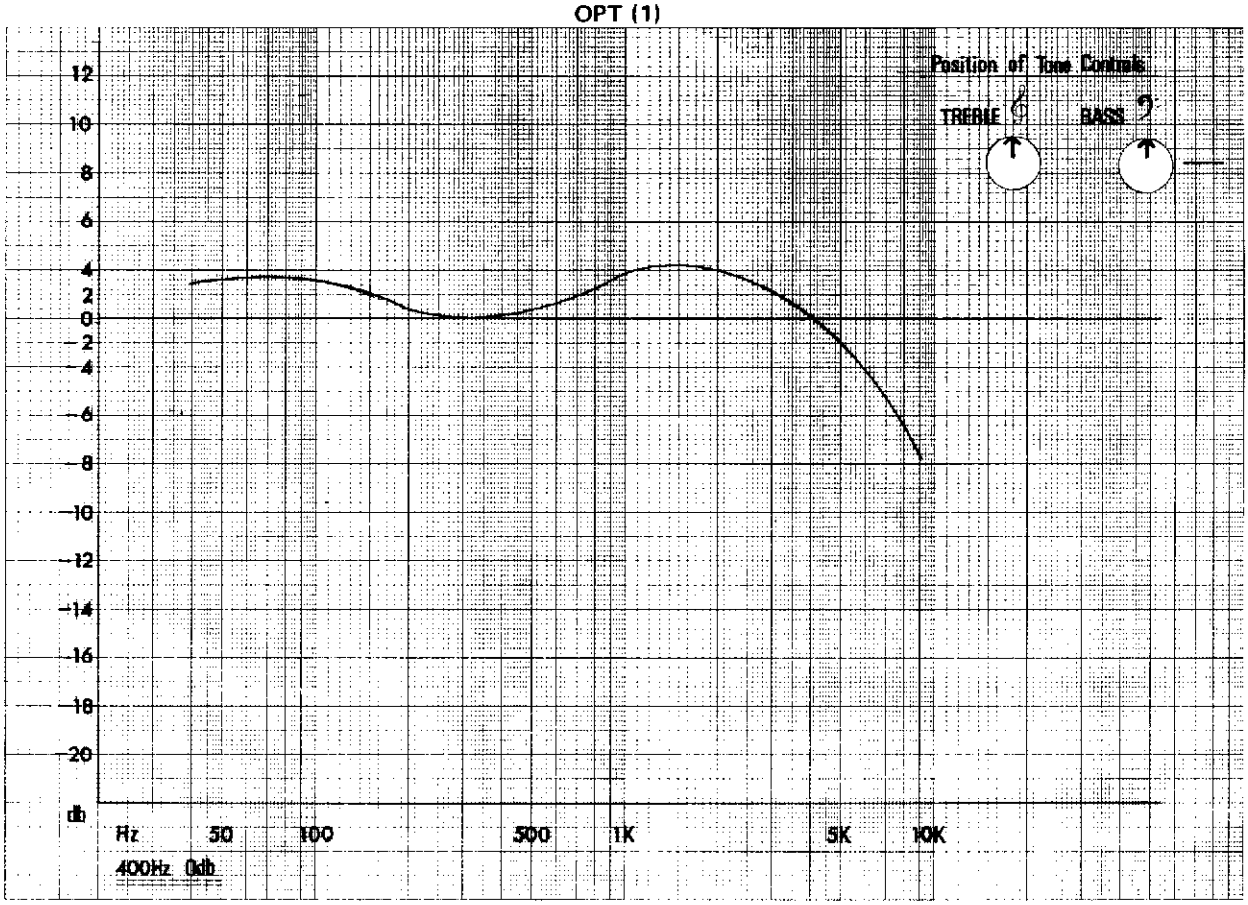
E-3: "N" Series Amplifier Frequency Response

NOTE: This is one of the typical patterns, and the figure may vary slightly with each projector.

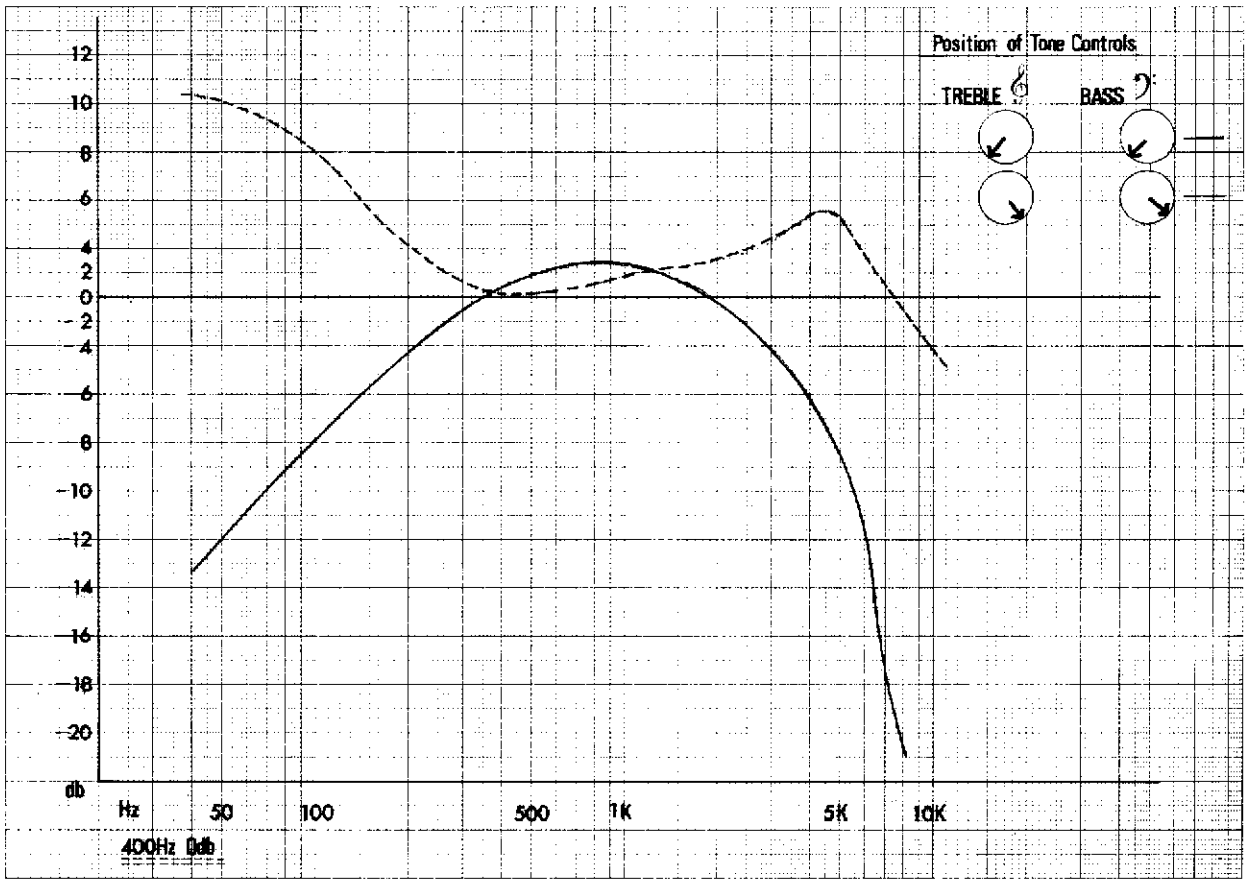
Position of Tone Control		OPT					MAG				
	TREBLE 𝄞	↑	↙	↘	↙	↘	↑	↙	↘	↙	↘
	BASS 𝄢	↑	↙	↘	↘	↙	↑	↙	↘	↘	↙
Frequency Response (400Hz 0db)	50	3.5	-12.0	10.0	8.5	-11.0	1.5	-15.5	6.0	5.0	-14.5
	100	3.5	-7.5	8.0	7.0	-7.0	1.5	-9.0	6.5	5.5	-8.0
	200	0.5	-3.0	4.0	3.0	-3.0	-0.5	-4.5	3.0	2.0	-4.0
	300	0.0	-1.0	1.5	1.0	-1.0	-0.5	-1.5	1.0	1.0	-1.0
	500	1.5	2.0	0.5	0.5	2.0	0.5	1.0	-0.5	0.0	1.0
	1K	3.0	3.0	2.0	1.0	4.0	2.0	1.5	0.0	-0.5	3.0
	2K	3.0	-0.5	3.5	-2.0	5.0	2.0	-1.0	3.0	-2.5	5.0
	3K	2.5	-4.5	4.5	-6.0	5.5	2.0	-3.5	5.5	-5.0	7.0
	4K	3.0	-6.0	6.5	-7.0	8.0	2.0	-5.5	7.0	-7.5	8.5
	5K	0.5	-10.0	5.5	-12.0	6.5	3.0	-6.5	9.0	-8.5	10.5
	6K	-3.0	-15.5	3.0	-16.0	4.5	3.0	-7.5	10.5	-9.5	12.0
	7K	-5.0	-19.0	1.0	-20.0	2.5	4.0	-8.0	12.0	-10.0	13.0
	8K						4.0	-9.5	12.0	-11.5	13.5
	9K						3.0	-11.5	12.0	-14.0	13.0
	10K						1.5	-15.0	10.0	-17.0	11.0

"N" Series Amplifier Frequency Response (typical pattern)

OPT (1)

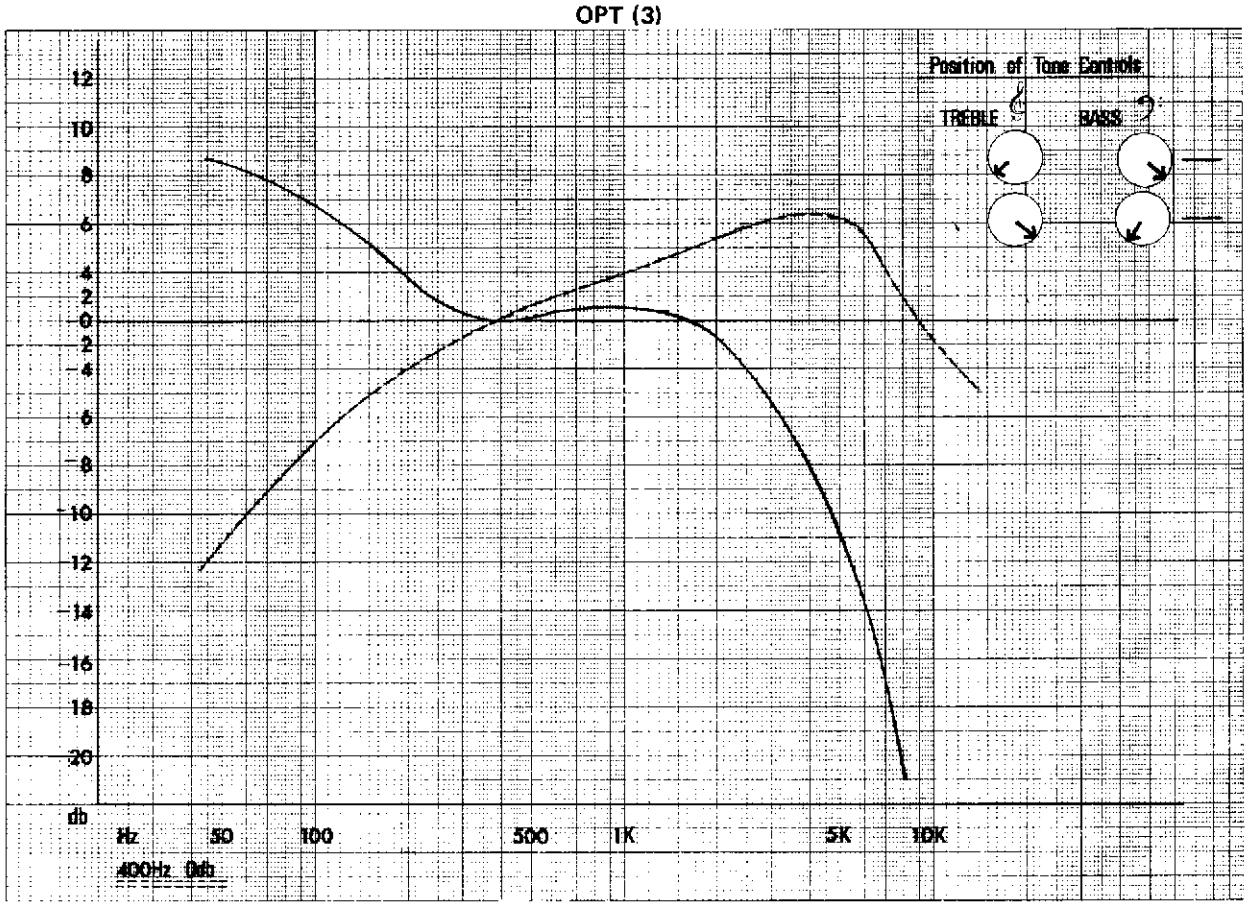


OPT (2)

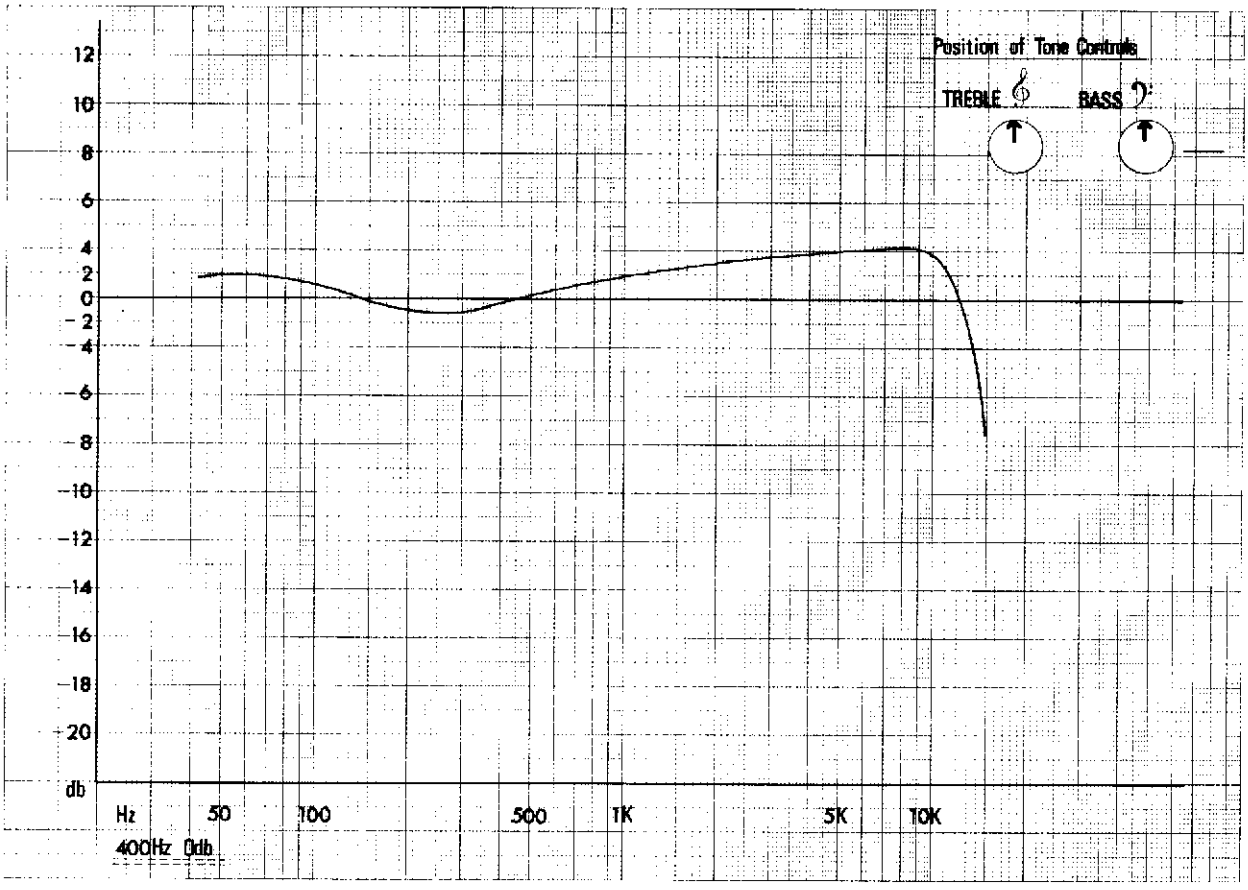


"N" Series Amplifier Frequency Response (typical pattern)

OPT (3)

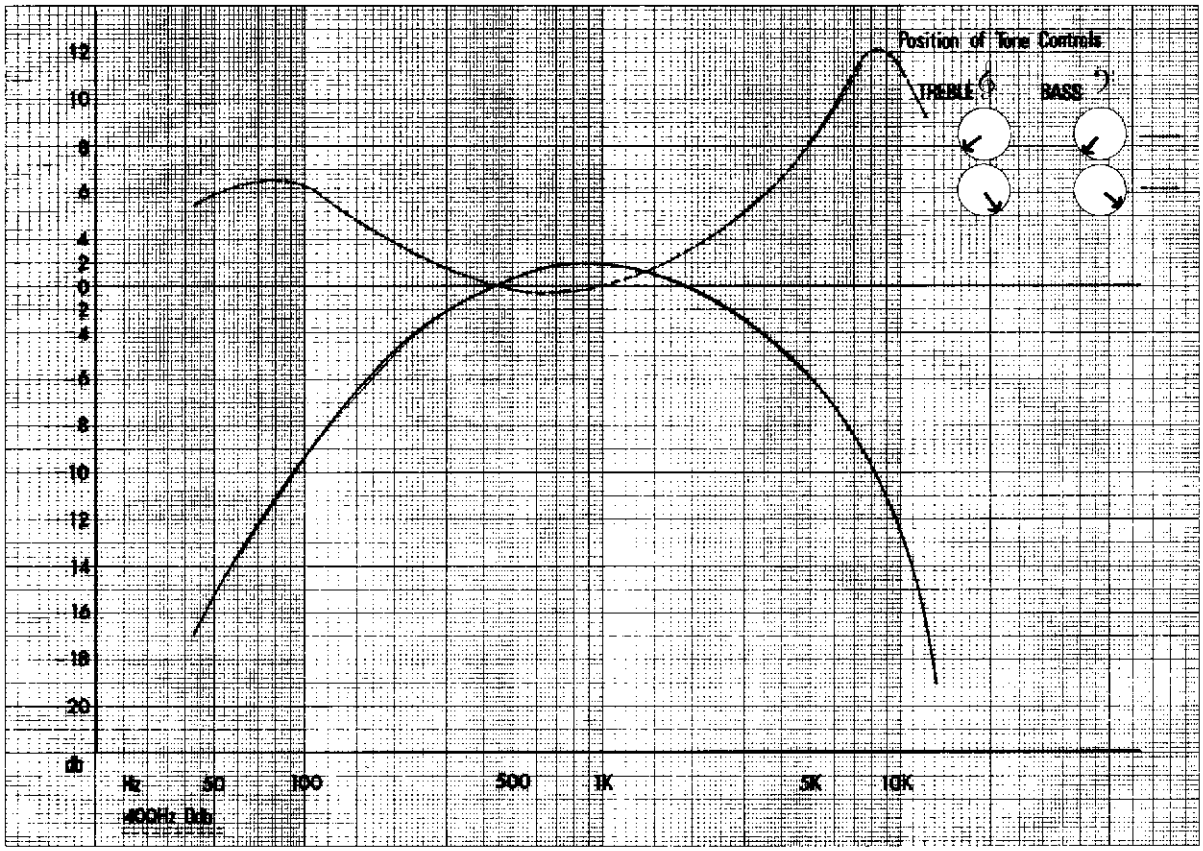


MAG (1)

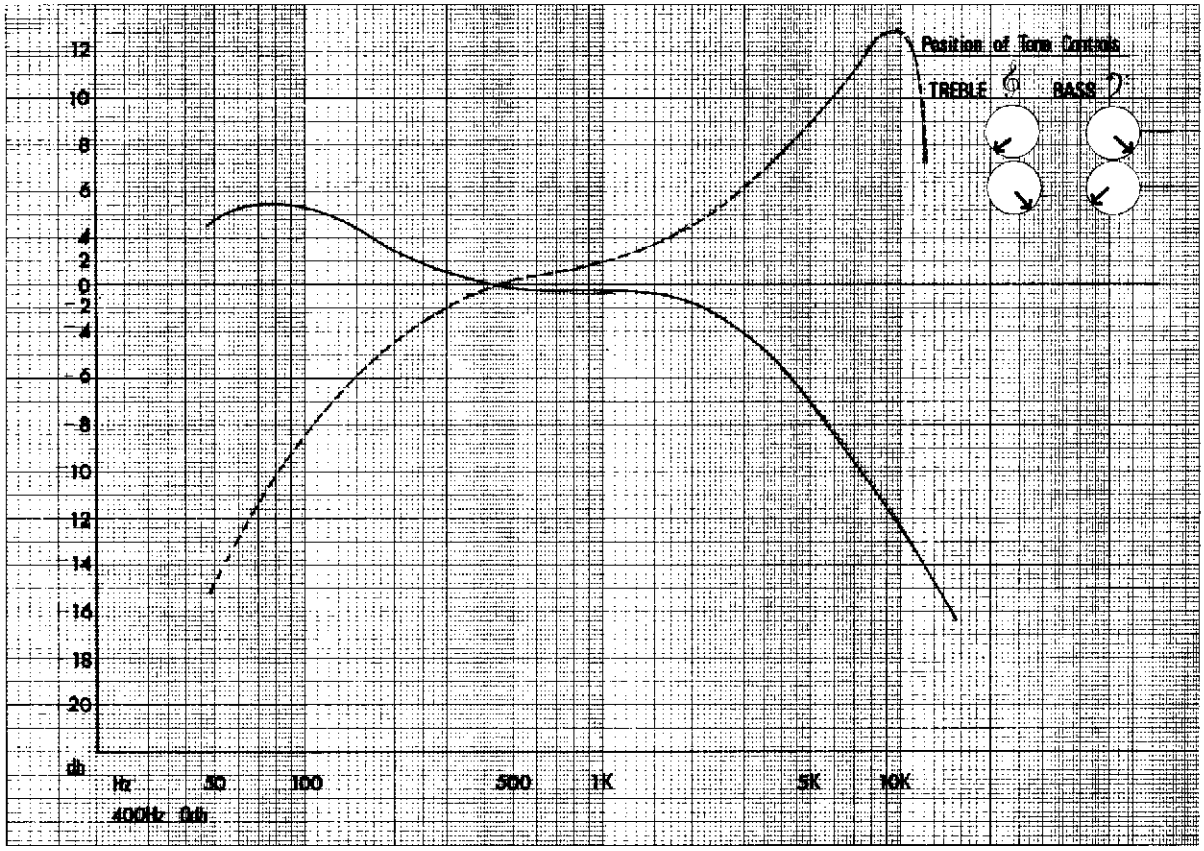


"N" Series Amplifier Frequency Response (typical pattern)

MAG (2)



MAG (3)



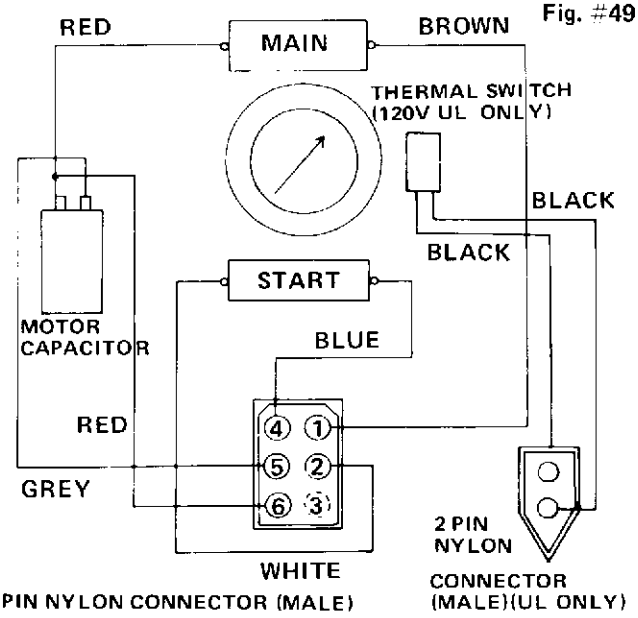
4-3: MOTOR MODULE

A. Specification

AC Induction type
1/20HP
100 – 120V, and 220 – 240V
Power consumption: 144 – 168W (120V, 1.2A) or
(220, 240V 0.7A)
Starting Torque: 1.6kg
Rated Torque: 0.8kg

B. Motor Circuit Diagram

Fig. #49



C. 6 pin Motor Connector (Female) (Fig. #50)

Pin #	Wire Color	Connected To:
1.	Brown	Micro Switch #1
2.	White	Micro Switch #2
3.	N/C	
4.	Blue	Micro Switch #3
5.	Grey	Micro Switch #3
6.	Red	AC Terminal #4 – #3 (Semko: Terminal Ⓝ)

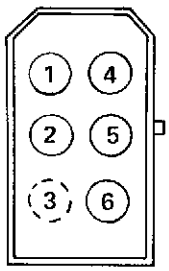


Fig. #50

D. Silent Film Operation And 50 ↔ 60Hz Conversion

1. Silent Film Operation

a. Disconnect power cord.

b. Open rear cover. Turn inching knob, at the same time guiding the belt first to the smaller motor pulley then to the larger shutter pulley.

c. Change back to sound speed by reversing the above procedure.

NOTE: 50/60Hz models do not have silent speed.

2. 50 ↔ 60Hz Conversion

The standard "N" series projector is available either as 50Hz sound and silent or 60Hz sound and silent operations. Conversion from 50 to 60Hz or 60 to 50Hz can be accomplished by changing the motor pulley only.

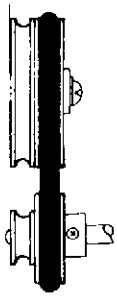
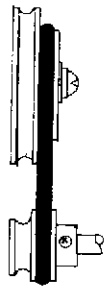
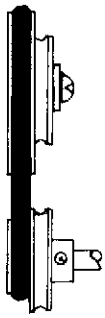
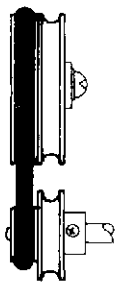
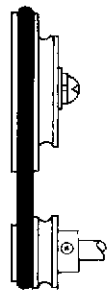
To allow the projector to be operated at either 50 or 60Hz sound only, it is necessary to change the motor pulley and the cam tank pulley (Shutter Pulley). It is now possible to change frequency by simply shifting the motor drive belt.

The chart below indicates each speed combination:

NOTE: For Dual-Voltage models, such as 110/220V, or 120/240V 50/60Hz, the combination is;

	110/220V 50/60Hz	120/240V 50/60Hz
Shutter Pulley :	312-11901	312-11901
Motor Pulley :	314-12991	314-12981

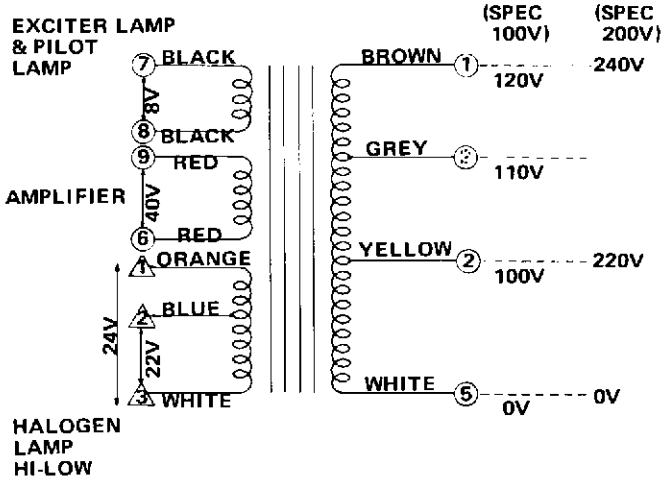
Speed Change Combination Chart

	50Hz Sound & Silent (24fps & 18fps)	50/60Hz Sound/Sound (24fps & 24fps)	60Hz Sound & Silent (24fps & 18fps)
Shutter Pulley	312-11801	312-11901	312-11801
Motor Pulley	312-12921	314-12971	312-12911
	Sound (24fps) speed 	Sound 50Hz 24fps speed 	Sound (24fps) speed 
	Silent (18fps) speed 	Sound 60Hz 24fps speed 	Silent (18fps) speed 

4-4: TRANSFORMER MODULE

A. Transformer Circuit Diagram
(Earlier Production)
Applicable on;
NT : S/N 10001 – 26135
NST : S/N 10001 – 10673

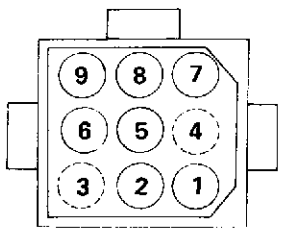
Fig. #51



B. Connector Wiring Code
(Earlier Production)
9 Pin Nylon Connector (Male) (Fig. #53)
Applicable on;
NT : S/N 10001 – 26135
NST : S/N 10001 – 10673

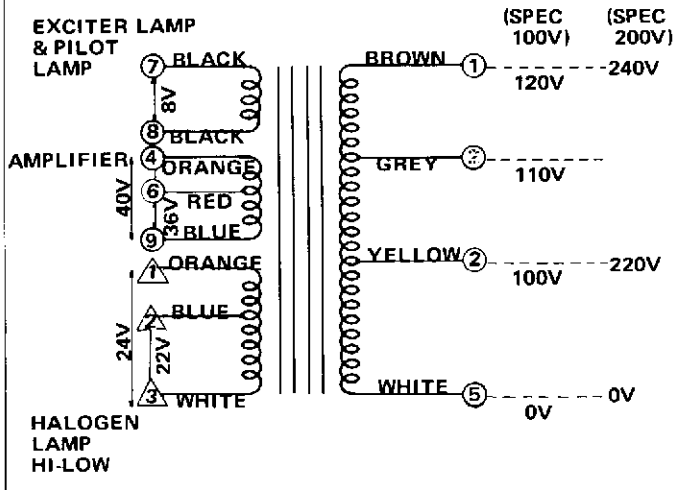
Pin #	Color of Wire (for 100V, 120V, 220V, 240V types)	Color of Wire (for 110V type only)
1.	Brown	Brown
2.	Yellow	Grey
3.	N/C	N/C
4.	N/C	N/C
5.	White	White
6.	Red	Red
7.	Black	Black
8.	Black	Black
9.	Red	Red

(MALE) Fig. #53



(Later Production)
Applicable on;
NT : S/N 26136 and up
NST : S/N 10674 and up

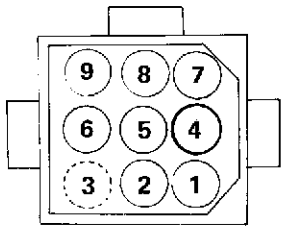
Fig. #52



(Later Production)
9 Pin Nylon Connector (Male) (Fig. #54)
Applicable on;
NT : S/N 26136 and up
NST : S/N 10674 and up

Pin #	Color of Wire (for 100V, 120V, 220V, 240V types)	Color of Wire (for 110V type only)	Color of Wire (for 120V UL & CSA)
1.	Brown	Brown	Brown
2.	Yellow	Grey	Yellow
3.	N/C	N/C	Grey
4.	Orange	Orange	Orange
5.	White	White	White
6.	Red	Red	Red
7.	Black	Black	Black
8.	Black	Black	Black

(MALE) Fig. #54



NOTE: Transformers of later production are supplied with the 36V tap connected. To change to the 40V tap, extract pins #4, #6, and insert the orange wire into #6 hole and the red wire to #4 hole.

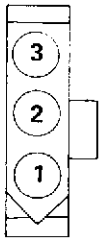
NOTE: The transformer with AC 36V & 40V taps is identified by the following part numbers;

314-60201a	Transformer	120V
314-60301a	Transformer	110V
314-60401a	Transformer	220/240V
314-60801a	Transformer	220V (FEMKO type)
314-60951a	Transformer	220V (SEMKO type)
314-60981a	Transformer	110/220V (Dual Voltage)
314-60991a	Transformer	120/240V (Dual Voltage)

3 Pin Nylon Connector (Female) (for all types) (Fig. #55)

Pin #	Color of Wire
1.	Orange
2.	Blue
3.	White

Fig. #55

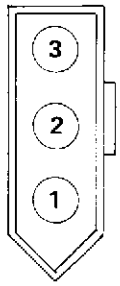


(FEMALE)

3 Pin Nylon Connector (Male) (Fig. #56) (for all types)

Pin #	Color of Wire	Connection to:
1.	Red	Micro Switch #5 (Lamp High)
2.	Blue	Micro Switch #4 (Lamp Low)
3.	White	Halogen Lamp

Fig. #56

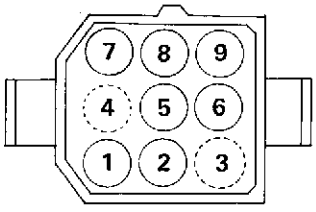


(MALE)

9 Pin Nylon Connector (Female) (Fig. #57)

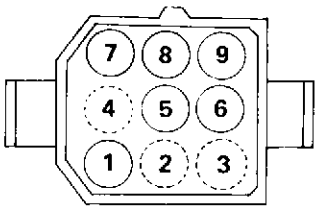
Pin #	Color of Wire (for 100V, 110V, 120V, 220V, 240V standard types)	Color of Wire (for 120V UL, CSA type)	Color of Wire (for 220V SCAN type)	Connection to:
1.	Brown	Brown	N/C	AC Terminal #1
2.	Black	N/C	Black	AC Terminal #2
3.	N/C	N/C	N/C	
4.	N/C	N/C	N/C	
5.	White	White	White	AC Terminal #4 – #3
6.	Orange	Orange	Orange	MT 9 Pin Socket #1 (or #2)
7.	Blue, Blue	Blue, Blue	Blue, Blue	MT 9 Pin Socket #4 Pilot Lamp
8.	Blue, Blue	Blue, Blue	Blue, Blue	MT 9 Pin Socket #5 Pilot Lamp
9.	Orange	Orange	Orange	MT 9 Pin Socket #2 (or #1)

(STANDARD TYPE) Fig. #57-A



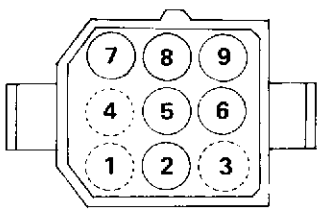
(FEMALE)

Fig. #57-B
(120V UL & CSA TYPE)



(FEMALE)

Fig. #57-C
(220V SCAN & SEMKO TYPE)



(FEMALE)

4-5: LENS AND GATE MODULE

A. Film Gate Assembly

Fig. #58

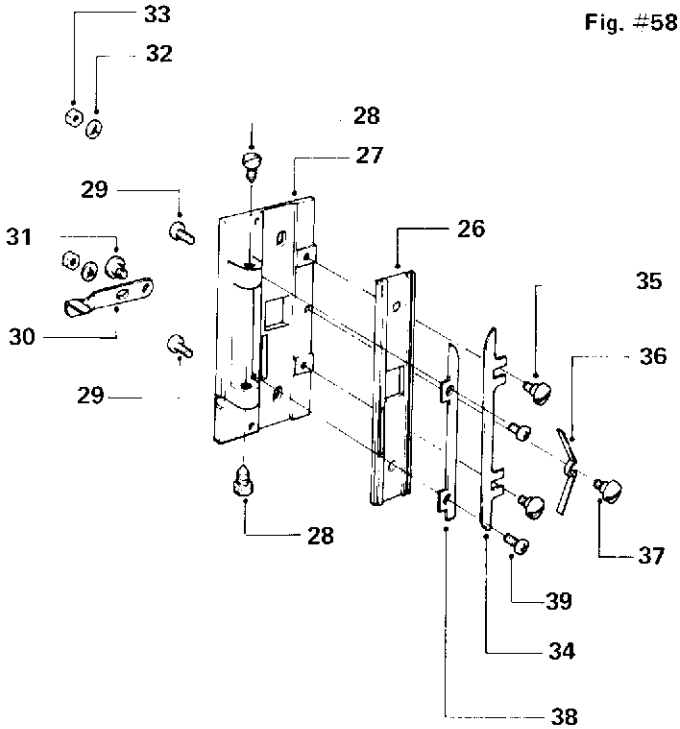
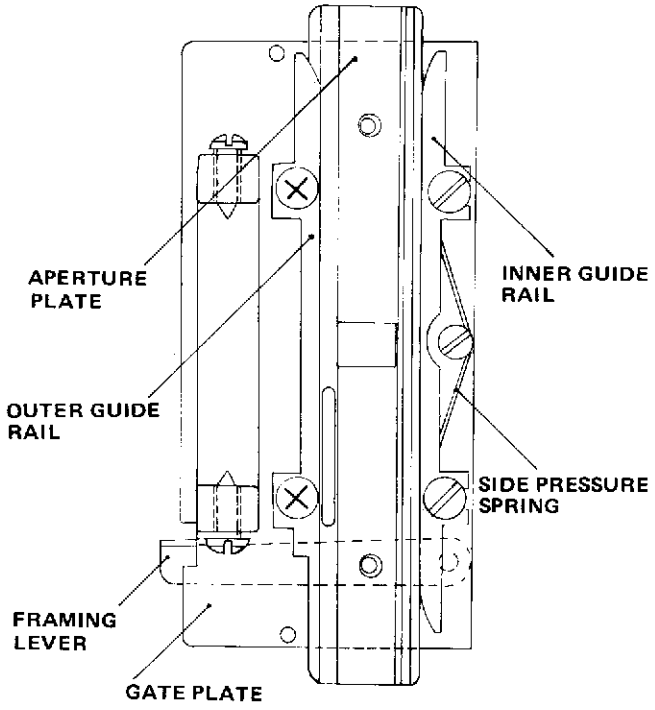


Fig. #59

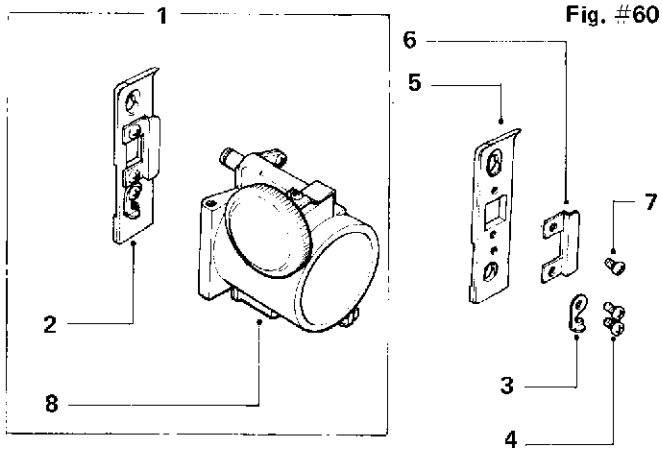


The film gate assembly consists of the aperture plate (26), framing lever (30), inner (34) and outer (38) guide rails and the film gate plate (27). The film gate assembly maintains close contact with the film and must be kept free from accumulated dust or dirt. The aperture plate (26) is mounted to the gate plate by two nuts, allowing it to slide up and down with the framing lever. The outer guide rail (38) is fixed to the gate plate by two screws. The inner guide rail (34) is movable and is mounted by two shoulder screws and is adjusted by the side pressure spring (36).

1. Adjustment Of The Inner Guide Rail:
   The tension of the inner guide rail is determined by the side pressure spring (36) about 60 – 70 grams. Excessive tension will cause early film wear, while insufficient tension causes an unsteady picture. The tension can be increased or decreased by slightly bending the spring. A weak or incorrectly formed spring should be replaced.
2. Adjusting The Outer Guide Rail Position:
   Unless the gate plate has been removed or the outer rail has been replaced, no adjustment should be required. To adjust, thread a SMPTE registration test film and align the center of the frame with the center of the aperture by adjusting the position of the outer rail. It may also be necessary to re-position the claw (See Sec. 4-1-D)

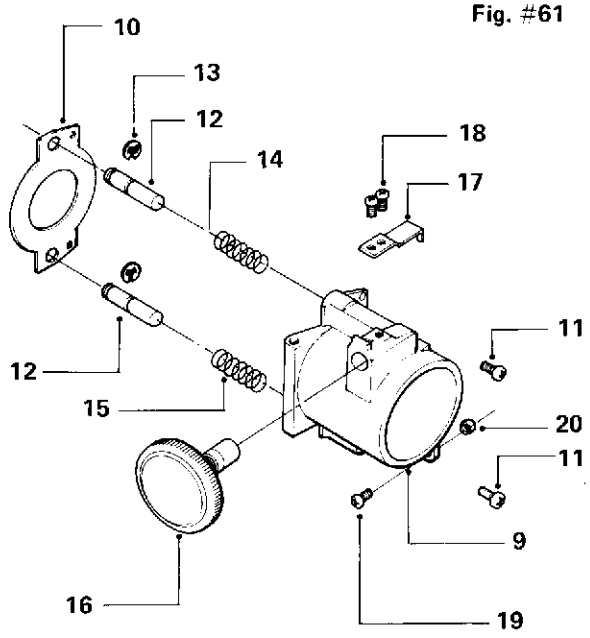
B. Film Shoe And Lens Holder Assembly

Fig. #60



1. Film Shoe (Fig. #60)
   The film shoe assembly (2) consists of the film shoe (5), the threading release plate (6) and the shoe lock (3). The film shoe assembly is easily removable with the shoe lock for cleaning or replacement. It is important that the shoe be kept clean and free to seat squarely against the aperture plate. The threading release plate engages with the self-threading mechanism to release the film shoe during threading.

Fig. #61



2. Lens Holder (Fig. #61)
The lens holder consists of the lens holder barrel (9), the focus knob (16) and the lens friction drive pinion, the upper and lower shoe pins (12) and springs (14) and (15).

3. Adjustments

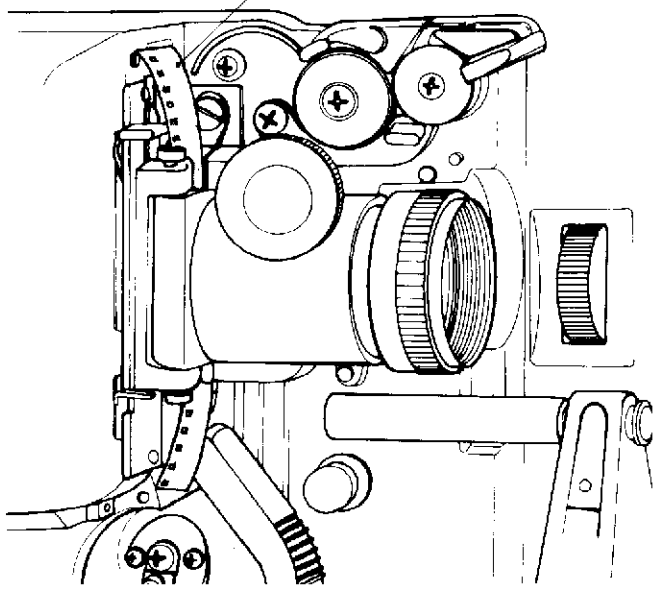
a. Film Shoe Pressure
The pressure of the film shoe against the film is maintained by the tension springs (14 & 15) located behind the shoe pins (12). Excessive film shoe tension will cause unnecessary film wear, insufficient tension can cause an unsteady picture, excessive film gate noise and uneven or erratic focus. To test the film shoe pressure retract the cam claw, insert a strip of film in the gate and close the gate. Attach a gram scale to the end of the film at the top. A gentle steady pull should produce about 90 to 110 grams of pull, indicating the correct film shoe pressure. To adjust the pressure, stretch, shorten or replace the shoe springs.

NOTE: The upper spring is shorter than the lower spring. The extra tension of the lower spring is designed to overcome the film movement caused by the claw action at the lower end of the film shoe. It is important the shoe pins move freely in the lens holder. If not, clean away any dirt or grease restricting its free movement. Do not lubricate.

b. Film Shoe Position
When the gate is closed the film shoe should line up along the edge of the outer guide rail and seat flat against the aperture plate. To adjust the position of the film shoe, loosen the retaining plate screws (11), close the film gate and insert one film thickness between the outer rail and the film shoe. (Fig. #62)
Reposition the retaining plate to obtain moderate tension on the film and secure the retaining plate screws (11). Open and close the gate to be sure the film shoe seats completely.

FILM

Fig. #62



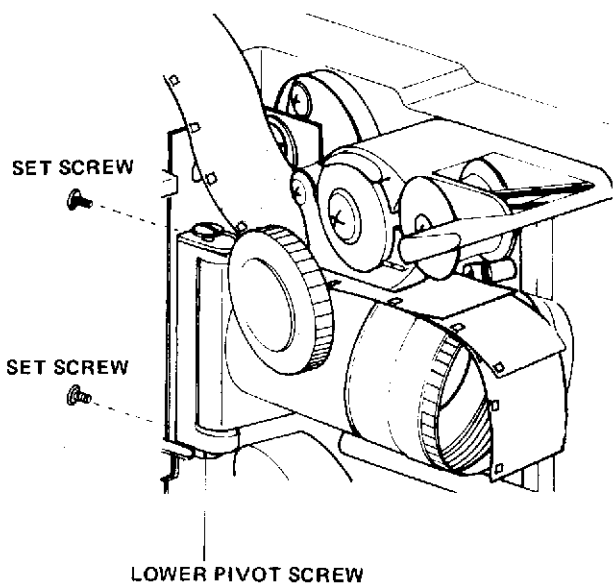
c. Uneven Focus
Uneven focus occurs whenever the image on the film is not flat and perpendicular to the optical path. To adjust the axis of the lens to the aperture plate, set the projector to exact right angles to the screen. Without a film in the gate, project an image of light on a screen at least 3' or 1m wide. Focus the edges of the image. If both sides are not focused equally, adjust the lens holder index screw and lock nut (19 & 20) to achieve optimum equal focus.

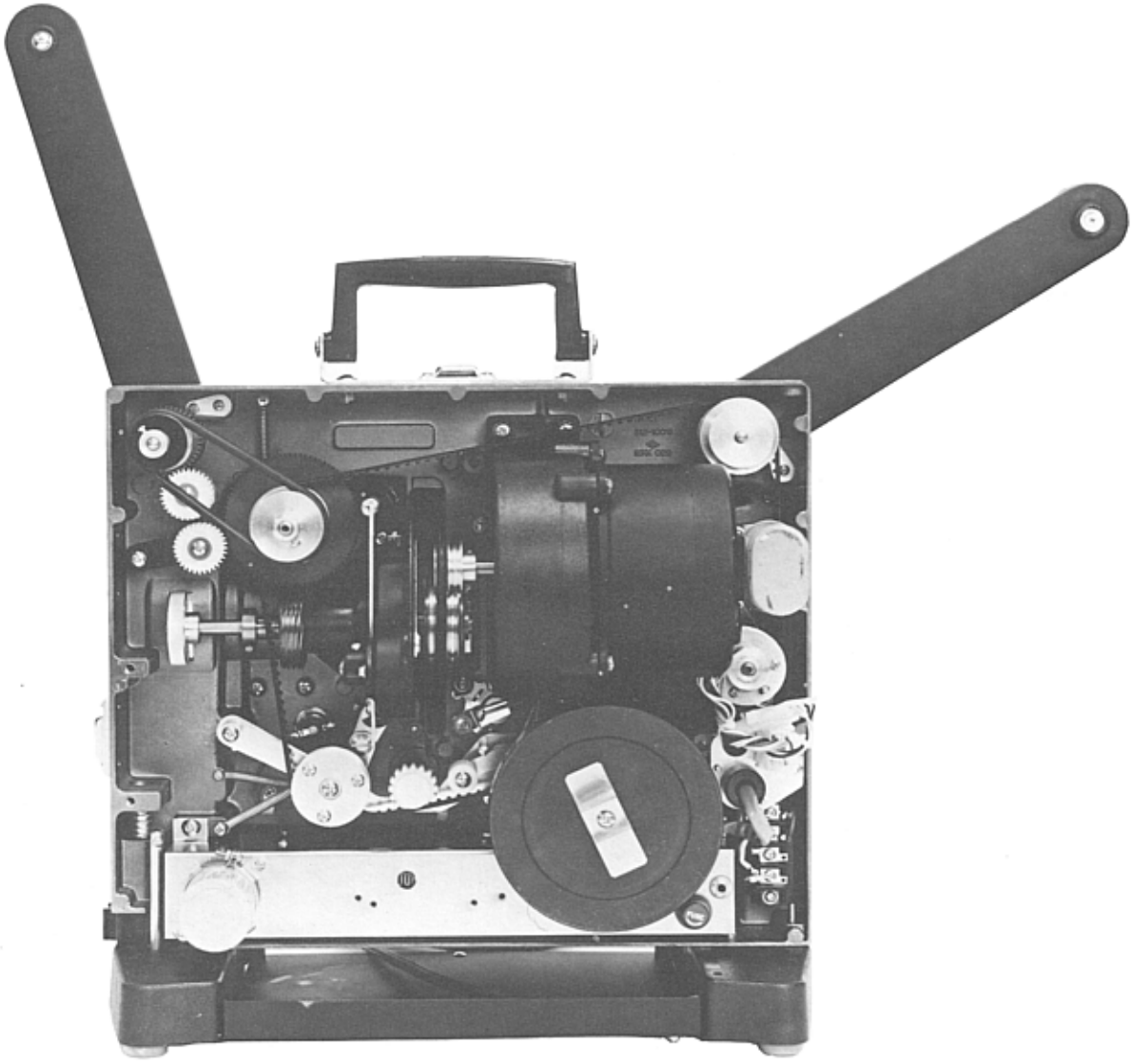
NOTE: Fast lenses such as the standard f/1.2 50mm (2") require more precise adjustments than slower lenses.

d. Lens Holder Hinge Adjustment
The lens holder provides for automatic closing of the No. 1 film shoe when manually thread-

ing the projector and restricts the opening of the film shoe during the self-thread operation. Too tight a clearance does not allow for easy film threading or removal, and may possibly puncture the film between the perforations during self-thread. The clearance between the No. 1 film shoe and the lens holder should be no less than three film thickness. (Fig. #63) To adjust, open the lamp house door and loosen two set screws behind the gate plate (29 of Fig. #58, and Fig. #63), and slightly turning the upper and lower pivot screws (28 of Fig. #58, and Fig. #63) adjust the lens holder's position to obtain the correct clearance. The pivot screws should be snug against the lens holder.

Fig. #63





314—5: GENERAL MECHANICAL SERVICING AND ADJUSTMENTS

5-1: TAKE-UP ARM ASSEMBLY

A. Description (Fig. #64 & 65)

The drive to the take-up arm is obtained through the take-up clutch mechanism (Items 11, 12 and 13). In forward and rewind the clutch cam (12) is engaged, driving the belt and take-up pulley (18) in a clockwise direction for normal film take-up. In reverse the clutch cam (12) is disengaged, removing all drive to the take-up pulley (18). The amount of torque required to take-up a film is proportioned to the weight and diameter of the reel. As the weight of the film pack increases the friction between the spindle assembly (14) and the take-up pulley (18) increases to provide the necessary torque to take-up reels up to 2000ft or 600m.

B. Adjustments

1. The take-up torque

The take-up torque is automatically controlled by the weight and size of the film pack, however, for this to function properly it is essential that the take-up pulley (18) be well lubricated and free running on the bushing. The cork liner in the spindle assymbly (14) must be well lubricated to provide a smooth, even take-up. Excessive take-up tension is caused by insufficient or improper lubrication of the cork liner. Weak or no take-up may be caused by a worn cork liner or oily belt. Refer to lubrication chart for proper lubrication.

Fig. #64

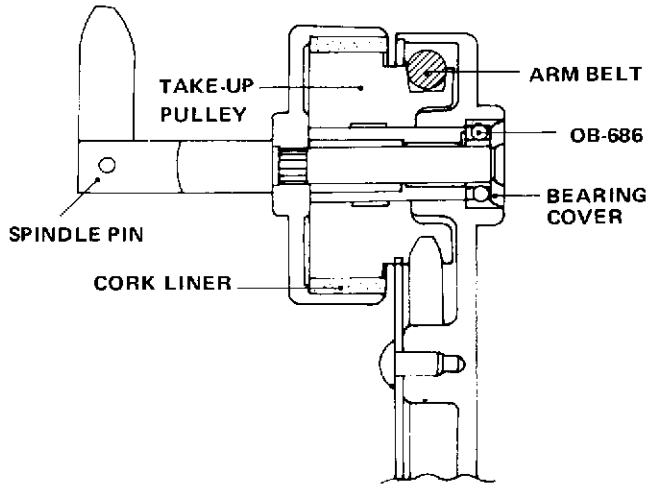
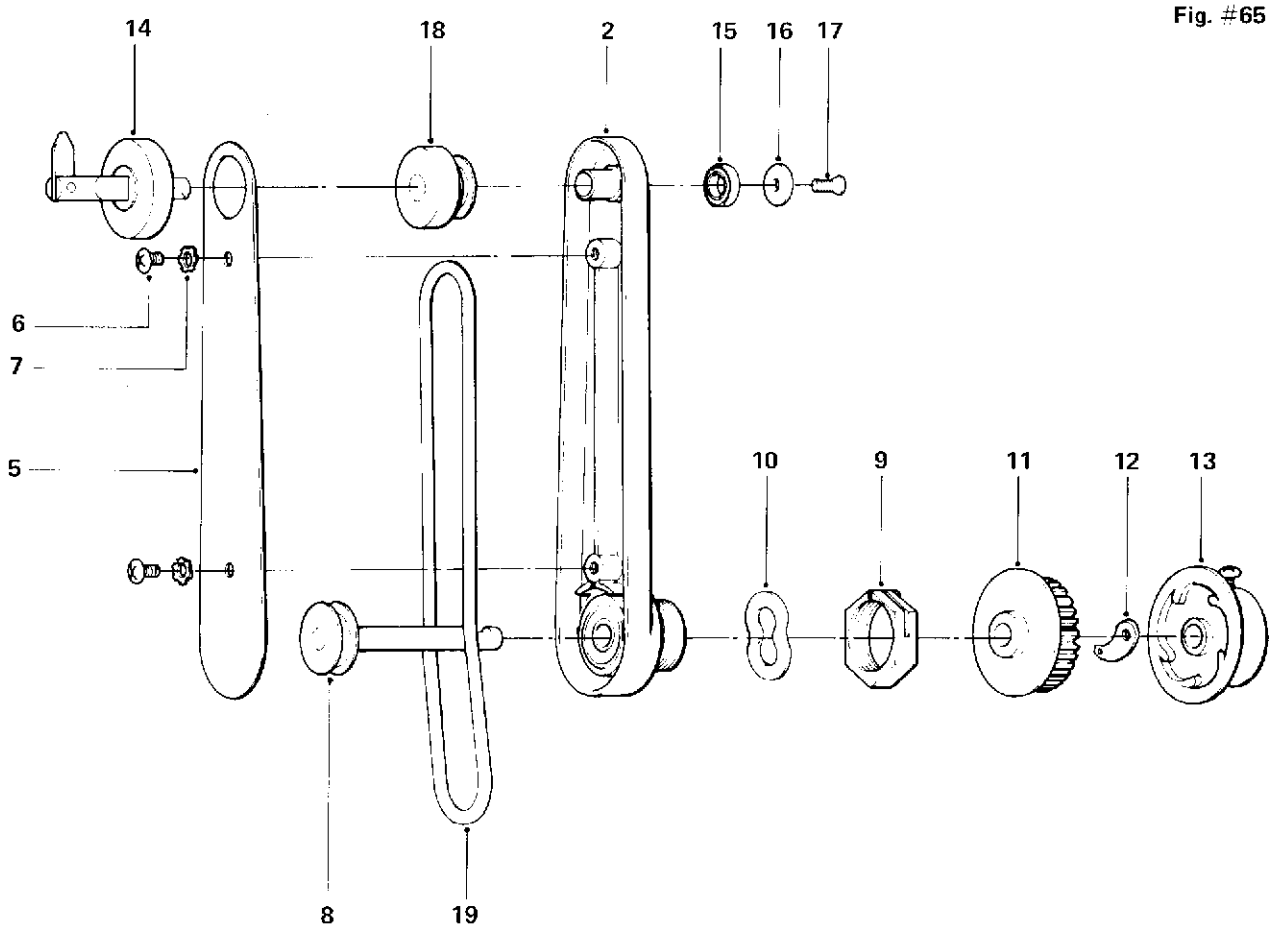


Fig. #65



2. Take-Up Clutch Mechanism:

The take-up clutch mechanism requires no lubrication. The clutch cam (12), clutch cover (13), and drive gear (11) should be kept clean and free from dirt. A small amount of silicone oil on the drive pulley shaft is sufficient (see lubrication chart). When re-assembling the clutch mechanism, it is important that the clutch cam be positioned correctly. A space of 0.2mm is required between the drive gear and clutch cover. (Fig. #66 & 67)

Fig. #66

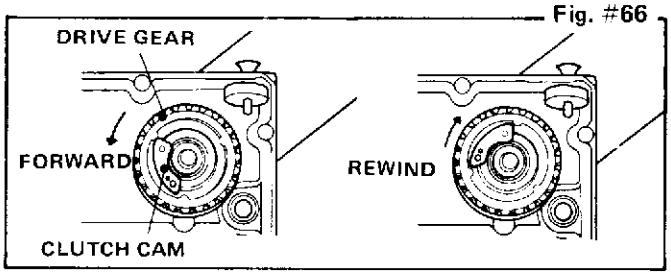
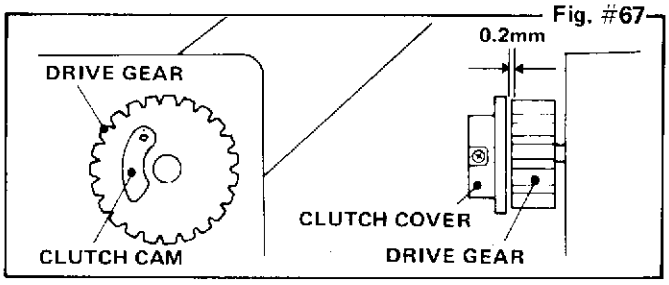


Fig. #67



5-2: SUPPLY ARM

A. Description: (Fig. #68)

During forward the supply arm only serves as a drag to provide a small amount of back tension to the film. The amount of back tension is controlled by the cork disc (17) spring (20) and the adjustment of the knurled nut (22). In reverse the motor reverses direction engaging the reverse drive clutch (18) and the reverse belt drives reverse pulley (19) which is clutch coupled via the cork disc (17) to drive the pulley (8) and spindle (23) providing reverse film take-up.

In rewind the drive to the supply arm is accomplished through upper and lower rewind gears which are engaged when the rewind lever is in the rewind position. (Fig. #69 & 70)

Fig. #69

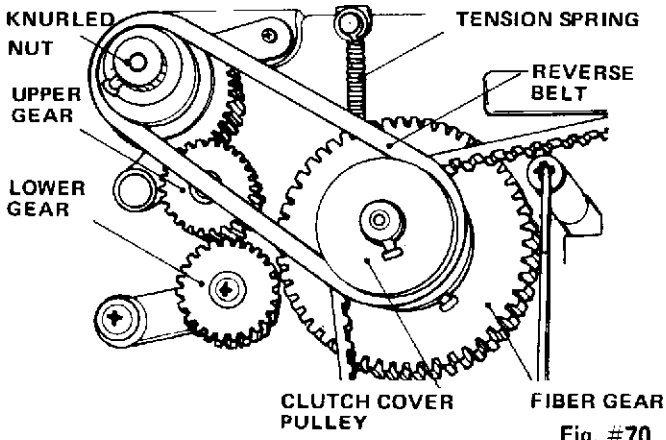


Fig. #70

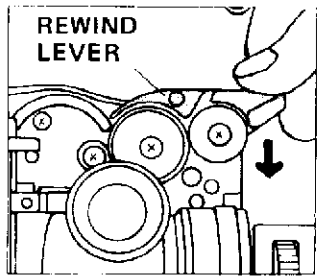
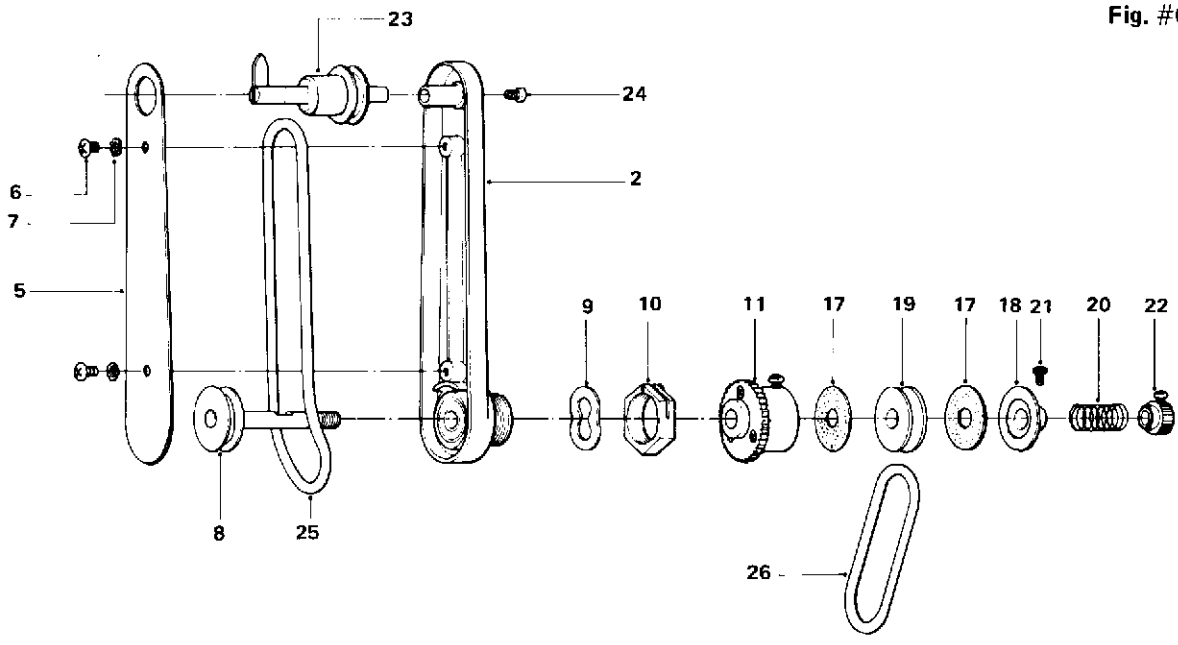


Fig. #68



B. Adjustments:

The supply spindle should be lubricated with petroleum oil (see lubrication chart). The belt must be clean and free from oil or dirt. Oily belt may result in poor rewind. The knurled nut (22) adjusts the back tension to the supply reel, too little back tension will result in uneven or jerky film feed and weak reverse take-up tension. Adjusting the knurled nut effects both the reverse take-up and the supply tension. Correct adjustment will be a compromise.

5-3: REVERSE PROJECTION

A. Description

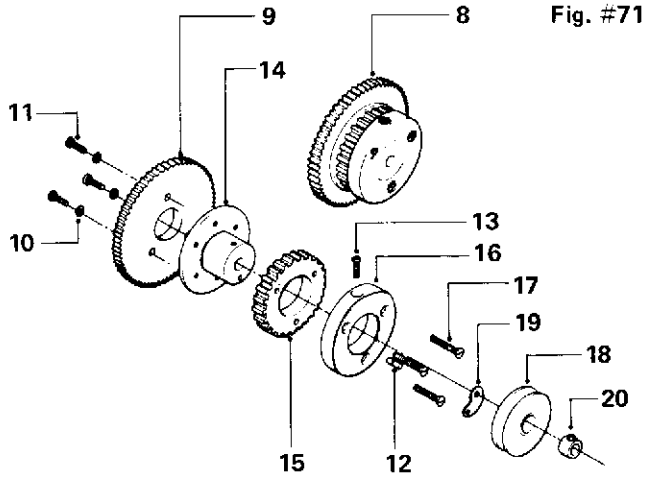
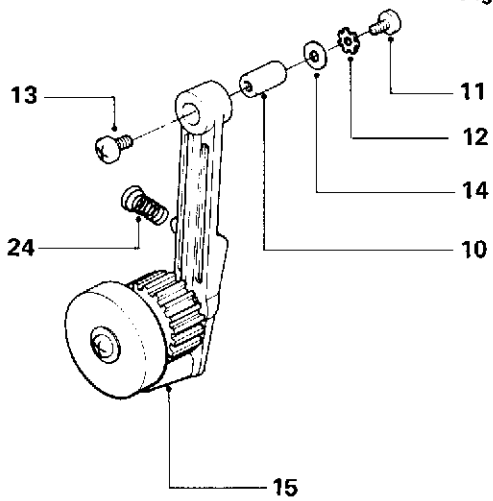


Fig. #71

In reverse the motor rotates in a counter-clockwise direction engaging the reverse take-up clutch cam (19) which in turn drives the clutch cover pulley (18), driving the reverse belt. At the same time the main drive belt drives the reverse rubber roller (15 of Fig. #72 & Fig. 73) against the set collar behind the flywheel, thereby driving the set collar or the sound drum in the counter clockwise direction.

Fig. #72



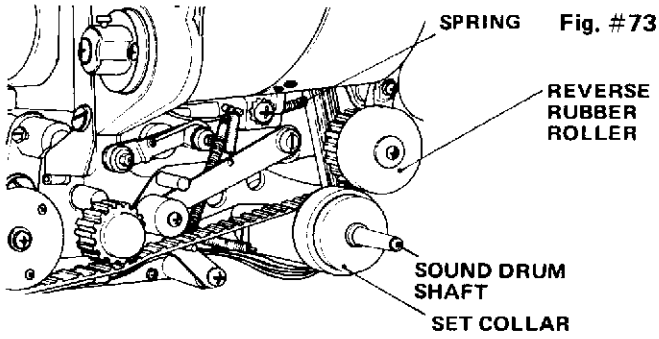


Fig. #73

Driving the flywheel is necessary to maintain the lower loop when operating the projector in reverse. In normal forward projection the main drive belt carries the reverse rubber roller and bracket assembly (15) away from the set collar where it can rotate freely. The rubber roller must not be in contact with the set collar in the forward mode. (See Sec. 5-7-A)

B. Adjustments:

The reverse take-up clutch requires no lubrication except the bushing of the clutch cover pulley (18). (See lubrication chart). When re-assembling the reverse take-up clutch mechanism, it is important that the clutch cam (19) be positioned correctly. A space of approximately 0.2mm is required between the drive gear assembly (8) and the pulley (18). This is determined by the position of the set collar (20).

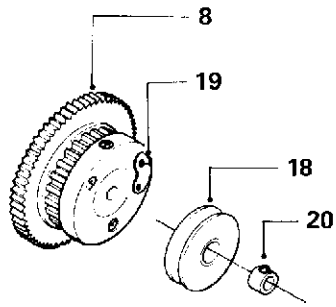


Fig. #74

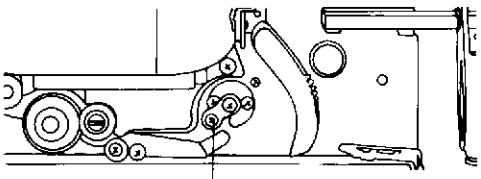
The reverse rubber roller requires no adjustments as long as the main drive belt is in contact with the roller's drive gear. The spring (24) is required to maintain enough pressure to assure the gears contact with the main drive belt. It may be necessary to stretch this spring to assure that the roller has cleared the set collar in the normal forward position and that it drives the sound drum during reverse. This action can be observed by operating the mechanism manually via the inching knob and with the flywheel removed. The rubber roller should be clean and free from any grease or oil. A dry or glazed roller should be replaced.

5-4: LOWER LOOP SETTER SYSTEM

A. Description

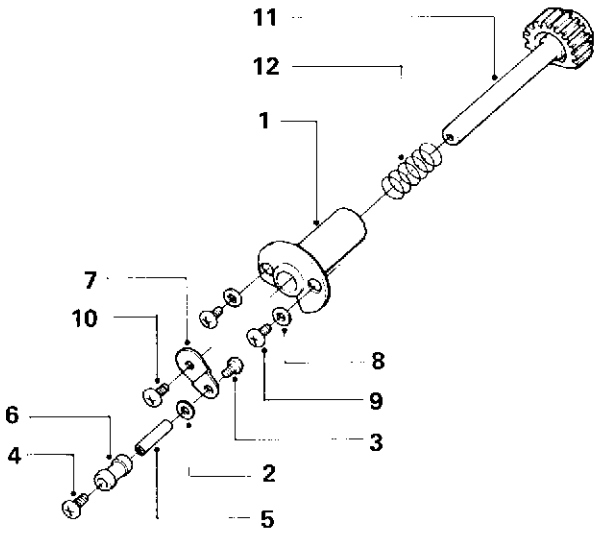
Torn or damaged sprocket holes in a film will cause the lower loop to be shortened. When this occurs, the film pull down will be out of sequence with the shutter causing a jitter or jumping picture. When this occurs the automatic loop setter will reset the lower loop again bringing the film under control of the pull down mechanism.

Fig. #75



LOWER LOOP SETTER ROLLER
"7:30 O'CLOCK" POSITION

Fig. #76



The automatic loop setter consists of the setter roller (6), the hub assembly (1) and the gear and shaft assembly (11). When the lower loop is shortened one complete frame or more, the film applies pressure on the setter roller (6) which in turn causes the eccentric gear (11) to engage, rotating the setter roller one complete revolution, pulling down on the film thus re-establishing the correct lower loop. Additional rotations may indicate severely damaged film or incorrect loop setter adjustments.

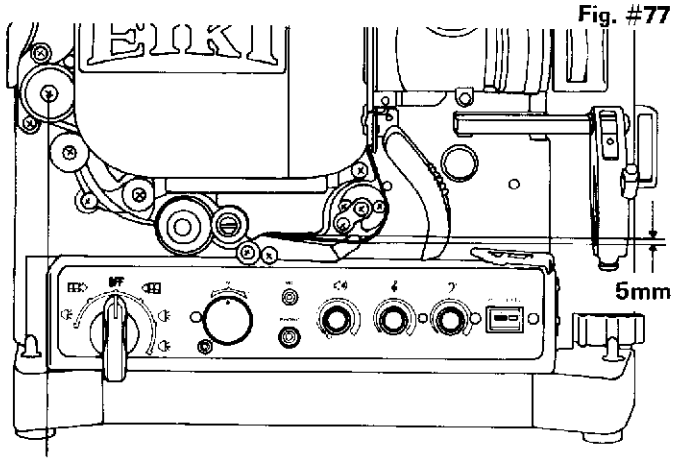
B. Adjustments

In the normal operate position with good film the loop setter roller should rest at approximately 7:30 o'clock (Fig. #75), with the flat side of the gear (11) parallel to the main drive belt with approximately 0.5 to 1mm of clearance. The belt must ride flat with respect to the gear. If not, the tension gear and arm assembly is not aligned correctly. To correct this condition it may be necessary to reform the tension gear arm. With the belt and gear parallel the loop setter roller is adjusted to the 7:30 position by loosening the arm position screw (10). While holding the gear in place, adjust the arm position and secure the screw. Operate the projector without film. If the loop setter rotates more than once with a small amount of upward pressure, the spring (12) tension is too loose. Remove the spring and slightly stretch or replace it. Re-adjust and test again.

C. Loop Setter Timing:

Correct timing is required for proper operation of the loop-setter. Set the projector to self-thread. Turn on the projector and insert a 2 – 3 meter strip of good film. When threaded, release the threading mechanism. Observe the loop setter should only rotate once. Continued rotation indicates too small a lower loop. Too large a loop will not reset the loop when missing or damaged sprocket holes are present. The size of the lower loop is determined by the relationship between the claw and the #2 sprocket drive.

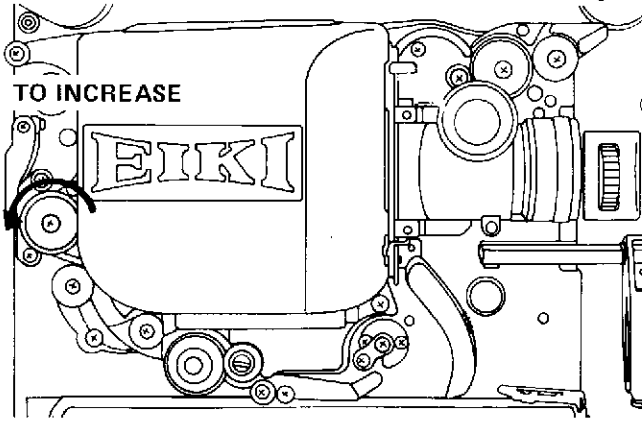
Fig. #77



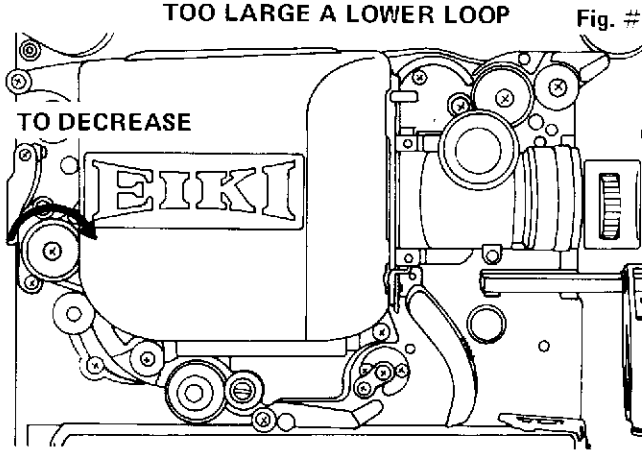
#2 SPROCKET
COVER SCREW

To increase the lower loop size, stop the projecto
loosen the #2 sprocket cover screw, slightly rota
the sprocket teeth plate counter clockwise (Fi
#78). To decrease the loop, rotate the sprock
teeth plate clockwise (Fig. #79). Tighten the cov
screw. Unthread the projector, re-thread ar
release the threading mechanism. It may requi
several repeat adjustments to achieve approx
mately 5mm of clearance between the loop and th
loop setter roller (Fig. #77). Correct timing w
result in one loop setter cycle when two successi
damaged sprocket holes or a bad splice pass throug
the gate. In some cases continuous cycling of th
loop setter may be caused by very poor or damage
film or too strong a take-up tension. Excessive tak
up tension may cause the film to skip over the #
sprocket drive resulting in lower loop loss. (Se
Sec. 5-1).

TOO SMALL A LOWER LOOP Fig. #



TOO LARGE A LOWER LOOP Fig. #



5-5: SELF-THREADING MECHANISM

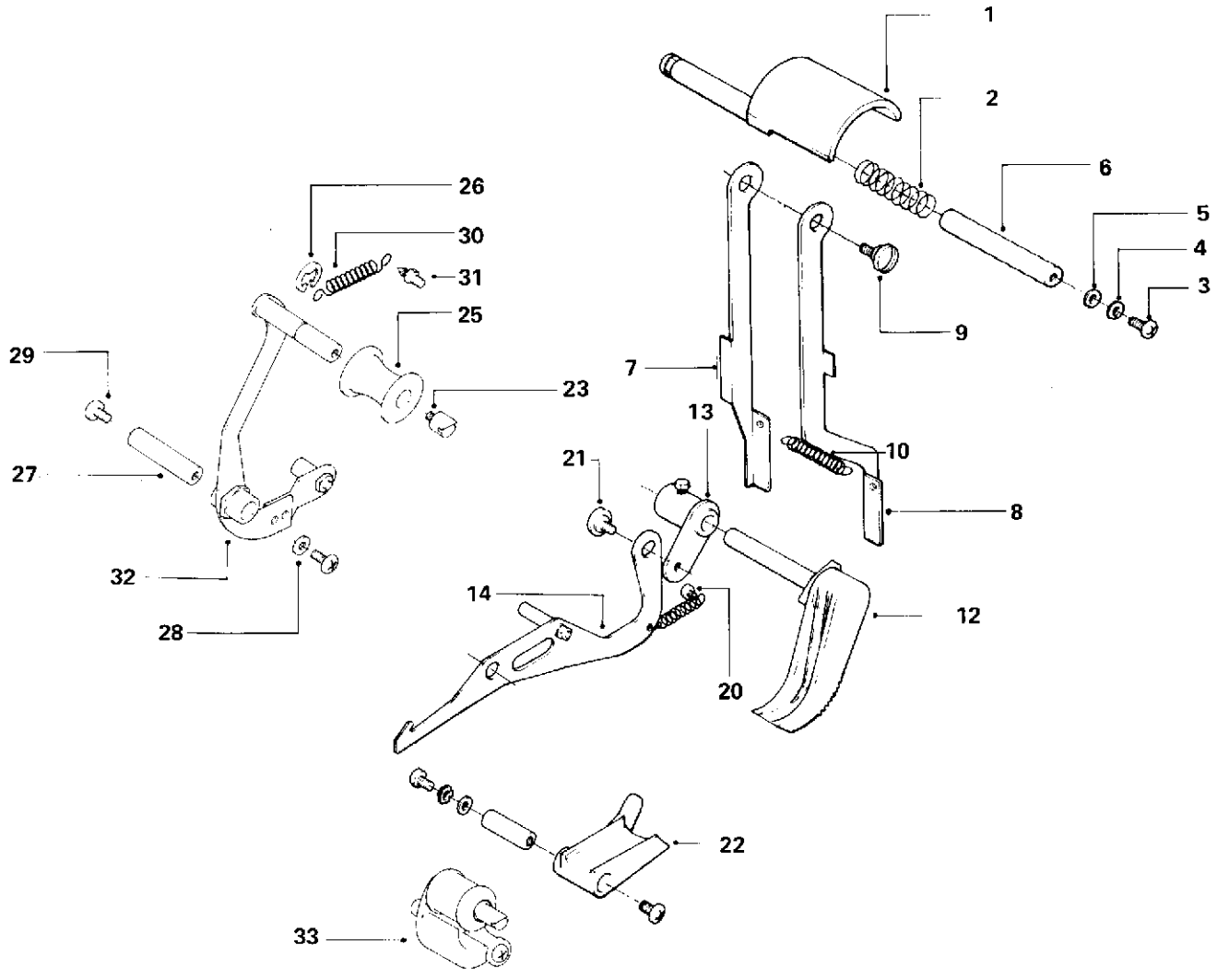
A. Description:

The self-threading mechanism is activated by pushing the #2 film guide (12) into the thread position, locking the interlocking bracket (14) to the release bracket (8).

At the same time the #1 film guide (1) is extended from behind the casting to guide the film into the film gate while forming the upper loop. The film shoe is released by plate (8) and the claw is retracted out of the gate by plate (7). Film guide #2 (12) lines up with guide #3 (22) and the rubber pinch roller (33) is released from the sound drum.

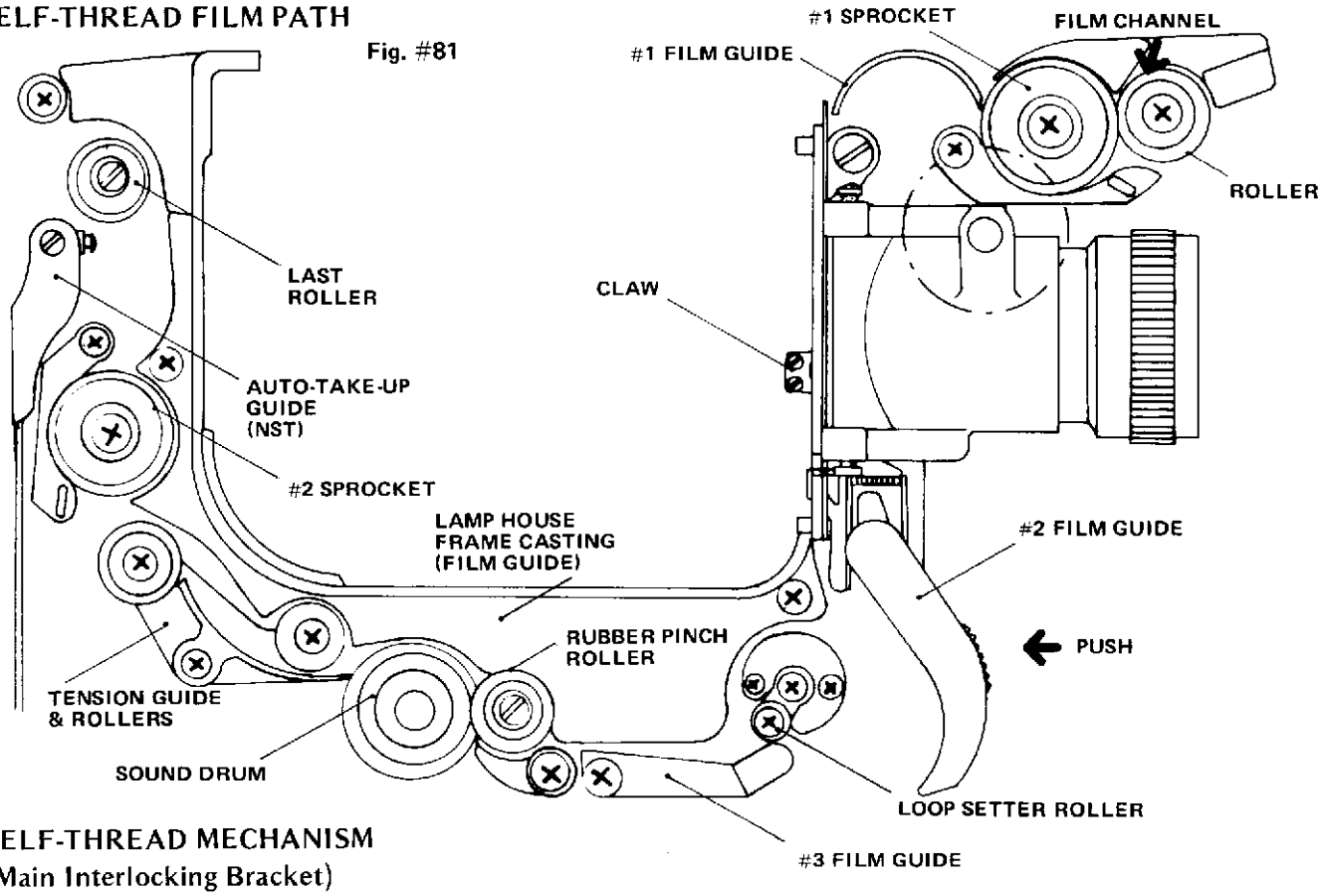
The loop setter is locked out by the safety arm assembly which exerts a downward pressure against the main drive belt preventing the loop setter gear from activating the loop setter during the threading operation. The lower portions of the lamp house cover provide the guides necessary to complete the threading. To thread, turn the function switch to forward, set the #2 film guide to thread, insert the film into the film channel. When the film exits at the last roller, a light tug releases the threading mechanism. The projector is now ready to operate, the safety arm is released and the loop setter is activated, the film shoe and claw lever is also released. The tension around the sound drum is automatically controlled by the tension of the rubber pinch roller.

Fig. #80



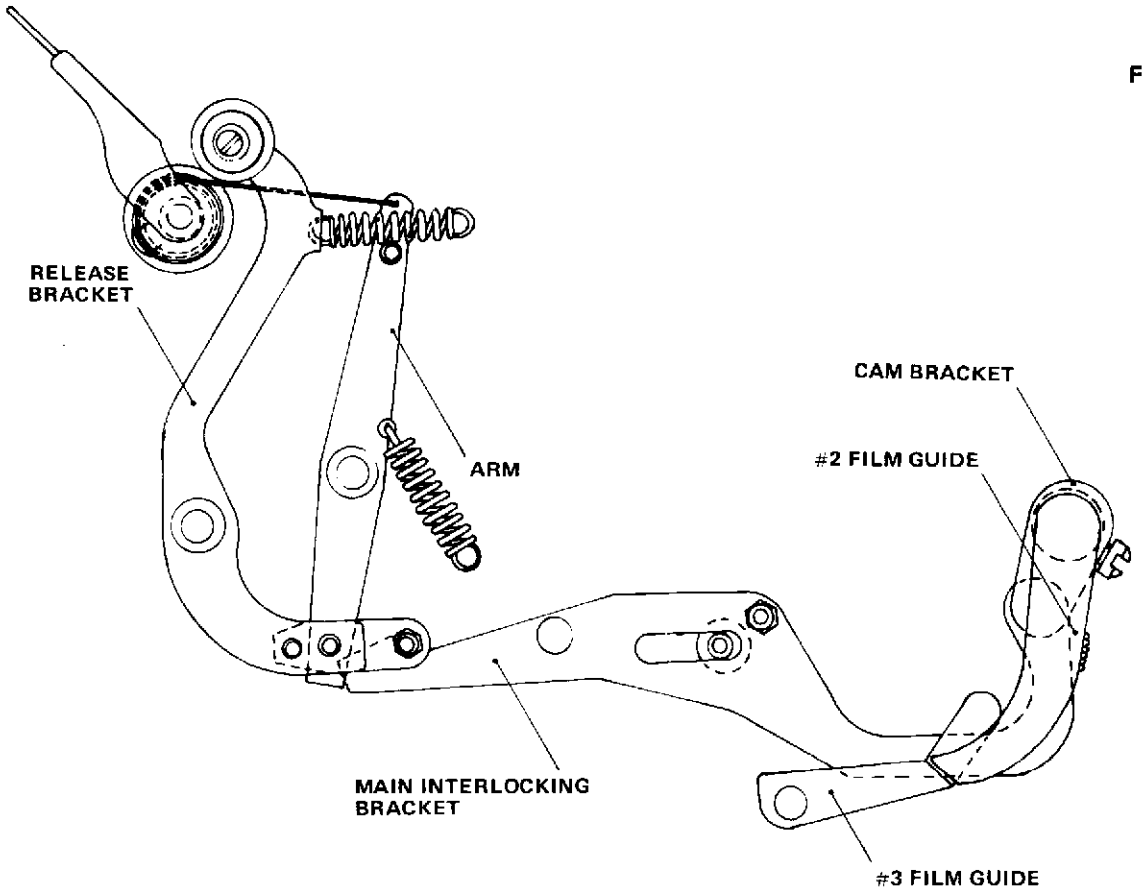
SELF-THREAD FILM PATH

Fig. #81



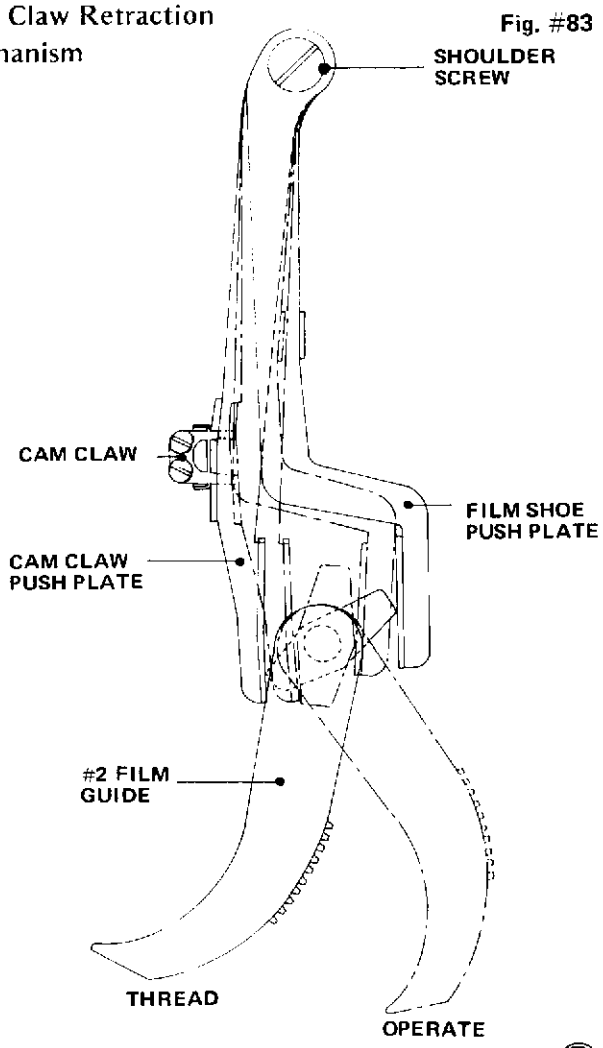
SELF-THREAD MECHANISM
(Main Interlocking Bracket)

Fig. #82



Cam Claw Retraction Mechanism

Fig. #83



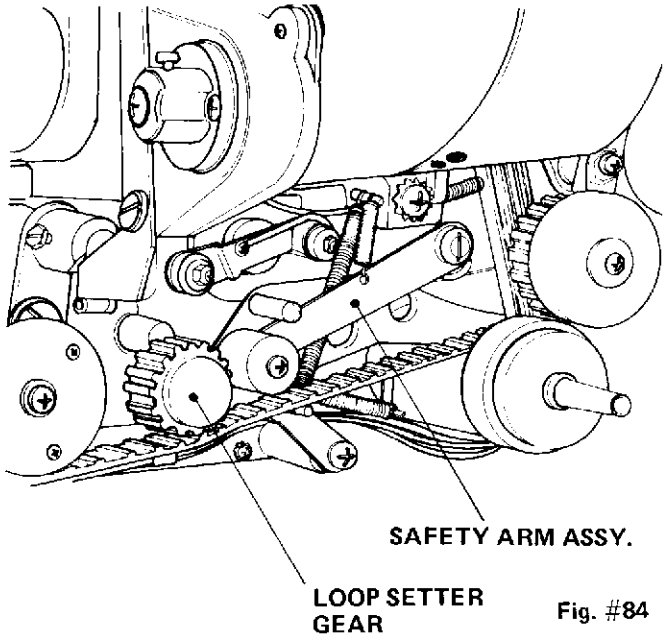
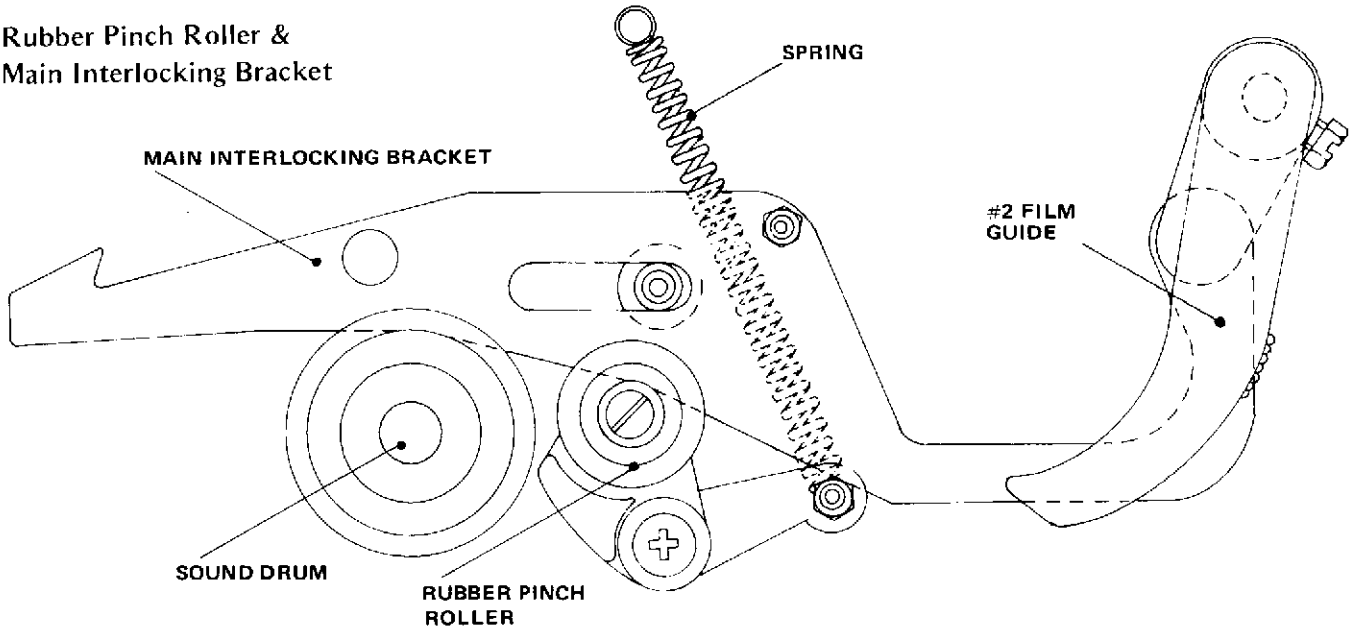


Fig. #84

Rubber Pinch Roller & Main Interlocking Bracket

Fig. #85



B. Adjustments:

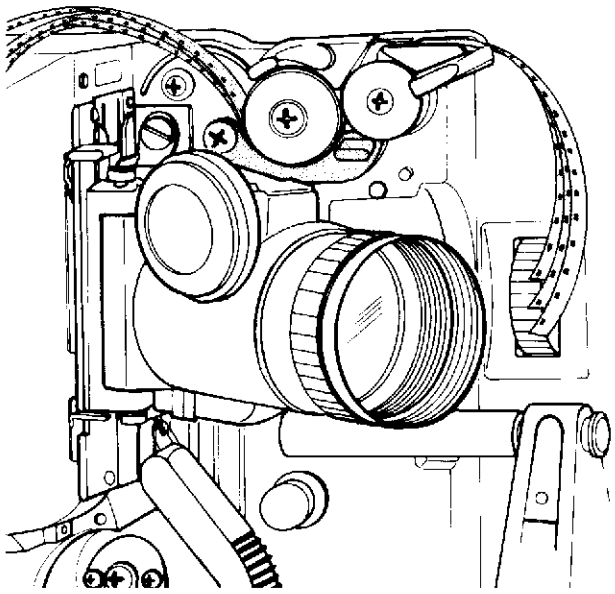
1. #1 Sprocket Shoe Assembly:

The #1 sprocket shoe is spring loaded to keep the film in contact with the sprocket teeth, driving the film into the gate.

For manual thread, it may be opened when the lens holder is open. Check the shoe clearance using three layers of film in the following manner:

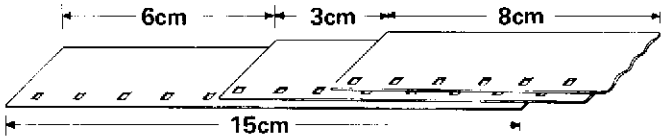
First insert one 5cm (2") strip of film into the film channel, advance the mechanism using the inching knob. When the first strip is fed through the film shoe, insert another strip on the first, continue to advance the inching knob. With two thicknesses of film, the shoe should not begin to open. Next, insert a third strip and advance the inching knob. This time the shoe should slightly open with three layers of film between the sprockets and the shoe.

Fig. #86



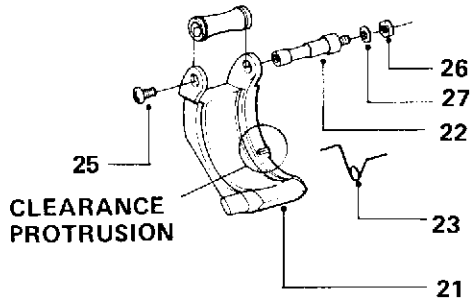
NOTE: A simple test film may be made by cementing three short strips of film together.

Fig. #87



Under normal circumstances, the shoe does not require any adjustments, however, as the film shoe wears, the clearance will become too great, requiring replacement. When a replacement is not available, the small protrusion which determines the clearance may be filed to the correct clearance.

Fig. #88

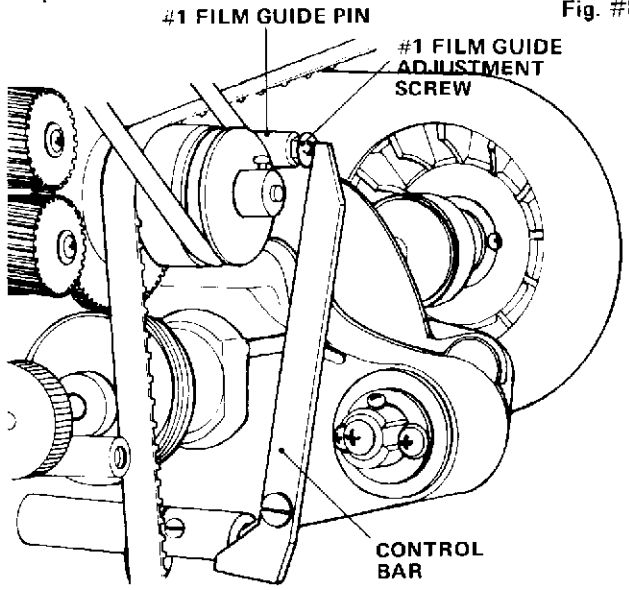


Too little or no clearance will cause film wear or damage. Care should be taken when removing the shoe not to lose the "V" spring (23).

2. #1 Film Guide:

In the self-thread position, the #1 film guide (1, Fig. #80) is extended from the main casting, guiding the film from the #1 sprocket and shoe into the film gate. After the threading mechanism is released, the guide recedes away from the film path.

Fig. #89

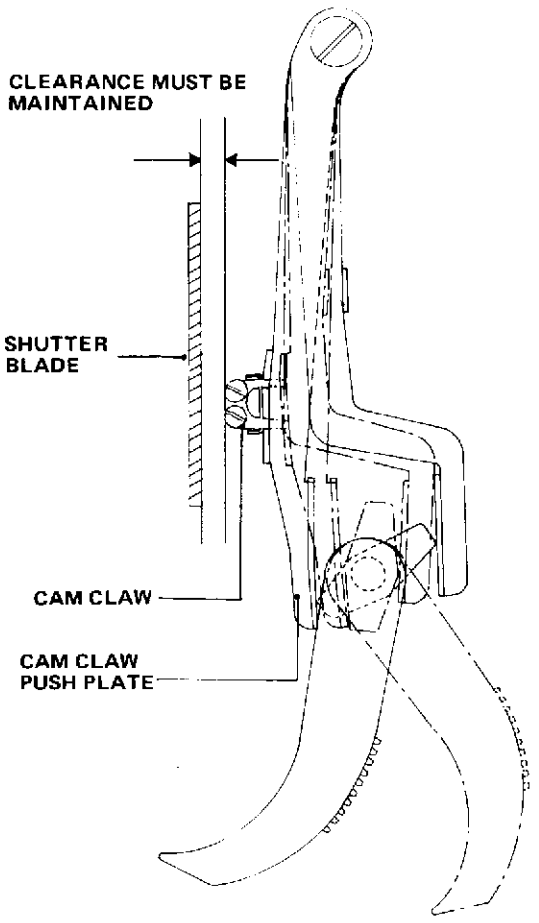


The film guide travels approximately 20mm from operate to self-thread. This travel is not critical. There should be enough travel for the guide to retract away from the film in normal operation, and in self-thread extend to the width of the aperture plate. To adjust this travel, loosen or tighten the screw and jam nut. (See Fig. #89).

NOTE: The position of the cam tank may affect the position of the control bar which activates the #1 film guide. It is important that the control bar aligns with the #1 film guide.

3. Retraction Of The Claw:
When the #2 film guide (12) is set to self-thread, plate (7) pushes the claw away from the gate. The claw must be completely retracted, however, if it is pushed too far, the rear of the claw lever will interfere with the shutter blades. A loud click, click sound will be heard.

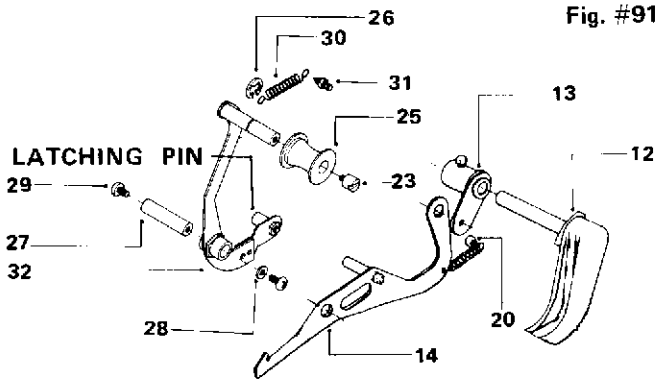
Fig. #90



To adjust this clearance, it is necessary to slightly re-form the plate (7) decreasing or increasing the claw's retraction. In instances where the shutter blade has been bent, it may be necessary to re-form the shutter blade.

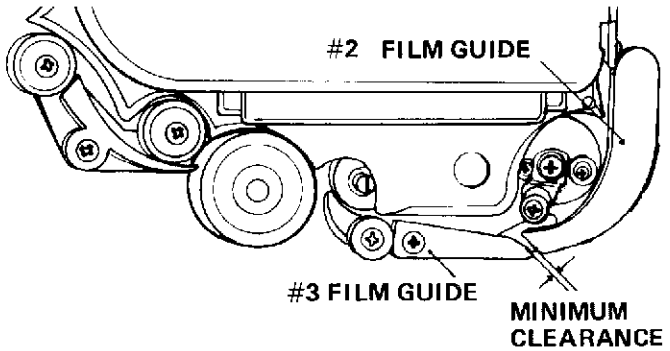
4. #2 Film Guide:
The #2 film guide acts as the self-threading mechanism setting lever. At the same time it forms the path for the lower loop. When the #2 film guide (12) is set, the cam bracket (13), mounted to the pivot shaft of the #2 film guide, activates the interlocking bracket sub-assy. (14) engaging the release bracket assy. (32) locking the mechanism in self-thread position. To adjust, it may be necessary to reform the latching pin on the release bracket if the mechanism will not set to self-thread.

Fig. #91



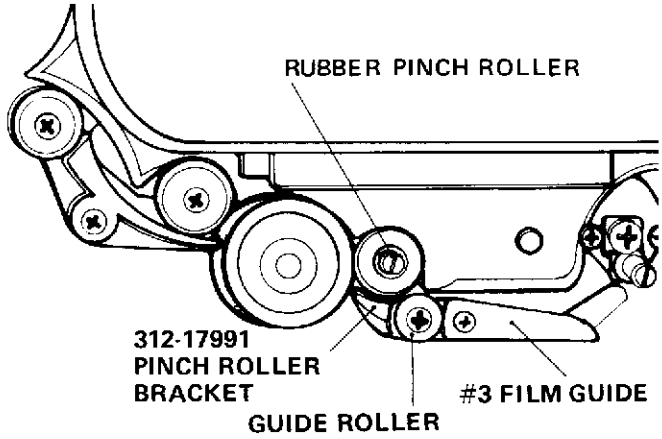
A small amount of silicone grease on latching pin is required for smooth operation of the latching and release mechanism. It is important that the #2 and #3 film guide line up with a minimum of clearance. Too much clearance will allow the film to go under the #3 guide.

Fig. #92



5. Sound Drum Rubber Pinch Roller:
(Fig. #92, 93)

Fig. #93



The sound drum rubber pinch roller is mounted on the #4 film guide (or pinch roller bracket 312-17991) which directs the film up and over the sound drum in the self-thread operation. This is accomplished by the interlocking bracket 312-17091 which depresses pin 312-17361, raising the rubber pinch roller away from the sound drum. When the self-thread mechanism is released, the rubber pinch roller rests firmly against the sound drum.

It is important that the rubber pinch roller be kept clean and that it rotates freely on the shaft. Remove the roller to clean and lubricate.

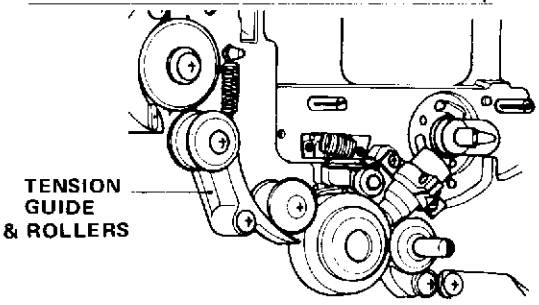
If the roller does not turn freely, it may restrict the film from advancing over the sound drum during self-threading. A dirty or restricted roller may also contribute to excess wow & flutter.

To adjust the tensions of the pinch roller, push the #2 film guide to self-thread position.

a. Insert two layers of 16mm film between the shoulders of the rubber pinch roller and lamp house casting.
b. Locate pin 312-17361 so that it touches the bottom edge of the interlocking bracket.
c. While pressing the rubber pinch roller toward the casting (with film between the roller shoulders and casting), tighten the screw that holds the pin bracket to the rubber roller shaft.

6. Tension Guide And Roller Assembly

Fig. #95



The tension guide and roller assembly provides the dampening required between the #2 sprocket drive and the sound drum. When the guide rides midway between its limits, wow and flutter is minimized. During the self-thread operation, the tension guide (41) provides a path for the film to travel from the sound drum to the #2 sprocket drive.

Fig. #96

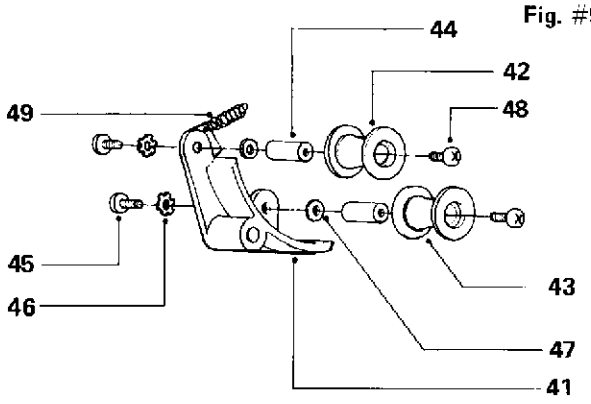
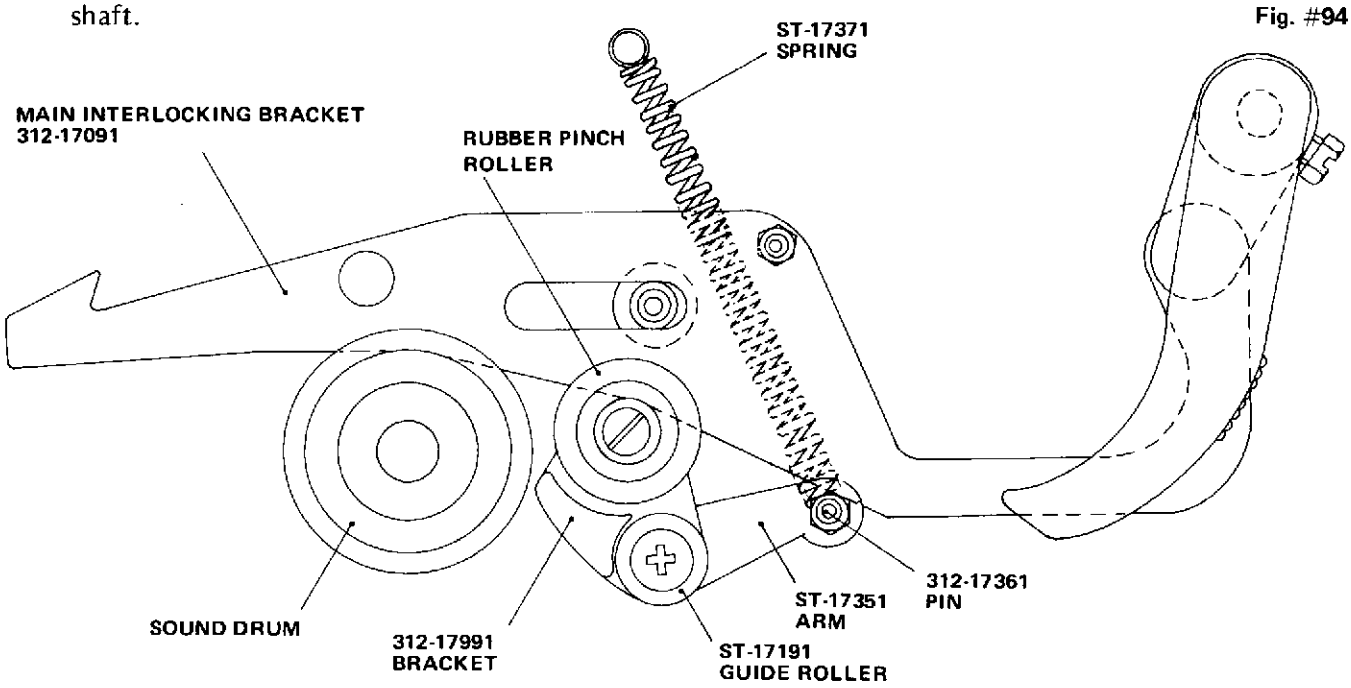


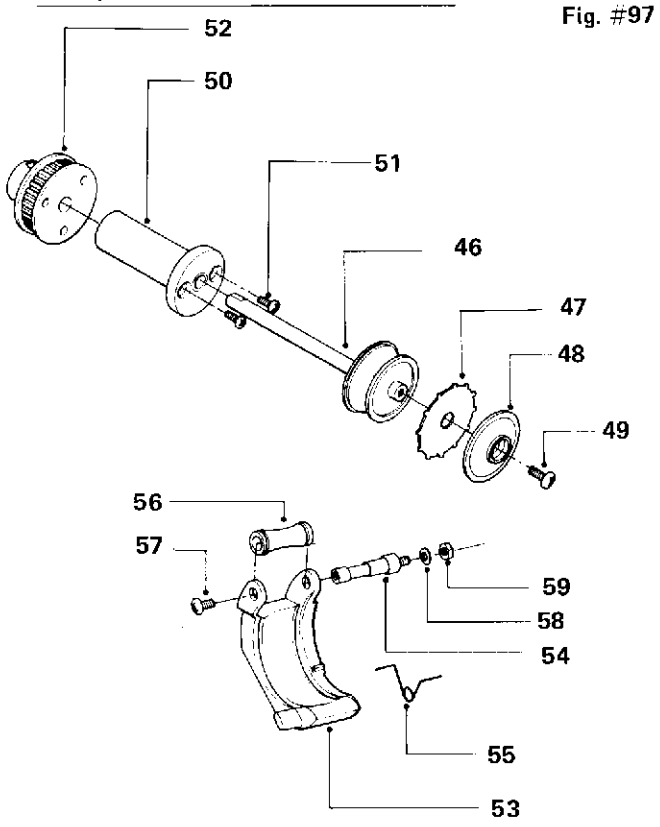
Fig. #94



The rollers (42) and (43) must be clean and rotate freely on the shafts. The tension guide assembly (41) must pivot freely without binding. A rhythmic movement of the tension guide roller assembly indicates that a roller or the sound drum is binding or out of round. An out-of-round or bent #2 sprocket drive will also cause excessive tension guide movement. All of the above symptoms will result in abnormal wow and flutter. The tension of the guide and roller assembly is determined by spring (49) and can be adjusted by replacing the spring or slightly stretching or shortening the spring to achieve minimum wow and flutter. All nylon rollers should be cleaned with alcohol and lubricated sparingly with silicone oil.

7. #2 Sprocket And Shoe Assembly:

Fig. #97

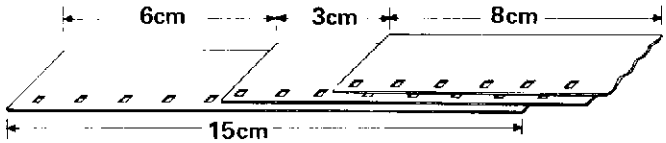


The drive consists of the sprocket cover (48), the sprocket teeth plate (47), the sprocket drum and shaft (46), the hub and bushing assembly (50), and the drive gear (52). There must be no end play of the sprocket drum shaft in the bushing. Small fiber washers (G4-070120, G8-070120) are installed to achieve this condition. The sprocket plate (47) must be in good condition, with no defective sprocket teeth, otherwise it must be replaced. For correct timing adjustment of the #2 sprocket drive assembly, refer to the loop setter section. (Sec. 5-4)

The #2 sprocket shoe keeps the film in contact with the sprocket teeth. The shoe should always remain closed on all self-threading projectors. The shoe tension is maintained by the "V" spring (55). It is important to note that the #2 sprocket shoe spring is stronger than the #1 sprocket shoe spring. The proper clearance between the shoe (53) and the sprocket drum (46) is very important. To test this clearance, take short piece of film and feed it into the #2 sprocket using the inching knob to advance the projectors mechanism. Add another strip of film on top of the first and advance the projector. With a double thickness of film the film shoe should not begin to open. Add a third layer of film and advance the projector. This time the film shoe should begin to open, indicating that the shoe clearance is correct.

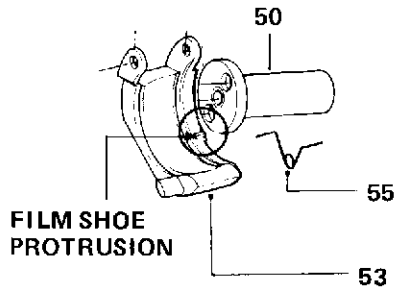
NOTE: A simple test film may be made by cementing three short strips of film together. (See Sec. 5-5-B-1, Note)

Fig. #98



The proper film shoe clearance is determined by a small protrusion molded on the shoe which indexes the shoe against the bushing hub (50).

Fig. #99



As the shoe wears it may be necessary to replace it to obtain the correct clearance. In some cases the shoe clearance may be reduced by filing the protrusion.

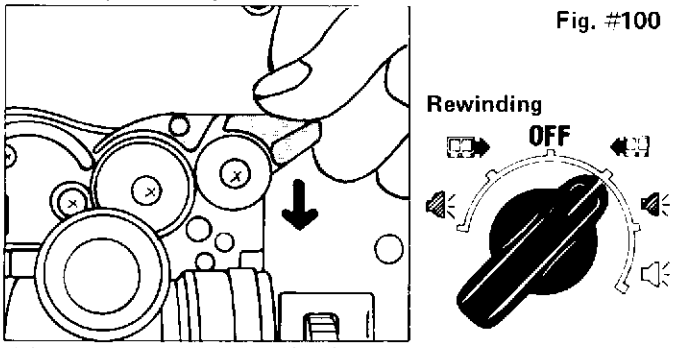
CAUTION: Too close a clearance will result in poor threading or possible film damage.

5-6: REWIND MECHANISM

A. Description (Fig. #100, 101)

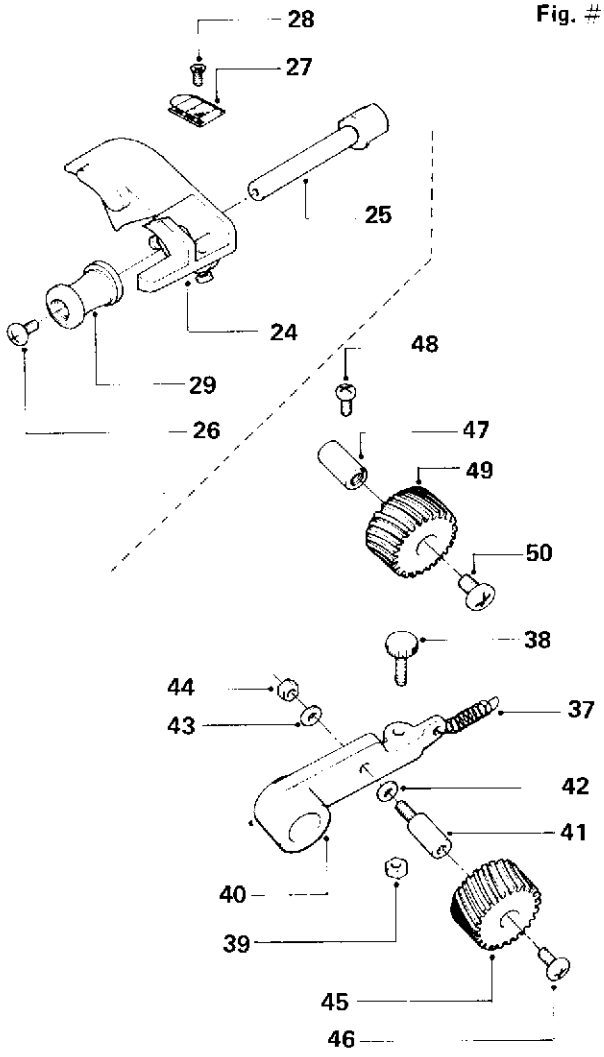
The rewind is accomplished by threading the film from the take-up reel to the supply reel, and engaging the rewind gears by pressing down on the rewind lever, then switching the projector to the forward/rewind position.

Fig. #100



When the rewind lever (24) is engaged, the eccentric shaft (25) releases the pressure to the cap screw (38) causing the rewind gears (45) and (49) to mesh, thus positively driving the supply arm.

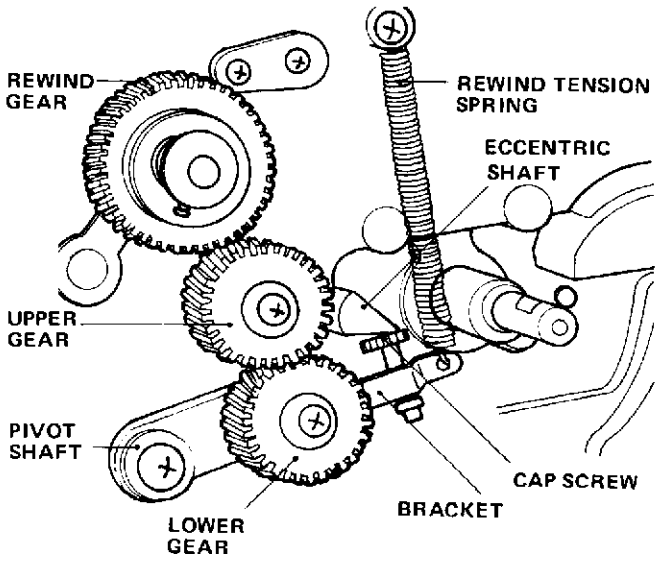
Fig. #101



B. Adjustments

The amount of gear lash is determined by the cap screw (38). The tension of the rewind lever is controlled by the spring (37). The rewind gears (45) and (49) must mesh completely with only a slight amount of lash to avoid unnecessary wear. It is important that all the gears roll freely with a slight amount of silicone oil on the shaft. The rewind bracket assembly should also operate freely on its pivot shaft (33).

Fig. #102



5-7: SOUND DRUM AND FLYWHEEL

A. Description

The sound drum and flywheel assembly's main function is to stabilize the film, allowing the sound optics or magnetic head to read the sound tracks with a minimum of speed variations. The sound drum, shaft, bearing and flywheel are precision machined and balanced to maintain a consistent linear film speed. Care should be used when disassembling or re-assembling these precision parts.

The sound drum shaft (5) is seated in two precision ball bearings (3) which are sealed and factory lubricated. The ball bearings are lightly press fitted into the sound hub casting (2). The shaft is secured in place by a set collar (6). With the fiber washer in place, with no end play in the sound drum shaft, it must rotate freely and not bind. Any binding or imperfections in the ball bearing will result in excessive wow & flutter. In the forward direction, the sound drum shaft (5) is driven by the tension of the film. The flywheel is free to slip on the sound drum shaft during the initial start up of the projector to prevent any possible film damage. In the reverse direction, the set collar (6) is driven by the reverse rubber roller, allowing the film to be transported smoothly across the sound drum in the reverse direction. (Fig. #103, 104, 105)

B. Adjustments

The drive torque to the flywheel is determined by the tension of the plate spring (8). The normal torque should be between 20 – 25 grams. To check this, use a gram scale and attach a string to the flywheel with adhesive tape. With no film in the projector, switch to reverse while holding the gram scale attached to the string. To adjust this torque, remove the plate spring and bend to obtain the correct tension. A badly formed spring should be replaced. (Fig. #106)

Fig. #104

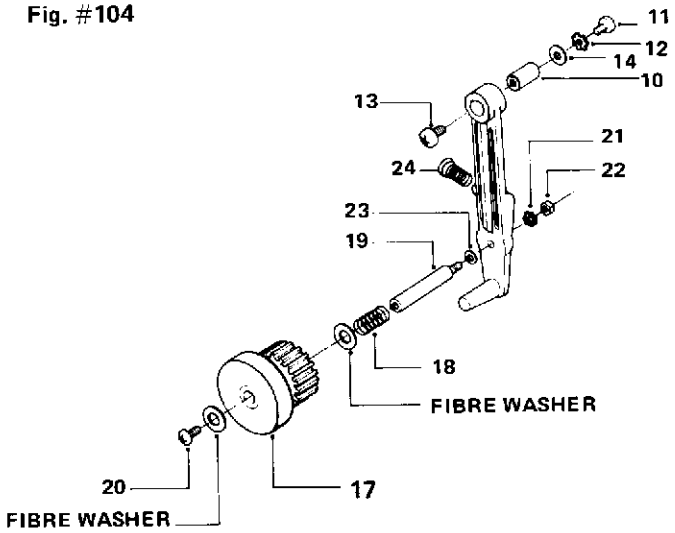


Fig. #105

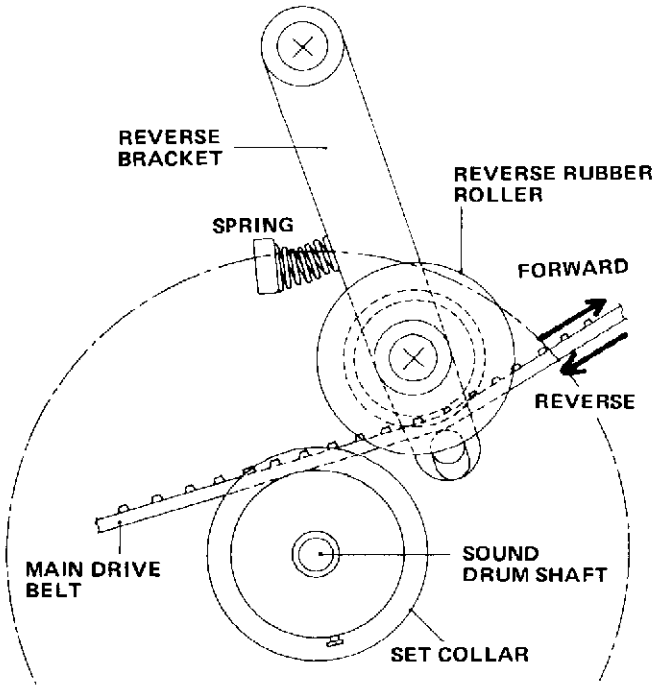


Fig. #106

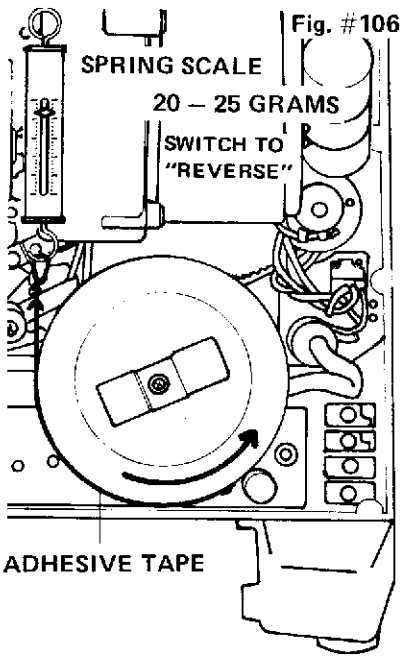
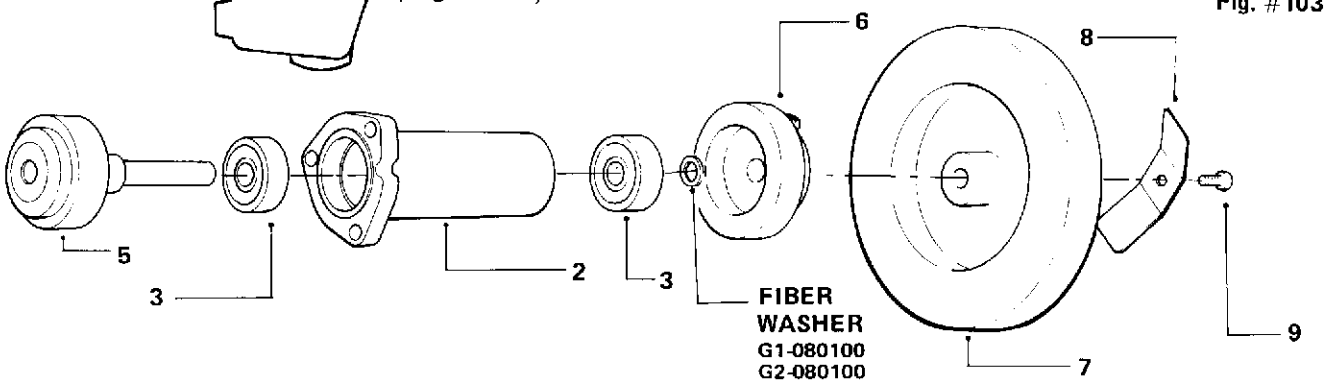


Fig. #103



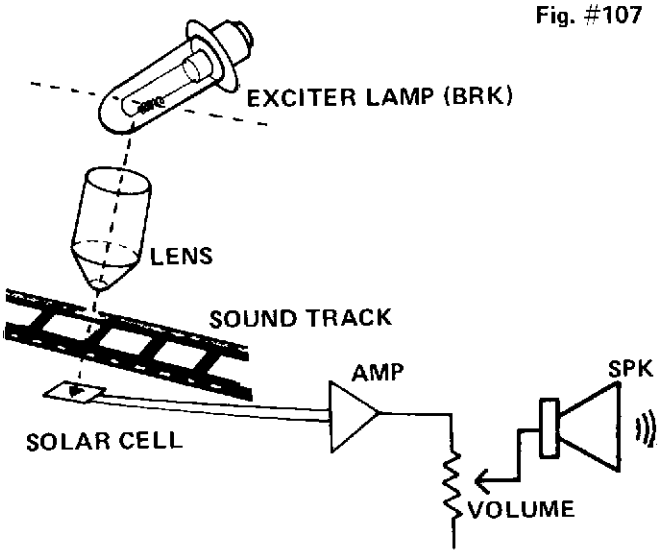
314—6: SOUND PICK—UP SYSTEM

6-1: OPTICAL SOUND FOCUSING PROCEDURE

A. Description

Models NST-0, NT-0, NST-1 and NT-1 are optical sound playback only. Models NST-2 & NT-2 are both optical and magnetic playback and NST-3 & NT-3 are optical playback with magnetic playback and record. The optical pick-up system resembles a small projector within a projector, consisting of a light source, a lens, an image, and a screen or target.

Fig. #107



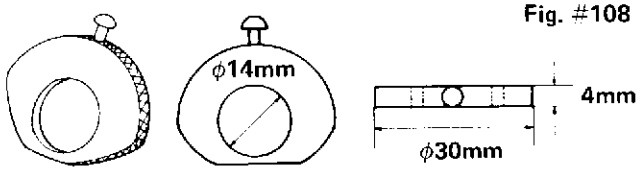
The light from the exciter lamp is focused through the sound track imaged onto the (target) solar cell where varied light intensity is converted into minute electrical voltage changes that are amplified and converted into acoustical variation or sound which directly relate to the photographic variation recorded on the film.

B. Sound Focus Alignment Procedure

1: Tools and Equipment Required

a. Screw driver set (Iso)
b. Sound lens adjustment tool (Tool No. 320-02T. Fig. #108, See note below)
c. SMPTE sound focus test film 7000Hz
d. SMPTE buzz track test film
e. AC VTVM (audio range) and or
f. Oscilloscope
g. 8 ohm 30 watt dummy load resistor
h. External speaker (front cover)

Fig. #108

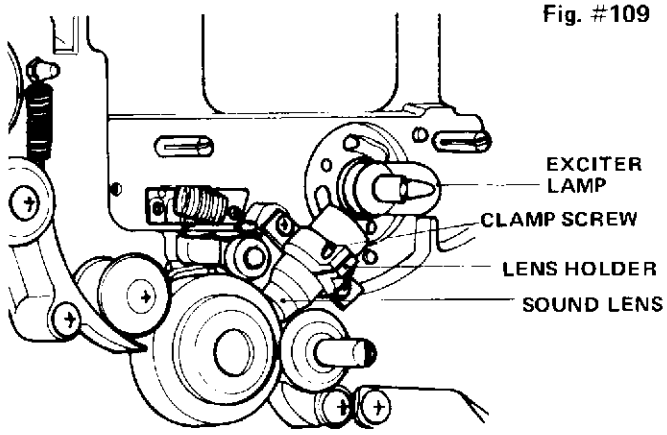


SOUND LENS ADJUSTMENT TOOL

2. Set-up Procedure

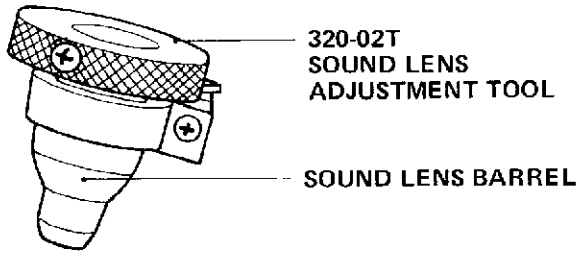
a. Open the lamp house door and remove the exciter lamp cover.
b. Remove the lamp house door with frame casting to obtain access to the sound lens.

Fig. #109



c. Insert the tool No. 320-02T onto the larger barrel of the sound lens and tighten the set screw on the tool.

Fig. #110



NOTE: This adjustment may also be performed by adjusting the sound lens with your fingers, if the tool is not available.

3. Sound Focusing Adjustment Procedure

a. Connect the dummy load resistor to the speaker output jack.
b. Thread the 7000Hz SMPTE test film loop with the emulsion side towards the film shoe.
c. Connect either an AC VTVM (20 volt range) or an Oscilloscope across the dummy load resistor. (Fig. #113)

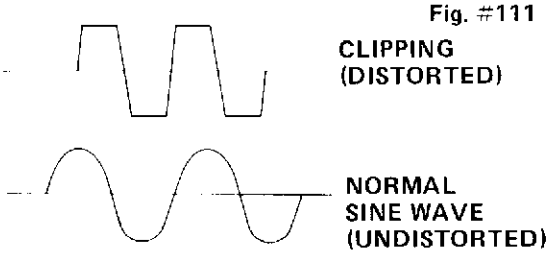
NOTE: When using instruments with a grounded shield input, avoid a ground loop condition by not connecting the shield at the load resistor.

d. Turn the projector's function switch to forward.

e. Set the treble control to the Max. position and the bass to the Minimum.
Loosen the sound focus lens clamp screw slightly to allow a rotation of the lens.

f. Turn on the volume control towards maximum and observe the AC VTVM or the Oscilloscope.
(1). With the AC VTVM connected, observe the meter while slowly moving the lens up or down and slightly rotating until the maximum voltage reading is achieved. Clamp the sound lens and this completes the sound focusing alignment.
(2). With the Oscilloscope connected across the dummy load resistor a more precise alignment can be achieved. Observe the 7000Hz sine wave at both full volume and a lower volume at the same time adjusting the rotation and up or down position of the sound lens, for maximum P-P voltage of the sine wave. A clean undistorted sine wave should be observed as shown in Fig. #111 corresponding to the volume and tone control positions as indicated.

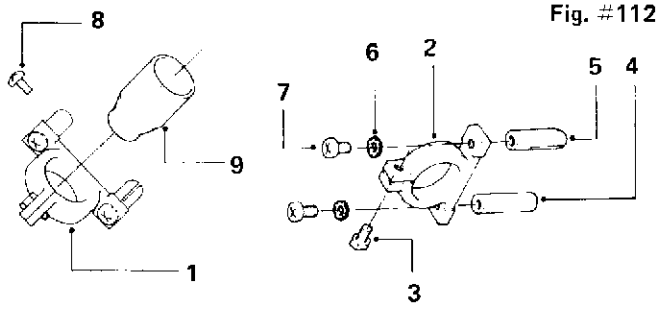
Fig. #111



g. This completes the Sound Focus adjustment. Clamp the sound lens clamp screw and test with a good sound track film.

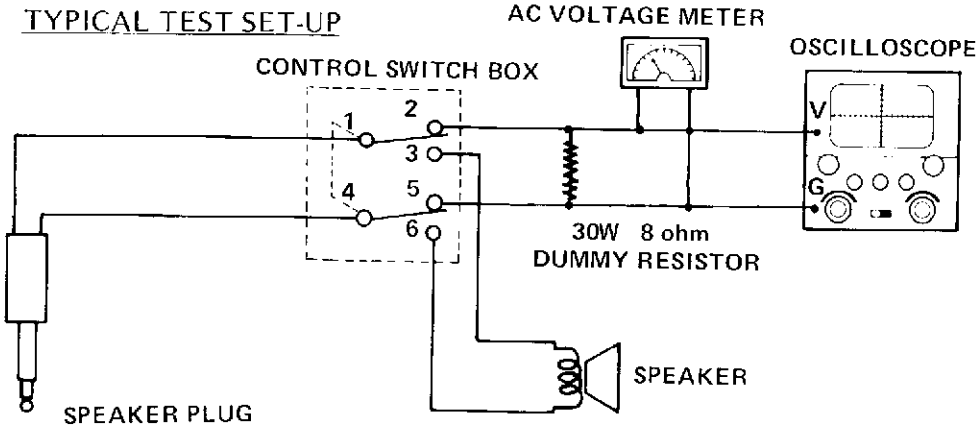
4. Buzz Track Adjustment Procedure
a. Connect the projector to the test set-up as Fig. #113.
b. Load an SMPTE buzz track test film loop with the emulsion side towards the film shoe.
c. Turn the function control switch to the Forward position.
d. Turn the amplifier volume and tone controls to maximum (clockwise) and listen for a clear 1000Hz tone.
e. Sound lens holder is mounted on two pins (4) & (5) which slide into holes of the frame casting. Loosen the upper screw (8) to allow adjustment.
Adjust the buzz track by slowly sliding out the sound lens holder (1), until the 1000Hz tone is inaudible and a 300Hz tone becomes audible.
f. Then slowly slide in the sound lens holder until neither the 300Hz or the 1000Hz tone is audible, indicating correct buzz track alignment. Tighten the upper lock screw (8).
g. Re-check the 7000Hz sound focus alignment.
h. Remove the exciter lamp. Remove the round lens adjustment tool. Re-install the exciter lamp and wipe off any fingerprints.

Fig. #112



TYPICAL TEST SET-UP

Fig. #113



6-2: MAGNETIC SOUND PLAYBACK SYSTEM

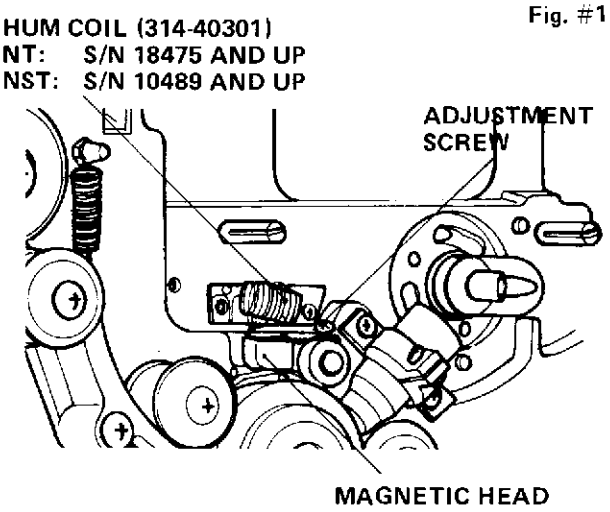
A. Description

In addition to the standard optical sound playback, models NST-2 & NT-2 include magnetic soundtrack playback and models NST-3 & NT-3 include both magnetic playback and record. The Mag/Opt selector switch operates a lever which positions the magnetic head against the films sound track, at the same time the appropriate electrical connections are made.

In the record models the lock-out button prevents the selector from being accidently switched to record. A special combination record/play and erase head is used for simplicity and a minimum of adjustment. Both the record level and playback volume is accomplished with the volume control and equalization is provided by the bass and treble controls. The small meter provides level monitoring during record.

Since the record and playback is accomplished using only one head the alignment procedure for the NST-2 & NT-2 and NST-3 & NT-3 models are the same.

Fig. #114



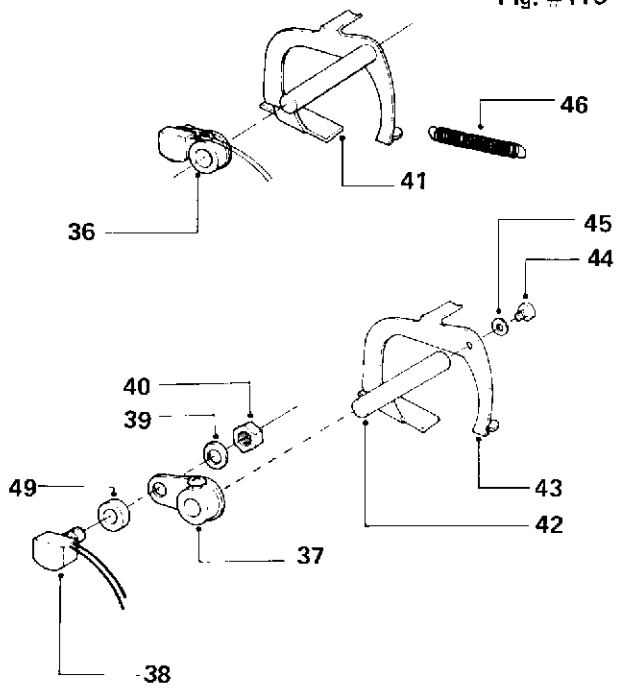
B. Magnetic Head Alignment Procedure

1. Tools and Equipment Required

a. Screw driver set (Iso)
b. Magnetic Azimuth 7000Hz alignment SMPTE test film loop.
c. Pliers
d. AC VTVM (Audio Range) and or
e. Oscilloscope
f. 8 ohm 30 watt dummy load resistor
g. External speaker (front cover)

2. Set-up Procedure

Fig. #115



a. Open the lamp house door.
b. Remove the frame casting to obtain access to the magnetic head.
c. Thread a magnetic azimuth alignment test film.
d. Set the Mag/Opt switch to the Mag Play position.
e. Connect the projector to a dummy load resistor and test set-up. (See Sec. 6-1-B-3. Fig. #113)
f. Turn on the projector and amplifier.
g. Set the treble control to the Max. position and the bass at the Minimum.
h. Adjust the volume control to just before the amplifier clips.
i. Carefully loosen the adjustment screw which allows the head to be positioned on the mag. track.

To adjust, hold the mag. head gently with the pliers and slightly turn the head clockwise or counter-clockwise until the correct head position on the mag. track is obtained. Then, align the head core slit right on the mag. track by slightly bending, if necessary, the head mounting arm to the right or left.

When the correct head position and the angle are obtained, a maximum voltage reading will be indicated on the AC VTVM, while at

the same time the sine wave observed c
the oscilloscope is not clipped.

j. With the Oscilloscope connected across th
load resistor, observe that the 7000Hz sir
wave is not clipped or unusually distorted
both low and high volume. If necessar
make additional minor adjustments.

k. When a clean, undistorted sine wave at max
mum voltage is achieved, the alignment
complete.

l. Secure the adjustment screw, and apply
drop of lock-tight sealer.

m. Check the sound with a well recorded sour
track.

n. On NST & NT-3 models, make a recordir
and re-check the playback.

NOTE (1): Should the record not function, refe
to the amplifier section 314-4-2 an
check amplifier or bias oscillator fun
tions.

NOTE (2): Excessive audio hum may occur b
installing a motor without its magneti
shield.

314-5070! AMP MODULE COMPLETE
FOR -3 TYPE MAG PLAY MODEL

314-5090! AMP MODULE COMPLE
FOR -3 TYPE MAG RECORD MODEL
COMPLETE WITH 314-5088 OSCILLATOR
P.C. BOARD ASSY.

314—7: LAMP CIRCUIT

7-1: LAMP CIRCUIT

A. Description

The "N" series projector is designed with a 24 volt AC Quartz Halogen 250 watt ELC lamp. A 200 watt EJL lamp may also be used with some reduction in light output. The function switch provides either a high or low lamp voltage selection to extend the lamp life.

B. Replacement And Alignment

1. Disconnect AC power cord.
2. Open the lamp house door.
3. Push the lamp ejection lever to the left and the lamp will come out.

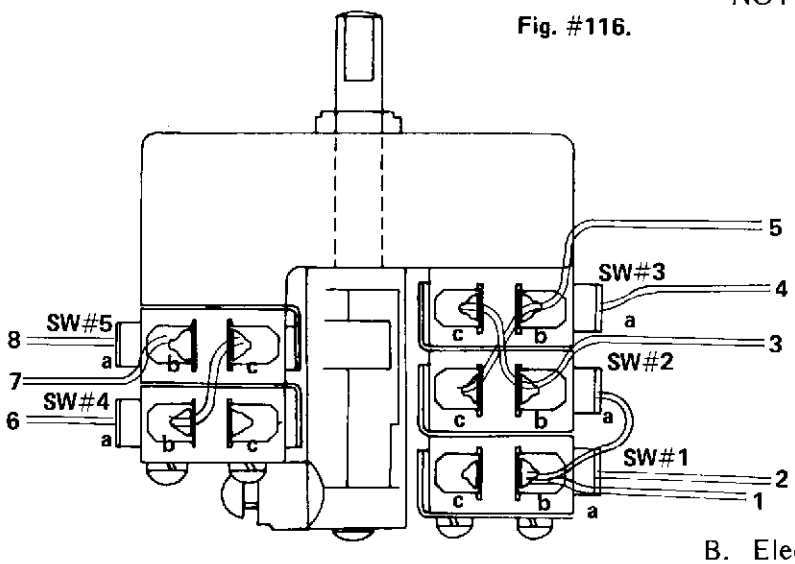
CAUTION: LAMP MAY BE HOT

4. When replacing lamp be sure that it snaps into the lamp socket properly and that heat shield and lamp house cover are re-installed.
5. For maximum, even illumination, it may be necessary to adjust the lamp position to allow for slight variations in lamps. Turn knurled nut for horizontal adjustment.

OFF ○ : ALL OFF
: SW#1 ON
: SW#1 & 4 ON
: SW#1, 4 & 5 ON
: SW#1, 2 & 3 ON
(REV) : SW#1, 2, 3 & 4 ON

FUNCTION ROTARY SWITCH

Fig. #116.



a: Common
b: Normal open
c: Normal close

314—8: ELECTRICAL SYSTEM

"N" Series (8-1-B)

8-1: ELECTRICAL SYSTEM

A. Function Switch

Micro Switch #	Type of Switch & Part #		Function
SW#1	V-15-1A3M	312-60051	Forward
SW#2	V-15-1A3M	312-60051	Reverse
SW#3	V-15-1A3M	312-60051	Reverse
SW#4	V-15-1A3M	312-60051	Lamp Low
SW#5	V-15-1A3M	312-60051	Lamp High

Wire #	Color	Type	Connected to:
#1	Brown	AWG #20 (*)	Motor 6 Pin Connector #1
#2	Brown	AWG #20	AC Terminal #1 (**)
#3	White	AWG #20	Motor 6 Pin Connector #2
#4	Grey	AWG #20	Motor 6 Pin Connector #5
#5	Blue	AWG #20	Motor 6 Pin Connector #4
#6	Blue	AWG #18	Transformer 3 Pin Connector #2
#7	Red	AWG #18	Transformer 3 Pin Connector #1
#8	Red	AWG #18	Halogen Lamp

*NOTE (1): For 120V UL & CSA only, wire #1 is AWG #18.

**NOTE (2): For 220V SCAN type, wire #2 is connected to AC Terminal #2

NOTE (3): For 220V SEMKO type see page 78.

B. Electrical Circuit Diagrams
(Electrical Schematic)
(Electrical Block Diagram)
(See the end of this manual)

314—9: SERVICE UPDATES AND MODIFICATIONS

EIKI "N"-Series has had several modifications. All the important modifications are included and discussed in this manual.

Further modification after the issue of this manual will be covered by SERVICE UPDATES, which are recommended to be filed in this section.