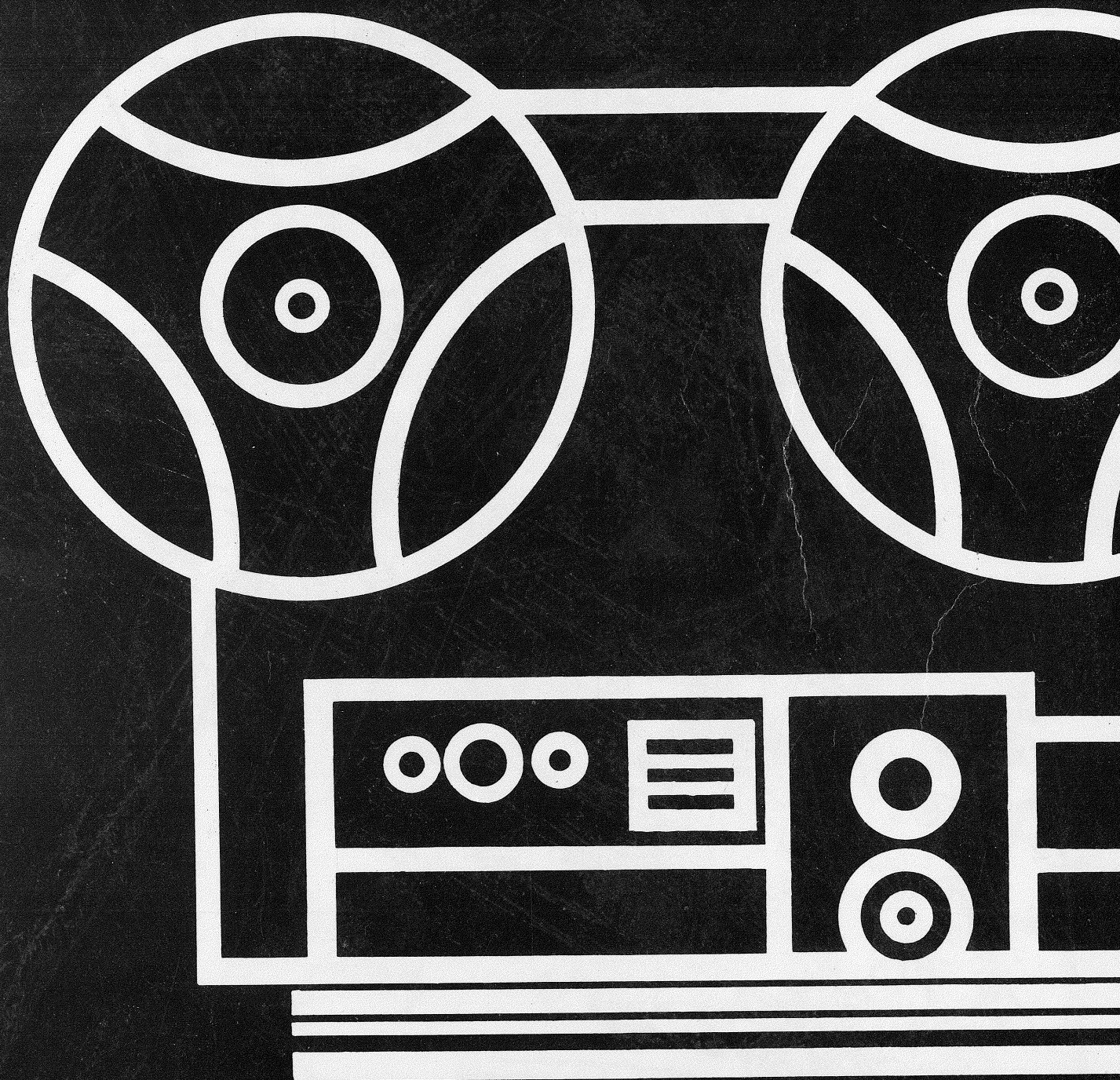




ILLUSTRATED SERVICE MANUAL

for

8MM MOVIE PROJECTORS



USING THE 8MM SERVICE MANUAL

This manual describes and illustrates complete service and repair instructions for all 8MM projectors manufactured by GAF Corporation. It is divided into alphabetically listed sections for easy location and identification of mechanisms to be serviced. Locate projector malfunction in the trouble shooting index chart (Section B), then refer to the trouble shooting chart for each section of manual which will pertain to specific repairs. Information in this manual supersedes all previous issued service instructions including alterations and modifications issued in temporary service bulletins.

The service manual **should not** be used as a guide for ordering service parts; use only the illustrated parts manuals for part numbers of specific models. Prices for service parts are listed in the current service parts price list.

SUPPLEMENTS

Supplementary pages for this manual will be issued annually and must be included in proper location by section and paragraph number. The supplements will include new models and service bulletins issued since the previous printing. For identification, supplements will be printed on colored paper (blue, pink, yellow, etc.) and dated. New pages are to be added to the service manual in accordance with instructions on cover sheet of the supplement.

CODE NUMBER IDENTIFICATION

A 3/8-inch diameter white sticker internally attached to all projectors identifies the week of manufacture by code number. This manual will use the code number to identify non-interchangeable changes or modifications to projectors. Projectors will not be identified by serial number located on specification plate other than those manufactured prior to January, 1968.

INDEX

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MODELS AND FEATURES CHART	A
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A

Model	Super 8 Only	Dual 8	Still	Bright Still	Slow Motion	Step Motion	Room Light	Zoom Lens	Auto Rewind	Cord Reel	Quartz Lamp
Forward Only Projectors											
*ANSCOVISION® 80	X										
ANSCOVISION 88		X									
ANSCOVISION 188		X									
ANSCOVISION 188Z		X						X			
*ANSCOVISION 333		X									
*ANSCOVISION 388		X									
ANSCOVISION 1388D		X									
*CRESTLINE S800	X										
*GAF® 1333		X									
GAF 1372Z		X						X			
GAF 1388		X									
GAF 1388Z		X						X			
GAF 2388		X									
GAF 2388Z		X		X				X			
*MEMORY MASTER™		X									
MEMORY MASTER II		X									
SEARS 9828		X									
*VICEROY® S/800	X								X		
VICEROY 811		X									
*WARDS 852		X									
*WARDS 853		X						X			
WARDS 808		X						X			
Forward, Reverse Projectors											
ANSCOVISION 488		X	X								
*ANSCOVISION 555		X	X				X	X			
ANSCOVISION 588		X	X				X	X			
ANSCOVISION 666		X	X		X		X	X			
*ANSCOVISION 688		X	X		X		X	X			
*ANSCOVISION 788		X	X		X		X	X		X	X
*CRESTLINE® 148		X	X					X			
*CRESTLINE 168		X	X		X		X	X	X		
*EMDEKO 7000		X	X								
*EMDEKO 9000		X	X								
GAF 1488		X	X								
GAF 1555DZ		X	X				X	X			
GAF 1564Z		X	X				X	X	X		
GAF 1588Z		X	X				X	X	X		
GAF 1688Z		X	X		X		X	X	X		
GAF 1788Z		X	X		X		X	X	X	X	X
GAF 2488		X		X							
GAF 2588Z		X		X			X	X	X		
GAF 2688Z		X		X	X		X	X	X		X
GAF 2788Z		X		X	X	X	X	X	X	X	X
*SEARS 9230		X	X					X			

Model	Super 8 Only	Dual 8	Still	Bright Still	Slow Motion	Step Motion	Room Light	Zoom Lens	Auto Rewind	Cord Reel	Quartz Lamp
Forward, Reverse Projectors (Cont'd)											
SEARS 9232		X	X					X			
*VICEROY [®] 800R	X		X						X		
*VICEROY 800Z	X		X					X	X		
VICEROY 813		X	X						X		
WARDS 809		X	X					X			
WARDS 810		X	X		X			X			
*WARDS 888		X	X					X			
*WARDS 899		X	X		X			X			
Cartridge Projectors											
GAF 2500		X	X				X	X	X		X
GAF 2600		X	X		X		X	X	X		X
GAF 2700		X	X		X		X	X	X	X	X
SEARS 9240		X	X				X	X	X		X

TROUBLE SHOOTING INDEX

B

B

1. LOCATE PROJECTOR PROBLEM IN THIS CHART.
2. REFER TO TROUBLE SHOOTING CHART LISTED FOR CAUSE AND REMEDY DETAILS.

MODEL	TROUBLE		SEE TROUBLE SHOOTING CHART
ALL	FORWARD	NO REEL TAKE-UP	C-1
		STALL OUT	
ALL WITH FORWARD AND REVERSE	REVERSE	FILM JAMS	
		NO POWER	
		FORWARD TAKE-UP SPINDLE RUNS	
	FAST FORWARD	SLOW	
ALL	REWIND	NO POWER	
		FORWARD TAKE-UP SPINDLE RUNS	
ALL PROJECTORS WITH AUTO REWIND	AUTO REWIND	FAILS TO TRIP	
		WON'T RESET	
		BUZZING SOUND FROM SOLENOID	
		OPERATES BEFORE END OF FILM	
		SHUTTLE ENGAGES FILM PERFORATIONS	
		SLOW	
ALL FORWARD AND REVERSE PROJECTORS WITH STILL FEATURE ON CONTROL SWITCH	STILL	FILM BURN	
		DRIVES FORWARD OR REVERSE	
		KNOB DIFFICULT TO TURN	
ALL PROJECTORS WITH BRIGHT STILL FEATURE	BRIGHT STILL	INDEX ARM WON'T STAY IN POSITION	
		LARGE GEAR WON'T TURN FREE WHEN CAM SHAFT IS ROTATED	
		MECHANISM WON'T SHIFT POSITIONS	
		FRAMER KNOB ROTATES DURING PROJECTION	
ALL PROJECTORS WITH SLOW MOTION FEATURE	SLOW MOTION	INDEX ARM WON'T STAY IN POSITION	
		LARGE GEAR WON'T TURN FREE WHEN CAM SHAFT IS ROTATED	
		MECHANISM WON'T SHIFT POSITIONS	
		FRAMER KNOB ROTATES DURING PROJECTION	
ALL PROJECTORS WITH STEP MOTION ^{T.M.} FEATURE	STEP MOTION	EXCESSIVE NOISE AND PICTURE JUMP	
		MECHANISM WON'T SHIFT OR IS LOCKED UP	
		FRAMER KNOB ROTATES DURING PROJECTION	

MODEL	TROUBLE	SEE TROUBLE SHOOTING CHART
ALL	WILL NOT THREAD	F-1
	PROJECTOR THREADS BUT SHUTTLE DOES NOT PICK UP FILM	G-1
	PROJECTOR THREADS BUT SHUTTLE DOES NOT PICK UP FILM	H-1
	SHUTTLE RUNS IN STILL POSITION	
	PROJECTION LAMP WON'T LIGHT	K-1
	MOTOR WON'T WORK	
	CONTROL SWITCH MOVES HARD	
	CONTROL SWITCH CATCHES OR IS FROZEN	
	MOTOR STALLS	
	FILM BURNS IN STILL POSITION	
	SLOW FAST FORWARD	
	FORWARD TAKE-UP DRIVE NOT DISENGAGED DURING AUTO REWINDING CAUSING DRAG	
	AUTO REWIND WON'T TRIP	
CARTRIDGE PROJECTORS ONLY	FORWARD TAKE-UP SPINDLE RUNS WITH CONTROL KNOB IN REVERSE	
	CONTROL KNOB DIFFICULT TO TURN FROM FORWARD TO REVERSE POSITIONS	
ALL	GHOSTING	L-1
	RESOLUTION	
	FILM WOBBLE	
	INTERMITTENT FILM WOBBLE	
	PICTURE NOT CENTERED	
	VERTICAL PICTURE JUMP IN FORWARD	
	VERTICAL PICTURE JUMP IN FORWARD AND REVERSE	
	VERTICAL PICTURE JUMP IN REVERSE ONLY	
	FILM FAILS TO THREAD AND PICTURE NOT CENTERED	
	SHUTTLE NOISE	
	PICTURE DARK OR DARK ON ONE SIDE	
	SHADOW ON EDGE OF PROJECTED PICTURE WITH SUPER 8MM FILM	
	PROJECTED PICTURE SHORT WITH STANDARD 8MM FILM	

MODEL	TROUBLE	SEE TROUBLE SHOOTING CHART
ALL	PROJECTED PICTURE NARROW WITH STANDARD 8MM FILM	L-1
	RAPID HORIZONTAL AND VERTICAL PICTURE JUMP AND NOISE	
	HORIZONTAL PICTURE JUMP	
	LENS WOBBLE	
	PROJECTOR WILL NOT FOCUS	
	FILM BURNS	
	NO DRIVE IN FAST FORWARD	M-1
	WON'T DRIVE IN REWIND	
	SHUTTLE WON'T DRIVE IN FORWARD	
	PROJECTOR DRIVES FORWARD OR REVERSE WHEN CONTROL SWITCH IS IN STILL POSITION	
CARTRIDGE PROJECTORS ONLY	VIBRATION IN REVERSE OR FAST FORWARD	
	PUCK RUMBLE IN REVERSE	
	GEAR NOISE IN FORWARD	
ALL	NO POWER	O-1
CORD REEL MODELS ONLY	CORD REEL STICKS OR LOCK SLIPS	
	CORD WON'T RETRACT	

CONTROL FUNCTIONS

C

- C-1 QUICK TROUBLE SHOOTING OUTLINE**
- C-2 GENERAL CONTROL FUNCTION INFORMATION**
- C-3 FORWARD**
- C-4 REVERSE**
- C-5 FAST FORWARD**
- C-6 REWIND**
- C-7 AUTO REWIND**
- C-8 STILL**
- C-9 BRIGHT STILL**
- C-10 SLOW MOTION**
- C-11 STEP MOTION**

C

C-1 QUICK TROUBLE SHOOTING OUTLINE

Not all control functions are included on all model projectors.

PROJECTOR FUNCTION IN	TROUBLES	SEE TROUBLE SHOOTING CHART
FORWARD	NO REEL TAKE-UP.	C-3
	STALL OUT.	
REVERSE	FILM JAMS.	C-4
	NO POWER.	
	FORWARD TAKE-UP SPINDLE RUNS.	
FAST FORWARD	SLOW.	C-5
REWIND	NO POWER.	C-6
	FORWARD TAKE-UP SPINDLE RUNS.	
AUTO REWIND	FAILS TO TRIP.	C-7
	WON'T RESET.	
	BUZZING SOUND FROM SOLENOID.	
	OPERATES BEFORE END OF FILM.	
	SHUTTLE ENGAGES FILM PERFORATIONS.	
	SLOW.	
STILL	FILM BURN.	C-8
	DRIVES FORWARD OR REVERSE.	
	KNOB DIFFICULT TO TURN.	
BRIGHT STILL	INDEX ARM WON'T STAY IN POSITION.	C-9
	LARGE GEAR WON'T TURN FREE WHEN CAM SHAFT IS ROTATED.	
	MECHANISM WON'T SHIFT POSITIONS.	
	FRAMER KNOB ROTATES DURING PROJECTION.	
SLOW MOTION	INDEX ARM WON'T STAY IN POSITION.	C-10
	LARGE GEAR WON'T TURN FREE WHEN CAM SHAFT IS ROTATED.	
	MECHANISM WON'T SHIFT POSITIONS.	
	FRAMER KNOB ROTATES DURING PROJECTION.	
STEP MOTION ^{T.M.}	EXCESSIVE NOISE AND PICTURE JUMP.	C-11
	MECHANISM WON'T SHIFT OR IS LOCKED UP.	
	FRAMER KNOB ROTATES DURING PROJECTION.	

GENERAL CONTROL FUNCTION INFORMATION	C-2
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- C-2a CONTROL SWITCH CHART (FORWARD ONLY)
- C-2b CONTROL SWITCH CHART (FORWARD, REVERSE, STILL
EARLY DRIVE SYSTEM)
- C-2c CONTROL SWITCH CHART (FORWARD, REVERSE, STILL
CURRENT DRIVE SYSTEM)
- C-2d CONTROL SWITCH CHART (CARTRIDGE PROJECTORS ONLY)
- C-2e INTERMITTENT BUZZ (CARTRIDGE PROJECTORS ONLY)
- C-2f CONTROL KNOB CHANGE (CARTRIDGE PROJECTORS ONLY)
- C-2g RIM DRIVE (CARTRIDGE PROJECTORS ONLY)
- C-2e INTERMITTENT BUZZ

C-2

C-2a FORWARD ONLY MODELS

CONTROL KNOB POSITION	MOTOR	LAMP	FRONT SPINDLE	REAR SPINDLE	GATE
Off	Off	Off	Both Spindle Wheels Engaged by Friction Drives		Partially Open
*Motor	On	Off	Free Wheeling	Friction Drive Engaged	Closed
Lamp	On	On	Free Wheeling	Friction Drive Engaged	Closed
Rewind	On	Off, *On	Friction Drive Engaged	Free Wheeling	Full Open

*Late Model Projectors have 3-position switch. This position was eliminated.

C-2b FORWARD, REVERSE, STILL MODELS
(Early Pulley Drive System)

CONTROL KNOB POSITION	MOTOR	LAMP	FRONT SPINDLE	REAR SPINDLE	FLAG	GATE	*ROOM LIGHT
Off	Off	Off	Both Spindle Wheels Engaged by Large Friction Drives		Down	Open	On
Forward	On	On	Free Wheeling	Small Friction Drive Engaged	Down	Closed	Off
Still	On	On	Free Wheeling	Large Friction Drive Engaged	Up	Closed	Off
Reverse	On	On	Small Friction Drive Engaged	Free Wheeling	Down	Closed	Off
Stop	On	Off	Both Spindle Wheels Engaged by Large Friction Drives		Down	Open	On
Fast Forward	On	Off	Free Wheeling	Large Friction Drive Engaged	Down	Open	On
Stop	On	Off	Both Spindle Wheels Engaged by Large Friction Drives		Down	Open	On
Rewind	On	Off	Large Friction Drive Engaged	Free Wheeling	Down	Open	On

*On some models.

C-2c FORWARD, REVERSE, STILL MODELS
(Current Gear Pulley Drive System)

CONTROL KNOB POSITION	MOTOR	LAMP	FRONT SPINDLE	REAR SPINDLE	FLAG	GATE	*ROOM LIGHT
Off	Off	Off	NO TURN		Down	Open	On
Forward	On	On	Free	Small Friction Drive Engaged	Down	Closed	Off
†Still	On	On			Up	Closed	Off
Reverse	On	On	Small Friction Drive Engaged	Free	Down	Closed	Off
Stop	On	Off	NO TURN		Down	Open	On
Fast Forward	On	Off	Free	Large Friction Drive Engaged	Down	Open	On
Stop	On	Off	NO TURN		Down	Open	On
Rewind	On	Off	Large Friction Drive Engaged	Free	Down	Open	On

*On some models.

†Models prior to bright still system

C-2d CARTRIDGE PROJECTORS ONLY

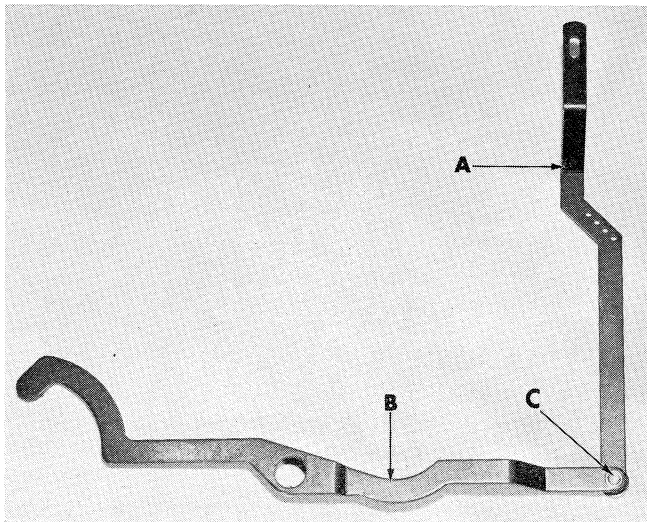
CONTROL KNOB POSITION	MOTOR	LAMP	*FRONT SPINDLE	PUCK	REAR SPINDLE	FLAG	GATE	ROOM LIGHT
Off	Off	Off	NO TURN			Down	Open	On
Rewind	On	Off	Free	Up and Turning	Free	Down	Open	On
Stop	On	Off	Free	Down and Free	No Turn	Down	Closed	On
Forward	On	On	Free	Down and Free	Small Friction Drive Engaged	Down	Closed	Off
Still	On	On	Free	Down and Free	Small Friction Drive Engaged	Up	Closed	Off
Reverse	On	On	Free	Up and Turning	Free	Down	Closed	Off
Stop	On	Off	Free	Down and Free	No Turn	Down	Closed	On
Fast Forward	On	Off	Free	Down and Free	Large Friction Drive Engaged	Down	Open	On

*For use with reels only

C-2e INTERMITTENT BUZZ

(Cartridge Projectors Only)

As the control knob is turned, a loud buzz may be heard in some positions. This is caused by rear cluster link vibration. To correct this situation, bend Link, P/N 490-507, at (A) toward projector frame. If buzzing persists, lift up electrical leads and wrap tape around lower link at (B) located over rib on projector frame. By hitting Rivet (C) with a screwdriver and hammer, it may be possible to tighten the assembly. Projectors manufactured after Code Week 413 have a spring washer located under Rivet (C) which will eliminate the buzz.



C-2e.1

C-2f CONTROL KNOB CHANGE

(Cartridge Projectors Only)

Turning bar on control knob has been increased in length for easier turning. Wall section of knob shank is thicker to eliminate breakage or splitting. Projectors manufactured after Code Week 418 were equipped with new knob.

C-2g RIM DRIVE

(Cartridge Projectors Only)

The rim drive wheel should be replaced on projectors which have a "whitish" colored tire or grooves worn in the tire, which indicates extensive use of steel reels. Replacing worn rim drive wheels will insure satisfactory reverse operation of the projector. Accumulation of black powder near the drive wheel indicates that the tire may be rubbing inside of cartridge or hitting cartridge latch. Drive wheel must be adjusted away from projector frame. Three washers are visible on shaft with drive wheel removed. For more clearance, add one or two washers, P/N 520-087, as required to shaft and check clearance between tire and inside edges of 50' and 400' cartridges. End play for complete rim drive assembly should be from .005 to .020. Decrease end play by adding one washer, P/N 520-087, in back of shaft E-ring. Recheck end play after securing rim drive wheel in place with screw.

FORWARD	C-3
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- C-3a FORWARD TROUBLE SHOOTING
- C-3b FORWARD TAKE-UP SYSTEM (FORWARD ONLY)
- C-3c FORWARD TAKE-UP SYSTEM (FORWARD, REVERSE, STILL
EARLY DRIVE SYSTEM)
- C-3d FORWARD TAKE-UP SYSTEM (FORWARD, REVERSE, STILL
CURRENT DRIVE SYSTEM)
- C-3e FORWARD TAKE-UP SYSTEM (CARTRIDGE PROJECTORS ONLY)
- C-3f SPINDLE END PLAY
- C-3g FORWARD TAKE-UP SPRING TENSION
- C-3h CONTROL SWITCH PROBLEM (EARLY FORWARD ONLY PROJECTORS)
- C-3i DRIVE ROLLER CHATTER (EARLY FORWARD ONLY PROJECTORS)
- C-3j DEFECTIVE TAKE-UP SPINDLE (SOME GAF® 1564 &
ANSCOVISION® 88 PROJECTORS)

C-3

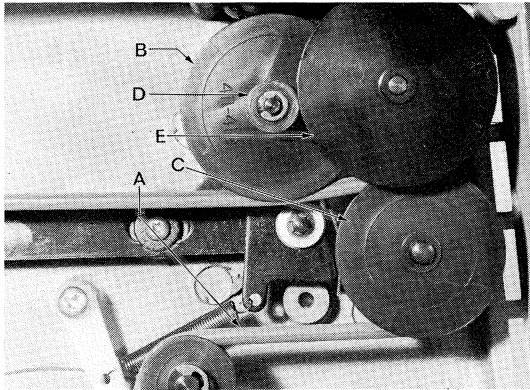
C-3a FORWARD TROUBLE SHOOTING

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	NO REEL TAKE-UP	REAR SPINDLE BINDING	RELIEVE BEARING	C-3
			INCREASE END PLAY	
		IMPROPER SPRING TENSION	ADJUST TAKE-UP SPRING	
		OIL ON DRIVE ROLLER AND/OR TAKE-UP SPINDLE	CLEAN (REMOVE OIL)	R
ALL WITH AUTO REWIND		AUTO REWIND WIRE LINK OUT OF ADJUSTMENT	BEND WIRE LINK	C-7
ALL	STALLS OUT WHEN CONTROL KNOB IN FORWARD POSITION	FLAT BELT SLIPS	READJUST TRANSMISSION BELT	N
			REPLACE BELT	
		MOTOR "O" BELT STRETCHED OR WORN	REPLACE	
		OIL ON FLAT BELT AND PULLEYS	CLEAN (REMOVE OIL)	R
		EXCESSIVE TORQUE TO ROTATE CAM SHAFT	REDUCE TENSION ON TOP SHUTTLE SPRING	H
			ADJUST SHUTTER END PLAY	I
		TRANSMISSION LEVER BENT AND RUBBING ON SIDE OF CAM	STRAIGHTEN LEVER AND READJUST TRANSMISSION	M
		DRAG IN SPINDLE DRIVE SYSTEM	CHECK ALL PULLEYS, SHAFTS AND WHEELS FOR BINDING	C-4
			CHECK BELTS FOR RUBBING	N
CARTRIDGE PROJECTORS ONLY	STALLS OUT WHEN CONTROL KNOB IN FORWARD POSITION OR WHEN THREADING LEVER IS OPERATED	FAN STALL ON MOTOR OR REAR COVER	REPOSITION FAN	M
		THREADER CLUTCHES JAMMED OR ENGAGING EACH OTHER TOO FAR	REPLACE CLUTCH WHEELS	F
			SHORTEN PUSH-ROD SPRING	

C-3b FORWARD TAKE-UP SYSTEM

(Forward Only Projectors)

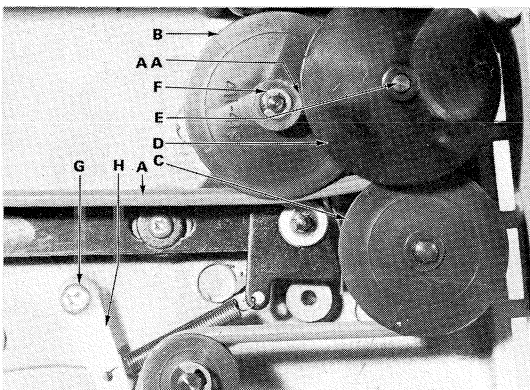
Take-up system on Forward Only projectors is driven by main drive belt (A) in a counterclockwise direction when projector is in Forward position. Drive belt (A) drives pulley (B) through idler pulley (C). Drive spindle (D) is attached to pulley (B) and drives rear spindle wheel (E). When projector is in Rewind position, drive spindle (D) is pulled slightly away from rear spindle wheel (E) so that it will turn free.



C-3b.1

Disassembly and Adjustment

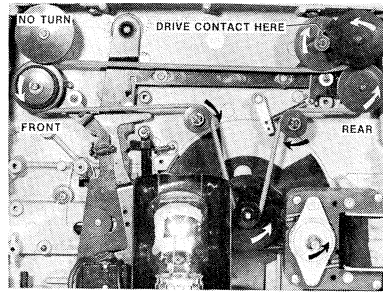
1. Work drive belt (A) loose from idler pulley (C) and pulley (B).
2. Remove take-up spindle and rear spindle wheel (D) by driving shaft (E) through projector frame with a 1/8 inch drift. Reassemble by supporting reel spindle on end of shaft (E) and pressing on spindle wheel (D).
3. With rear spindle wheel (D) removed, idler pulley (C) can be lifted off of shaft. Remove E-ring (F) and pulley (B) with pressed on drive wheel.
4. After reassembling pulleys, spindle drive tension is adjusted by loosening screw (G) and swinging arm (H) forward to increase or back to decrease drive pulley tension at (AA). Adjustment should be made with projector in OFF or FORWARD position. When projector is in Rewind position, drive wheel must not be in contact with spindle wheel (D) at (AA) (in Rewind, spindle is free).



C-3b.2

Direction of Pulley Rotation in Forward

The projector drive system operates through a series of pulleys and drive belts most of which are turning when the projector is in any of the drive positions.



C-3b.3

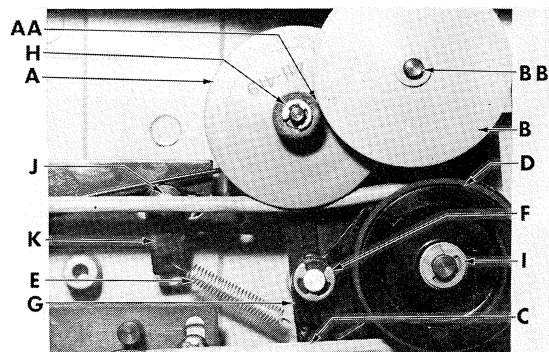
C-3c FORWARD TAKE-UP SYSTEM

(Forward, Reverse, Still Projectors, Early Pulley Type Drive System)

With the projector in Forward position, take-up link moves small drive pulley (A) into drive position at (AA), against spindle wheel (B). Drive pulley (A) is driven by belt (C) through large drive pulley (D). Only when in Forward position is small drive pulley in contact with spindle wheel (B).

Disassembly and Adjustment

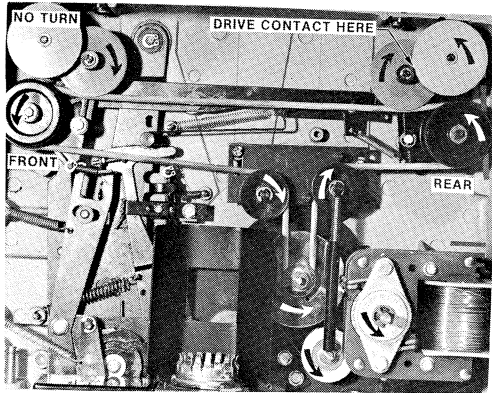
1. Remove drive belt (C) from pulley (D). Disconnect spring (E) and wire link.
2. Remove take-up spindle and spindle wheel (B) by driving shaft through projector frame at (BB) with 1/8 inch drift. Reassemble by supporting reel spindle and pressing on spindle wheel (B).
3. Remove E-ring (F) and slide rear pulley plate (G) with pulleys off of shaft. Pulley (A) and (D) can be removed from pulley plate by removing E-ring (H) and (I). NOTE: Pulley (A) and (D) can be removed individually from pulley plate without removing the complete assembly from the projector.
4. After reassembling pulleys or complete assembly, spindle drive tension is adjusted by loosening screw (J) and swinging arm (K) forward to increase or back to decrease drive pulley tension at (AA). Adjustment should be made with projector in Forward position. Small friction drive is not in contact with take-up spindle wheel in all positions but Still.



C-3c.1

Direction of Pulley Rotation in Forward

The projector drive system operates through a series of pulleys and drive belts, most of which are turning when the projector is in any of the drive positions.

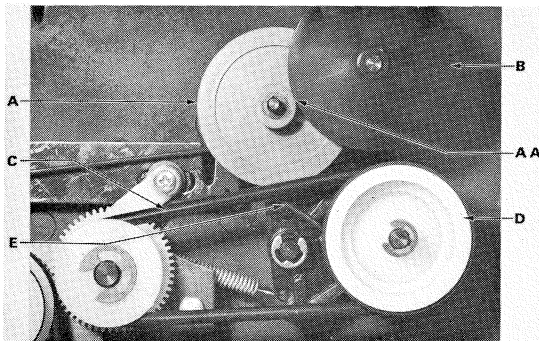


C-3c.2

C-3d FORWARD TAKE-UP SYSTEM

(Forward, Reverse, Still Projectors with Current Gear Pulley Drive System)

For film take-up in Forward position, the take-up link moves drive pulley (A) against spindle wheel (B). Drive belt (C) turns drive pulley (D) with belt (E) clockwise. Belt (E) turns drive pulley (A) which friction drives spindle wheel (B) at (AA). The only time drive pulley (A) is in contact is in Forward and Still positions. In all other switch positions, the small friction drive is not in contact with take-up spindle wheel.



C-3d.1

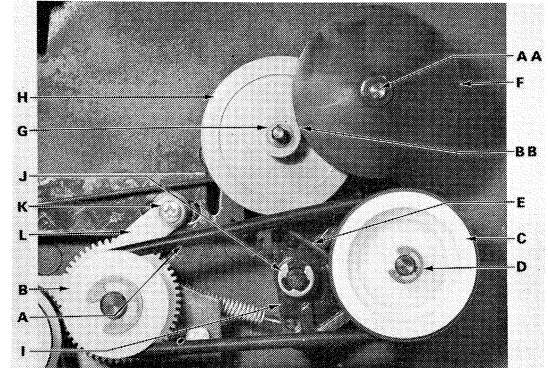
Disassembly and Adjustment

1. Work drive belt (A) off of pulley (B) and (C). Remove E-ring (D) and slide pulley off of shaft until drive belt (D) can be disconnected from back of pulley (C). Remove pulley (C).
2. Remove take-up spindle and spindle wheel (F) by driving shaft through projector frame at (AA) with 1/8 inch drift. Reassemble by supporting reel spindle and pressing on spindle wheel (F).
3. Remove E-ring (G) and slide drive pulley (H) off of shaft.

NOTE: Complete rear pulley plate (I) with drive pulleys attached can be removed from the projector by disconnecting drive belt (A) and removing take-up spindle wheel

(F). Disconnect spring and wire link. Remove E-ring (J) and slide complete assembly from shaft.

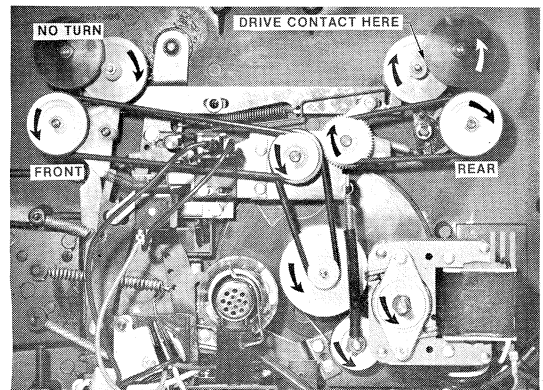
4. After reassembling pulleys or complete assembly, spindle drive tension is adjusted by loosening screw (K) and swinging arm (L) forward to increase or back to decrease drive pulley tension at (BB). Adjustment should be made with projector in Forward position. The small friction drive is not in contact with take-up spindle wheel in any position but Still.



C-3d.2

Direction of Pulley Rotation in Forward

The projector drive system operates through a series of pulleys, gears and drive belts, most of which are turning when the projector is in any of the drive positions.

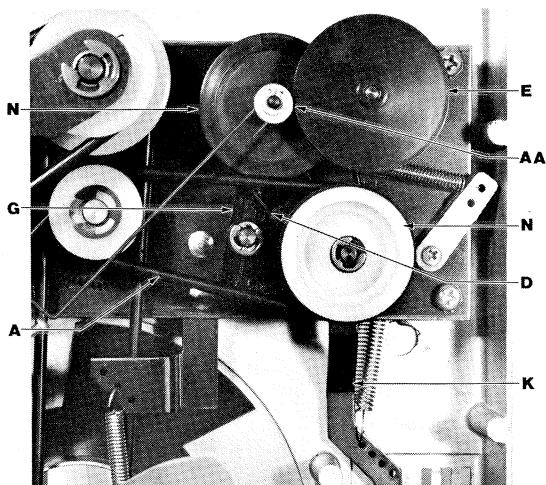


C-3d.3

C-3e FORWARD TAKE-UP SYSTEM

(For Cartridge Projectors Only)

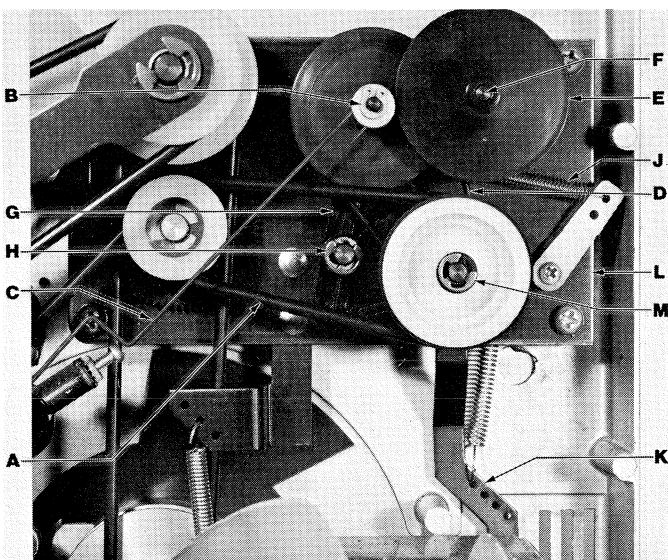
For take-up in Forward position, link (K) pulls down on drive assembly (G) which pivots drive pulley (N) against spindle wheel (E). Drive belt (A) turns pulley (O) with belt (D) clockwise. Belt (D) turns small drive pulley (N) which friction drives spindle wheel (E) at (AA). The only time drive pulley (N) is in contact is in Forward position. The small friction drive is in contact with take-up spindle wheel in Still position only.



C-3e.1

Disassembly and Adjustment

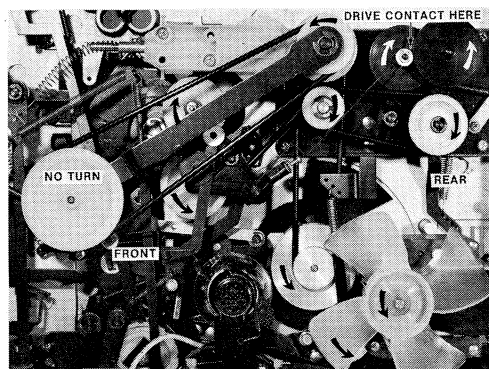
1. Replace drive belt (A) by removing grip ring (B) and wire link (C).
2. Replace forward take-up belt (D) by removing grip ring (B), wire link (C) and drive belt (A).
3. Remove front spindle, or spindle drive wheel (E), by driving shaft (F) through projector frame with a 1/8" drift. Reassemble by supporting reel spindle on end of shaft (F) and pressing on spindle wheel (E).
4. To remove drive assembly (G), complete the above steps and remove E-ring (H), disconnect spring (J), and slide assembly off of pin. When reassembling, if link (K) is NOT held to plate (L) by E-ring and pin, be sure shaft (M) is assembled through slot in link (K).



C-3e.2

Direction of Pulley Rotation in Forward

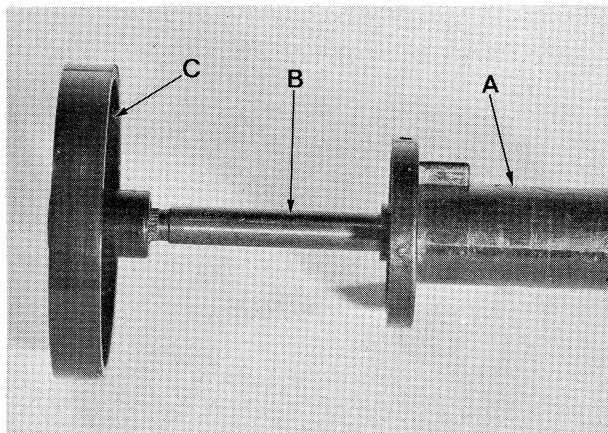
The projector drive system operates through a series of pulleys, gears and drive belts, most of which are turning when the projector is in any of the drive positions.



C-3e.3

C-3f SPINDLE END PLAY

Forward take-up spindle (A) must be free to rotate without drag. To "free-up", add about .020 end play by hitting shaft (B) in the center of rear wheel spindle (C) with a suitable 1/8" drift.



C-3f.1

C-3g FORWARD TAKE-UP SPRING TENSION

If the take-up reel does not take up film correctly, the take-up spring must be adjusted to 100± 25 grams torque on rear spindle measured with a Waterman torque wrench or 12 to 15 grams measured 2½ inches from rear spindle. Advance spring until a full 400-foot reel will take up and not produce picture jump.

C-3h CONTROL SWITCH PROBLEM

(Some Early Model Forward Only Projectors)

On some model Forward Only Projectors, an occasional condition may occur; when slowly turning control switch from Motor to Lamp position, it may be possible to have the projection lamp on and the motor off causing film burn. Replacement switches are now designed to eliminate this condition.

C-3i DRIVE ROLLER CHATTER

(Early Model Forward Only Projectors)

Some early model Forward Only projectors may be returned for a "chattering" noise caused by drive roller vibration against the spindle wheel. This was serviced as follows:

1. Remove Take-up lever assembly. Make certain that groove pin, P/N 591-022, measures .55 from end of locking grooves to end of pin. Replace if necessary. Pin must be pressed securely into frame casting so that locking grooves are below surface of boss.
2. Lightly grease groove pin before reassembling lever assembly.
3. With take-up lever in place, install bowed washer, P/N 411-833 (bow down), Washer, P/N 520-051, and Retainer, P/N 590-052. Lever assembly must pivot freely with retainer installed. Washer was added to take up end play.
4. Readjust take-up lever for proper (100 ± 25 grams) take-up torque in Motor Lamp Switch position.

C-3j DEFECTIVE TAKE-UP SPINDLE

(On some GAF® 1564 and ANSCOVISION® 88 Projectors)

Some GAF 1564 and Anscovision 88 Projectors manufactured during Code Week 424 were found to have defective take-up spindles. The ball may be pulled from the socket in the spindle when using a metal reel. Units with this problem must have the complete take-up spindle replaced.

REVERSE	C-4
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- C-4a REVERSE TROUBLE SHOOTING
- C-4b REVERSE DRIVE SYSTEM (FORWARD, REVERSE, STILL,
EARLY DRIVE SYSTEM)
- C-4c REVERSE DRIVE SYSTEM (FORWARD, REVERSE, STILL,
CURRENT DRIVE SYSTEM)
- C-4d REVERSE DRIVE SYSTEM (CARTRIDGE PROJECTORS ONLY)
- C-4e REPLACEMENT SPINDLE ADAPTERS (EARLY
MODEL PROJECTORS)

C-4

C-4a REVERSE TROUBLE SHOOTING

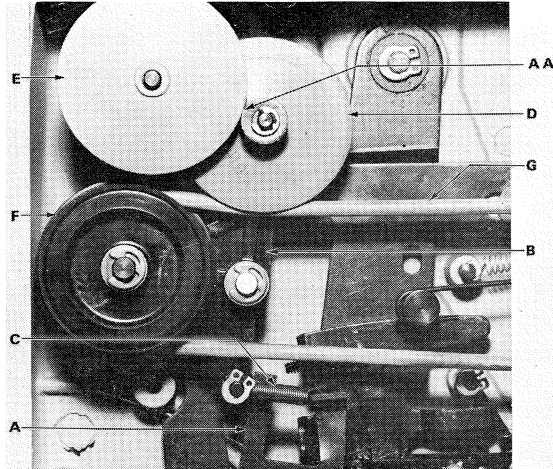
MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	FILM JAMS IN REVERSE	IMPROPER FILM SPLICE	DEFECTIVE SPLICE WILL USUALLY OPERATE IN FORWARD BUT NOT IN REVERSE. RESPLICE FILM.	—
CARTRIDGE PROJECTORS ONLY		IMPROPER CONTROL KNOB OPERATION.	DO NOT GO FROM FAST FORWARD TO REVERSE WHEN USING 400' CARTRIDGE. EXCESSIVE FILM SPILL WILL OCCUR AND PUCK CANNOT TAKE UP EXCESS BEFORE JAMMING. PROPER SWITCH SEQUENCE IS FROM FAST FORWARD TO FORWARD THEN TO REVERSE.	—
		WEAK REVERSE SPRING ON PUCK.	INCREASE SPRING PRESSURE BY MOVING SPRING PIVOT TO THE LEFT. NOTE: EXCESSIVE SPRING PRESSURE WILL CAUSE VERTICAL PICTURE JUMP.	C4d
			CLEAN BRONZE PIVOT BUSHING. REPLACE PIVOT PLATE IF PIN IS LOOSE.	C4d
		TRANSMISSION CLUTCH WEAK AND PUCK MAY STOP.	IF PUCK TURNS SLOWLY AND DOESN'T SLIP, LOOSEN TRANSMISSION JAM NUTS AND INCREASE TENSION BY TURNING SCREW ONE TURN COUNTERCLOCKWISE. NOTE: IF TRANSMISSION DOESN'T HAVE TWO JAM NUTS, REMOVE E-RING AND ADD WASHER TO INCREASE SPRING TENSION.	C4d
		LOOSE PUCK.	TIGHTEN SCREW.	C4d
		TIRE CROOKED ON PUCK.	STRAIGHTEN TIRE. MUST BE PARALLEL WITH PLASTIC PUCK TO AVOID RUBBING ON SIDE OF CARTRIDGE.	C4d
		MISALIGNED PUCK.	ALIGN PUCK BY REMOVING. ADD OR SUBTRACT WASHERS AS REQUIRED. PUCK MUST ENTER ON CENTER LINE OF CARTRIDGE WITH SOME END PLAY AND NOT RUBBING SIDE OF CARTRIDGE.	C4d

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
CARTRIDGE PROJECTORS ONLY CONT'D.		REEL BRAKE DRAGGING ON SUPPLY SPINDLE.	BRAKE SPRING MUST BE IN PLACE AND BRAKE CLEARS SPINDLE.	C4
			REEL MUST FREE-WHEEL IN REVERSE WITH PUCK HELD OFF REEL.	C-4
		PUCK NOT ROTATING BECAUSE OF MISSING TRANSMISSION SPRING.	REPLACE SPRING.	M
ALL	NO POWER IN REVERSE.	GREASE ON MOTOR "O" BELT.	DEGREASE BELT OR REPLACE.	N
		MOTOR "O" BELT STRETCHED, BROKEN OR OFF PULLEY.	REPLACE.	N
		TRANSMISSION OUT OF ADJUSTMENT.	ADJUST TRANSMISSION.	M
		WEAK MOTOR REVERSE SPRING.	INCREASE MOTOR REVERSE SPRING TENSION BY ATTACHING SPRING IN NEXT HIGHER HOLE.	M
	FORWARD TAKE-UP SPINDLE RUNS IN REVERSE.	DRIVE WHEEL ENGAGING FORWARD TAKE-UP SPINDLE.	SHOULD BE ABOUT 1/16" BETWEEN DRIVE WHEEL AND FORWARD TAKE-UP SPINDLE. BEND FAST FORWARD DRIVE WHEEL DOWN TO INCREASE SPACING. NOTE: THERE MUST BE SOME SLACK IN LINK IN FORWARD, TO TAKE UP 400' OF FILM.	C-4

C-4b REVERSE DRIVE SYSTEM

(For Forward, Reverse, Still Projectors with Early Pulley Type Drive System)

Reverse drive system is operated by rewind lever (A) which is part of the lamp bracket assembly. With control switch in Reverse position, rewind lever (A) is moved to the right pulling front pulley plate assembly (B) by spring (C). Pulley plate (B) pivots on a shaft moving small drive pulley (D) into contact at (AA) with front spindle wheel (E) driving supply reel in reverse direction at standard film speed. Pulleys (D) and (F) are driven by belt (G). In all other switch positions, small friction drive is not in contact with front spindle wheel.



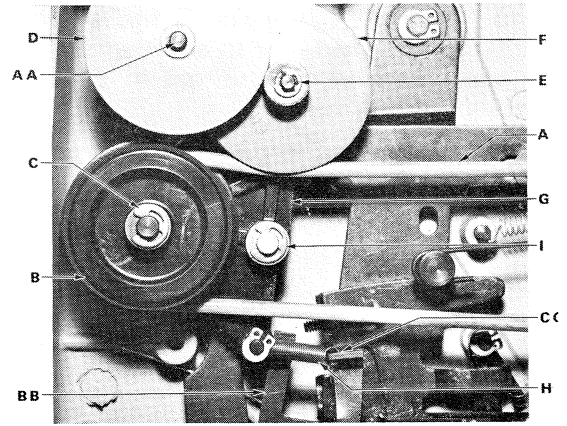
C-4b.1

Disassembly and Adjustment

1. Disconnect drive belt (A) from pulley (B). Remove E-ring (C) and slide pulley (B) off of shaft.
2. Remove front spindle and spindle wheel (D) by driving shaft through projector frame at (AA) with 1/8 inch drift (be sure spindle adapter is removed). Reassemble by supporting reel spindle and pressing on spindle wheel (D).
3. Remove E-ring (E) and slide drive pulley (F) off of shaft.

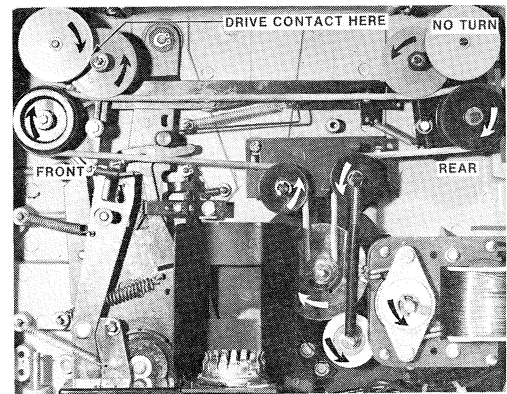
NOTE: Complete front pulley plate assembly (G) with drive pulleys attached can be removed from projector by disconnecting drive belt (A) and removing front spindle wheel (D). Unhook spring (H), remove E-ring (I) and slide complete assembly from shaft.

4. After reassembling pulleys or complete assembly, drive tension is adjusted as follows:
 - a. Turn control knob to Reverse position. Adjust rewind lever by bending at (BB) so that front spindle drives at 1.4 to 2 inch ounces torque.
 - b. Turn control knob to Rewind position and adjust rewind lever by bending at (CC) so that large friction drive pulley (B) engages spindle wheel (D).
 - c. Check control switch positions and be sure small friction drive is not engaged in any other position than Reverse.



C-4b.2

Direction of Pulley Rotation in Reverse



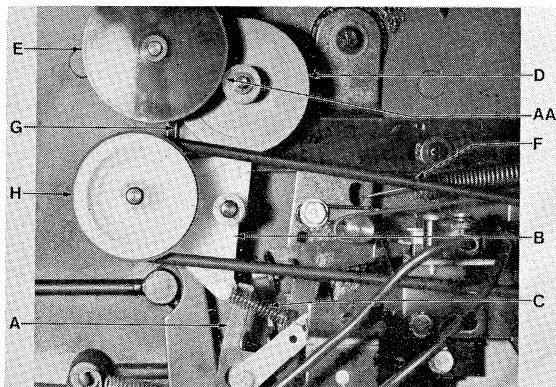
C-4b.3

C-4c REVERSE DRIVE SYSTEM

(For Forward, Reverse, Still Projectors with Current Gear Pulley Drive System)

Reverse drive system is operated by rewind lever (A) which is part of the lamp bracket assembly. When control switch is in Reverse position, rewind lever (A) moves slightly to the right relieving tension against front plate assembly (B). Spring (C) pivots front plate assembly (B) so that small drive pulley (D) is in contact with front spindle wheel (E) at (AA) driving supply reel in reverse direction at standard film speed. Pulley (H) is driven by drive belt

(F) and turns belt (G) which is figure-eighted between pulley (D) and (H). In all other switch positions, small friction drive is not in contact with front spindle wheel.



C-4c.1

Disassembly and Adjustment

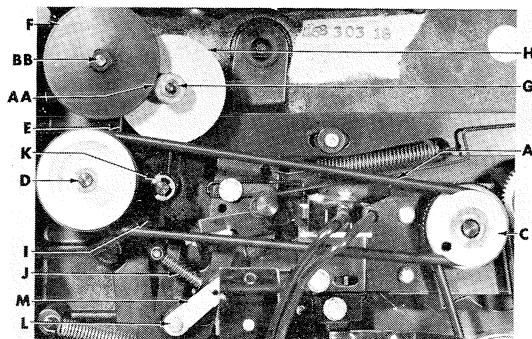
1. Disconnect drive belt (A) from pulley (B) and (C). Remove E-ring (D) and slide pulley (B) off of shaft so belt (E) can be removed. NOTE: Be sure belt (E) is properly installed when pulleys are re-assembled. See Section N.

2. Remove front spindle and spindle wheel (F) by driving shaft through projector frame at (BB) with 1/8 inch drift (be sure spindle adapter is removed). Reassemble by supporting reel spindle and pressing on spindle wheel (F).

3. Remove E-ring (G) and slide small drive pulley (H) off of shaft.

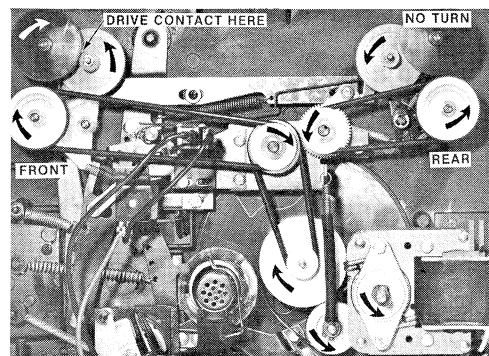
NOTE: Complete front pulley plate assembly (I) with drive pulleys attached can be removed from projector by disconnecting drive belt (A) and removing front spindle wheel (F). Unhook spring (J) from pulley plate, remove E-ring (K) and slide complete assembly from shaft.

4. After reassembling pulleys or complete assembly, spindle drive tension is adjusted by loosening screw (L) and swinging arm (M) down to increase or up to decrease drive pulley tension at (AA). Adjustment should be made with projector in Reverse position. In other switch positions, the small friction drive is not in contact with front spindle wheel.



C-4c.2

Direction of Pulley Rotation in Reverse



C-4c.3

C-4d REVERSE DRIVE SYSTEM

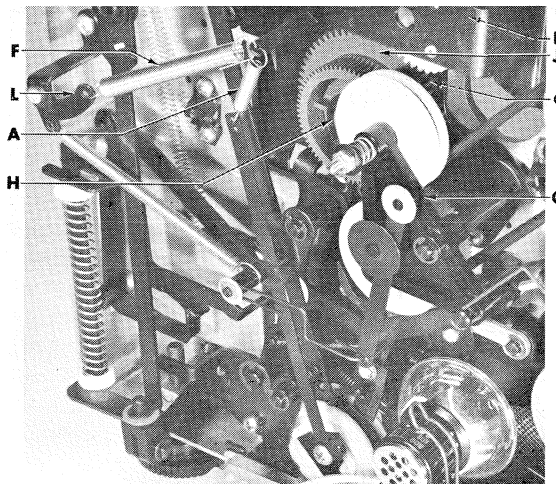
(Cartridge Projectors Only)

Puck Drive in Reverse Position

With control knob in Reverse position, rewind spring (A) is slack, and reverse spring (F) pulls puck (C) to the reel with a very light pressure. With projector elevated about 15° and running in Reverse, tap puck (C) several times. The puck should snap forward with a slight click each time it is tapped. If there is any hesitation, be sure tab (I) is not touching anything on either side as it comes up. Bend if necessary. If there is still a hesitation, remove transmission (G) (see Section M).

Puck Drive Removal

Remove puck (C) and loose washers on shaft. Disconnect springs (A) and (F). Remove E-ring (H) and slide out double gear (J). Rotate pivot plate (I) to the right to clear main support plate, and slide off of pin. Pivot plate bronze bushing must be clean and free of burrs. Run a 5/16" reamer of fine emery cloth wrapped around a 1/4" rod through bushing to enlarge slightly. Install pivot plate (I), double gear (J), transmission (G) and puck. Only after the above steps have been completed should reverse spring tension be increased slightly by rotating spring pivot (L) up.



C-4d.1

Reel Brake Operation

The reel brake mechanism is operated from the control knob cam. It is only used with reel operation and is equipped with four brake shoes (B) which press against the reel spindle when it is inserted through projector frame.

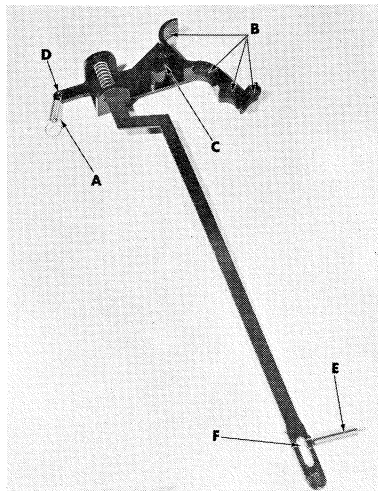
When checking or servicing this feature, be sure reel spindle is pushed into its socket only when control knob is in Forward position, otherwise spindle may damage the brake shoes.

The 400' reel brake shoe (B) is applied with Eastman 910 glue, the other three shoes are self-adhering. The reel brake is required because the projector is equipped with Fast Forward feature and is applied on Stop and Off positions, or either side of Fast Forward to prevent spilling of film from supply reel.

It is essential that pivot (C) be free and that spring (A) be strong enough to insure that shoes do not rub spindle while projector is in Forward, Reverse, or Rewind positions. If necessary, another spring can be added at (A).

Reel Brake Removal

Disconnect spring (A) at (D). Remove E-ring from pivot pin (C), and remove spring (E). Slide assembly off of pin (C). Lift lower end of brake rod out of cam and off of pin (F). Entire assembly can now be lifted straight up and out of projector without further projector disassembly.



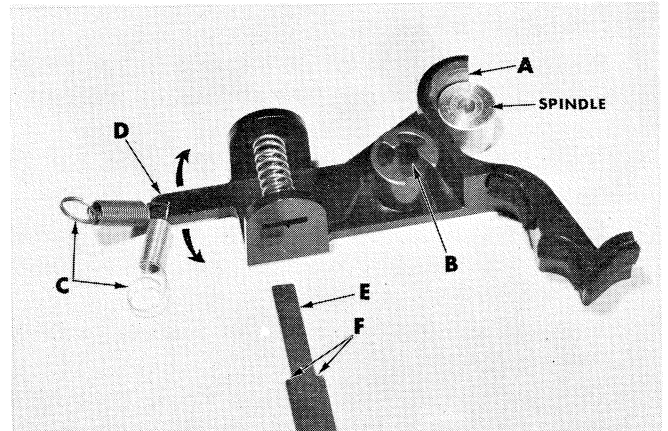
C-4d.2

Reel Brake Problems

The reel brake may cause vertical picture jump in Forward, Slow Fast-Forward, Slow Rewind, Slow Auto-Rewind, false auto rewind tripping, and film jamming in Reverse with reel to reel operation. One or all of these problems may be caused by the reel brake shoe not completely releasing and exerting "drag" on the spindle at (A). Brake assembly must be free to rotate at pivot (B) and spring (C) must be strong enough to pivot brake arm (D) down, releasing any drag on spindle. If more pressure is needed, another spring (C), P/N 490-615, should be added to brake arm (D).

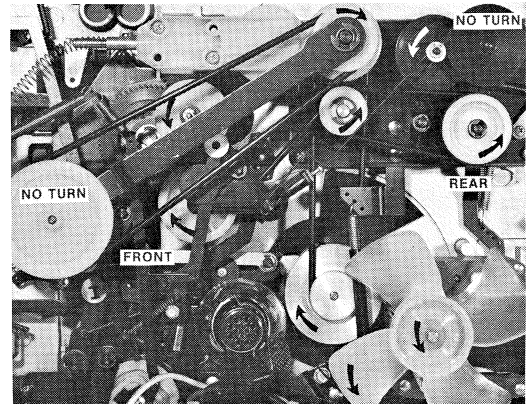
If the problem still persists, remove brake assembly and brake rod (E) by first removing keeper at (B) and spring (C). File down both brake rod shoulders at (F) .015.

NOTE: Spindle must be inserted and removed with projector in Forward position only. Forcing spindle into hole will often bunch up, or push off brake shoes. Always check to insure brake shoes are intact and do not rub spindle.



C-4d.3

Direction of Pulley Rotation in Reverse



C-4d.4

Installation of Service Kit to Provide Separate Reverse Drive and Rewind

(For Cartridge Projectors Manufactured Prior to Code Week 425)

This kit should be installed on all cartridge projectors manufactured prior to Code Week 425 which are returned for service.

Install the kit as follows:

1. Remove spring (A) and install spring, P/N 490-617, with special ends which require no crimping. Loosen screw holding spring pivot (S).
2. Elevate front of projector by extending elevating foot all the way down and turn control knob to Reverse position. Follow puck drive instructions, Section C-4d.

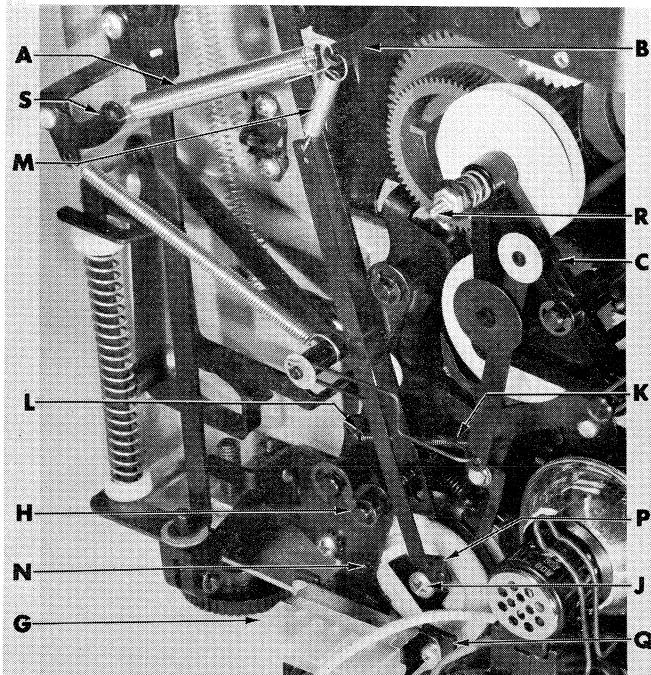
3. Remove two screws and switch (G) from lamp bracket.
4. Remove E-ring (H) and discard plastic switch pawl. Remove cam screw (J) and discard washer under screw.
5. Move shifter spring (K) back to groove closest to reel bracket bar. Grasp reel brake pin (L) with pliers at the unused groove and bend pin until it breaks off at groove.
6. Turn control knob to Stop position between Reverse and Fast Forward.
7. Position lower end of connecting rod assembly, P/N 490-539, into switch cam and secure with screw (J).
8. Hook connecting rod spring (M) into bar (B) along with reverse spring.
9. Install metal switch pawl, P/N 490-773, making sure cam follower (N) fits into slot. Install spacer, P/N 490-270, and E-ring (H).
10. Position switch slide into pawl and secure switch (G) with screws.
11. Rotate control knob several times, both directions, to be sure it rotates freely. If control knob sticks, bend rivet end of rod (P) in or out to insure clearance at follower (N) and lug (Q). If necessary, bend lug (Q) down slightly for additional clearance.
12. It is important that rewind spring (M) be free and slack when projector is in Reverse. Connecting rod can touch transmission (C) when slack, but if it can get caught in any linkage, it should be bowed out away from projector frame.
13. If first jam nut is more than 1/8" from slotted end of shaft, adjust both nuts back to 1/8" as shown (R) and lock securely.

14. With 50' cartridge in place and control knob in Reverse, the puck will not slip on the reel with very light pressure. Some reels may clatter in Reverse which is not objectionable as long as the picture is steady. Reel clatter may be reduced by rotating spring pivot (S) up slightly. If picture jump appears in Reverse, decrease reverse spring tension and tighten screw on spring pivot (S).

C-4e REPLACEMENT SPINDLE ADAPTERS

(For Early Model Projectors with Cast-Silver Spindles)

Plastic spindle adapter, P/N 468-599, was manufactured as a service replacement part for coin-slot type spindles used on early model projectors with cast-silver spindles. First try standard spindle adapter, P/N 468-576, for fit. If it does not, then use spindle adapter P/N 468-599.



C-4d.5

FAST FORWARD	C-5
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- C-5a FAST FORWARD TROUBLE SHOOTING
- C-5b FAST FORWARD SYSTEM (FORWARD, REVERSE, STILL, EARLY DRIVE SYSTEM)
- C-5c FAST FORWARD SYSTEM (FORWARD, REVERSE, STILL, CURRENT DRIVE SYSTEM)
- C-5d FAST FORWARD SYSTEM (CARTRIDGE PROJECTORS ONLY)

C-5

C-5a FAST FORWARD TROUBLE SHOOTING

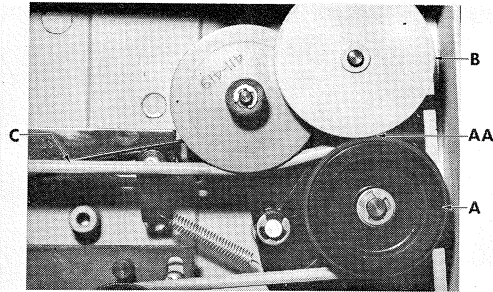
MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	SLOW FAST FORWARD	FORWARD TAKE-UP SPINDLE DRAGS.	SPINDLE MUST BE LOOSE ENOUGH TO SPIN FREELY. FROM REAR OF PROJECTOR TAP SPINDLE SHAFT TO PROVIDE END PLAY.	C-3
		GATE OR PRESSURE PLATE NOT OPEN FAR ENOUGH.	PRESSURE PLATE SHOULD OPEN A MINIMUM OF .080. REMOVE LAMP BRACKET AND INSTALL NEW GATE CONTROL ARM IF NECESSARY.	G
		DRIVE BELT SLIPS ON MOVEMENT PULLEY.	REPOSITION IDLER PULLEY ON ARM.	M
			INCREASE FLAT BELT TENSION BY ADJUSTING IDLER BRACKET ASSEMBLY.	N
			REPLACE FLAT BELT IF WORN OR GLAZED.	N
		OIL ON MOVEMENT PULLEY.	CLEAN BELT AND PULLEY.	R
		EXCESSIVE TORQUE TO ROTATE CAM SHAFT	REDUCE TENSION OF TOP SHUTTLE SPRING. MOVEMENT PULLEY MUST HAVE .003 TO .005 END PLAY.	H
		EXCESSIVE FILM DRAG FROM LIGHT SHIELD SPRING GUIDE.	REMOVE MOVEMENT HOUSING AND DECREASE SPRING GUIDE TENSION. HORIZONTAL PICTURE JUMP WILL OCCUR IF GUIDE IS RELAXED TOO MUCH.	D
CARTRIDGE PROJECTORS ONLY		FAST FORWARD DRIVE SPRING NOT ENGAGED.	IF SPRING IS ENGAGED WITH TOP HOLE SUFFICIENT FORCE IS APPLIED TO TAKE-UP SPINDLE.	C-5d
		THREADER HOUSING NOT IN PLACE CORRECTLY.	REPOSITION.	D
		FILM HAS JUMPED OFF FILM PATH GUIDE ROLLERS.	REWIND FILM AND TEST AGAIN.	—
		REMOVABLE FILM PATH PINCHING FILM.	REPOSITION FILM PATH.	D
		REEL BRAKE DRAGGING ON SUPPLY REEL SPINDLE.	CHECK REEL BRAKE SPRING. ADD EXTRA SPRING IF NECESSARY.	C-4d

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
		THREADER ASSEMBLY DOESN'T GO ALL THE WAY DOWN AFTER USE.	CHECK IF LINKAGE HANGS UP	F
			ADJUST THREADER SPRING PIVOT FOR PROPER TRAVEL.	F
		THREADER ASSEMBLY LOOSE AND HAS SHIFTED CROWDING FILM IN FILM PATH.	LOOSEN TWO THREADER SCREWS AND REPOSITION THREADER.	F
			REPLACE THREADER LIFT BAR IF IT CAN BE TWISTED.	F

C-5b FAST FORWARD SYSTEM

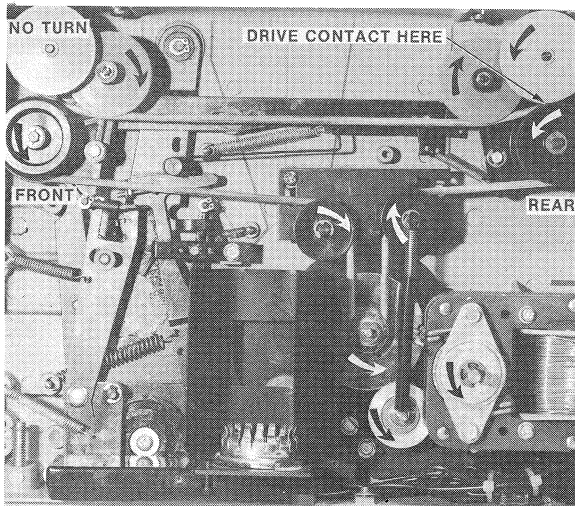
(Forward, Reverse, Still Projectors with Early Pulley Drive System)

Fast Forward system is part of Forward take-up system and is disassembled and adjusted per instructions Section C-3c. With control switch in Fast Forward position, the rubber tire on large drive pulley (A) is turning clockwise and in contact at (AA) with spindle wheel (B). Pulley (A) is driven by drive belt (C). Drive pulley (A) is in contact with spindle wheel (B) in Off, Stop and Fast Forward control switch positions. All other positions, large drive pulley is not engaged.



C-5b.1

Direction of Pulley Rotation in Fast Forward

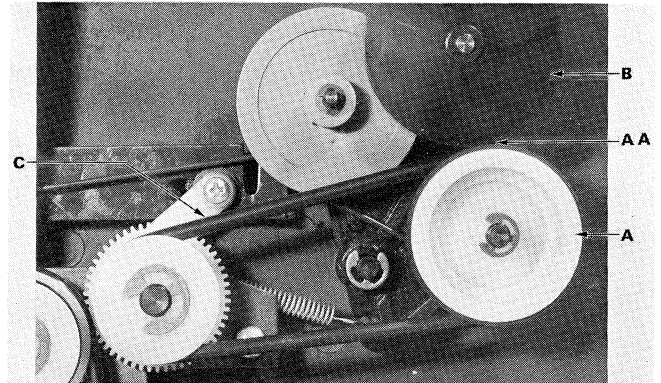


C-5b.2

C-5c FAST FORWARD SYSTEM

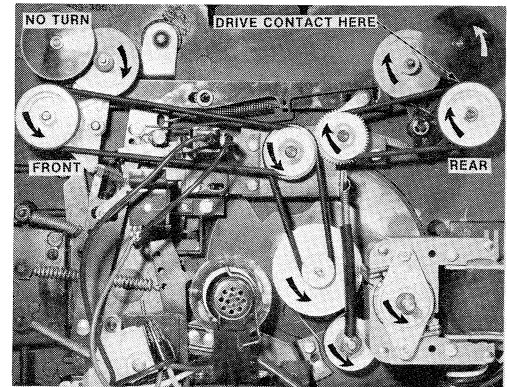
(Forward, Reverse, Still Projectors with Current Gear Pulley Drive System)

Fast Forward system is part of Forward take-up system and is disassembled and adjusted per instructions, Section C-3d. With control switch in Fast Forward position, the rubber tire on large drive pulley (A) is turning clockwise and in contact at (AA) with spindle wheel (B). Pulley (A) is driven by drive belt (C). Drive pulley (A) is in contact with spindle wheel (B) in Off, Stop and Fast Forward control switch positions. All other positions, large drive pulley is not engaged.



C-5c.1

Direction of Pulley Rotation in Fast Forward

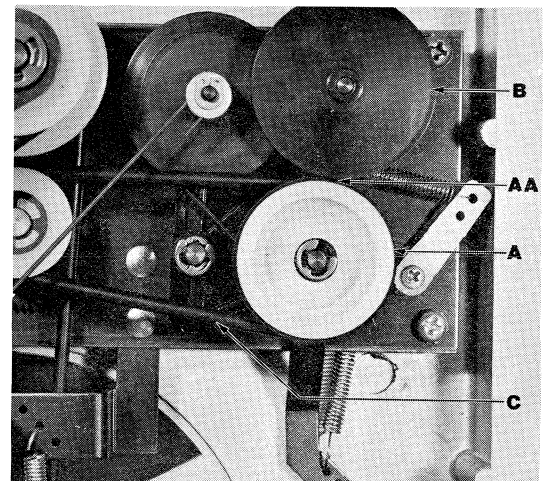


C-5c.2

C-5d FAST FORWARD SYSTEM

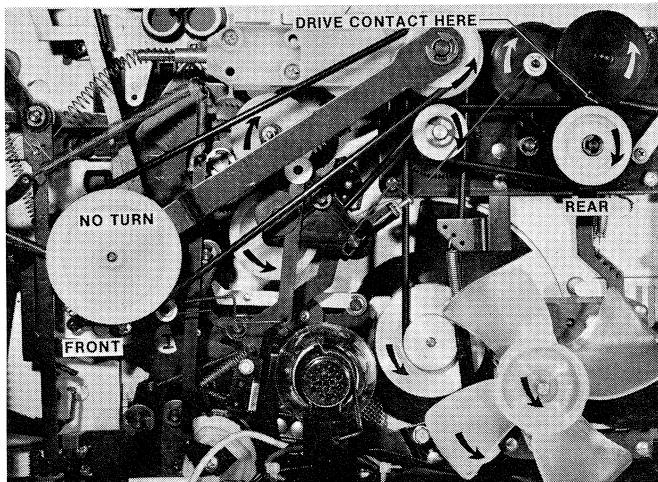
(For Cartridge Projectors Only)

Fast Forward system is part of Forward take-up system and is disassembled and adjusted per instructions, Section C-3e. With control switch in Fast Forward position, the rubber tire on large drive pulley (A) is turning clockwise and in contact at (AA) with spindle wheel (B). Pulley (A) is driven by drive belt (C). Drive pulley (A) is in contact in Off, Stop and Fast Forward positions. All other positions, large drive pulley is not engaged.



C-5d.1

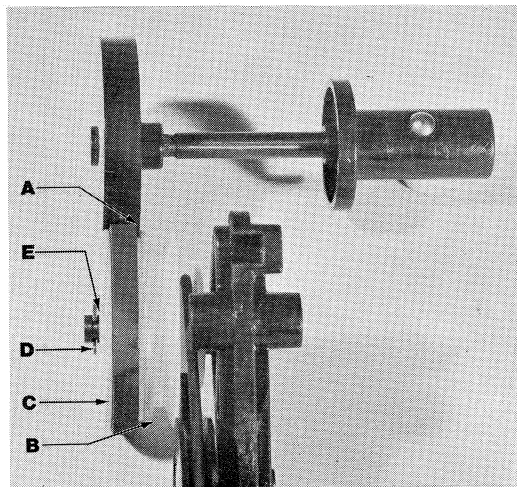
Direction of Pulley Rotation in Fast Forward



C-5d.2

Slow Fast Forward

Slow Fast Forward may be caused by rear drive belt (B) rubbing on rear spindle wheel at (A). Drive pulley (C), while under load, may move out away from projector frame causing drive belt to rub on rear spindle wheel. To correct, remove E-ring (D) from drive pulley shaft and add washers, P/N 520-046, as required at (E) to reduce end play of drive pulley. Replace E-ring (D).

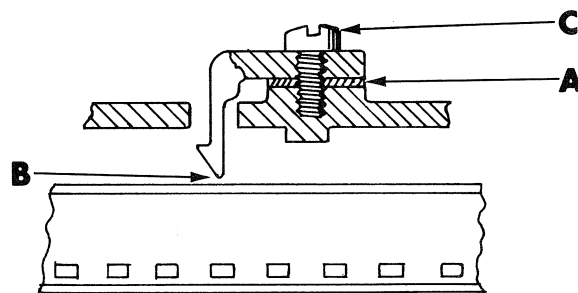


C-5d.3

Cartridge Clip Interference

Some projectors may have problems with the reel hitting cartridge clips at (B) in Rewind and Fast Forward positions. First determine that the trouble is not a warped supply reel or spindle not completely inserted into projector frame.

If screw (C) is loosened, the cartridge clip must be readjusted to insure that the cartridge is held firmly against projector frame. A 50' and 400' cartridge must be used to check holding force. With a full 400' cartridge installed, the clips should hold in place if projector is slowly rotated over to a horizontal position. If more force is required, slide right-hand clip to the right, and left-hand clip to the left. If it is necessary to move the clip in, away from the reel, file clip approximately .020 at (B).



C-5d.4

REWIND	C-6
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C-6a REWIND TROUBLE SHOOTING

C-6b REWIND SYSTEM (FORWARD ONLY PROJECTORS)

C-6c REWIND SYSTEM (FORWARD, REVERSE, STILL, EARLY
DRIVE SYSTEM)

C-6d REWIND SYSTEM (FORWARD, REVERSE, STILL, CURRENT
DRIVE SYSTEM)

C-6e REWIND SYSTEM (CARTRIDGE PROJECTORS ONLY)

C-6

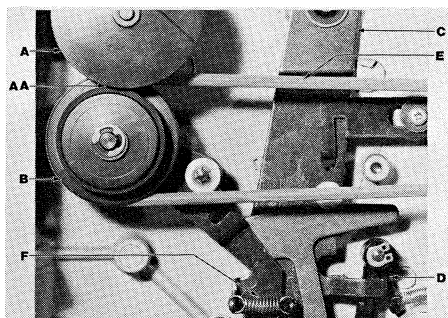
C-6a REWIND TROUBLE SHOOTING

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	NO POWER IN REWIND	GREASE ON DRIVE BELTS.	DEGREASE OR REPLACE.	N
		MOTOR BELT STRETCHED, BROKEN OR OFF PULLEY.	REPLACE.	
		TRANSMISSION OUT OF ADJUSTMENT.	READJUST.	M
		WEAK TRANSMISSION SPRING.	INCREASE SPRING TENSION BY ATTACHING SPRING IN NEXT HIGHER HOLE.	M
	FORWARD TAKE-UP SPINDLE RUNS IN REWIND.	DRIVE WHEEL ENGAGED WITH FORWARD TAKE-UP SPINDLE.	ADJUST FORWARD TAKE-UP SPRING TENSION.	C-3

C-6b REWIND SYSTEM

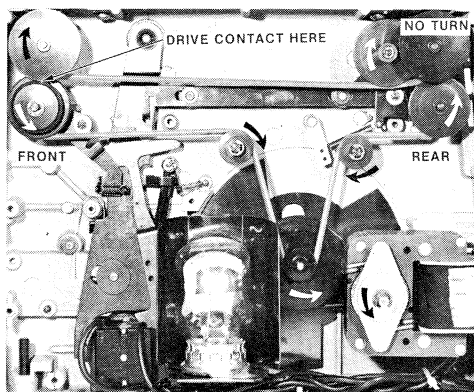
(Forward Only Projectors)

The Rewind system in Forward Only projectors consists of front spindle, spindle wheel (A) and large drive pulley (B). With control switch in Rewind position, control lever (C) pivots forward pulling film feed buffer (D) forward. Pulley (B) is driven by belt (E) and is in contact at (AA) with spindle wheel (A) in Off and Rewind positions. With control knob in Forward position, drive pulley (B) is moved away from spindle wheel (A). Drive tension between pulley (B) and spindle is regulated by spring (F).



C-6b.1

Direction of Pulley Rotation in Rewind

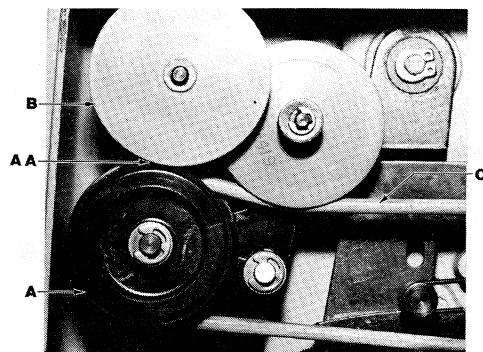


C-6b.2

C-6c REWIND SYSTEM

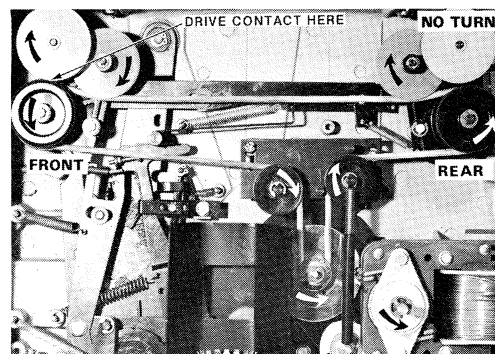
(For Forward, Reverse, Still Projectors with Early Pulley Type System)

The Rewind system is part of Reverse drive mechanism and is disassembled and adjusted per instructions, Section C-4b. With control switch in Rewind, the rubber tire on large drive pulley (A) is turning counterclockwise and in contact at (AA) with spindle wheel (B). Pulley (A) is driven by drive belt (C) and is in contact with spindle wheel (B) in Off, Stop and Rewind control switch positions. All other positions, large drive pulley is disengaged.



C-6c.1

Direction of Pulley Rotation in Rewind

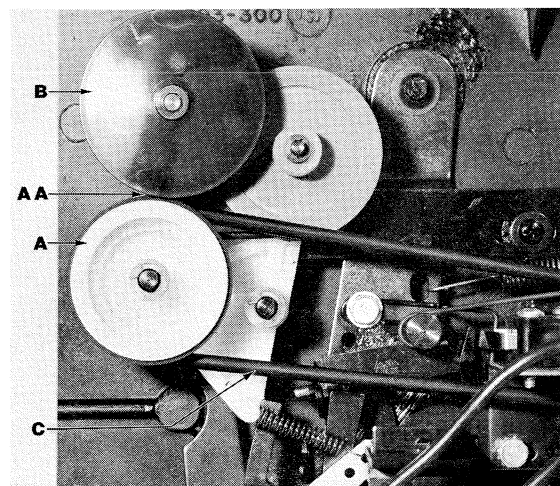


C-6c.2

C-6d REWIND SYSTEM

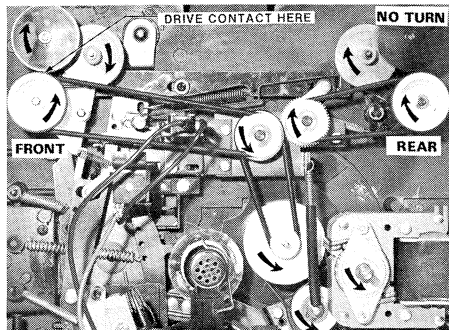
(For Forward, Reverse, Still Projectors with Current Gear Pulley Drive System)

The Rewind system is part of Reverse drive mechanism and is disassembled and adjusted per instructions, Section C-4c. With control switch in Rewind, the rubber tire on large drive pulley (A) is turning counterclockwise and in contact at (AA) with spindle wheel (B). Pulley (A) is driven by drive belt (C) and is in contact with spindle wheel (B) in Off, Stop and Rewind control switch positions. All other positions, large drive pulley is disengaged.



C-6d.1

Direction of Pulley Rotation in Rewind



C-6d.2

C-6e REWIND SYSTEM

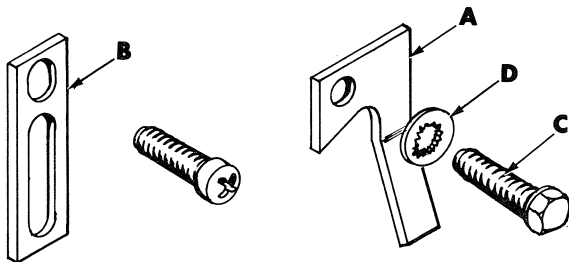
(For Cartridge Projector Only)

Rewind and Transmission Adjustment

Projectors manufactured after Code Week 417 have lever (A), P/N 490-154, in place of shifter (B), P/N 490-137, on transmission shifter assembly, P/N 490-531. It is not necessary to replace old shifter plate when working on transmission, but if it has to be adjusted, it is best to replace with new lever. Lever (A) is adjusted as follows:

- (1) Turn control knob to Rewind position and loosen hex drive screw (C) allowing transmission gear teeth to engage the double gear fully without gear tooth clearance.
- (2) Slowly move lever to the right increasing gear center distance and providing gear tooth clearance.
- (3) Continue shifting lever to the right until projector runs quieter, drive belts run smoother and the speed is increased. Hold lever in position and secure drive screw.

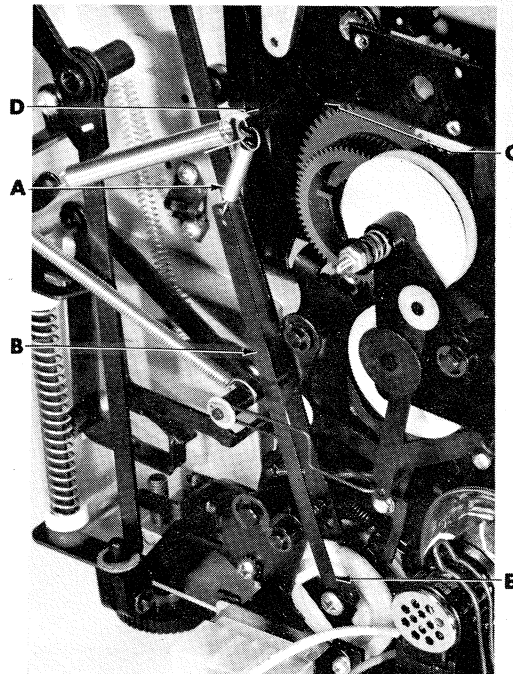
Projectors manufactured prior to Code Week 421 must have internal lockwasher (D), P/N 521-001, installed under head of drive screw (C).



C-6e.1

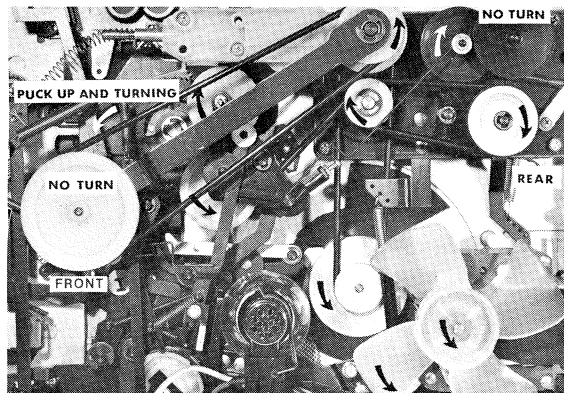
Puck Drive in Rewind Position

When control knob is in Forward or Rewind positions, spring (A) is pulled down by connecting rod (B) to provide an increased driving force on puck (C). If the puck does not snap up when control knob is turned to Rewind position, bend end of bar (D) to the left 1/8". Rewind spring (A) must be slack when projector is in Reverse. If there is any chance of connecting rod (B) catching on surrounding linkage, bend rod away from the projector at (E).



C-6e.2

Direction of Pulley Rotation in Rewind



C-6e.3

Service Kit for Separate Rewind and Reverse Drive

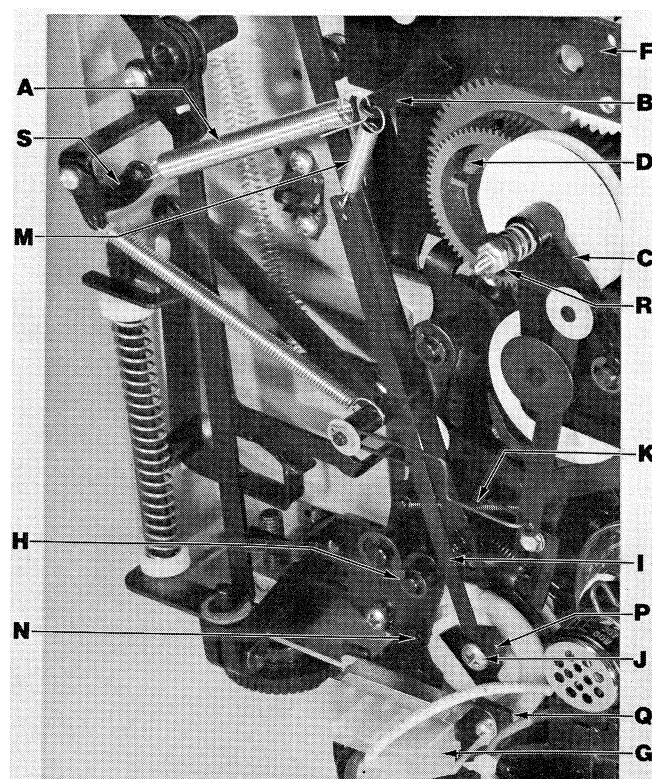
This kit should be installed on all projectors returned for service which were manufactured prior to Code Week 425, regardless of operational condition. This kit when installed will eliminate vertical picture jump in Reverse, Slow Rewind, Slow Auto-Rewind, film jamming due to puck stopping in Reverse, and difficult Reverse clutch adjustment.

Procedure:

1. Remove spring (A) and install reverse spring, P/N 490-617, with special ends which require no crimping. Loosen screw holding spring pivot (S). Extend elevating foot all the way down and turn control knob to Reverse.
 - a. If puck does not come up, or jumps toward rear of projector causing stall-out, bend lever (B) to the left 1/8 inch. NOTE: In Reverse, puck should come all the way forward with no hesitation. With projector running, tap puck several times; each time the puck should snap forward with a slight click.
 - b. If there is any hesitation or stickiness in puck travel, remove transmission (C), E-ring and double gear (D). Remove puck and slide double gear pivot plate (F) out of projector. Pivot plate bronze bushing must be clean and free of burrs. Run 5/16" reamer or fine emery cloth wrapped around a 1/4 inch rod through bushing to enlarge it slightly. Install pivot plate (F), double gear (D), transmission (C) and puck. Only after the above steps have been completed should Reverse spring tension be increased slightly by rotating spring pivot (S) up.
3. Remove two screws and switch (G) from lamp bracket.
4. Remove E-ring (H) and discard plastic switch pawl. Remove cam screw (J) and discard washer under screw.
5. Move shifter spring (K) back to groove closest to reel brake bar. With pliers, grasp reel brake. Pin will break off at groove.
6. Turn control knob to Stop position between Reverse and Fast Forward. Position lower end of connecting rod assembly (I) into switch cam (fits only one way) and secure with screw (J). Hook connecting rod spring (M) into bar (B) with Reverse spring.
7. Install metal switch pawl, P/N 490-773, making sure cam follower (N) fits into slot. Install switch pawl spacer, P/N 490-270, and E-ring (H).
8. Position switch slide into pawl and secure switch (G) with two screws.
9. Rotate control knob several times, both directions, to be sure it rotates freely. If the knob sticks, it is caused by riveted end of connecting rod (P) hitting switch pawl at (N) or lamp bracket lug (Q).
 - a. Bend rivet end of rod (P) in or out, to insure clearance at follower (N) and lug (Q).
 - b. Bend lug (Q) down slightly for additional clearance.
10. It is imperative that Rewind spring (M) be free and slack when projector is in Reverse. Connecting rod may touch transmission (C) when slack, but if it can get caught in any of the linkage, it should be bowed out away from projector frame.

11. Reverse clutch adjustment (R) is no longer used. If first jam nut is more than 1/8" away from slotted end of shaft, adjust both nuts back to the 1/8" dimension as shown and lock securely.

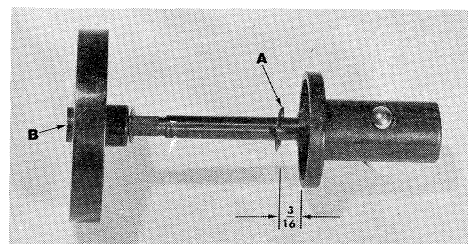
12. With 50' cartridge in place, turn control knob to Reverse. Notice that the puck now slips on reel with very light pressure. Some reels may chatter in Reverse which is not objectionable as long as the picture is steady. Reel chatter may be reduced by rotating spring pivot (S) up slightly. If picture jump appears in Reverse, decrease tension in Reverse spring and tighten screw on spring pivot (S).



C-6e.4

Slow Rewinding

On some projectors manufactured prior to Code Week 400, there may be a bright washer (A) under the take-up spindle which can cause slow rewinding. To correct this problem, drive the spindle shaft out from back of projector at (B) about 3/16 inch. If the bright washer (A) is visible, remove spindle assembly and replace the washer with washer, P/N 520-046. If this washer is not available, re-assemble the spindle without a washer. The take-up spindle must be free for proper rewinding.

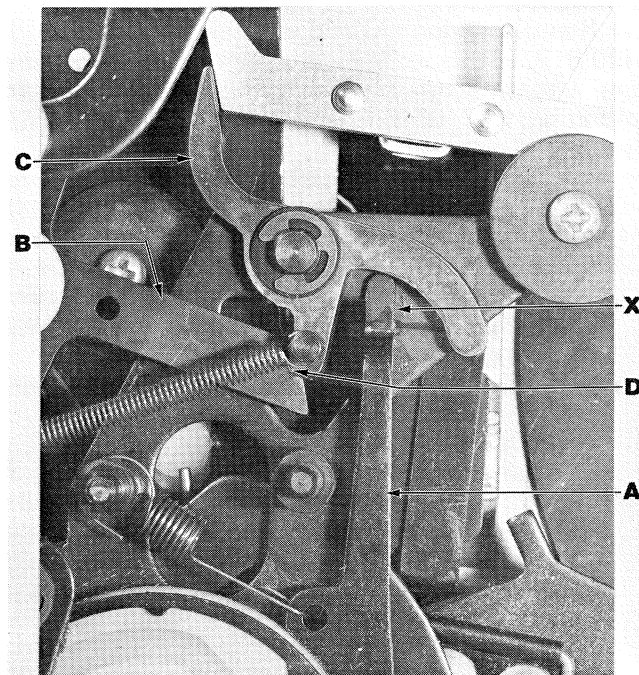


C-6e.5

Improper Reverse Tripper Lever Adjustment

If the control knob will not turn counterclockwise or is difficult to turn from Forward to Rewind position, it is because of improper reverse tripper lever adjustment. As control knob is turned counterclockwise, arm (B) moves slightly to the right and lever (A) should move to the right unlatching trigger (C) at (D). If trigger (C) is not unlatched as arm (B) moves to the left, the control knob becomes difficult to turn.

Correct this problem by removing projection lamp and transmission spring from shifter assembly, P/N 490-531. Lift shifter assembly out of cam and push to the right. **DO NOT REMOVE TRANSMISSION.** Lever (A) can be pulled out slightly, away from projector frame, and moved to the right beyond trigger (C) for easier bending. Bend lever (A) at (X) to the right to speed up unlatching action. After bending lever, rotate control knob from Forward to Rewind position to see if trigger (C) unlatches easier. **CAUTION:** If lever (A) is bent too far to the right, the trigger will delay when control knob is turned clockwise or from Rewind to Forward. This condition will result in a projector that won't latch, and when in Forward, rubber drive wheel comes up against the supply reel.



C-6e.6

AUTO REWIND	C-7
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- C-7a AUTO REWIND TROUBLE SHOOTING
- C-7b AUTO REWIND SYSTEM (EARLY VICEROY® S/800, 800R,
800Z PROJECTORS)
- C-7c AUTO REWIND ADJUSTMENT PROCEDURE (SOLENOID OPERATED
SYSTEM)
- C-7d AUTO REWIND SYSTEM (CARTRIDGE PROJECTORS ONLY)
- C-7e AUTO REWIND WIRE LINK ADJUSTMENT

C-7

C-7a AUTO REWIND TROUBLE SHOOTING

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	AUTO REWIND FAILS TO TRIP.	DAMAGED FILM PERFORATIONS.	CUT OUT DAMAGED OR ELONGATED FILM PERFORATIONS. REPOSITION FILM CLIP.	—
		NO POWER TO REWIND SWITCH.	CHECK FOR POWER TO SWITCH WITH VOLT METER.	P
		BAD REWIND SWITCH OR SOLENOID.	REPLACE.	C-7c
		IMPROPER ADJUSTMENT.	READJUST.	
		TRIGGER ASSEMBLY SET TOO FAR FORWARD CAUSING BUFFER TO HIT LENS HOUSING BEFORE TRIGGER IS TRIPPED.	READJUST TRIGGER ASSEMBLY.	
		BURR ON END OF LATCH OR REWIND LEVER WHERE LEVER ENGAGES LATCH.	REMOVE BURRS WITH FILE AND/OR EMERY PAPER.	
		INSUFFICIENT TOOTH ENGAGEMENT.	BEND CAM FOLLOWER ON SHUTTLE .030-.040 BEYOND APERTURE PLATE WITH SHUTTLE ARM IN FORWARD POSITION.	H
ALL WITH SLOW MOTION			ADJUST APERTURE PLATE TOWARD SHUTTLE SO SHUTTLE PROTRUDES THROUGH APERTURE PLATE .030-.035.	G
CARTRIDGE PROJECTORS ONLY.		STICKY BUFFER.	BUFFER MUST BE FREE TO MOVE DOWN TO ALUMINUM TRIP LEVER.	C-7d
		WORN OR BURRED TRIGGER.	REPLACE TRIGGER.	
		WORN OR BURRED CONTROL ARM.	TRY TWO TRIGGERS BEFORE REPLACING LAMP BRACKET.	
VICEROY® S/800, 800R 800Z ONLY	AUTO REWIND WON'T RESET.	LATCH WON'T ENGAGE AUTO REWIND ARM.	READJUST AUTO REWIND MECHANISM.	C-7b
ALL	BUZZING SOUND FROM SOLENOID WHEN ENGAGED.	PLUNGER NOT FULLY RETRACTING.	ADJUST SOLENOID POSITION.	C-7c

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	AUTO REWIND OPERATES BEFORE END OF FILM.	SUPPLY REEL NOT ALL THE WAY ON SPINDLE.	REPOSITION SPINDLE AND REEL PROPERLY.	—
		DEFECTIVE FILM OR SPLICE.	REPLACE.	—
		SUPPLY REEL DRAGGING ON PROJECTOR FRAME.	CHANGE REEL.	—
		INCORRECT ANGLE ON LATCH.	REPLACE LATCH.	C-7c
		IMPROPER SWITCH POSITION.	REPOSITION SWITCH FOR MAXIMUM BUFFER TRAVEL PRIOR TO TRIPPING REWIND SWITCH. READJUST RETRACT WIRE.	
VICEROY® S/800, 800R, 800Z ONLY		TRIGGER ASSEMBLY TOO FAR BACK RESULTING IN SHORT BUFFER DIS-PLACEMENT WHICH TRIPS TRIGGER.	READJUST TRIGGER ASSEMBLY.	C-7b
		SUPPLY SPINDLE BINDING.	FREE SPINDLE.	
		DRAG ON FRONT SPINDLE.	FREE-WHEELING IN FORWARD POSITION. INCREASE END PLAY BY RELIEVING GEARING.	
CARTRIDGE PROJECTORS ONLY		TRIGGER NOT FULLY LATCHED (MECHANISM MAY TRIP WITH FILM DRAG OR IF JARRED).	READJUST.	C-7d
		FILM JUMPS OFF GUIDE ROLLERS CAUSING FILM DRAG.	REWIND FILM AND TRY AGAIN.	—
		FLASHING OR FOREIGN MATERIAL IN HUB OF CARTRIDGE REEL.	REEL MUST SPIN FREELY ON CARTRIDGE HUB.	—
		OVERSIZE CARTRIDGE HUB OR UNDER-SIZE REEL.	CHANGE REEL OR CARTRIDGE.	—
		REMOVABLE FILM PATH COCKED CAUSING FILM DRAG.	REPOSITION FILM PATH.	E
		REEL BRAKE DRAGGING ON SUPPLY SPINDLE.	BE SURE REEL BRAKE SPRING IS IN PLACE — ADD ADDITIONAL SPRING IF NECESSARY. FOR MORE CLEARANCE PLACE SCREWDRIVER IN E-RING SLOT OF REEL BRAKE PIN AND TAP WITH HAMMER TOWARD FRONT OF PROJECTOR.	C-7d

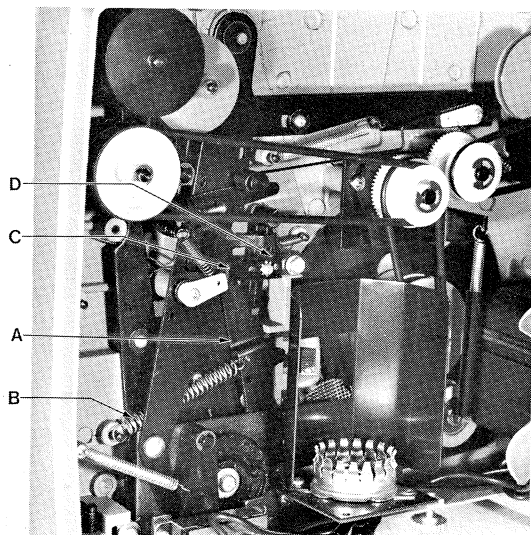
MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
CARTRIDGE PROJECTORS ONLY (CONT'D.)		BUFFER SPRING MISSING.	REPLACE SPRING.	E
		THREADER ASSEMBLY DOES NOT GO ALL THE WAY DOWN AFTER USE.	CHECK LINKAGE FOR HANG UP.	F
			ADJUST THREADER SPRING PIVOT FOR PROPER TRAVEL.	
		THREADER ASSEMBLY LOOSE AND HAS SHIFTED CROWDING FILM IN FILM PATH.	LOOSEN THREADER SCREWS AND REPOSITION THREADER.	F
			REPLACE THREADER LIFTER BAR IF IT CAN BE TWISTED BY HAND.	
ALL	SHUTTLE ENGAGES FILM PERFORATIONS DURING AUTO REWIND.	EXCESSIVE TOOTH ENGAGEMENT.	ADJUST CAM FOLLOWER ON SHUTTER FOR 1/32 INCH MAXIMUM TRAVEL THROUGH APERTURE PLATE.	H
ALL WITH SLOW MOTION			MOVE APERTURE PLATE FORWARD TO REDUCE CLAW PROJECTION.	G
CARTRIDGE PROJECTORS ONLY		GATE OR PRESSURE PLATE NOT OPENING FAR ENOUGH.	ADJUST GATE TO OPEN .100.	G
			DISCONNECT BOTH AUTO REWIND WIRE LINKS AND BEND LEVER TOWARD MOTOR TO INCREASE GATE OPENING. REINSTALL WIRE LINKS AND ADJUST SO GEARS ENGAGE AND TAKE-UP REEL DISENGAGES DURING AUTO REWIND CYCLE.	C-7d
ALL	SLOW AUTO REWIND	FORWARD TAKE-UP SPINDLE DRAGS.	FORWARD TAKE-UP SPINDLE MUST BE LOOSE ENOUGH TO SPIN FREELY. PROVIDE END PLAY BY TAPPING SPINDLE SHAFT FROM REAR OF PROJECTOR.	C-3
			TRIP AUTO REWIND MECHANISM TO BE SURE TAKE-UP DRIVE PULLEY DISENGAGES SPINDLE PULLEY. ADJUST WIRE LINK IF NECESSARY.	
		EXCESSIVE FILM DRAG CAUSED BY LIGHT SHIELD SPRING GUIDE.	REMOVE MOVEMENT HOUSING AND DECREASE SPRING SIDE GUIDE TENSION. HORIZONTAL PICTURE JUMP WILL OCCUR IF SIDE GUIDE IS RELAXED TOO MUCH.	D

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL (CONT'D)	SLOW AUTO REWIND (CONT'D)	GATE OR PRESSURE PLATE NOT OPENING FAR ENOUGH.	READJUST.	G
CARTRIDGE PROJECTORS ONLY			ADJUST LINK TO OPEN GATE .100 IN AUTO REWIND.	C-7d
		FILM HAS JUMPED OFF OF FILM PATH GUIDE ROLLERS.	REWIND FILM AND TEST AGAIN.	—
		REMOVABLE FILM PATH PINCHING FILM.	REPOSITION REMOVABLE FILM PATH.	E
		REEL BRAKE DRAGGING ON SUPPLY REEL SPINDLE.	BE SURE REEL BRAKE SPRING IS IN PLACE. ADD ADDITIONAL SPRING IF NECESSARY.	C-4d
		THREADER ASSEMBLY DOES NOT GO ALL THE WAY DOWN AFTER USE.	CHECK FOR LINKAGE THAT MAY BE HANGING UP. IF CLEAR, ADJUST THREADER SPRING PIVOT FOR PROPER TRAVEL.	F
		THREADER ASSEMBLY IS LOOSE AND HAS SHIFTED, CROWDING FILM IN FILM PATH.	LOOSEN TWO THREADER SCREWS AND REPOSITION THREADER.	
			REPLACE THREADER LIFTER BAR IF IT CAN BE TWISTED BY HAND.	
		PUCK REWIND SPRING MISSING OR LINKAGE HANGING UP.	CHECK FOR FULL TENSION OF REWIND SPRING APPLIED TO PUCK PIVOT PLATE.	C-7d
		PUCK LOOSE AND SPINNING.	TIGHTEN PUCK.	C-4d
VICEROY® S/800, 800R, 800Z ONLY		THREADER HOUSING NOT SNAPPED IN PLACE CORRECTLY.	REPOSITION THREADER HOUSING.	D
		CONTROL LEVER DOES NOT TRAVEL FAR ENOUGH FORWARD TO DISENGAGE DRIVE PULLEY FROM SPINDLE WHEEL.	MAKE CERTAIN CONTROL LEVER OR RETRACT LEVER ARE NOT BINDING.	C-7b
			BE SURE THERE IS GREASE ON FRAME WHERE CONTROL LEVER RIDES, ALSO ON CONTROL LEVER WHERE REWIND LEVER RIDES.	R
			CHECK FOR BENT LEVERS AND REPLACE IF NECESSARY. INCREASE AUTO REWIND LEVER SPRING TENSION BY REMOVING TURNS IF NECESSARY.	C-7b
		REWIND WIRE WON'T DISENGAGE REAR TAKE-UP TIRE FROM REAR SPINDLE.	READJUST AUTO REWIND MECHANISM.	

C-7b AUTO REWIND SYSTEM

(Used on Early Model VICEROY® S/800, 800R and 800Z Projectors Only)

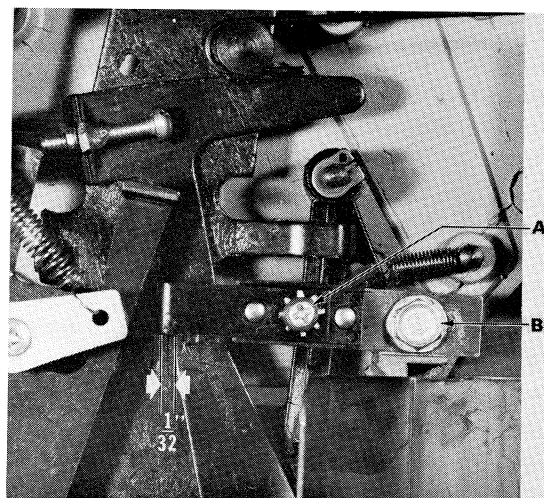
Early model Viceroy projectors contain a mechanical type Auto Rewind feature which is activated by trailing end of film secured to the supply reel with tape or a film clip. Trailing end of film will automatically trigger Rewind system and film is wound back onto the supply reel. Rewind lever (A) pivots from lamp bracket and is loaded toward front of projector by Rewind lever spring (B). With control switch in Forward (Motor/Lamp Viceroy S/800) position, a break in the wall of switch cam is adjacent to camming surface of Rewind lever and Rewind lever is hooked by latch (C) preventing it from pivoting forward. With control switch in any other position, cam surface of Rewind lever rests on circular wall of switch cam. When film is fastened to supply reel, the shuttle will continue to pull on film after it is used up and reel has stopped turning. Tension pushes buffer forward forcing trigger assembly (D) back unlatching Rewind lever. With control switch in Forward position, Rewind lever spring will pull Rewind lever forward. Tang on Rewind lever engages control lever and pivots it toward front of projector causing system to go into Rewind cycle. The only difference between Viceroy 800R-800Z and S/800 is method of disengaging take-up system when Rewind arm has tripped to Forward position.



C-7b.1

Auto Rewind Adjustment Procedure (For VICEROY® S/800 Only)

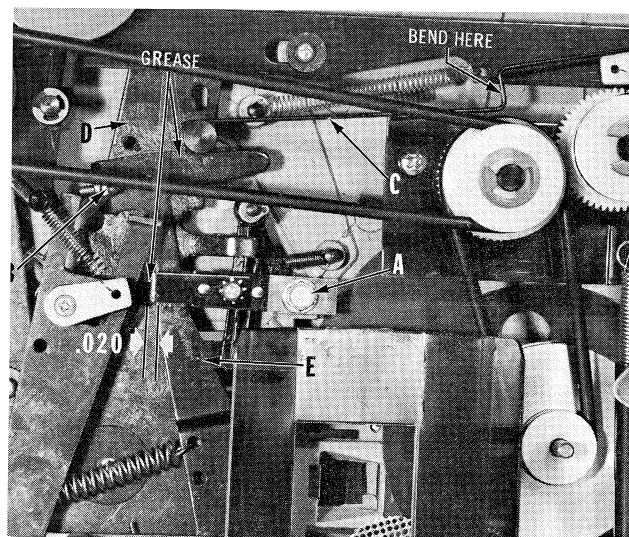
1. With control knob in Motor position, loosen screw (A) and adjust trigger (C) so that latch clears Rewind lever when buffer is 1/8 inch from lens housing. Tighten screw (A).
2. Loosen screw (B) and adjust latch to 1/32 inch between latch and Rewind lever. Tighten screw (B) (control knob in Motor position).
3. Turn control knob to Motor Lamp position and check for clearance between Rewind and control levers.



C-7b.2

Auto Rewind Adjustment Procedure (Viceroy 800R-800Z Only)

1. Check for .020 gap between front take-up drive pulley and front spindle wheel. It may be necessary to bend Rewind wire (C) to obtain proper clearance between rear spindle and rear take-up drive pulley. Bend the Z-shaped portion of wire (C) with pliers.
2. Grease areas on control arm (D) where Auto Rewind arm (E) makes contact.
3. Loosen screw (A) and adjust trigger assembly to full rear position. Tighten screw (A). Check that latch is square with Rewind arm.
4. Adjust control arm buffer hook so that buffer does not hit trigger with projector in OFF position. Latch must be adjusted to clear Rewind arm by .020 in OFF and Still positions. Hook on Rewind arm should clear control arm by .020 in Forward, Still and Reverse positions.
5. Trip Auto Rewind mechanism and adjust screw (B) so that .080 gap exists between aperture and pressure plates with control switch in Forward position.



C-7b.3

C-7c AUTO REWIND ADJUSTMENT PROCEDURE

(For Projectors with Solenoid Operated Auto Rewind System)

Disassembly

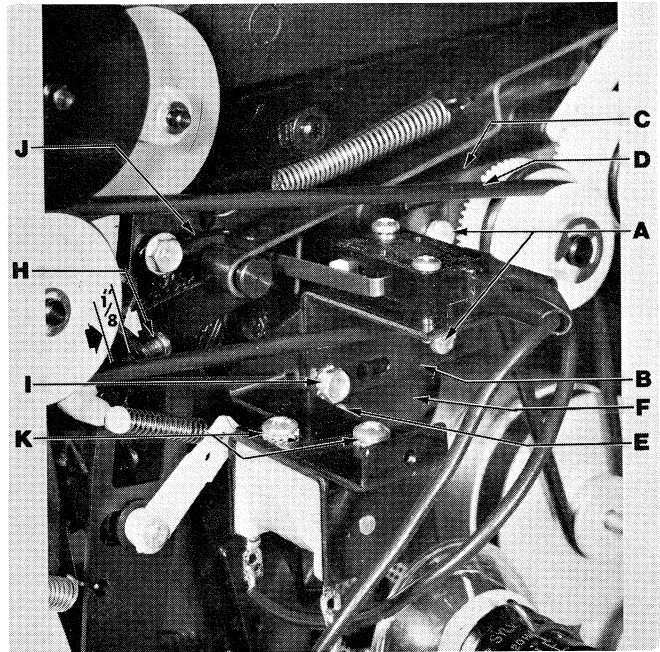
1. Unplug power cord and allow projector to cool. Remove solenoid switch cover and projection lamp.
2. Remove two screws (A) which attach solenoid and switch bracket (B) to plate and gear support (C). Detach wires from Auto Rewind switch for clearance of Reverse drive belt (D).
3. Remove screw (E) which retains trigger spring and plunger assembly (F).
4. Remove lamp bracket assembly (see Section K). Be careful not to damage film feed buffer.
5. Reassemble system in reverse of disassembly.

NOTE: Do not plug in and operate projector until Rewind adjustments have been made.

Adjustment

1. Remove switch cover and securely tighten two lamp bracket mounting screws. Replace switch cover.
2. Make all Forward and Reverse projector operation adjustments.
3. Adjust screw (H) in upper end of Auto Rewind lever to approximately 1/8 inch. This allows spindle drag when Auto Rewind lever is tripped. When screw (H) is properly adjusted, tighten nut.
4. Check upper arm of film feed buffer to see that it is positioned to actuate Auto Rewind switch arm.
5. Turn control knob to Forward position. Loosen screw (I) on switch bracket and adjust to actuate when film feed buffer is almost in retracted position. Tighten screw (I).
6. Turn control knob to Off position and set latch to barely clear (approximately .025) trip lever. Edge of latch should rest against control lever.
7. Manually trip Auto Rewind system and adjust switch latch wire (J) to restrict buffer from actuating Rewind switch. Latch wire (J) should be set to almost allow switch to actuate.
8. Plug in power cord and turn control knob to Forward position.
 - a. Push film feed buffer to full retraction position. If buffer arm does not actuate Auto Rewind switch, adjust switch bracket to trip slightly sooner or repeat Steps 6 and 7.
 - b. If a buzzing sound appears in the solenoid when Auto Rewind is tripped, loosen two mounting screws (K) and move solenoid in slightly. Tighten screws (K). If solenoid energizes but does not trip Auto Rewind lever, the solenoid should be moved out slightly.
 - c. After completing the previous adjustments, adjust switch latch wire (J) to restrict Rewind switch from actuating when in Auto Rewind position.
 - d. Install solenoid switch cover.

9. If the shuttle hits film when rewinding, recheck the previous adjustments, pressure and aperture plates for proper opening in Auto Rewind. Bend Auto Rewind lever tab flush with control arm in Forward position if necessary.



C-7c.1

C-7d AUTO REWIND SYSTEM

(For Cartridge Projectors Only)

Adjustment

1. Before attempting to adjust Auto Rewind system, be sure that transmission (A) has been adjusted.
2. With control knob in Forward position, trip bar (J) with screwdriver or other metal rod (do not use fingers). Link (B) should shift transmission (A) until Rewind gear (C) engages with double gear (D). If more shifting power is required, loosen screw (F) and rotate spring pivot (E) down slightly. It is important that spring adjuster (E) is securely locked so it cannot shift. Lockwasher must be between spring adjuster (E) and projector frame, and not under screw head (F).
3. Trip bar (J) again. Push bar (P) to the left after transmission has shifted. If very little movement, this means transmission has shifted.
4. Turn projector around and check gate (K) opening for 1/8 inch when in Auto Rewind. If gate does not open 1/8 inch, lube rubbing surface of arm (G) and bend slightly to the right. Trip Auto Rewind mechanism again and check for 1/8 inch gate opening.
5. Trip Auto Rewind bar again and be sure that link (L) moves pulley (M) away from take-up pulley (N). When projector is in Forward, link (L) should have about .020 end play only which will increase gap between drive pulley (M) and spindle (N) when in Auto Rewind.

Adjust wire links (B) and (L) by bending at Z in link. All previous adjustments should be made carefully so that tension in spring (H) will be at a minimum and still shift all components. Excessive spring pressure at (H) greatly increases pressure required by buffer to trip Auto Rewind, as well as making control knob harder to turn.

Auto Rewind Noise

Noise in the Auto Rewind mechanism is generally gear noise caused by transmission (A) not shifting completely. Be sure link (B) is short enough that when link (Q) shifts, it also shifts transmission (A). Be sure arm (G) has not been bent too far to the right causing gate (K) to open over 1/8 inch. Gate (K) springs will bottom out preventing complete shifting of the entire system. If the mechanism does not shift properly and periodic gear noise is heard, it is caused by a worn double gear (D). To replace double gear, remove transmission, E-ring (R) and slip double gear out of projector (for transmission removal, see Section M).

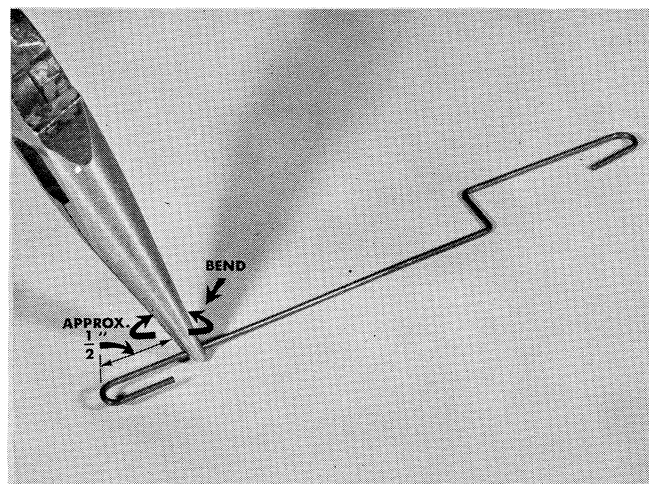
Auto Rewind Will Not Trip

If the Auto Rewind fails to operate, check the following:

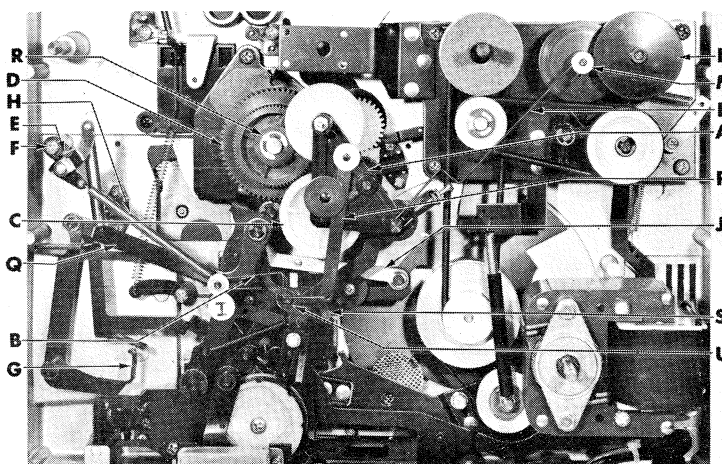
1. Be sure film is anchored to reel and that no film perforations are damaged.
2. Be sure shuttle claw projects .030 through aperture plate. Adjust if necessary.
3. Be sure buffer is free to move down to trip lever (J). Trip lever must be free to move up and down.
4. Trigger (S) must be free to pivot.
5. Trip Auto Rewind system by pushing down at front end of trip bar about twice and then with film in projector.
6. If Auto Rewind system still fails to operate, remove E-ring (U) and replace trigger (S). For convenience, lift transmission bar out of cam groove to obtain more working room.
7. If the system still fails to trip, change trigger (S) again. If two triggers have been tried and the mechanism still does not trip easily, replace the lamp bracket.

C-7e AUTO REWIND WIRE LINK ADJUSTMENT

Some Auto Rewind projectors manufactured after Code Week 423 may have problem with the wire link, P/N 438-603, positioning the take-up assembly in neutral or Reverse positions. To correct this condition, gently bend the Auto Rewind wire link approximately 1/2" from front mounting hook with long-nose pliers. With rear cover removed and control switch in Forward position, lift up on take-up assembly and check for smooth operation.



C-7e.1



C-7d.1

STILL	C-8
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- C-8a STILL TROUBLE SHOOTING
- C-8b STILL OPERATING PRINCIPLES
- C-8c STILL MAINTENANCE
- C-8d FILM BURNING IN STILL POSITION

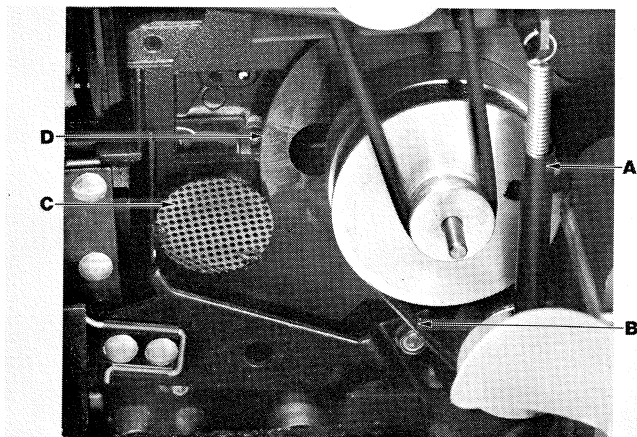
C-8

C-8a STILL TROUBLE SHOOTING

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	FILM BURNS IN STILL POSITION.	FLAG STICKS AND DOES NOT COVER LIGHT OPENING.	BEND FLAG TO ALLOW MOVEMENT.	C-8c
		WEAK SPRING.	REPLACE SPRING.	
		LENS HOUSING MOUNTING SCREW HITS FLAG.	ADD WASHER UNDER SCREW HEAD.	C-8d
			REPLACE WITH SHORTER SCREW.	
	PROJECTOR DRIVES FORWARD OR REVERSE WHEN IN STILL POSITION.	TRANSMISSION OUT OF ADJUSTMENT.	READJUST.	M
	STILL KNOB DIFFICULT TO TURN.	TIGHT CAM SHAFT.	DRIVE PULLEY SHOULD HAVE .005 END PLAY.	I

C-8b STILL OPERATING PRINCIPLES

When the control knob is turned to still position, the motor keeps running and the shutter and movement cam stop. This is accomplished by cams, one of which allows Spring (A) to raise the drive pulley up to an intermediate position and slacken flat belt (B) causing no rotation of shutter and cam. The other cam allows Flag (C) to come up and cover light path to the mirror which prevents film burning. The Shutter (D) has three blades which are mounted on the cam shaft. These blades block out light while film is motionless and shuttle is moving into position to advance film to the next frame. When the control knob is turned to Still position, one of the shutter blades may be blocking the light to the film making it necessary to turn Still Knob by hand, which will turn the cam and shutter allowing the light to project a still image on the screen. Flag (C) cuts down the brilliance of projected image to prevent the film from burning.



C-8b.1

C-8c STILL MAINTENANCE

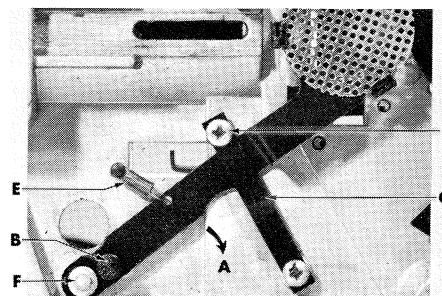
With movement housing in place and projector in Still position, the Still knob should be free to turn which will rotate the shutter to obtain maximum picture brightness. If a new cam is installed, the Still knob may be difficult to turn. From rear of projector, tap end of cam shaft which is located in center of drive pulley. The pulley should have about .005 end play when pushing in and out on pulley. If the assembly is still tight, it may be necessary to install a thinner leaf spring on the cam. If shuttle runs while projector is in Still position, motor flat belt has been adjusted too tight and the motor transmission must be adjusted (see Section M).

The flag is a device that pops up between lamp and mirror when projector is in Still position. It will absorb some of the heat and prevent film burning. Flags are made of special heat resistant glass, or perforated metal. When repairing a projector, care should be exercised to insure that no part of the flag mechanism is bent or distorted. When removing or installing the lamp bracket, hold the flag down toward (A) with one finger allowing the cam to clear cam follower (B) without bending the flag.

It is important that the flag be free to pivot up and down not dragging along Guide (C). If flag movement is sluggish, Guide (C) may be pried up slightly to increase clearance. This is particularly important when using the glass flag since it is much heavier than the perforated metal flag. Further work on the flag will require projector disassembly and removal of the lamp bracket. A thin washer, .005-.010 thick, may be installed under Guide (C) at Screw (D) to increase clearance. The same spring (E) is used for both metal and glass flags.

The flag is held in position by Washer (F) which is staked to a boss on projector frame. It is essential that end play under washer be at a minimum allowing flag to pivot. If end play is excessive, flag cam which rides on cam follower (B) will tend to use up end play instead of pivoting flag up and down and as a result the flag will lock up making it difficult to rotate the control knob. It may be possible to carefully restake the boss to reduce end play under washer (F).

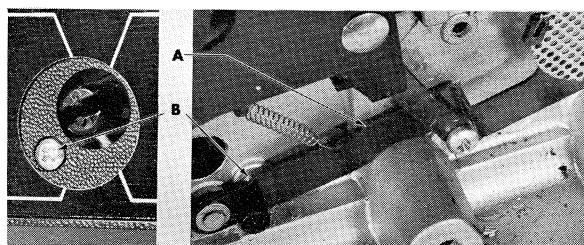
If procedure is unsuccessful, remove flag, drill and tap boss for a 4-40 screw. With washers, adjust end play to a minimum. Install lamp bracket and rotate control knob to be sure flag operates properly before reassembling the projector.



C-8c.1

C-8d FILM BURNING IN STILL POSITION

Some early model projectors may be returned for repair because of film burning in Still position. Check to see if flag (A) moves up into position between lamp and mirror when the projector is in Still. If not, the lens housing mounting screw (B) located under the control knob may be too tight or a longer screw has been used which may bind against the heat filter flag making the filter inoperable causing film burn. Replace 1/2 inch long screw, P/N 501-122, with 7/16 inch long screw, P/N 501-134, so there is no possibility of the screw binding against the heat filter flag.



C-8d.1

BRIGHT STILL	C-9
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- C-9a BRIGHT STILL TROUBLE SHOOTING
- C-9b BRIGHT STILL OPERATING PRINCIPLES
- C-9c MAINTENANCE

C-9

C-10a SLOW MOTION TROUBLE SHOOTING

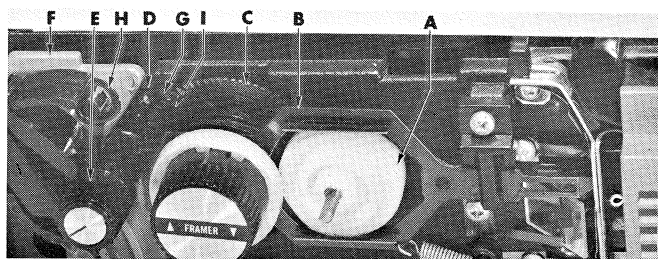
MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	INDEX ARM WON'T STAY IN NORMAL OR SLOW POSITION.	INDEX ARM SPRING NOT IN POSITION.	SPRING ARM WITH DOUBLE OFFSET SHOULD BE HOOKED INTO HOLE IN PROJECTOR FRAME.	C-10c
			SPRING ARM WITH SINGLE OFFSET SHOULD BE IN HOLE IN INDEX ARM LEG.	
	LARGE GEAR WON'T TURN FREE WHEN CAM SHAFT IS ROTATED.	DAMAGED TOOTH ON LARGE GEAR.	REPLACE LARGE GEAR.	
		DAMAGED TOOTH ON SMALL GEAR.	REPLACE CAM SHAFT ASSEMBLY.	I
		LARGE GEAR TIGHT ON FRAMER STUD.	REPLACE LARGE GEAR.	C-10c
	MECHANISM WON'T SHIFT FROM SLOW TO NORMAL POSITION.	DAMAGED GEARS.	REPLACE AS REQUIRED.	
		SHUTTLE BENT IN AREA OF CAM FOLLOWER.	REPLACE OR BEND SHUTTLE ASSEMBLY.	H
		EXCESSIVE GREASE ON FRAMER STUD.	DEGREASE AND LUBRICATE WITH LIGHT GREASE. GEARS MUST HAVE BACK-LASH BETWEEN ALL ENGAGING GEAR TEETH.	R
	FRAMER KNOB ROTATES DURING PROJECTION.	PUSHNUT ON FRAMER STUD NOT TIGHT AGAINST FIBER WASHER.	TIGHTEN OR REPLACE PUSHNUT.	H
		FRAMER STUD LOOSE.	RESTAKE.	

C-10b SLOW MOTION OPERATING PRINCIPLES

(Small Frame)

The projector motor, through pulley reduction, drives the shutter and cam (A) at 1,080 rpm. When divided by 60 seconds, this means cam (A) is running at 18 FPS (18 frames per second). Cam (A) drives shuttle (B) in, down, out and up 18 times every second, which advances 18 film frames per second for normal operation.

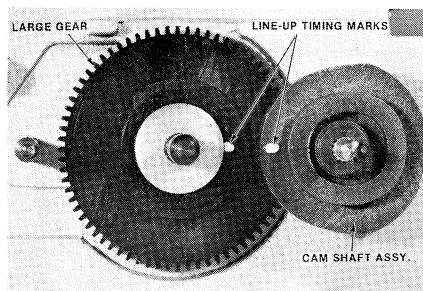
Slow Motion is accomplished with a special shuttle (B) and a large gear (C) which has two cams. Cam (A) is not used to drive shuttle in and out (in and out cam is located on large gear (C)). Large gear turns at 1/3 speed of cam (A), but since its normal cam has 3 lobes, it drives the shuttle 3 times faster, 18 FPS. When index cam (D) is rotated clockwise, from Normal to Slow, it shifts large gear (C) out toward shuttle, and the cam follower now rides on the second cam, which has only one lobe. This cam cuts shuttle speed by 2/3 driving the shuttle at 6 FPS producing Slow Motion. CAUTION: Index arm should not be shifted unless the shuttle is operating.



C-10b.1

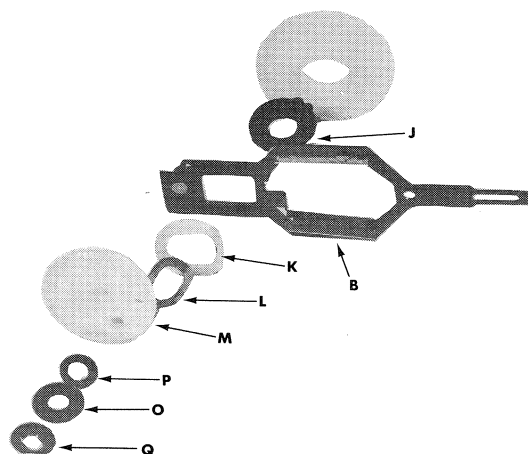
Some parts of the Slow Motion mechanism require complete disassembly of the projector. Others do not.

1. Pull off Slow Motion knob (E).
2. Remove film path assembly (F) which holds index arm (D).
3. Slow Motion Spring (G) can be replaced by removing push-on nut (H). Lift arm (D) away from projector frame far enough to insert spring (G) in index arm hole. Brass washer (I) must be in place over small hole in frame when spring is installed.
4. Shuttle cam follower can be replaced by installing new shuttle assembly (see Shuttle Mechanisms Section H).
5. Damaged cam or large Slow Motion gear will require major disassembly of projector, including cam, and retiming of Slow Motion gears. Install gear and cam so that timing marks on each part line up.



C-10b.2

6. If shuttle parts have been replaced, the assembly should be reassembled before installation. Slip shuttle pivot (J) into shuttle (B) which must be an easy sliding fit; if not, rotate pivot (J). Place plastic washer (K) over shuttle pivot (J). If there is a flat surface on outside of washer, place flat toward front of projector. Install brass washer (L) over plastic washer (K). Place indexing tang toward shuttle and to the front of the shuttle. Insert framer (M) through the assembly which will hold the parts together. Then insert shuttle leaf springs (N) into shuttle and work entire assembly onto slow motion shaft. Rotate cam so leaf springs (H) will not be forced over corners or edges of cam. If cam edge or surface is chipped, it will cause objectionable noise which will require replacement of the cam. Replace washers (O) and (P) and install push nut (Q).



C-10b.3

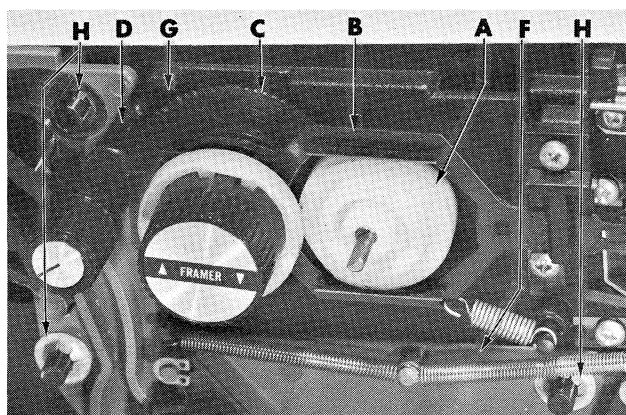
C-10c MAINTENANCE

(Small Frame)

All components of the Slow Motion mechanism are located on the front face of the projector and are accessible for service with the movement housing removed.

Slow Motion Shuttle (B) is not interchangeable with Forward Only shuttle. For removal, first remove framer knob assembly (see Shuttle Removal Section H). Teeth of large gear (C) and small gear on cam shaft must be clean and free of nicks or excessive

picture jump may occur. Remove cam (A) from cam shaft before removing either gear (see Section I for Cam Removal and Timing). Spring (G) holds index arm (D) in position. If spring (G) comes loose from the hole in the frame, it can be worked back into position without projector disassembly. If the spring comes loose from index arm (D), three push nuts (H) and film path (F) must be removed. If spring (G) extends through projector frame too far, it may cause an intermittent tinkle sound. From the rear of the projector, pry up slightly with a flat blade screwdriver on each of the three shutter blades to provide additional clearance.



C-10c.1

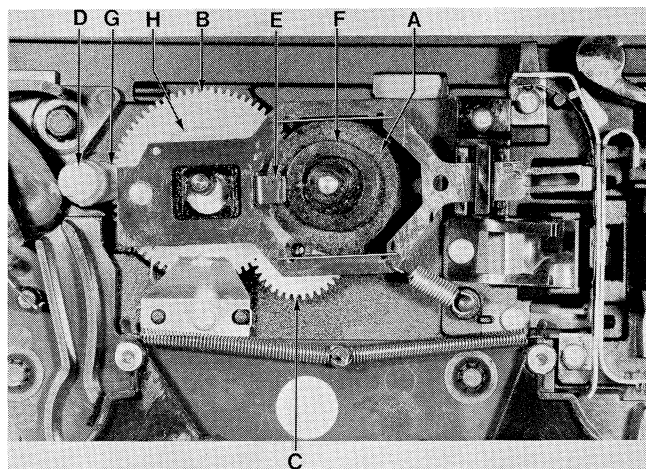
C-10d SLOW MOTION OPERATING PRINCIPLES

(Large Frame)

The motor drives shutter and cam (A) at 18 frames per second. Large gear (B) is reduced in speed by a 9 to 1 ratio running 9 times slower than cam (A). This is accomplished by driving large gear (B) through two small idler gears. One gear is molded on cam (A) which drives idler gear (C) in turn driving large gear (B) at 2 frames per second (FPS). During normal 18 FPS projection, shuttle cam follower (E) located at rear of cam (A) rides on cam surface (F), while large gear (B) has been shifted toward the projector frame.

When index arm (D) is rotated one position clockwise, it shifts large gear (B) out toward shuttle. Cam follower (G) comes in contact with large gear cam (H) which has three high lobes on its surface holding the shuttle back and only letting it travel forward three times per revolution. Since the large gear is running at two revolutions per second, this produces 6 revolutions per second (6 FPS) which is Slow Motion speed.

When index arm (D) is turned to the last position clockwise, large gear (B) is again shifted closer to the shuttle. Cam follower (G) now rides on a high cam with no lobes. This will hold the shuttle back from film perforations and the projector is now in Bright Still position.



C-10d.1

C-10e MAINTENANCE

(Large Frame)

Major Maintenance

The following defects will require major disassembly if the projector has:

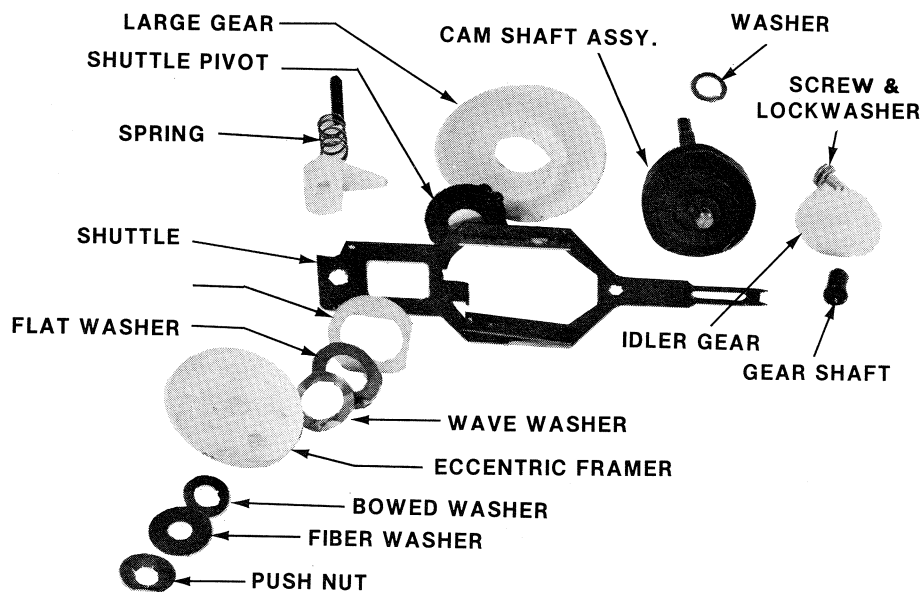
1. Damaged teeth on gears.
2. Loose gear shaft.
3. Loose gear shaft lever pin.
4. Worn gear shifter.
5. Gear hub frozen on shaft or excessively worn.
6. Damaged cam on gear.

Noisy projector, excessive picture jump, large gear locking up, or failing to shift are symptoms of the above problems.

Disassembly Procedure

1. Remove shuttle.
2. Remove motor (do not disconnect wiring).
3. Remove solenoid cover, solenoid and switch mounting plate.
4. Remove auto rewind latching trigger.
5. Remove four springs from lamp bracket arm that are secured to projector frame.
6. Remove lamp bracket.
7. Remove shutter (see Section I).
8. All Slow Motion components can now be removed from the projector for service replacement.

A light coat of grease should be applied to all gear hubs and gear shaft lever pin. Do not get grease on gear teeth. Line up three timing marks with timing tool (see Minor Maintenance). Line up shutter to scratch mark (see Section I) and assemble shutter to cam shaft.



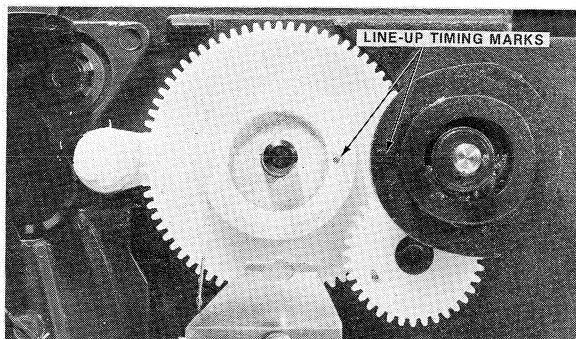
C-10e.1

Minor Maintenance

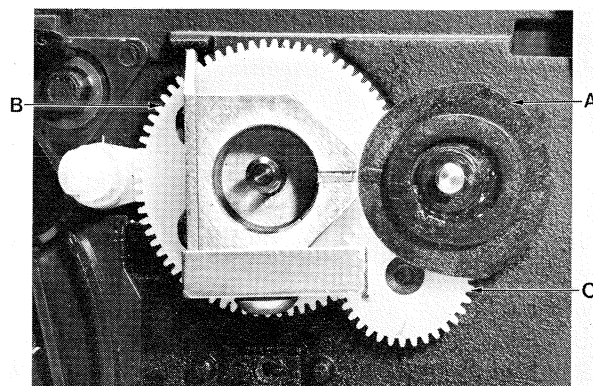
All components of the Slow Motion mechanism are located on the front face of the projector and are exposed for minor service with the movement housing removed. The mechanism is comprised of four gears which have possibilities of erratic operation due to foreign particles wedged between gear teeth. Before replacing any of the gears, be sure all gear teeth are clean and free of embedded objects. With motor drive belts disconnected and shuttle removed, the entire gear train should turn freely without feeling high spots.

If it is determined that the cam is only defective or worn part, it can be replaced following cam changing instructions in Section I with the following exceptions. Before pulling cam, locate and position 3 timing marks as shown.

Install timing tool which holds gears (B) and (C) in position when removing cam (A). If gear train is assembled just one tooth out of position, a noisy projector will result. Push cam (A) on only part way and check in back of cam to see if gear teeth, on back of cam (A), are going to mesh with teeth on gear (C). Push cam further on until teeth just touch gear (C) teeth. Move cam up and down slightly rotating gear (C) backlash until both cam and gear teeth mesh. Gear (B) must not move when shifting gear (C) slightly. Push cam (A) all the way on cam shaft so there is approximately .005 end play between cam and shutter when installation is complete. If the preceding instructions are not followed and gear (C) teeth become damaged, major projector disassembly will be required.



C-10e.2



C-10e.3

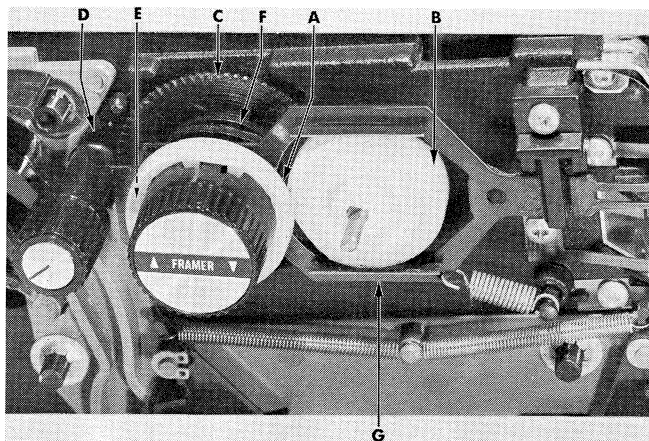
C-9a BRIGHT STILL TROUBLE SHOOTING

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	INDEX ARM WON'T STAY IN NORMAL OR STILL POSITION.	INDEX ARM SPRING NOT IN POSITION.	SPRING ARM WITH DOUBLE OFF-SET SHOULD BE HOOKED INTO HOLE IN PROJECTOR FRAME.	C-9c
			SPRING ARM WITH SINGLE OFFSET SHOULD BE IN HOLE IN INDEX ARM LEG.	
	LARGE GEAR WON'T TURN FREE WHEN CAM SHAFT IS ROTATED.	DAMAGED TOOTH ON LARGE GEAR.	REPLACE LARGE GEAR.	I C-9c
		DAMAGED TOOTH ON SMALL GEAR.	REPLACE CAM SHAFT ASSEMBLY.	
		LARGE GEAR TIGHT ON FRAMER STUD.	REPLACE LARGE GEAR.	
	MECHANISM WON'T SHIFT FROM STILL TO NORMAL POSITION.	DAMAGED GEARS	REPLACE AS REQUIRED.	H R
		SHUTTLE BENT IN AREA OF CAM FOLLOWER.	REPLACE OR BEND SHUTTLE ASSEMBLY.	
		EXCESSIVE GREASE ON FRAMER STUD.	DEGREASE AND LUBRICATE WITH LIGHT GREASE. GEARS MUST HAVE BACKLASH BETWEEN ALL ENGAGING TEETH.	
	FRAMER KNOB ROTATES DURING PROJECTION.	PUSHNUT ON FRAMER STUD NOT TIGHT AGAINST FIBER WASHER.	TIGHTEN OR REPLACE PUSHNUT.	C-9c
		FRAMER STUD LOOSE.	RESTAKE.	

C-9b BRIGHT STILL OPERATING PRINCIPLES

Bright Still feature is the newest of the Still systems used in 8mm projectors. It is obtained with the motor and shutter running and shuttle retracted so it does not engage film perforations. This system has the light restricting flag omitted which increases amount of heat which can cause film burn. Use of dichroic mirrors, special dichroic lamps, improved cooling and heat sinks have been incorporated to reduce the possibility of film burn. In order to have shuttle (G) move back away from film, normal 18 F.P.S. cam follower (A) is located in back of cam (B).

All Bright Still models use a large gear (C) similar to standard slow-motion gear and have same type of index arm (D) to shift this large gear. When index arm (D) is rotated clockwise, large gear (C) is shifted out toward shuttle (G) and cam follower (E) rides up on another large diameter cam (F). This action pulls cam follower (A) away from cam (B), which retracts shuttle (G) from film perforations and stops movement of film. The Still position on the control switch has been eliminated since the shutter continues to run during Still projection. There is no longer a need to rotate the shutter by hand to insure that the still image is not partially obscured. Index arm (D), which shifts from Normal to Still projection, should only be rotated while shuttle is running.



C-9b.1

C-9c MAINTENANCE

First determine whether troubles with Bright Still are mechanical or film burning on projectors returned for service. All models produce Bright Still by retracting the shuttle claw from the film perforations without use of a movable flag. The functions are accomplished in different ways on different models but all can become defective causing film burning. Since more light is used to produce Bright Still, the film is exposed to more heat.

The following items should be checked when problems of film burning occur.

1. All model projectors are equipped with dichroic mirrors.

2. All model projectors are equipped with special baffles in rear cover for improved cooling. Covers without baffles are not interchangeable.

3. All models move air flow through lens housing restricted by a special paper tab and are not interchangeable without air flow tabs.

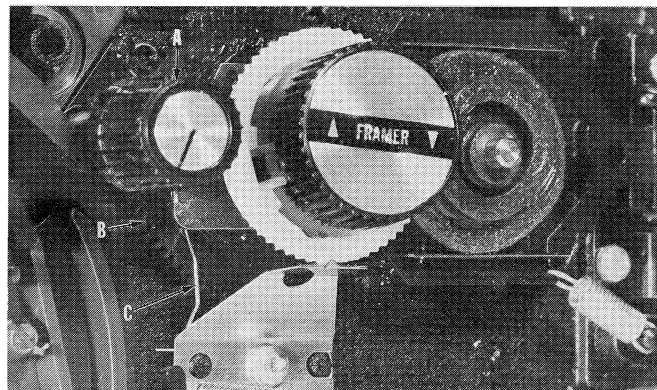
4. Large frame projectors have special heat sinks in front of projection lamp to absorb heat. These appear as a regular flag with a hole in the center and do not move as the control knob is rotated. The sinks must be centered in the center of the light beam.

5. All model projectors are equipped with 30 volt projection lamps. Check voltage of motor secondary winding for 30 volts \pm .75 volts. Change motor if voltage is excessive.

6. Check for incorrect projection lamp. Some projectors with Bright Still use ELE lamp which is identical in appearance to ELT lamp; however, ELE is a dichroic lamp.

Projectors with Bright Still with Forward Only, Forward/Reverse, or Forward/Reverse and Auto Rewind features are all equipped with the same mechanism for retracting the shuttle claw, and these parts are interchangeable. Mechanical defects which require removal of the large gear will require removal of the shuttle and cam. Slow Motion mechanism is almost identical to Bright Still mechanism in service procedure and appearance (see Slow Motion Section C-8). CAUTION: Large gear, cam shaft and shuttle are not interchangeable.

When gear shifter (A) is rotated clockwise, large gear (B) is pushed away from the projector frame causing shuttle cam to move up on high cam which holds shuttle claw back from film perforations. When gear shifter (A) is turned counterclockwise to Normal, large gear (B) must shift back against projector frame or the projector will remain in Bright Still. Mode spring (C) is standard on all projectors with Bright Still and Step Motion^{T.M.} features. Projectors received for service without this spring should have it added. After spring (C) has been secured in place, the tip of it near large gear (B) should be adjusted to just touch the gear with a minimum of spring load when gear (B) is all the way against the projector frame.



C-9c.1

SLOW MOTION	C-10
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- C-10a SLOW MOTION TROUBLE SHOOTING
- C-10b SLOW MOTION OPERATING PRINCIPLES (SMALL FRAME)
- C-10c MAINTENANCE (SMALL FRAME)
- C-10d SLOW MOTION OPERATING PRINCIPLES (LARGE FRAME)
- C-10e MAINTENANCE (LARGE FRAME)

C-10

STEP MOTION	C-11
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- C-11a STEP MOTION^{T.M.} TROUBLE SHOOTING
- C-11b STEP MOTION OPERATING PRINCIPLES
- C-11c MAINTENANCE

C-1'

C-11a STEP MOTIONTM TROUBLE SHOOTING

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	EXCESSIVE PROJECTOR NOISE AND PICTURE JUMP.	DAMAGED GEAR TEETH OR EXCESSIVE FOREIGN PARTICLES WEDGED IN GEAR TEETH.	CLEAN AND REPLACE GEARS IF REQUIRED.	R
		LOOSE GEAR SHAFT.	REPLACE.	C-11c
		WORN GEAR SHIFTER OR LOOSE LEVER PIN.	REPLACE.	
		GEAR HUB FROZEN ON SHAFT OR EXCESSIVELY WORN.	REPLACE GEAR.	
		DAMAGED CAM ON LARGE GEAR.	REPLACE LARGE GEAR.	
	MECHANISM WON'T SHIFT OR IS LOCKED UP.	DAMAGED GEARS.	REPLACE.	H
		SHUTTLE ARM BENT IN AREA OF CAM FOLLOWER.	REPLACE OR BEND SHUTTLE ASSEMBLY.	
		EXCESSIVE GREASE ON FRAMER STUD OR IN GEAR TEETH.	DEGREASE AND LUBRICATE WITH LIGHT GREASE. DO NOT GREASE GEAR TEETH.	R
		WORN GEAR SHIFTER OR LOOSE LEVER PIN.	REPLACE.	C-11c
		GEAR HUB FROZEN ON SHAFT OR EXCESSIVELY WORN.	REPLACE GEAR.	
	FRAMER KNOB ROTATES DURING PROJECTION.	PUSHNUT ON FRAMER STUD NOT TIGHT AGAINST FIBER WASHER.	TIGHTEN OR REPLACE PUSHNUT.	
		FRAMER STUD LOOSE.	RESTAKE.	

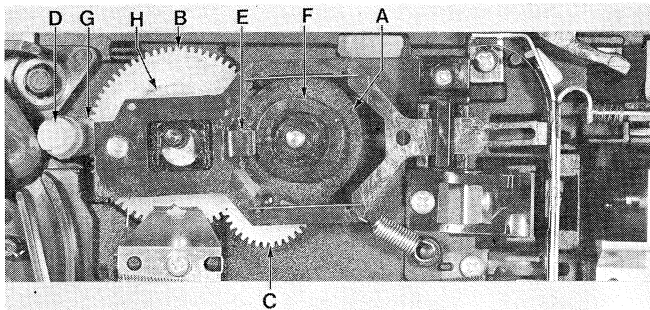
C-11b STEP MOTION^{T.M.} OPERATING PRINCIPLES

As in Slow Motion models, the motor drives shutter and cam (A) at 18 frames per second. Large gear (B) is reduced in speed by a 9 to 1 ratio running 9 times slower than cam (A). This is accomplished by driving large gear (B) through two small idler gears. One gear is molded on cam (A) which drives idler gear (C) in turn driving large gear (B) at 2 frames per second (FPS). Projectors with Bright Still and Step Motion, the index arm (D) is stepped with four positions. During normal 18 FPS projection, shuttle cam follower (E) located at rear of cam (A) rides on cam surface (F), while large gear (B) has been shifted toward the projector frame.

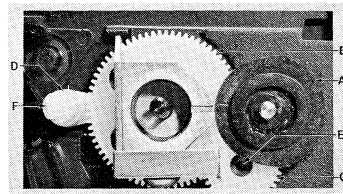
When index arm (D) is rotated one position clockwise, it shifts large gear (B) out toward shuttle. Cam follower (G) comes in contact with large gear cam (H) which has three high lobes on its surface holding the shuttle back and only letting it travel forward three times per revolution. Since the large gear is running at two revolutions per second, this produces 6 revolutions per second (6 FPS) which is Slow Motion speed.

When index arm (D) is turned one more position clockwise, large gear (B) is shifted one step closer to the shuttle. Cam follower (G) now rides on a cam with only one high lobe which allows the shuttle to travel forward once per revolution. Large gear (B) is turning 2 revolutions per second producing Step Motion at 2 FPS.

When index arm (D) is turned to the last position clockwise, large gear (B) is again shifted closer to the shuttle. Cam follower (G) now rides on a high cam with no lobes. This will hold the shuttle back from film perforations and the projector is now in Bright Still position.



C-11b.1



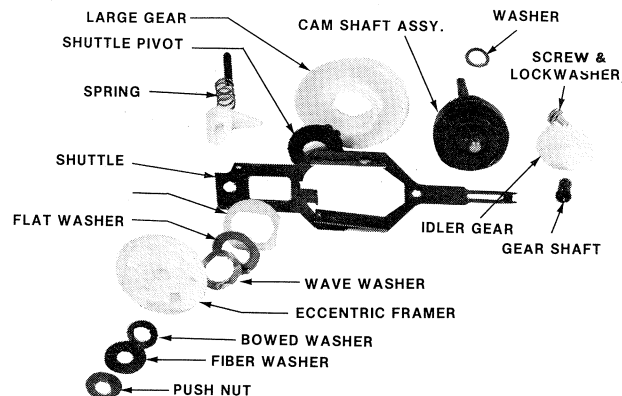
C-11c.1

Noisy projector, excessive picture jump, gear (B) locking up, or failing to shift are symptoms of the above problems.

Disassembly Procedure

1. Remove shuttle.
2. Remove motor (do not disconnect wiring).
3. Remove solenoid cover, solenoid and switch mounting plate.
4. Remove auto rewind latching trigger.
5. Remove four springs from lamp bracket arm that are secured to projector frame.
6. Remove lamp bracket.
7. Remove shutter (see Section I).
8. All Step Motion components can now be removed from the projector for service replacement.

A light coat of grease should be applied to all gear hubs and gear shaft lever pin. Do not get grease on gear teeth. Line up three timing marks with timing tool (see Minor Maintenance). Line up shutter to scratch mark (see Section I) and assemble shutter to cam shaft.



C-11c.2

C-11c MAINTENANCE

Major Maintenance

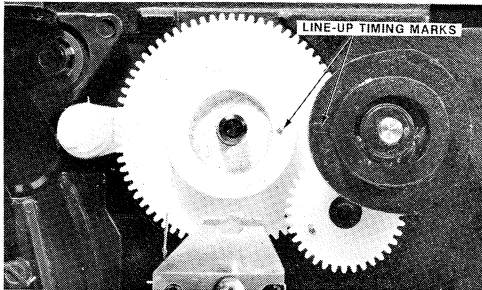
The following defects will require major disassembly if the projector has:

1. Damaged teeth on gears (B) and (C).
2. Loose gear shaft (E).
3. Loose gear shaft lever pin (F).
4. Worn gear shifter (D).
5. Gear hub frozen on shaft or excessively worn.
6. Damaged cam on gear (B).

Minor Maintenance

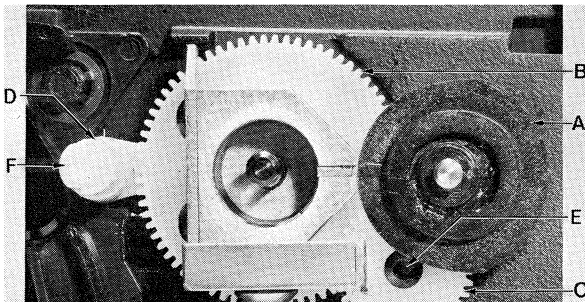
All components of the Step Motion mechanism are located on the front face of the projector and are exposed for minor service with the movement housing removed. The mechanism is comprised of four gears which have possibilities of erratic operation due to foreign particles wedged between gear teeth. Before replacing any of the gears, be sure all gear teeth are clean and free of embedded objects. With motor drive belts disconnected and shuttle removed, the entire gear train should turn freely without feeling high spots.

If it is determined that cam (A) is only defective or worn part, it can be replaced following cam changing instructions in Section I with the following exceptions. Before pulling cam (A), locate and position 3 timing marks as shown.



C-11c.3

Install timing tool which holds gears (B) and (C) in position when removing cam (A). If gear train is assembled just one tooth out of position, a noisy projector will result. Push cam (A) on only part way and check in back of cam to see if gear teeth, on back of cam (A), are going to mesh with teeth on gear (C). Push cam further on until teeth just touch gear (C) teeth. Move cam up and down slightly rotating gear (C) backlash until both cam and gear teeth mesh. Gear (B) must not move when shifting gear (C) slightly. Push cam (A) all the way on cam shaft so there is approximately .005 end play between cam and shutter when installation is complete. If the preceding instructions are not followed and gear (C) teeth become damaged, major projector disassembly will be required.



C-11c.4

HOUSINGS AND COVERS

D

- D-1 LENS HOUSING (LEVER FOCUS)
- D-2 LENS HOUSING (KNOB FOCUS)
- D-3 LENS HOUSING (CARTRIDGE PROJECTORS ONLY)
- D-4 MOVEMENT HOUSING ASSEMBLY
- D-5 MOVEMENT HOUSING ASSEMBLY (CARTRIDGE PROJECTORS ONLY)
- D-6 THREADER LEVER HOUSING (CARTRIDGE PROJECTORS ONLY)
- D-7 THREADER HOUSING (CARTRIDGE PROJECTORS ONLY)
- D-8 REMOVABLE FILM PATH (CARTRIDGE PROJECTORS ONLY)
- D-9 REMOVABLE SPINDLE REPAIR (CARTRIDGE PROJECTORS ONLY)
- D-10 PUCK REPLACEMENT (CARTRIDGE PROJECTORS ONLY)
- D-11 TRAP DOOR REMOVAL (CARTRIDGE PROJECTORS ONLY)
- D-12 LENS HOUSING CHANGE (ALL PROJECTORS WITH KNOB FOCUS)
- D-13 MODIFIED REAR COVER (FOR 1588Z PROJECTORS)
- D-14 CARTON STAPLING

D-1 LENS HOUSING

(Lever Focus)

Lever focus lens housing is removed by pulling off control knob, focus lever knob and removing screw under the knob which retains housing to the projector frame. Lift off lens housing.

Install lens housing by hooking tab into slot in projector frame, center hole in lens housing around control switch shaft and insert screw. If the screw is too long, it may bind against the heat filter flag making it inoperable causing film burn (Forward, Reverse, Still projectors only, see Section C-8d for complete information). Install focus lever knob and control switch knob. NOTE: On some models it is possible to install the control knob backwards. Check control switch positions after reassembling.

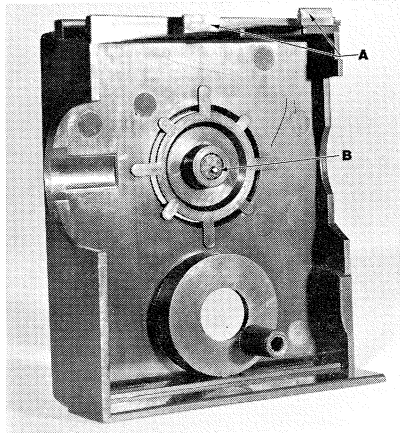
D-2 LENS HOUSING

(Knob Focus)

Remove lens housing from projector by pulling off control knob and removing screw under knob which attaches housing to projector frame. Replace lens housing if any of the following defects are apparent:

1. Hotstamped letters defective or worn off.
2. Locking tabs (A) broken off.
3. Focus nub (B) damaged or worn.

Install lens housing by hooking tabs (A) into slots in projector frame, push down on housing slightly, center hole in housing around control switch shaft and insert screw. If the screw is too long, it may bind against the heat filter flag making it inoperable causing film burn (see Section C-8d for complete information). Install control switch knob. NOTE: Models with Bright Still do not have heat filter flag.



D-2.1

D-3 LENS HOUSING

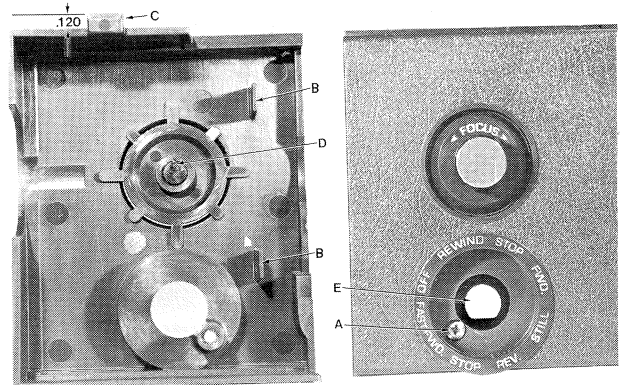
(Cartridge Projectors Only)

Remove control knob and screw (A) which attach lens housing to projector frame. Lift off lens housing. Replace the lens housing if any of the following defects are apparent:

1. Hotstamped letters defective or worn off.

2. Housing does not have two tabs (B) which prevent plate from jumping out of position.
3. Locking tab (C) not .120 high (Sears Only).
4. Focus nub (D) is damaged or worn.

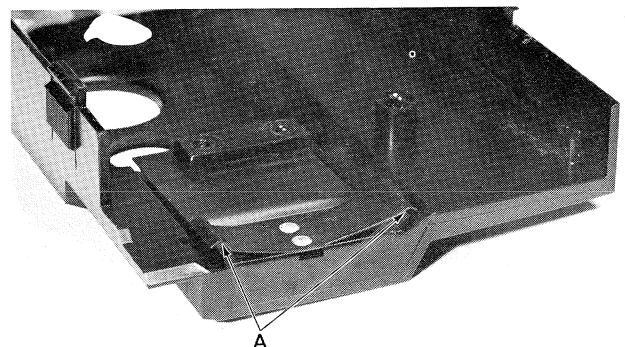
When installing lens housing, be sure locking tab (C) is slipped into slot in projector frame first. Push down on lens housing slightly to center hole in housing around shaft (E) when installing screw (A) so that control knob will fit in place. If screw (A) is stripped, a coarse thread screw can be cut to length to form a "strip-screw."



D-3.1

D-4 MOVEMENT HOUSING ASSEMBLY

Movement housing configurations may vary, but all contain about the same parts and have the same adjustments. If the projected image on the screen is not centered and a white edge appears at the right side, bend sheet metal light shield film guide springs (A) toward projector frame to center the picture. Film guide springs should be bent down about 10 degrees to prevent film clatter and interference of film guide with pressure plate. Film cannot move away from the shuttle in Rewind or Fast Forward without the 10 degree bend. If defects appear, replace the complete movement housing assembly.

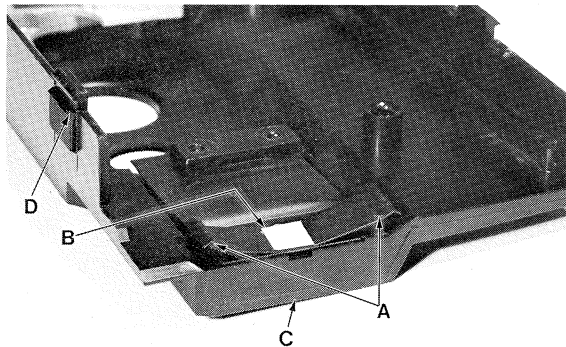


D-4.1

D-5 MOVEMENT HOUSING ASSEMBLY

(Cartridge Projectors Only)

If image on screen is not centered and white edge appears on the right side, bend sheet metal light shield film guide springs (A) toward projector frame to center picture. Film guide springs should always be bent down about 10 degrees to prevent film clatter. Without the 10 degree bend, film cannot move away from the shuttle in Rewind and Fast Forward, which causes noise and slow operation. There must be an aluminum reflector strip (B) on the film guide to prevent warping of movement housing at (C). Movement housing is serviced as a complete assembly only. If defects appear, including locking tabs (D) not holding housing to the projector frame, replace the complete assembly.



D-5.1

D-6 THREADER LEVER HOUSING

(Cartridge Projectors Only)

The threader lever knob is held in place by press fit and it can be pulled straight off. If threader lever housing is loose or damaged, it will be necessary to first remove the knob. From rear of projector, where threading lever comes through the frame, there are three screws in a vertical row; remove center screw to remove threader housing.

D-7 THREADER HOUSING

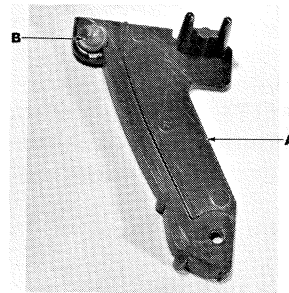
(Cartridge Projectors Only)

Threader housing is held in place by three metal studs which are part of the threader housing. Remove the housing from the projector frame by grasping the right side and pulling away from the projector frame. With the right side loose, a slight prying motion will disengage the left side. If the housing has broken pins, bosses, or is warped, it must be replaced.

D-8 REMOVABLE FILM PATH

(Cartridge Projectors Only)

The removable film path (A) is located under the threader housing and is held in place by it and three locating pins. The projector will not operate without this part. If film roller (B) is missing, it will be necessary to replace the film path assembly. Be sure film path locating pins are properly seated before snapping threader housing in place.

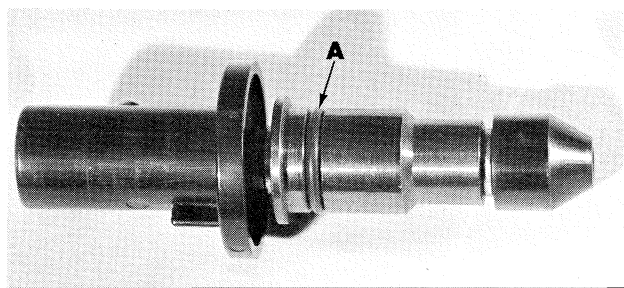


D-8.1

D-9 REMOVABLE SPINDLE REPAIR

(Cartridge Projectors Only)

It is recommended that the spindle be replaced as a complete assembly if found to be defective. The spindle has two bronze bushings in which the shaft must rotate freely with no drag. Spindle should slide into projector frame with a light press fit in order to hold supply reel in place. Be sure projector is in Forward position to avoid using excessive force when installing spindle in hole in projector frame. Excessive force may cause damage to the reel brake. Replace O-ring (A) if it is worn and spindle fails to stay in place.



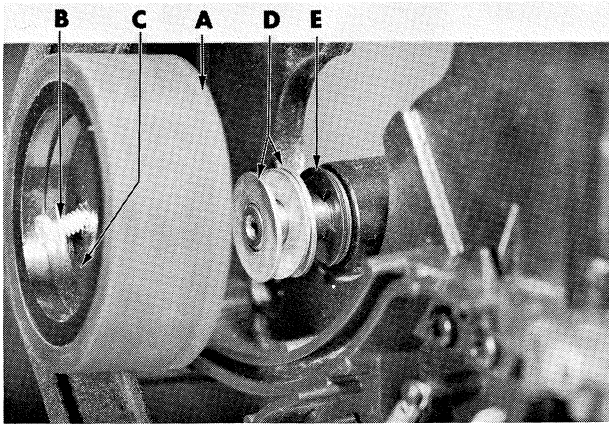
D-9.1

D-10 PUCK REPLACEMENT

(Cartridge Projectors Only)

Remove puck assembly (A) by holding rubber tire and removing screw (B) and washer (C). If tire is worn or loose on the puck, replace the complete assembly. With the puck removed, washers (D) can be added or subtracted so that puck (A) enters the cartridge without rubbing on either side. When replacing, screw (B) should be installed tight enough to slightly bow large stainless steel washer. Puck (A)

must have a small amount of end play to run free after it is fastened in place. To change end play, remove puck (A), spacer washers (D) and large E-ring (E). Add or subtract one washer and re-assemble puck. Check for end play and be sure tire is still on puck evenly.

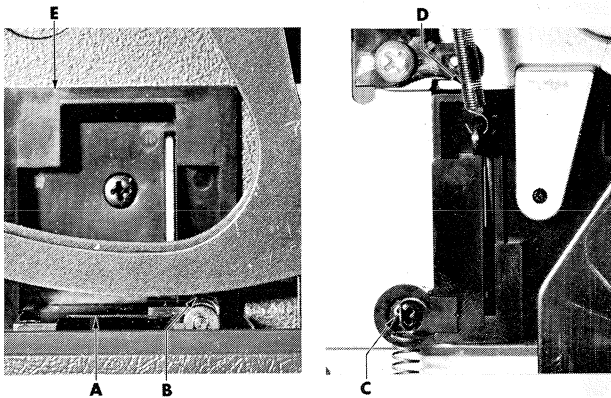


D-10.1

D-11 TRAP DOOR REMOVAL

(Cartridge Projectors Only)

If the trap door (A) lifts up and touches the supply reel at (B), it can cause slow rewind, defective reverse operation and false auto rewind tripping. From rear of projector remove left hand hold down tab (C), disconnect door spring (D) from link and remove trap door from front of projector. Install new trap door and check that roller does not touch 400' reel, that film will thread under door, and that door locks in down position and will snap up into frame when metal bar is pushed. The trap door assembly (E) is removed from the back of the projector and it is necessary to first remove the transmission double gear assembly and pivot plate (see Section M).



D-11.1

D-12 LENS HOUSING CHANGE

(All Projectors with Knob Focus)

Lens housings with knob focus have been changed to move detent closer to outer edge of the focus shaft. This change increases the amount of zoom focusing travel and provides for smallest image in focus at a shorter distance. This change can be made on older model projectors with knob focusing by using new lens housing or by rebuilding old housing with new focus shaft, P/N 449-478, which is normally not serviced.

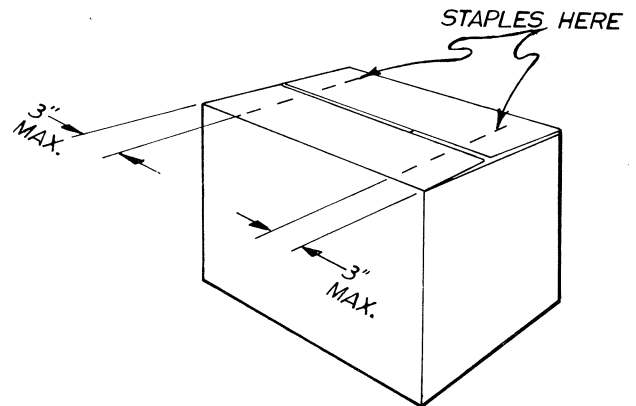
D-13 MODIFIED REAR COVER

(For 1588Z Projectors)

Approximately 5,000 1588Z Projectors were produced prior to Code Week 334 using rear covers with baffles. A modified cover is now used which eliminates the baffle and reduces noise. A slot was also added to the underside of the cover for additional cooling. New cover is interchangeable with old and is to be used as a replacement part in cases where projectors are returned because of excessive noise or cover damage. Other 1000 Series projectors use modified cover since start of manufacture.

D-14 CARTON STAPLING

The following procedure should be followed when stapling cartons to prevent possible damage to the projector handle. Cartons must not be stapled further inboard than 3 inches from outside edge.



D-14.1

FILM PATH SYSTEMS	E
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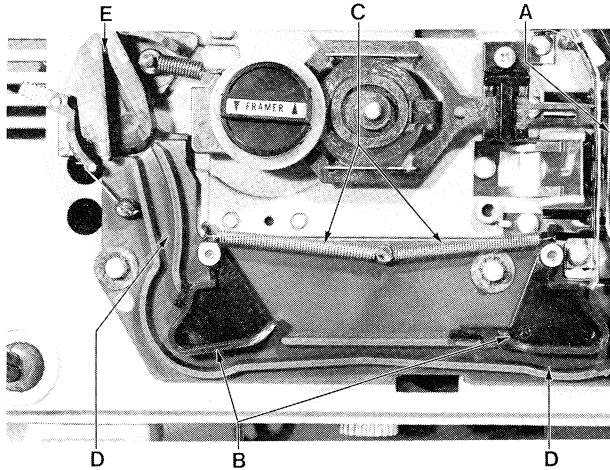
- E-1 FILM PATH ASSEMBLY
- E-2 FILM PATH REMOVAL AND ADJUSTMENTS
- E-3 FILM PATH ASSEMBLY (FOR CARTRIDGE PROJECTORS ONLY)
- E-4 FILM PATH ASSEMBLY ADJUSTMENTS (FOR CARTRIDGE PROJECTORS ONLY)
- E-5 SIDE GUIDE REMOVAL AND ADJUSTMENT
- E-6 BUFFER ASSEMBLY REMOVAL AND ADJUSTMENT (FOR CARTRIDGE PROJECTORS ONLY)
- E-7 REWIND GUIDE PATH AND UPPER FILM GUIDE (FOR CARTRIDGE PROJECTORS ONLY)
- E-8 FILM PATH ALTERATION (FOR ALL PROJECTORS NOT INCLUDING CARTRIDGE PROJECTORS)

E

E-1 FILM PATH ASSEMBLY

The film path is designed to reduce friction and jamming as much as possible. Both Forward Only and Forward, Reverse, Still model projectors have a film path system with few mating parts using buffers at the corners. Friction must be at a minimum before diagnosing slow rewinding or slow auto rewinding. Check the following points before making major adjustments:

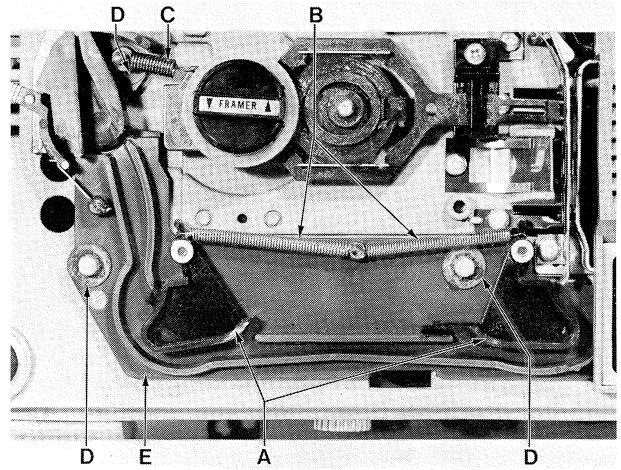
1. Supply reel rubbing on projector frame.
2. Pressure plate (A) opens at least 1/8 inch in re-wind and auto rewind.
3. Buffers (B) pivot without hang-up or catching on film.
4. Both springs (C) properly attached to buffers (B).
5. Film path (D) and film guide (E) free of obstructions and molding defects.
6. Take-up spindle is free with some end play.



E-1.1

E-2 FILM PATH REMOVAL AND ADJUSTMENTS

Film path assembly consists of front and rear buffers (A) which take-up shock from film as it is pulled through the system by the take-up spindle. Buffers prevent film from being pulled through the gate by the take-up mechanism. Springs (B) return buffers (A) to normal position as film moves through the system. Be sure springs (B) are not broken or detached from buffers. Replace springs if necessary. Buffers, springs and silencer pads are only serviceable parts other than the complete film path assembly. Film path assembly (E) is removed by unhooking shuttle spring (C), on models without Slow Motion, and Bright Still or Slow Motion knob on models so equipped. Remove three push-on nuts (D) by collapsing with screwdriver and hammer. Slide film path off of studs. On Slow Motion and Bright Still models, be sure film path clears index arm and does not disengage spring.



E-2.1

E-3 FILM PATH ASSEMBLY

(For Cartridge Projectors Only)

The film path is designed to reduce film jamming and friction as much as possible. This is accomplished by providing a smooth film path with few mating parts, utilizing rollers at each corner. It is important that friction be at a minimum before diagnosing slow rewind or slow auto rewind. The following points must be checked prior to making any major adjustments inside the projector:

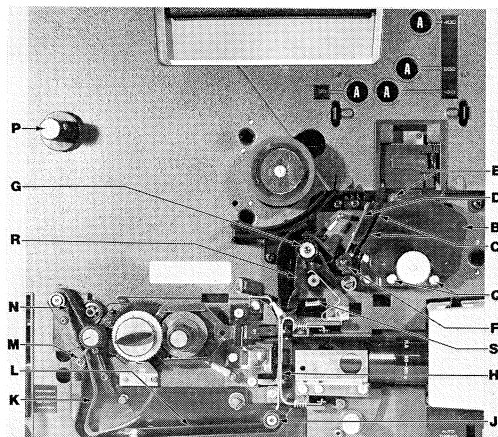
1. Reel brake dragging on reel adapter when inserted into holes (A).
2. Threader (B) not shifted and obstructing film path along surface (C).
3. Stripper finger (D) not bent and pinching film at roller (E).
4. Rollers (F) and (G) must be free to rotate.
5. Pressure plate (H) opens at least 1/8 inch in Re-wind and Auto Rewind.
6. Roller (J) is free to rotate.
7. Buffer (K) goes all the way back to the left and does not catch on film path (L). Bend up 1/8 inch if necessary.
8. Roller (M) is free to rotate.
9. Buffer (K) not bent and pinching film at roller (M).
10. Film guide (N) free of obstructions and molding defects.
11. Take-up spindle (P) is free and has some end play.

12. When in Auto Rewind, small drive wheel is clear of take-up spindle (P).

13. Buffer (R) should not touch bar (S) while in Reverse. Bend bar (S) down if necessary and check Auto Rewind function with 50' reel.

14. Threader (B) must be aligned with film path or film may jump out of film path.

15. Stripper finger (D) not aligned with film path may cause defective threading. Reposition threader (B) by loosening screws (Q).

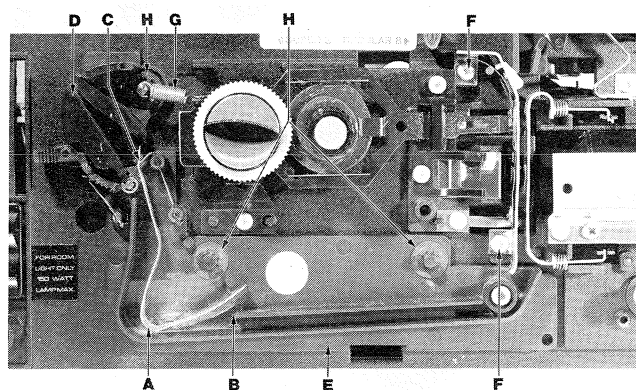


E-3.1

E-4 FILM PATH ASSEMBLY ADJUSTMENTS

(For Cartridge Projectors Only)

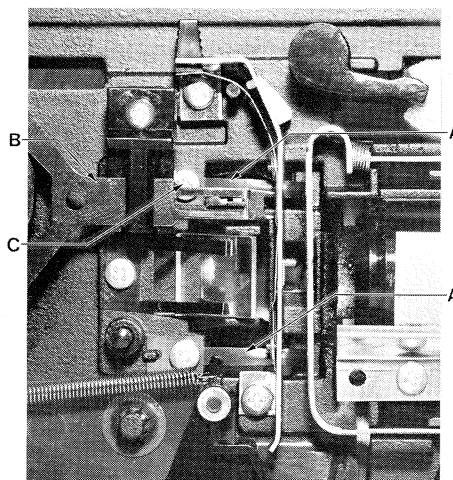
Bronze buffer (A) should be bent so that its end cannot catch under lip of film path at (B). Buffer guide (C) should be bent forward to touch film take-up assembly (D) when rotated. If too straight, it may catch on film perforations. Further work on film path will require installation of new film path assembly (E). For removal, loosen or remove screws (F) on aperture plate and Slow Motion knob. Remove shuttle spring (G) on projectors without Slow Motion feature. Remove three push-on nuts (H) by collapsing with screwdriver and hammer. Slide film path off of studs being sure film path clears Slow Motion index arm and does not disengage Slow Motion spring.



E-4.1

E-5 SIDE GUIDE REMOVAL AND ADJUSTMENT

Two side guide springs (A) can be removed without projector disassembly if shuttle (B) is rotated to clear side guide screw (C). The function of side guides is to help align and center picture. Side guides (A) are adjusted by bending in or out only after alignment of spring film guide on the movement housing (Section D) has failed to align picture.

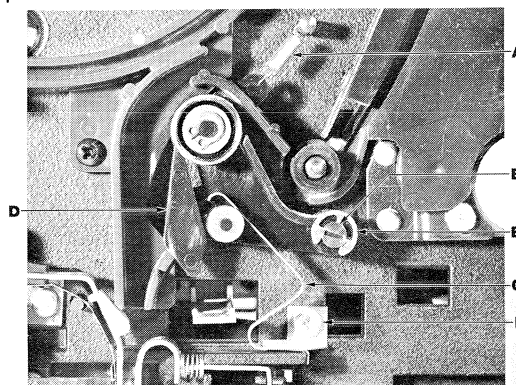


E-5.1

E-6 BUFFER ASSEMBLY REMOVAL AND ADJUSTMENT

(For Cartridge Projectors Only)

First remove threader housing and removable film path. Unhook buffer spring (A) and remove E-ring (B). Lift brass buffer spring (C) out of the way and slide buffer assembly (D) off of pivot pin (E). Buffer must pivot freely on pivot pin and roller must be free to turn. Replace the complete buffer assembly if it is defective. Pivot pin (E) is threaded into the projector frame and must be tight when reassembling. Be sure brass spring (C) does not rub on side of buffer assembly as it must be free to pivot up and down when the system is reassembled. Buffer spring (C) is a dampener to reduce picture jump in Reverse and is held in place by one screw (F) in the projector frame. If all parts in the Auto Rewind system are working properly, the buffer can be bent up slightly to trip the Auto Rewind mechanism easier.



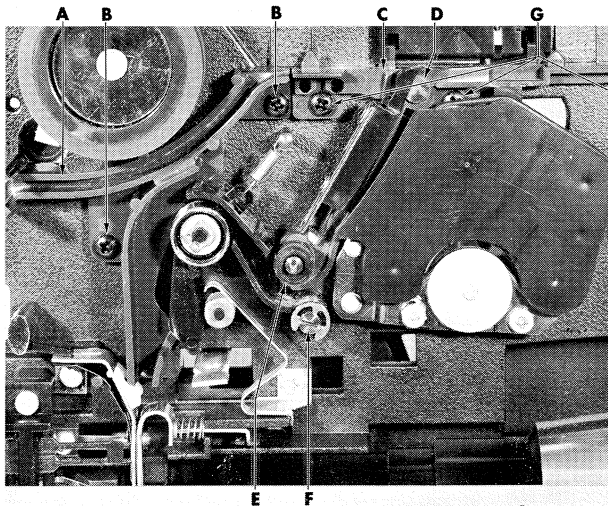
E-6.1

E-7 REWIND GUIDE PATH AND UPPER FILM GUIDE

(For Cartridge Projectors Only)

Guide path (A) is mounted to the projector frame by two screws (B). First remove buffer before guide path (A) can be lifted off.

Film guide (C) is serviced as an assembly only. It must be replaced if upper guide roller (D) is missing, lower roller shaft (E) is loose, or roller is not free to rotate. Stripper assembly must be separated from threader assembly by removing screws. Remove threader mounting screws and threader assembly. Unscrew buffer pin (F) and three screws (G) which hold film guide to frame.



E-7.1

E-8 FILM PATH ALTERATION

(For All Projectors Not Including Cartridge Projectors)

The film path has been altered to reduce film accordion-pleating and to accept incorrectly trimmed film. The altered film path is interchangeable with the old and is identified by increased wall thickness at the lower right hand corner. The part number was not changed on this part.

THREADING	F
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- F-1 TROUBLE SHOOTING**
- F-2 GENERAL THREADING INFORMATION**
- F-3 THREADER AND STRIPPER ASSEMBLIES (CARTRIDGE PROJECTORS ONLY)**
- F-4 THREADER ACTIVATING LINKAGE (CARTRIDGE PROJECTORS ONLY)**
- F-5 THREADER CLUTCH AND DRIVE MECHANISM (CARTRIDGE PROJECTORS ONLY)**
- F-6 ERRATIC THREADING (ON SOME EARLY MODEL CARTRIDGE PROJECTORS)**
- F-7 THREADER ASSEMBLY TOOL (FOR CARTRIDGE PROJECTORS ONLY)**

F

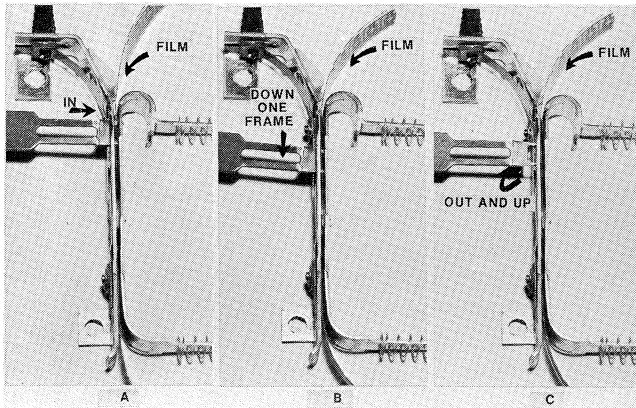
F-1 TROUBLE SHOOTING

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	WILL NOT THREAD.	SHUTTLE CLAW OUT OF ADJUSTMENT.	ADJUST SHUTTLE FOR 1/32" OF FILM ENGAGEMENT.	H
		PIECE OF FILM CAUGHT IN PLATES.	TURN CONTROL KNOB TO REWIND AND BE SURE PLATES ARE CLEAN.	F-2
		FILM NOT TRIMMED PROPERLY.	TRIM FILM OR LEADER.	
		KINK OR BEND IN FIRST FEW INCHES OF FILM.	REMOVE DEFECTIVE FILM.	
CARTRIDGE PROJECTORS ONLY		STICKY STRIPPER FINGER.	GRIP METAL SUPPORT BELOW PLASTIC SUPPORT AND PULL OUT SLIGHTLY FROM PROJECTOR TO FREE UP STRIPPER.	F-3
			REPLACE STRIPPER ASSEMBLY.	
		REMOVABLE FILM PATH MISSING.	REMOVE THREADER HOUSING AND MAKE SURE REMOVABLE FILM PATH IS IN PLACE. IF NOT, REPLACE.	E-7
		THREADER ASSEMBLY SHIFTED AND PINCHES FILM IN UPPER FILM PATH.	REMOVE THREADER HOUSING AND REMOVABLE FILM PATH. IF THREADER ASSEMBLY IS NOT PARALLEL WITH FIXED FILM PATH ON FRAME, LOOSEN TWO THREADER SCREWS AND REPOSITION THREADER.	F-3
		SMALL BELT HAS JUMPED OFF OF PULLEYS.	REMOVE THREADER HOUSING AND REPLACE BELT. THIS CONDITION INDICATES TOO MUCH PRESSURE BETWEEN REEL, OR TRAP DOOR AND THREADER. REDUCE PRESSURE BY MOVING THREADER SPRING PIVOT UP.	
		SMALL BELT BROKEN OR STRETCHED.	REPLACE BELT. NO DISASSEMBLY REQUIRED.	N
		THREADER ASSEMBLY BENT.	RAISE THREADER ALL THE WAY UP AND BEND IN OR OUT AS REQUIRED.	F-5
		BELT SLIPS.	WHILE RUNNING, CLEAN BELT WITH ALCOHOL OR DEGREASING FLUID.	—
		FILM LOOSE ON CARTRIDGE REEL.	MOMENTARILY TURN CONTROL KNOB TO REWIND TO TIGHTEN FILM ON REEL.	—

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
CARTRIDGE PROJECTORS ONLY CONT'D.	WILL NOT THREAD. CONT'D.	REEL TIGHT IN CARTRIDGE.	CHANGE REEL OR CARTRIDGE SO THAT REEL SPINS FREE ON CARTRIDGE HUB.	—
			TOO MUCH FILM ON REEL FOR CAPACITY OF REEL.	—
		THREADER BELT NOT TURNING.	REMOVE REAR COVER AND LARGE THREADER BELT. TURN THREADER PULLEY BY HAND AND IF NOT FREE, TAP PULLEY SHAFT TO INCREASE END PLAY.	F-5
		THREADER NOT CONTACTING REEL WITH SUFFICIENT PRESSURE.	ADJUST THREADER SPRING PIVOT; ROTATE DOWN TO INCREASE THREADER PRESSURE. THREADER ASSEMBLY MUST GO ALL THE WAY DOWN WHEN THREADING LEVER IS RELEASED.	F-4
		MAIN THREADER CLUTCH NOT DRIVING.	PRESS DOWN ON THREADER LEVER AND SPRING SHOULD MOVE CLUTCH ROD FORWARD AND DRIVE MAIN THREADER BELT. ADJUST ROD HOUSING SO THAT ROD IS FREE TO MOVE FORWARD.	F-4
			MAIN DRIVING CLUTCHES MUST HAVE SMOOTH SURFACES. IF CIRCULAR WEAR LINES ARE VISIBLE, REPLACE THE CLUTCHES.	F-5
		GATE DOES NOT OPEN.	GATE SHOULD OPEN A MINIMUM OF 1/16". BEND CLEVIS DOWN UNTIL GATE OPENS WHEN THREADING LEVER IS PUSHED ALL THE WAY DOWN. AFTER BENDING, CLEVIS MUST HAVE SOME END PLAY AND NOT BE HELD UP BY LIFT SPRING.	G

F-2 GENERAL THREADING INFORMATION

Film threading system can also be considered as part of the film transport system and consists of a cam and shuttle. Rotation of the cam moves the shuttle to advance film frame by frame past the aperture plate opening. As the cam rotates, the shuttle moves forward (A) engaging tips of shuttle in film perforations. As cam continues to rotate, the shuttle travels down (B) moving film downward. Further cam rotation allows shuttle to withdraw from film perforations and move up (C) for the next cycle. A complete cycle takes place with each revolution of the cam advancing film one frame. Normal projector speed is 18 frames per second (18 FPS).



F-2.1

Most problems which occur with projector threading are not a mechanical defect of the projector, but are problems with the film or projector operation. Film selector switch must be in the proper position for the type of film that is being projected and the leading end of film must be properly trimmed and free of kinks. Film path must be free of broken film and other foreign objects, and movement housing must be latched in place. If all of these symptoms have been checked and the projector still will not thread, the problem may be caused by an improperly adjusted or bent shuttle (see Section G for aperture and shuttle adjustments).

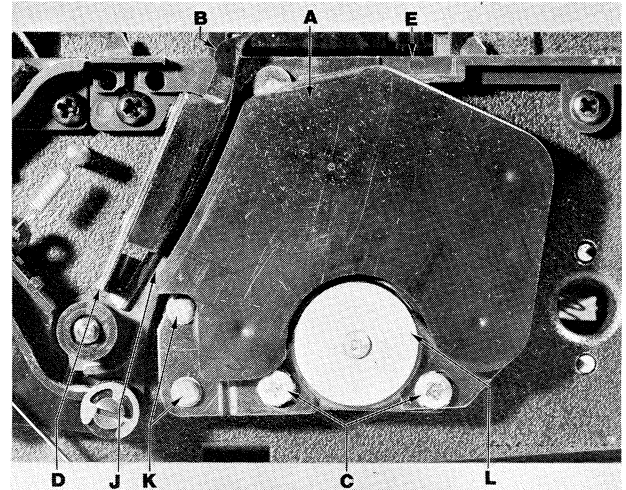
F-3 THREADER AND STRIPPER ASSEMBLIES

(Cartridge Projectors Only)

Remove threader housing and removable film path from projector. Threader assembly (A) and stripper finger (B) must be parallel to film path on projector frame and not obstructing or partially covering film path.

To adjust threader assembly (A), loosen screws (C) and rotate the assembly until it aligns with film path. Support area under screws and tighten. **BE SURE THREADER ASSEMBLY DOES NOT MOVE WHILE TIGHTENING SCREWS.** If stripper finger (B) is not quite parallel with film path, bend slightly at (D) to align. Threader lifter spring must be pre-loaded so that when auto thread lever is de-

pressed and slowly released, threader assembly (A) will not bottom out, but rest with drive belt approximately even with plastic ledge at (E).



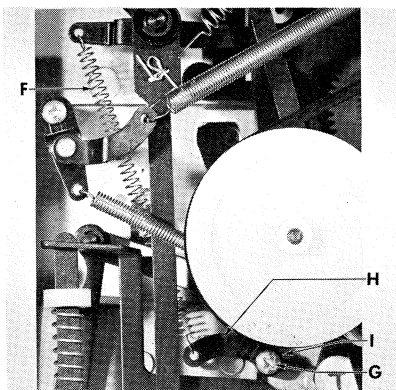
F-3.1

Preloading spring is necessary to obtain sufficient pressure between reel and threader to drive film to the gate, even if 50-foot reel contains only 25 feet of film. Determine correct spring (F) tension by loosening screw (G), push spring pivot (H) down and retighten screw in 1/8 inch increments. The preceding must be performed on all projectors which have spring (F) located as shown, because screw (G) extends through projector frame and is threaded into plastic lens housing and may not remain tight. Projectors manufactured prior to Code Week 410 must have screw (G) replaced with longer screw and lockwasher located between projector frame and pivot (H). Projectors manufactured after Code Week 410 have a metal boss at (I) for the screw. **IMPORTANT: PROJECTORS MUST HAVE LOCKWASHER BETWEEN FRAME AND SPRING PIVOT (H) AND NOT UNDER SCREW HEAD.**

Check threading performance with both 50-foot cartridge and reel with trap door in proper threading position after making any adjustment. Adjustments are the same for Sears projectors even though pivot (H) is secured with nut instead of screw. Threader belt can be replaced without disassembly by removing it from pulleys and working it out between stripper and threader along film path at (J). Remove threader assembly (A) by removing two screws (K), two screws (C), pulling belt off of drive pulley (L) and lift off threader. If threader is bent or has defective idler pulleys, replace the assembly.

Remove two screws (K) to remove film stripper (D). Stripper can be worked around until it snaps under film path without bending metal part. Stripper finger must not stick in any position, have a light spring load and always pop up. If defective, replace the complete assembly. **CAUTION: DO NOT FORCE STRIPPER UNDER FILM PATH AS BENDING MAY OCCUR.**

Drive pulley (L) can be removed from rear of projector with threader lifter bar removed or by removing screw in center of pulley. A prying motion is required since drive pulley is also held on with a light press fit over a knurl. Replace drive pulley (L) if flanges are bent or distorted during removal.



F-3.2

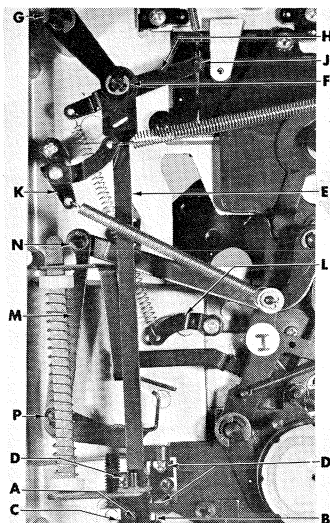
F-4 THREADER ACTIVATING LINKAGE

(Cartridge Projectors Only)

Remove threader lever (A) by pulling knob off from front of projector. Remove E-ring (B) and slide out clevis pin (C). Remove screws (D) and slide lever assembly out through projector frame.

Remove E-ring (B), slide out clevis pin (C), remove E-ring (F) and (G) and lift out lift lever (E) which can be removed without disturbing other linkage. Remove E-ring (G), (F) and (J) to remove toggle arm (H). If spring pivot (K) or (L) are removed, be sure to install lockwasher between pivot and projector frame, and tighten securely. The projector will not thread if pivot (L) is loose or auto rewind system will not operate if pivot (K) is loose. Pivot (K) is usually locked in place at about 20-degree angle as shown.

Remove E-ring (N) and (P) to remove link (M). Install link (M) so that it does not bind with link (Q). This assembly must pivot freely.



F-4.1

F-5 THREADER CLUTCH AND DRIVE MECHANISM

(Cartridge Projectors Only)

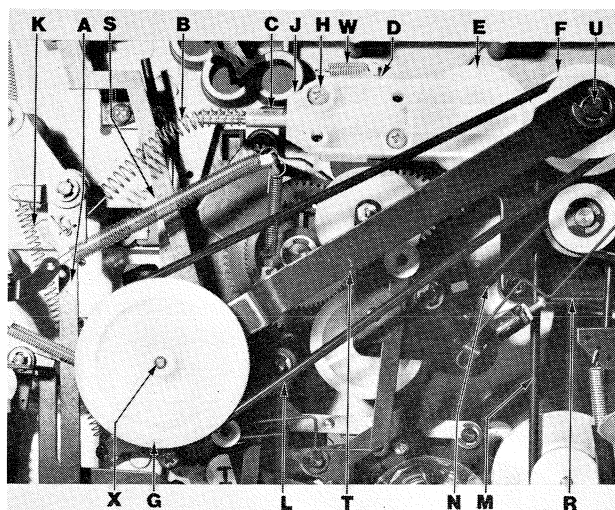
Threader mechanism on the front of the projector operates through a clutch and only runs when threader lever is pressed down. When rod (A) moves up, toggle spring (B) moves pushrod (C) against clevis assembly (D) engaging clutch wheel (E) and disc (F).

Disc (F) should drive pulley (G) at smooth even rpm and wheel (E) should slow down and stop when threading lever is released. Remove two screws (H) and replace wheel (E) if it has grooves worn on sides due to continuous running. Be sure clutch housings (J) are aligned so that pushrod (C) does not drag or bind. If wheel (E) engages disc (F) too tight causing motor to slow down, shorten spring (B) slightly. Crimp end of spring so it will not slide off of pushrod (C).

If threading is still erratic, remove drive belt (L). Pulley (G) should turn easily by hand with no uneven drag or high spots. Tap end of threader shaft (X) to increase shaft end play. If threader still turns hard, remove two threader screws, replace threader assembly and readjust. If wheel (E) clatters when not in use, a small light spring (W) may be added to clutch housing. If this spring is added, check threader to be sure spring does not impair threading by being too strong.

Service threader drive mechanism with threader and threader clutch components removed.

1. From front of projector, remove threader assembly and two screws.
2. Remove E-ring (S) and (V), screws (H) and clutch housing (J).
3. Slide threader bar assembly (T) off of pivot pin (U) and remove motor drive belt (M). Remove transmission drive belt (N) and support plate (R).



F-5.1

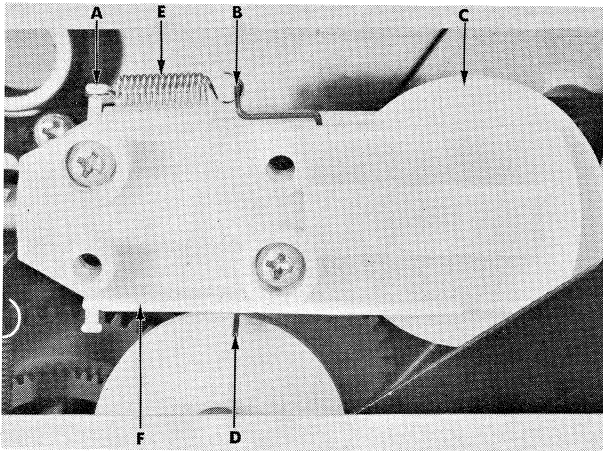
F-6 ERRATIC THREADING

(On Some Early Model Cartridge Projectors)

Erratic threading is caused by improper engagement of clutch drive wheel (C), P/N 490-460. Threader clutch wheel must rotate at a smooth, even rpm only when auto thread lever is depressed. If allowed to rotate intermittently while projector is in Forward, wear grooves will appear on inside flanges of clutch wheel and impair threading.

Make the following checks with the trap door down in threading position.

1. Replace clutch wheel (C) if grooves are worn on inside wheel flanges, if evidence of white power in the area, or if wheel rotates intermittently while in Forward.
2. If threading rpm is still erratic, or clutch wheel (C) still rotates with projector in Forward, replace clevis (D). Clevis side must be parallel, with no indication of being bent, and must be free to slide with- in two clutch retainers (F).
3. A light spring (E), P/N 445-617, may be added to spring posts (A) and (B) provided on clevis and clutch retainers if problem persists. Spring (E) will insure complete disengagement of clutch wheel, but if it is too strong, a smooth even threader rpm will not be possible.



F-6.1

F-7 THREADER ASSEMBLY TOOL

(For Cartridge Projectors Only)

Threader tool, P/N 490-504-T1, is a support fixture only and not an alignment fixture. This tool is used when adjusting or installing threader assembly, P/N 490-504. Lift up threader assembly, insert tool in rectangular hole in projector frame and then drop threader assembly back in place. Hold threader in line with film path and tighten two screws, P/N 500-153. Remove tool, grasp threader around outside and try to rotate right or left. If movement occurs, alignment is lost indicating defective stake on pivot assembly, P/N 490-516. Replace assembly and repeat alignment procedure.

APERTURE	G
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- G-1 TROUBLE SHOOTING
- G-2 GATE SYSTEM
- G-3 APERTURE AND PRESSURE PLATE REPLACEMENT
(SMALL SIZED FRAME CASTING)
- G-4 APERTURE PLATE INSTALLATION
- G-5 GATE OPENING
- G-6 GATE SYSTEM (CARTRIDGE PROJECTORS ONLY)
- G-7 APERTURE AND PRESSURE PLATE REMOVAL
(CARTRIDGE PROJECTORS ONLY)

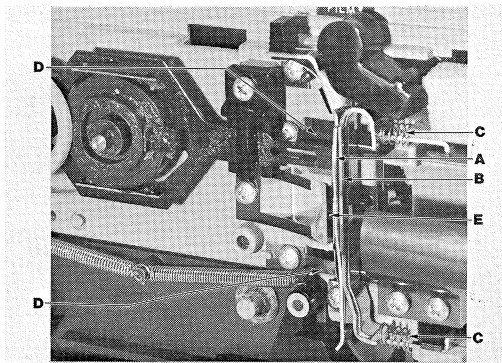
G

G-1 TROUBLE SHOOTING

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	PROJECTOR THREADS BUT SHUTTLE DOES NOT PICK UP FILM.	PRESSURE PLATE DOES NOT CLOSE.	PRESSURE PLATE HANGING UP ON FRAME OR GUIDE PIN ON APERTURE PLATE. LOOSEN APERTURE PLATE SCREWS, LOWER ASSEMBLY AND RETIGHTEN SCREWS.	G-4
CARTRIDGE PROJECTORS ONLY			THREADER LIFT SPRING CLEVIS RESTING ON SPRING AND HOLDING PLATE OPEN. BEND CLEVIS UP FROM SPRING. MAKE SURE GATE OPENS UP 1/16 WHEN THREADER LEVER IS OPERATED.	F-3
ALL		PRESSURE PLATE BINDS IN FRAME CASTING.	BEND ARMS AS REQUIRED.	G-5
		PRESSURE PLATE HANGS UP ON MOVEMENT HOUSING SPRING GUIDE.	BEND TOP AND BOTTOM SPRING SIDE GUIDE AWAY FROM PROJECTOR. TOO MUCH BENDING WILL RESULT IN HORIZONTAL PICTURE JUMP.	
		WEAK PRESSURE PLATE SPRINGS.	REPLACE SPRINGS.	
		FILM SELECTOR IN WRONG POSITION OR NOT FULLY IN POSITION.	CHECK FILM SELECTOR POSITION FOR TYPE OF FILM BEING USED.	F-2
		MOVEMENT HOUSING NOT IN PLACE.	CHECK AND REINSTALL.	
		PRESSURE PLATE NOT OPENING WHEN FILM REACHES GATE.	BE SURE PRESSURE PLATE IS NOT BINDING ON PROJECTOR FRAME OR HANGING UP ON MOVEMENT HOUSING SPRING GUIDE.	G-5
CARTRIDGE PROJECTORS ONLY.			BEND THREADER LIFT SPRING CLEVIS DOWN SLIGHTLY AND OPERATE THREADER LEVER.	F-3

G-2 GATE SYSTEM

The gate system is comprised of aperture plate (A), pressure plate (B), pressure springs (C), guide springs (D) and film guide (E). The function of the gate is to hold film flat, steady and align it horizontally. Aperture plate (A) is fastened to the projector frame while pressure plate (B) is free to move. Film is sandwiched between the two plates during projection and pressure plate (B) is held against the film by two pressure springs (C). Film is aligned horizontally by guide springs (D) and film guide (E). Perforated edge of film is aligned with outside edge of aperture plate against film guide (E) which furnishes a bearing surface for the film. Guide springs load film against film guide located inside movement housing. When projector is in Fast Forward or Rewind, pressure plate (B) moves away from aperture plate (A) approximately 1/8 inch. Plastic guide (F) will cause the film to move away from aperture plate (A) to avoid film tearing as film moves rapidly past shuttle claw.

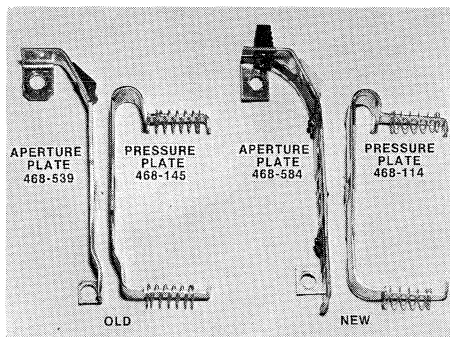


G-2.1

G-3 APERTURE AND PRESSURE PLATE REPLACEMENT

(Small Size Frame Casting)

To simplify production and reduce film scratch, new aperture and pressure plates are being installed on frame castings, Revision 14, after July 1969. Frame casting revision number is located on inside upper middle of casting with rear cover removed. Unidentified castings use older type aperture and pressure plates. New style aperture and pressure plates will not fit older (pre-14 Revision) castings. New style should be installed as a set and used whenever possible to simplify picture quality adjustment.

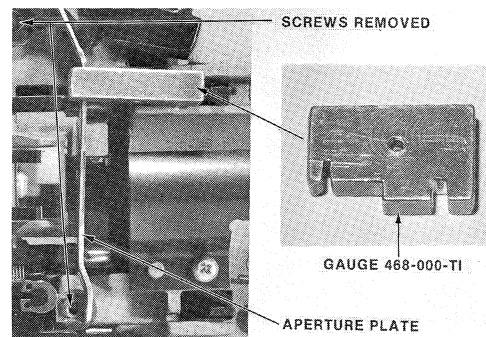


G-3.1

G-4 APERTURE PLATE INSTALLATION

Whenever replacing the aperture plate, it is advisable to use aperture plate alignment gauge, P/N 468-000-T1. This gauge will insure that all major adjustments and alignments are correct. Rotate cam by hand and check that the shuttle is not bent and that it enters slot in aperture plate without hitting.

To use the gauge, first remove aperture plate mounting screws and the shuttle from the projector. The shuttle may become bent if it is not removed. Insert alignment gauge, P/N 468-000-T1, over aperture plate and reinstall screws. Remove gauge, reassemble shuttle in projector and check for clearance where shuttle enters aperture plate.



G-4.1

G-5 GATE OPENING

Projectors must have the pressure plate open with the control knob in Off position for the following reasons:

1. Threading: Film is pushed down into the open gate with projector in Off position and when it is turned to Forward, the film automatically feeds on through the system.
2. Breaking: When the projector is turned off, brakes are applied to the drive system. Some film passes the shuttle and would become torn if the gate did not open.

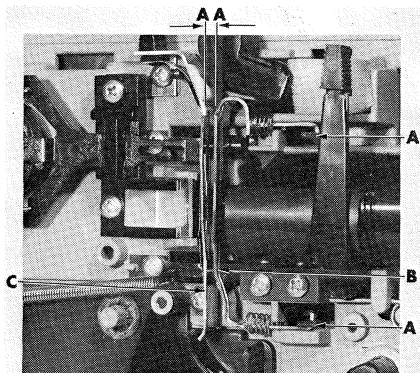
If the projector is turned to the Off position and the shuttle engages and tears film perforations, adjust the projector by:

- a. Bending retract fingers (A) forward (toward lens) to reduce clearance between ends of pressure plate (B) and retract fingers.
- b. Bending fingers forward will cause the pressure plate to open more.

Proper clearances are as follows:

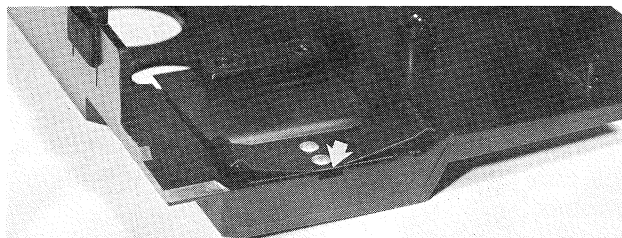
1. Forward Only Projectors: Bend retract fingers (A) until gap (AA) is 1/16 inch.
2. Forward/Reverse/Still Projectors: Bend retract fingers (A) until gap (AA) is 5/32 inch.
3. Cartridge Projectors: Retract fingers are not adjustable — DO NOT BEND.

All projectors must have pressure plate (B) completely closed during film projection. If retract fingers are bent too much, the pressure plate may not completely close. Aperture plate (C) must be checked in the projection position after any adjustment is made.



G-5.1

If the retract fingers are correctly adjusted and the pressure plate still does not close completely in the project position, remove the movement housing and check the system. If the pressure plate now closes, it was caused because the pressure plate was binding on the film guide in the movement housing. Bend the film guide down to approximately 10 degrees as shown.



G-5.2

If the pressure plate still does not close completely, check spring legs of pressure plate and make sure they are parallel. Make sure that one or both legs are not binding on the projector frame.

Minor Adjustments

After gate system has been properly installed and adjusted, check the projector for picture quality. Picture alignment, film wobble and film jump can generally be controlled by **FINE** adjustment of the aperture and pressure plates. For specific optical problems, see Section L. Projected Image.

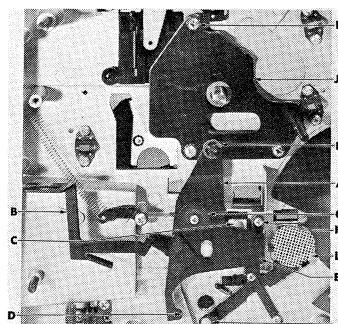
Aperture Mask

Some 8mm projectors may exhibit a problem with the mask slipping from Super to Standard 8 format by vibration. This condition can be corrected by slightly squeezing the top portion of the mask to produce drag on the lever so it cannot inadvertently slip from one format to the other. As of Code Week 393, aperture plate, P/N 468-113, is being manufactured with two small dimples at the top to eliminate the slipping problem.

G-6 GATE SYSTEM

(Cartridge Projectors Only)

When threading lever pushes up on arm (A) at (B), arm (A) pivots, and slides pressure plate activator (C) to the left. When control switch cam pushes arm (A) at (D), the arm pivots and slides pressure plate activator (C) to the left. Arm (A) must be free to pivot, not dragging or binding under guide (E). Control arm (A) should slip out from under guide (E) with E-ring (F) and screw (G) removed. Be sure to replace small washer under screw (H) if guide (E) is removed. Small washer provides proper spacing for arm (A). With control arm (A) removed, pressure plate activator (C) can be lifted out. Pivot plate (J) should only be replaced if staked pivot pins are loose. Remove three screws (K) to remove pivot plate (J). Normally flag (L) is not serviced since it is cold-staked into the projector frame. If stake (M) is loose, the control knob becomes very difficult to turn. Restake flag and insert lamp bracket, but do not reassemble. If control knob still turns hard, the stake boss will need to be drilled and tapped for a screw and washer which will replace the cold stake.



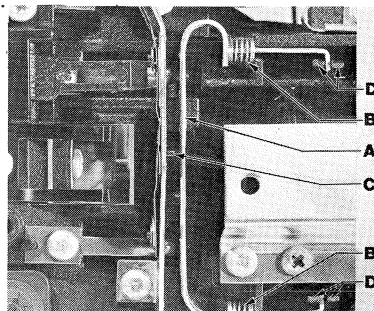
G-6.1

G-7 APERTURE AND PRESSURE PLATE REMOVAL

(Cartridge Projectors Only)

Installation and removal of pressure plate (A) must be done with control knob in Forward position. Push pressure plate back compressing springs (B) until plate is clear of aperture plate pin (C). Pressure plate can now be pulled out free of retract fingers (D). If springs (B) are damaged or distorted, replace pressure plate. Replace rather than try to reform the pressure plate if it is bent or scratched. Do not attempt to adjust retract fingers (D).

Pressure plate should be free to slide on frame guides (E).



G-7.1

SHUTTLE MECHANISMS	H
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H-1 TROUBLE SHOOTING

H-2 SHUTTLE MECHANISM DISASSEMBLY

H-3 SHUTTLE IDENTIFICATION CHART

H-4 SHUTTLE ASSEMBLY REPLACEMENT (FOR ALL EXCEPT PROJECTORS
WITH SLOW MOTION, STEP MOTION^{T.M.} AND BRIGHT STILL FEATURES)

H-5 SHUTTLE ADJUSTMENT PLIERS

H-6 PICTURE JUMP CAUSED BY LOOSE CAM SHAFT

H-7 PICTURE FRAMING CREEPS WITH PROJECTOR RUNNING
(ON SOME EARLY MODEL PROJECTORS)

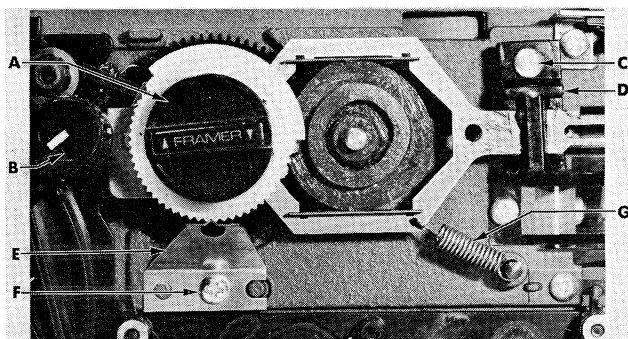
H

H-1 TROUBLE SHOOTING

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	PROJECTOR THREADS BUT SHUTTLE DOES NOT PICK UP FILM.	NOT ENOUGH SHUTTLE ENGAGEMENT.	BEND SHUTTLE CAM FOLLOWER TO GET ABOUT 1/32 MAXIMUM ENGAGEMENT THROUGH APERTURE PLATE.	H-2
ALL WITH SLOW MOTION			MOVE APERTURE PLATE BACK TO INCREASE SHUTTLE ENGAGEMENT.	G-4
ALL		IMPROPER HORIZONTAL ALIGNMENT OF SHUTTLE AND FILM.	BEND END OF SHUTTLE TO ENGAGE FILM PERFORATIONS.	H-5
			BEND FILM SPRING GUIDE TO ALIGN FILM AND SHUTTLE.	E-5
CARTRIDGE PROJECTORS		PRESSURE PLATE NOT OPENING WHEN FILM REACHES GATE.	BE SURE PRESSURE PLATE IS NOT BINDING ON CASTING OR HANGING UP ON MOVEMENT HOUSING SPRING GUIDE. IF NECESSARY, BEND THREADER LIFT SPRING CLEVIS DOWN SLIGHTLY AND OPERATE THREADER LEVER.	F-5
ALL	SHUTTLE RUNS IN STILL POSITION.	TRANSMISSION OUT OF ADJUSTMENT.	WHEN MOTOR FLAT BELT IS ADJUSTED IN FORWARD, STALLING OUT THE SHUTTER PULLEY SHOULD STALL OUT THE MOTOR.	M

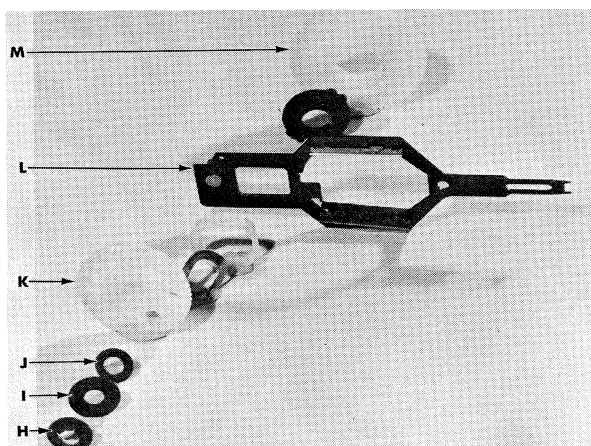
H-2 SHUTTLE MECHANISM DISASSEMBLY

Remove framer knob (A) by pressing in on sides to disengage three locking tabs on periphery of knob and pull straight off. If the projector is equipped with Slow Motion, Bright Still or Step Motion^{T.M.} remove knob (B). Remove screw (C), shuttle guide (D), screw (E), detent spring (F) and shuttle spring (G) (location depends on projector model). The shuttle is now ready for removal.



H-2.1

With a hammer and screwdriver, remove pushnut (H), lift off fiber washer (I) and bowed spring washer (J). Framer eccentric (K) is pressed on shaft and can be removed with a steady pull out while twisting or rotating. As the framer eccentric moves off the shaft, slide shuttle (L) along with it as an assembly. With the shuttle, framer and cam removed, the Slow Motion, Step Motion or Bright Still gear (M) can be removed on models so equipped.



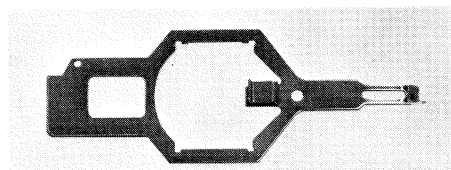
H-2.2

The framer knob changes elevation or angle of shuttle (L) as it passes through the aperture plate. When rotating framer knob a full turn, it may cause a clicking noise. This usually means that the shuttle is hitting either the top or bottom slot in the aperture plate. This is not objectionable if the knob can be rotated until the noise disappears, still frame the picture and there is no picture jump in either Forward or Reverse projection with both Super and Standard 8mm film.

H-3 SHUTTLE IDENTIFICATION CHART

Shuttle A

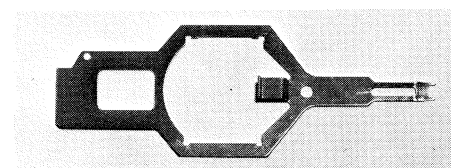
Forward Only/Forward Reverse
Interchangeable with Shuttle B



H-3.1

Shuttle B

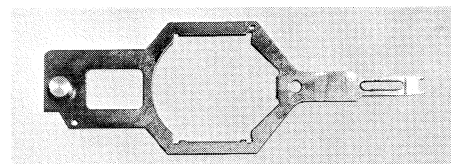
Forward Only/Forward Reverse
Interchangeable with Shuttle A



H-3.2

Shuttle C

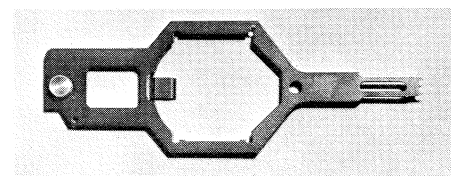
Forward Reverse/Slow Motion
Not Interchangeable



H-3.3

Shuttle D

Forward Reverse/Slow Motion/Step Motion
Interchangeable with Shuttles A, B and C



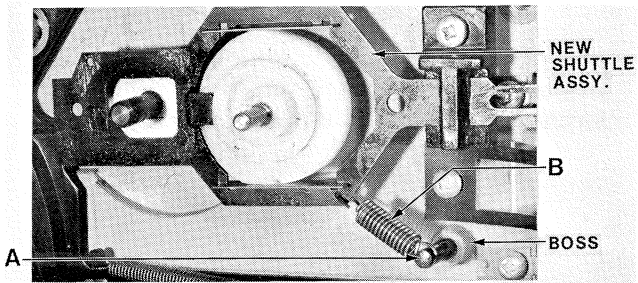
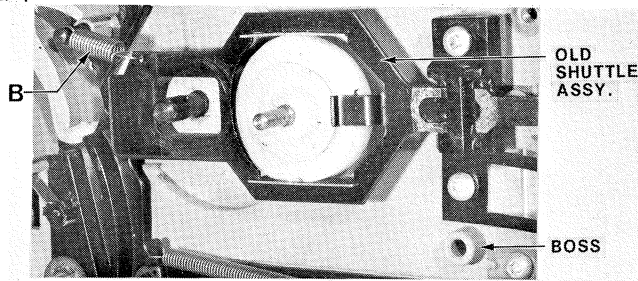
H-3.4

H-4 SHUTTLE ASSEMBLY REPLACEMENT

(For All Except Projectors with Slow Motion, Step Motion^{T.M.} and Bright Still Features)

Replace old shuttle assembly, P/N 468-101, with new shuttle assembly, P/N 803-509, which includes new shuttle, P/N 803-100. Press groove pin (A), P/N 591-023, into boss on projector frame. Relocate spring (B), P/N 411-603, from original position to new position between shuttle and groove pin (A). With spring in new location, all other adjustment

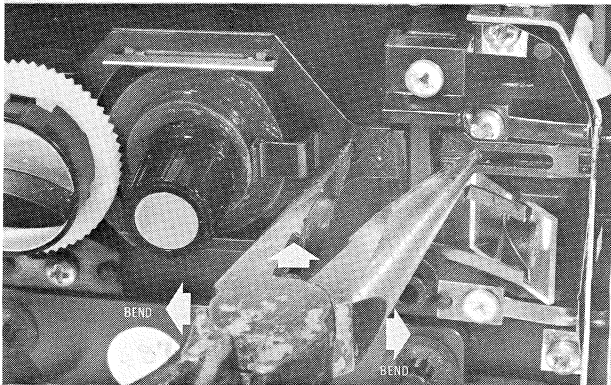
procedures are the same. Until further notice, shuttle assemblies which contain shuttle, P/N 468-105, will be used to service old Slow Motion model projectors.



H-4.1

H-5 SHUTTLE ADJUSTMENT PLIERS

Special shuttle adjustment pliers, P/N 468-101-T2, are available for faster, more accurate positioning of the shuttle. Insert pliers in shuttle and slightly bend in or out as required for proper shuttle adjustment.



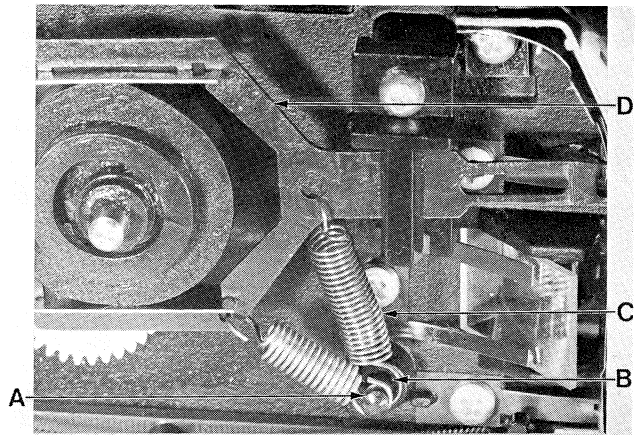
H-5.1

H-6 PICTURE JUMP CAUSED BY LOOSE CAM SHAFT

Some projectors may have picture jump caused by a loose cam shaft. The purpose of this adjustment is to eliminate projector disassembly and cam shaft replacement.

1. Projectors without Slow Motion: Press pin (A), P/N 591-023, into boss in projector frame at (B), same location as on Slow Motion models. Add spring (C), P/N 490-612, between shuttle (D) and pin (A). Adjustment for picture jump remains the same.

2. Projectors with Slow Motion: Add spring (C), P/N 490-612, between shuttle (D) and pin (A) on projector frame where shuttle spring is anchored. Adjustment for picture jump remains the same.

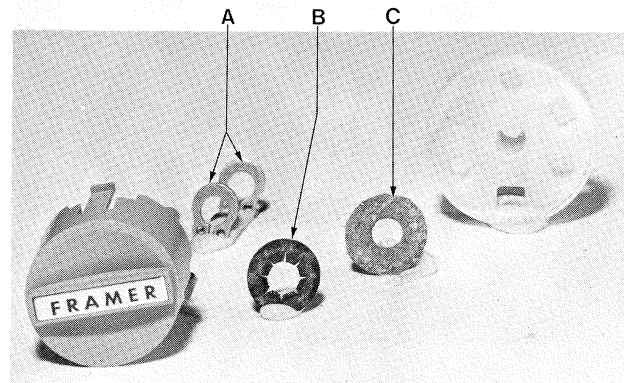


H-6.1

H-7 PICTURE FRAMING CREEPS WITH PROJECTOR RUNNING

(On Some Early Model Projectors)

If the eccentric framer cam is excessively loose, the framing of the picture on the screen may creep as the projector is running. Sometimes the framing knob can be seen moving or oscillating. To repair this situation, it is necessary to tighten the eccentric framer on the shaft by removing two grip rings (A) and replacing with a pushnut (B). Remove movement housing, framer knob and two grip rings (A). Replace cork ring (C), P/N 520-072, if worn, loose or slippery. Firmly push on pushnut (B), P/N 590-077, and replace knob. More pressure will be needed to rotate framer knob.



H-7.1

CAM AND SHUTTER TIMING	I
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I-1 CAM AND CAM SHAFT REPAIR

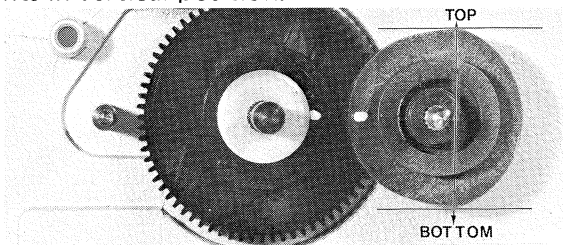
I-2 CHANGING THE CAM ONLY

I-3 CHANGING SHUTTER PULLEY ONLY (FORWARD ONLY PROJECTORS)

I-1 CAM AND CAM SHAFT REPAIR

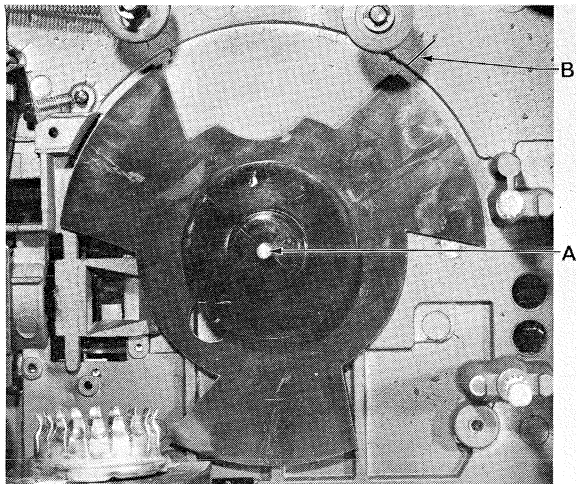
Noisy shuttle, excessive picture jump and ghosting are all symptoms of a worn cam or cam bushing. The cam bushing is pressed into the projector frame and bored at the factory and should not be serviced in the field. The fit between bushing and cam shaft is very critical and there should be no noticeable movement between the bushing and shaft when it is installed. If the projector requires extensive repairs and is for the most part disassembled, it is recommended that a new cam shaft assembly be installed as follows:

1. From front of projector, turn the cam until the shuttle is all the way forward and then remove shuttle.
2. From rear of projector, remove all parts in front of shutter including the lamp bracket. Do not remove the flag.
3. From front of projector, line up two cam high points in vertical position.



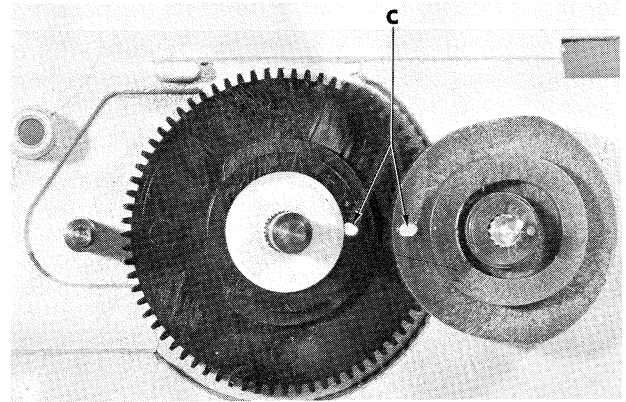
I-1.1

4. From rear of projector, use sharp scribe or other suitable tool and scratch a mark on the projector frame at (B).
5. With a 1/8 inch drift and hammer, drive cam shaft out from shutter pulley at (A).



I-1.2

6. Install new cam shaft assembly through bushing. Try several if necessary to obtain a snug fit.
7. Line up new cam with high points in same vertical position (shuttle will be all the way forward). If projector has Slow Motion feature, line up timing marks at (C).



I-1.3

8. Slip new adjustable shutter pulley, P/N 468-015, onto shaft until about .005 end play. After checking shutter timing mark and position of cam, tighten both set screws located on pulley groove. If adjustable shutter pulley is not available or repairs are being made to a cartridge projector, reuse original pulley and reassemble using the following steps.
9. Select best fitting cam shaft assembly and slip assembly into bushing in projector frame.
10. Line up cam timing marks and lay projector in horizontal position with rear of projector up. Place support under cam shaft.
11. Line up shutter with timing mark scratched on projector frame and tap pulley onto cam shaft about halfway.
12. Drive pulley all the way on the shaft with a socket or other tool that has a hole in it allowing the cam shaft to extend beyond the pulley. Drive pulley on until approximately .005 end play between pulley and cam. If cam shaft and pulley seem too tight, tap end of cam shaft to obtain approximately .005 end play. Reassemble projector.

I-2 CHANGING THE CAM ONLY

New cams may be installed if the projector is not to be extensively disassembled, if special pulley, P/N 468-015, is not available, if only a few cam shafts are on hand, or if visual inspection reveals that the cam is worn or chipped. Change the cam only by first removing a new cam from a new cam shaft assembly and proceeding as follows:

1. Turn cam so shuttle is all the way forward and remove shuttle. Two high points on cam should be vertical.
2. From rear of projector, scratch a timing mark on projector frame as in "Cam and Cam Shaft Repair." This mark can be made at any accessible point.
3. From front of projector, pry off worn cam. This can be accomplished with any small bearing pulley, cam puller or two flat blade screwdrivers supported near the cam.

4. Turn projector over making sure shutter is correctly lined up with timing mark on projector frame. Support end of cam shaft (not pulley). Place projector front side up and resting on shaft support.
5. If projector has Slow Motion feature — line up timing marks see Fig. I-1.3 (large frame projectors see section C-10). If projector does not have Slow Motion feature — line up cam high points.
6. With a small tool or socket (approximately 3/16 inch diameter hole) and hammer, tap on new cam. Outside diameter of the tool should not be more than 5/16 inch diameter to insure that neither surface becomes damaged.
7. Tap cam on shaft until about .005 end play between cam and shutter pulley.
8. Reassemble and test projector. Ghosting indicates that the timing mark or cam moved during reassembly and the complete operation will have to be repeated. **DO NOT** use the same cam again. Use new cam and check timing marks carefully.

I-3 CHANGING SHUTTER PULLEY ONLY

(Forward Only Projectors)

Forward Only projectors are manufactured with a plastic shutter pulley which may become cracked or loose on the cam shaft. For repairs, it is usually quickest to replace the pulley as follows:

1. Rotate cam until shuttle is all the way forward. Remove shuttle. Position cam as previously shown in Fig. I-1.1.
2. Remove lamp and motor.
3. Scribe the projector frame for timing as previously described in cam and cam shaft repair.
4. Support front face of projector and drive cam shaft out of pulley with suitable 1/8 inch drift.
5. Reposition front support under cam shaft and drive on new plastic pulley. Leave approximately .005 end play.

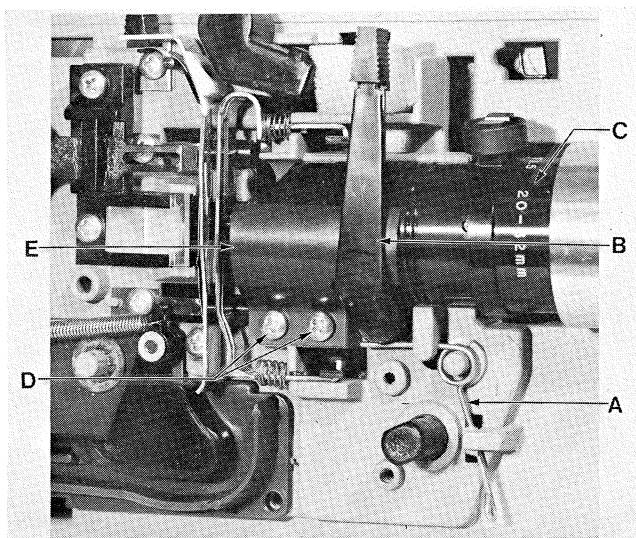
FOCUS SYSTEMS	J
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- J-1 FOCUS SYSTEM DISASSEMBLY AND ADJUSTMENT
(PROJECTORS WITH LEVER FOCUS)
- J-2 FOCUS SYSTEM DISASSEMBLY AND ADJUSTMENT
(PROJECTORS WITH KNOB FOCUS)
- J-3 ZOOM LENS SHROUD (CARTRIDGE PROJECTORS ONLY)
- J-4 FOCUS AND ZOOM MECHANISM (CARTRIDGE PROJECTORS ONLY)

J-1 FOCUS SYSTEM DISASSEMBLY AND ADJUSTMENT

(Projectors with Lever Focus)

Remove focus lever knob, control switch knob and screw which retains lens housing to projector frame. Lift off lens housing. Unhook focus lever spring (A) from notched hook on projector frame. Remove focus lever (B) and pull out lens (C). Lens barrel must be lightly greased and screws (D) tight. If lens wobbles, remove lens and bend lens holder (E) in slightly to tighten. When reassembling projectors with standard lens, place focus lever (B) in vertical position, insert lens (C) and hook spring (A). Center lens barrel threads under focus lever (B) in vertical position and rotate lens barrel until margins of lighted area are sharply defined on projection screen. Reassemble lens housing and knobs. When reassembling projectors with zoom lens, slide lens into place with flat side of lens collar against projector frame. Push lens all the way to the rear. Reassemble focus lever (B) tilted all the way to the rear resting against movement housing. Hook spring (A), move lever to vertical position and check lens for smooth operation. If the system does not focus closer than six feet, unhook spring and pull lens forward one groove. Hook spring and reassemble projector.



J-1.1

J-2 FOCUS SYSTEM DISASSEMBLY AND ADJUSTMENT

(Projectors with Knob Focus)

It is not necessary to remove the lens housing to remove the lens on projectors with knob focus. Gently pull out on focus knob and at the same time pull the lens toward the front of the projector. When replacing, pull out on knob and slide lens back into place. If the lens wobbles, it will be necessary to remove lens and lens housing, tighten screws that hold lens holder and bend lens holder in slightly. Lens housing is removed by removing control knob, screw under knob and lifting off the housing. When reassembling, no adjustment is necessary.

J-3 ZOOM LENS SHROUD

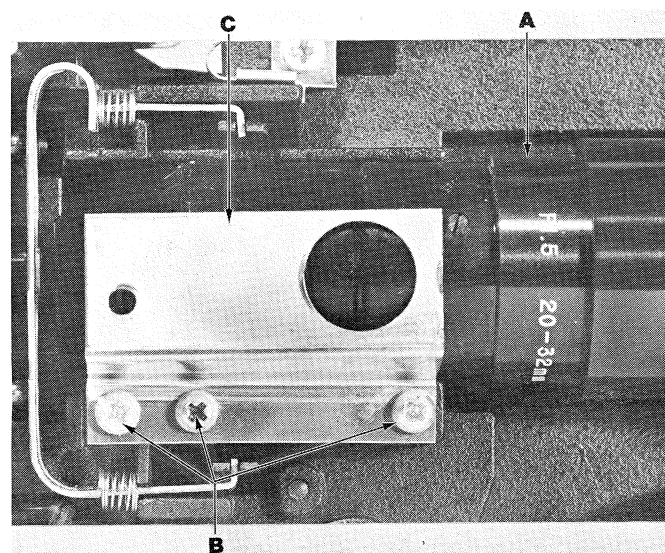
(Cartridge Projectors Only)

Two piece shroud is serviced as an assembly only. If it is damaged, scratched, separated, or if the zoom lever fails to operate, the entire assembly must be replaced. The shroud is held to projector frame by three self-tapping screws. With the lens and lens housing removed, the ends of the three screws are visible which can be removed from the rear of the projector. On some early models, the shroud was held in place with two screws. One of these two screws also held the threader lift spring in place.

J-4 FOCUS AND ZOOM MECHANISM

(Cartridge Projectors Only)

Lens barrel (A) must be lightly greased and screws (B) must be tight. If lens wobbles, remove lens and bend lens holder (C) in slightly to tighten. If lens fails to zoom, check to be sure yoke is engaged in lens groove. With lens and lens housing removed, the zoom yoke can be inspected. If nubs are broken off of yoke, the shroud must be replaced. If projector fails to stay in focus, it is because zoom portion of lens is drifting back and must be replaced (see section K-9 for additional information).



J-4.1

OPTICS AND LAMP REPLACEMENT	K
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- K-1 TROUBLE SHOOTING
- K-2 MIRROR CLEANING AND REPLACEMENT
- K-3 LAMP BRACKET REMOVAL AND REPAIR (FORWARD ONLY PROJECTORS)
- K-4 CONTROL LEVER REMOVAL (FORWARD ONLY PROJECTORS)
- K-5 LAMP BRACKET REPAIR (FORWARD, REVERSE, STILL PROJECTORS)
- K-6 LAMP BRACKET REMOVAL (FORWARD, REVERSE, STILL PROJECTORS)
- K-7 LAMP BRACKET DISASSEMBLY (FORWARD, REVERSE, STILL PROJECTORS)
- K-8 CONTROL LEVER AND FLAG ASSEMBLIES (FORWARD, REVERSE, STILL PROJECTORS)
- K-9 PROJECTION LENS SERVICE (CARTRIDGE PROJECTORS)
- K-10 REPAIRS WITHOUT REMOVING LAMP BRACKET FROM PROJECTOR
(CARTRIDGE PROJECTORS ONLY)
- K-11 LAMP BRACKET REMOVAL (CARTRIDGE PROJECTORS ONLY)
- K-12 LAMP BRACKET INSTALLATION (CARTRIDGE PROJECTORS ONLY)
- K-13 PROJECTION LAMP CHANGES
- K-14 PROJECTION LAMP REPLACEMENT CHART
- K-15 LAMP REMOVAL TOOL
- K-16 ZOOM LENS DAMPENING
- K-17 ZOOM LENS ASSEMBLY PROCEDURE

K

K-1 TROUBLE SHOOTING

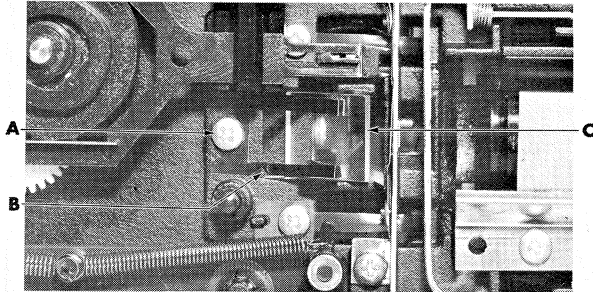
MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	PROJECTION LAMP WON'T LIGHT.	BURNED OUT LAMP.	REPLACE.	K-14
		NO POWER.	CHECK WIRING.	P
		SWITCH PAWL NOT PUSHING SLIDE SWITCH FAR ENOUGH.	ADJUST SWITCH.	K
		FAULTY SWITCH.	REPLACE.	
	MOTOR WON'T WORK.	DISCONNECTED WIRE.	CHECK WIRING.	P
		DEFECTIVE MOTOR.	REPLACE.	M
		SWITCH PAWL NOT PUSHING SLIDE SWITCH FAR ENOUGH.	ADJUST SWITCH.	K
	CONTROL SWITCH MOVES HARD.	LEVERS NOT FOLLOWING CORRECT SWITCH CAMS.	REMOVE LAMP BRACKET AND CHECK FOR BENT OR BROKEN LEVERS.	
		SWITCH CAM SCREW TOO TIGHT.	LOOSEN SCREW.	
		SWITCH SHAFT MISALIGNED.	LOOSEN LAMP BRACKET MOUNTING SCREWS AND REALIGN LAMP BRACKET. CHECK DRIVE IN FORWARD AND REVERSE.	
	CONTROL KNOB CATCHES OR IS FROZEN	SWITCH PAWL CATCHES IN SWITCH.	BEND SWITCH TANGS DOWN TO INCREASE CLEARANCE.	
	MOTOR STALLS.	TRANSMISSION OUT OF ADJUSTMENT.	READJUST.	M
	FILM BURNS IN STILL POSITION.	FLAG STICKS NOT COVERING LIGHT OPENING.	ADJUST FLAG.	K
		WEAK SPRING ON FLAG.	REPLACE.	
		LENS HOUSING MOUNTING SCREW HITS FLAG.	ADD WASHER OR CHANGE SCREW.	D
	SLOW FAST FORWARD.	FORWARD TAKE-UP MECHANISM IMPROPERLY ADJUSTED.	READJUST.	C-5
CARTRIDGE PROJECTORS ONLY		FAST FORWARD PULLEY HITS TOP OF SLOT.	BEND LINK UP SLIGHTLY.	

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	FORWARD TAKE-UP DRIVE NOT DISENGAGING DURING AUTO REWINDING CAUSING DRAG.	CONTROL LEVER NOT MOVING FORWARD ENOUGH TO DISENGAGE DRIVE PULLEY FROM SPINDLE WHEEL.	CHECK FOR BENT OR BINDING CONTROL LEVER. GREASE WHERE SURFACES RUB IF NECESSARY.	C-2
		REWIND WIRE NOT DISENGAGING TAKE-UP SPINDLE.	BEND TAKE-UP WIRE AT "Z" SHAPE.	C-7
CARTRIDGE PROJECTORS ONLY	FORWARD TAKE-UP SPINDLE RUNS WITH CONTROL KNOB IN REVERSE.	LAMP BRACKET OUT OF ADJUSTMENT.	BEND LINK UP SLIGHTLY.	K-10
	CONTROL KNOB DIFFICULT TO TURN FROM FORWARD TO REVERSE POSITIONS.	REVERSE TRIPPER LEVER OUT OF ADJUSTMENT.	READJUST.	K
ALL	AUTO REWIND WON'T TRIP.	AUTO REWIND OUT OF ADJUSTMENT.	READJUST.	C-7
CARTRIDGE PROJECTORS ONLY			REPLACE TRIGGER.	K-10

K-2 MIRROR CLEANING AND REPLACEMENT

(All Projectors)

Clean or replace mirror by removing screw (A) and mirror (B). Lift mirror out of projector frame by its edges to avoid damaging surfaces with fingerprints. Clean with lens tissue and replace in mirror groove with reflective surface toward aperture opening.



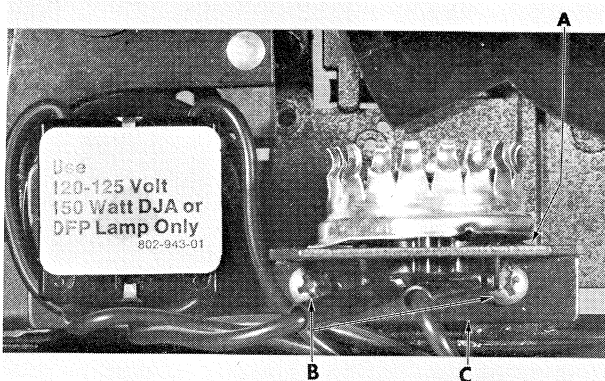
K-2.1

K-3 LAMP BRACKET REMOVAL AND REPAIR

(Forward Only Projectors)

The control lever can be removed from projector without removing lamp bracket assembly. For control switch or switch cam repairs, it is necessary to remove the lamp bracket assembly. Disassemble control switch and lamp bracket as follows:

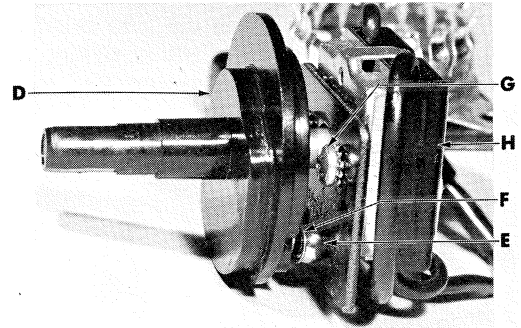
1. From front of projector, pull off control switch knob.
2. From rear of projector, remove projection lamp and disconnect two wires at the lamp socket by pulling loose.
3. Loosen or remove lamp socket screw (A) making lamp bracket mounting screws (B) accessible. Remove screws (B) and swing complete lamp bracket assembly (C) free from projector frame.



K-3.1

4. Carefully pull switch cam (D) from switch shaft because of loose ball (E) and spring (F) under cam. Ball, spring and cam can be replaced without further disassembly. Lightly grease switch cam (D) and switch bracket where parts rub together before re-assembling.

5. If switch is to be replaced, remove two screws (G) which attach switch (H) to switch bracket. Disconnect three wires (four on early models) from switch by depressing internal springs in switch where wires attach. When reassembling, be sure that wires are attached to proper positions since all wires may be the same color. It is not necessary to disassemble the lamp bracket if the complete assembly is to be changed. Disconnect wires, replace with new assembly and reconnect.

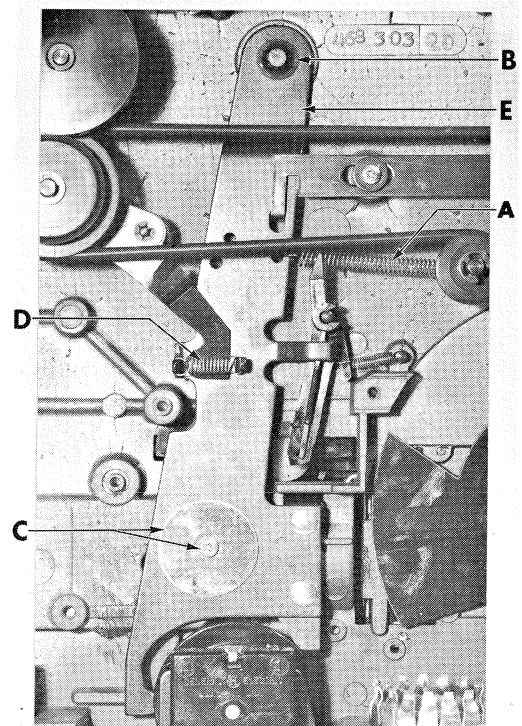


K-3.2

K-4 CONTROL LEVER REMOVAL

(Forward Only Projectors)

Normally it is not necessary to remove control lever (E) unless it becomes bent or broken. Replace by unhooking spring (A) from under idler pulley, remove pushnut (B), screw and washer (C). Disengage pressure plate on front side of projector. Unhook spring (D) from rewind lever and swing lever out of the way. Remove control lever assembly (E) from projector frame.



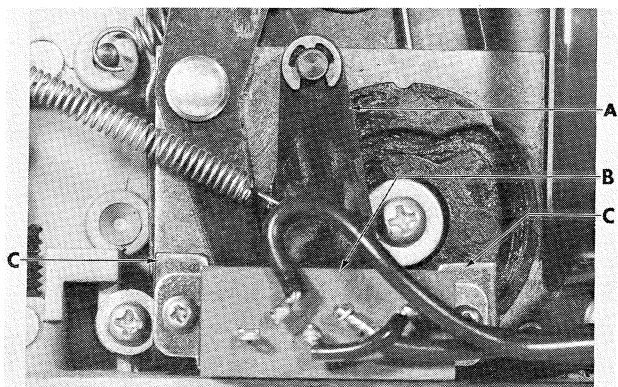
K-4.1

K-5 LAMP BRACKET REPAIR

(Forward, Reverse, Still Projectors)

Major repairs to the lamp bracket assembly require extensive disassembly of the projector. If possible, determine the cause of the trouble before removing lamp bracket assembly, because many repairs can be made without removing it.

1. **Control knob catches and stops or is frozen:** Switch pawl (A) catches in switch (B). Bend tab on switch bracket at (C) down slightly to increase clearance. If flag does not come up into position when control knob is turned to Still position, projector will need to be completely disassembled to repair or replace the flag.



K-5.1

2. **Auto Rewind will not trip:** See Section C-7 for Auto Rewind adjustments.

3. **Motor stalls:** See Section M for drive motor adjustment.

4. **Electrical problems with lamp socket or control switch:** Control switch and lamp socket can be removed from the projector without disassembling the lamp bracket assembly. See Section P for proper wiring diagram.

K-6 LAMP BRACKET REMOVAL

(Forward, Reverse, Still Projectors)

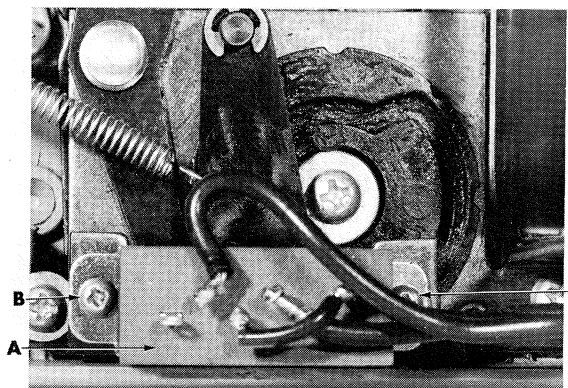
Many lamp bracket parts can be replaced without removal of the assembly from the projector (idler pulley, lamp socket, control switch). If the lamp bracket is bent or broken, or if the switch cams are damaged, the complete assembly will need to be replaced. Replacing the lamp bracket assembly requires major disassembly of the projector.

1. Remove Forward and Reverse take-up mechanisms (see Sections C-3 and C-4).

2. Remove motor assembly and drive belts. Swing motor out of the way (see Section M).

3. Remove Auto Rewind mechanism if projector is so equipped (see Section C-7).

4. If control switch (A) is in good condition, remove screws (B) and move switch out of the way without disconnecting wires. Pull two wire leads from lamp socket to disconnect.



K-6.1

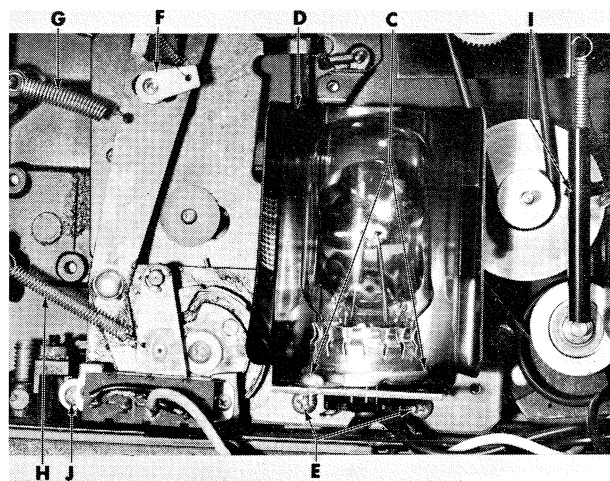
5. Loosen or remove two heat shield screws (C) on some models. Models without heat shield (D), loosen rear lamp socket mounting screw (C). Lamp bracket mounting screws are now accessible.

6. Remove spring, screw, arm and washer (F). Unhook springs (G) and (H) from projector frame.

7. Be sure control switch knob is removed from front side of projector.

8. Unhook transmission spring (I) and remove drive belts from idler pulley.

9. Remove lamp bracket mounting screws (E) and (J). Carefully remove lamp bracket assembly from projector frame being sure control links are disconnected from switch cams.

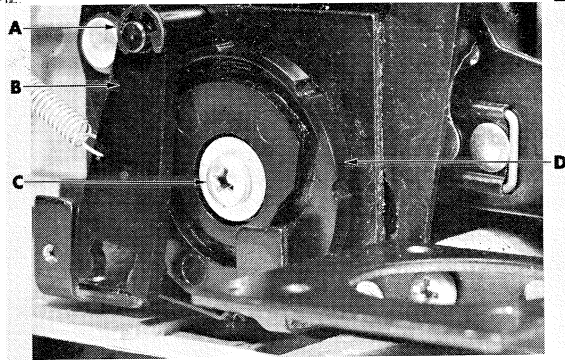


K-6.2

K-7 LAMP BRACKET DISASSEMBLY

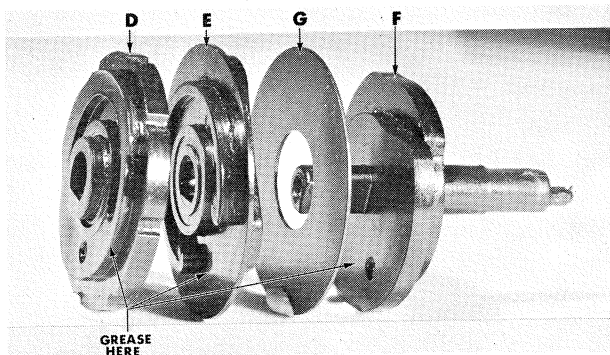
(Forward, Reverse, Still Projectors)

1. With lamp bracket assembly removed from projector frame, remove E-ring (A) and pawl (B) with spring attached.
2. Remove screw (C) with washers from switch cam (D). With screwdriver between switch cam (D) and lamp bracket, pry cam loose from bracket.



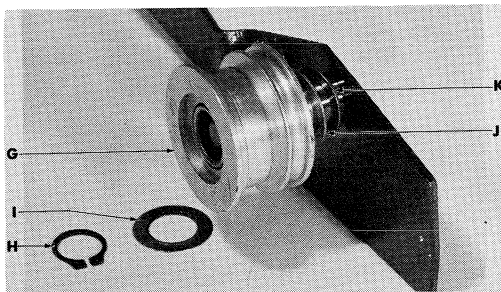
K-7.1

3. Switch cams are pressed together. With switch cam (D) removed, reversing cam (E), main cam (F) and cam washer (G) are pressed together as an assembly. These parts can be pried apart for service of individual parts. When reassembling cam parts, wipe off old grease and dirt, lightly grease cam surfaces. Be sure that parts are assembled in proper location and direction.



K-7.2

4. Service idler pulley (G) by removing snap ring (H) and washer (I). Idler pulley (G) with oil-lite bushing will slide off shaft and washers (J) and (K) are behind the pulley. When reassembling, wipe off excess oil from pulley and bushing.



K-7.3

K-8 CONTROL LEVER AND FLAG ASSEMBLIES

(Forward, Reverse, Still Projectors)

With lamp bracket assembly removed from projector frame, both control lever and flag are accessible for service. Normally, it is not necessary to remove the control lever unless it becomes bent or broken. With most parts removed from the projector frame, removal of the control lever is obvious. When reassembling, a light coat of grease should be applied to projector frame where lever is in contact. With lamp bracket assembly removed, the flag mechanism is accessible for service (see Section C-8). Projectors with Bright Still feature do not contain movable flag.

K-9 PROJECTION LENS SERVICE

(Cartridge Projectors)

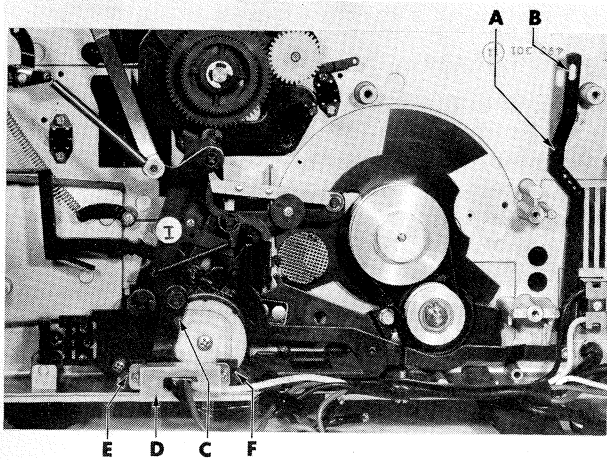
Cartridge projectors are equipped with a zoom lens. To remove the zoom lens, grasp end of lens with thumb and forefinger of right hand; with left hand, pull out on focus knob slightly to disengage lens and then pull lens straight out front of projector. It is not necessary to remove lens housing or lens shroud. Clean lens with soft brush or carefully wipe with lens cleaning tissue. Replace by pulling out focus knob and pushing lens slowly all the way back until a slight click is heard as the focus knob drops into lens focus groove. It may be necessary to slide lens back and forth until a second louder click is heard, which is the lens yoke dropping into place in lens groove. Move focus knob and zoom lever to be sure both items operate properly and are engaged (see section J-4 for additional information).

K-10 REPAIRS WITHOUT REMOVING LAMP BRACKET FROM PROJECTOR

(Cartridge Projectors Only)

Major repairs to the lamp bracket assembly will require extensive disassembly of the projector. Determine the exact cause of the trouble before removing lamp bracket; some repairs can be made without removing it.

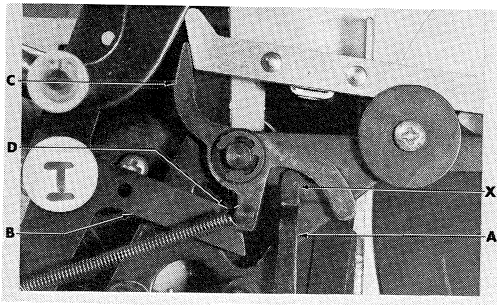
1. **Forward take-up spindle runs with control knob in Reverse:** Bend link (A) up slightly to increase clearance between drive pulley and spindle pulley.
2. **Slow Fast Forward:** After all other checks for slow Fast Forward have been made, link (A) can be bent up if Fast Forward pulley shaft hits top of slot (B).
3. **Control knob catches and stops or is frozen:** Usually occurs when switch pawl (C) catches in switch (D). Bend switch tangs (E) and (F) on lamp bracket down slightly to increase clearance.



K-10.1

4. **Control knob is difficult to turn from Forward to Reverse position:** May be caused by improper adjustment of Reverse tripper lever (A). As control knob is turned counterclockwise, arm (B) moves to the right slightly. At this point, lever (A) should move to the right and unlatch trigger (C) at (D). If trigger (C) is not unlatched as arm (B) moves to the left, control knob becomes difficult to turn. Lever (A) can be pulled out slightly, away from projector frame, and moved to the right beyond trigger (C) for easier bending with the projection lamp removed. Bend lever (A) at (X) to the right to speed up unlatching action. Rotate control knob from Forward to Rewind and see if trigger (C) unlatches easier.

CAUTION: If lever (A) is bent too far to the right, the trigger will delay when knob is turned clockwise or from Rewind to Forward. This condition will result in a projector that won't latch and the rubber drive wheel will come up against the supply reel when in Forward position.



K-10.2

5. **Auto Rewind system will not trip:** See Section C-7 for Auto Rewind adjustments. Replace trigger if necessary.

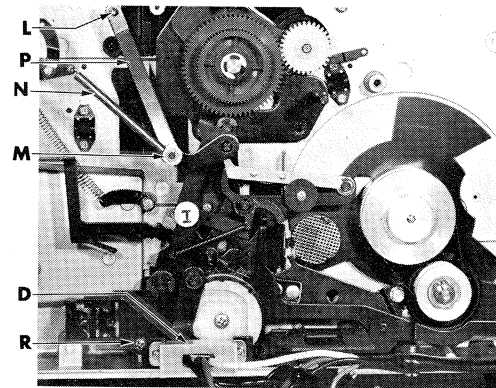
6. **Motor stalls due to transmission adjustment:** Refer to Section M, Drive Motor Adjustments.

K-11 LAMP BRACKET REMOVAL

(Cartridge Projectors Only)

If arm (K) does not pivot freely or trigger surface of arm is defective, the lamp bracket must be replaced. Remove lamp bracket as follows:

1. Remove projection lamp, motor and motor belts. Refer to Section M for motor removal.
2. Remove transmission (see Sec. M) and Forward take-up cluster (see Sec. C-1).
3. Remove puck pivot plate (see Sec. C-6) and reel brake. Remove control knob from front of projector.
4. Remove grip rings (L) and (M) and spring (N).
5. Remove link (P) and switch (D).
6. Cut wire ties to lamp bracket and disconnect leads to lamp socket.
7. Remove two lamp bracket screws (R).
8. Remove E-ring (S) and pull clevis pin (T). Push up on arm (U) to disengage cam and work lamp bracket straight back out of projector (see Fig. K-12.1).



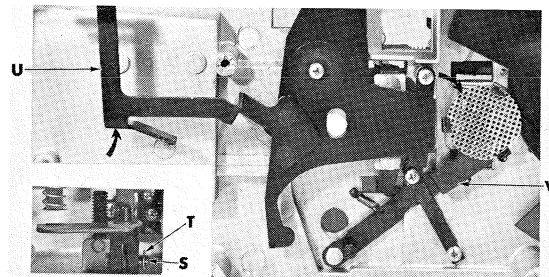
K-11.1

K-12 LAMP BRACKET INSTALLATION

(Cartridge Projectors Only)

Lamp bracket installation is in reverse of lamp bracket removal with the following exceptions:

1. Position lamp bracket control knob shaft into hole in projector frame and push assembly forward slightly.
2. Hold arm (U) up, flag (V) down (necessary to clear cams) and work lamp bracket all the way in until it rests against the two frame bosses.
3. Disassembly or replacement of the lamp bracket will require readjustment of the projector. Refer to appropriate sections for adjustments.



K-12.1

K-13 PROJECTION LAMP CHANGES

(1788Z Projectors, Code Week 423)

Starting Code Week 423, 1788Z Projectors were manufactured with ELT projection lamps in place of ENA lamps. These lamps are not interchangeable. Specification plates will identify proper usage. The ELT lamp system requires lamp bracket assembly, P/N 812-101, lamp socket, P/N 490-809, and ELT projection lamp.

(2688Z and 2788Z Projectors)

Original pilot run of 2688Z and 2788Z Projectors were manufactured with ELT projection lamps. Due to film burning in Bright Still, these projectors are now manufactured with ELE projection lamps. ELE lamp is equipped with a dichroic mirror and lowers film plane temperature, improves light lumens and is interchangeable with ELT lamps. Any 2688Z or 2788Z Projector returned for service with ELT projection lamp must have ELE lamp and proper specification plate installed.

K-14 PROJECTION LAMP REPLACEMENT CHART**Forward Only Projectors**

Model	Original Equipment		Substitutes		Lamp Voltage
	*Code	**Type	Tungsten	Quartz	
ANSCOVISION® 80	DJA	T	DFP	None	115V/150W
ANSCOVISION 88	DJA	T	DFP	None	115V/150W
ANSCOVISION 188	DJA	T	DFP	None	115V/150W
ANSCOVISION 188Z	DJA	T	DFP	None	115V/150W
(Aug. '73)	DMD	T	DGB	None	30V/80W
ANSCOVISION 333	DJA	T	DFP	None	115V/150W
ANSCOVISION 388	DJA	T	DFP	None	115V/150W
ANSCOVISION 1388D	DJA	T	DFP	None	115V/150W
CRESTLINE® S800	DJA	T	DFP	None	115V/150W
GAF® 1333	DJA	T	DFP	None	115V/150W
(Dec. '72)	DMD	T	DGB	None	30V/80W
GAF 1372	DJA	T	DFP	None	115V/150W
GAF 1388	DJA	T	DFP	None	115V/150W
(Aug. '73)	DMD	T	DGB	None	30V/80W
GAF 1388Z	DJA	T	DFP	None	115V/150W
(Aug. '73)	DMD	T	DGB	None	30V/80W
GAF 2388	DMD	T	DGB	None	30V/80W
GAF 2388Z	DMD	T	DGB	None	30V/80W
MEMORY MASTER ^{T.M.}	DJA	T	DFP	None	115V/150W
MEMORY MASTER II	DMD	T	DGB	None	30V/80W
SEARS 9228	DJA	T	DFP	None	115V/150W
VICEROY S/800	DJA	T	DFP	None	115V/150W
VICEROY® 811	DJA	T	DFP	None	115V/150W
WARDS 852	DJA	T	DFP	None	115V/150W
WARDS 853	DJA	T	DFP	None	115V/150W
WARDS 808	DJA	T	DFP	None	115V/150W

Forward, Reverse Projectors

Model	Original Equipment		Substitutes		Lamp Voltage
	*Code	**Type	Tungsten	Quartz	
ANSCOVISION® 488	DJA	T	DFP	None	115V/150W
ANSCOVISION 555	DJA	T	DFP	None	115V/150W
ANSCOVISION 588	DJA	T	DFP	None	115V/150W
ANSCOVISION 666	DJA	T	DFP	None	115V/150W
ANSCOVISION 688	DJA	T	DFP	None	115V/150W
ANSCOVISION 788	ENA	Q	None	None	30V/80W
CRESTLINE® 148	DJA	T	DFP	None	115V/150W
CRESTLINE 168	DJA	T	DFP	None	115V/150W
EMDEKO 7000	DJA	T	DFP	None	115V/150W
EMDEKO 9000	DJA	T	DGB	None	115V/150W
	DMD	T	DGB	None	30V/80W
GAF® 1488	DMD	T	DGB	None	30V/80W
GAF 1555DZ	DMD	T	DGB	None	30V/80W
GAF 1564Z	DMD	T	DGB	None	30V/80W
GAF 1588Z	DMD	T	DGB	None	30V/80W
GAF 1688Z	DMD	T	DGB	None	30V/80W
GAF 1788Z	+ENA	Q	None	None	30V/80W
	ELT	Q	None	None	30V/80W
GAF 2488	DMD	T	DGB	None	30V/80W
GAF 2588Z	DMD	T	DGB	None	30V/80W
GAF 2688Z	ELE	Q	None	None	30V/80W
GAF 2688Z Belgium	Phillips	Q	None	—	12V/75W
GAF 2788Z	ELE	Q	None	None	30V/80W
GAF 2788Z Belgium	Phillips	Q	None	—	12V/75W
SEARS 9230	DJA	T	DFP	None	115V/150W
SEARS 9232	DMD	T	DGB	None	30V/80W
VICEROY® 800R	DJA	T	DFP	None	115V/150W
VICEROY 800Z	DJA	T	DFP	None	115V/150W
VICEROY 813	DJA	T	DFP	None	115V/150W
	DMD	T	DGB	None	30V/80W
WARDS 809	DMD	T	DGB	None	30V/80W
WARDS 810	DMD	T	DGB	None	30V/80W
WARDS 888	DJA	T	DFP	None	115V/150W
WARDS 899	DJA	T	DFP	None	115V/150W

Cartridge Projectors

Model	Original Equipment		Substitutes		Lamp Voltage
	*Code	**Type	Tungsten	Quartz	
GAF® 2500	ELT	Q	None	ELE	30V/80W
GAF 2600	ELT	Q	None	ELE	30V/80W
GAF 2700	ELT	Q	None	ELE	30V/80W
SEARS 9240	ELT	Q	None	ELE	30V/80W

* Lamps shown in this column have been or are currently stocked by GAF Portland.

**T – Tungsten, Q – Quartz

+ Last used Code Week 422.

The following are 115V/150W projection lamps which will fit the projector and light but give poor picture image.

DO NOT USE THESE LAMPS AS ALTERNATES:

*DCH – Designed for Standard 8mm format.

*DCL – For Standard 8mm format with dichroic reflector.

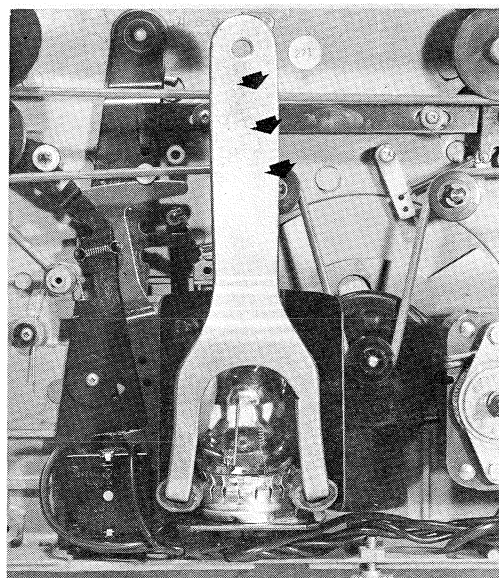
*DFC – Designed for horizontal burning (vertical filament).

DFG – 1¾ in. focal length (GAF® uses 2¼ in. focal length).

DFN – Designed for horizontal burning (vertical filament).

*Listed by Sylvania as substitutes for GAF projectors. This information is incorrect.

To obtain even projection lamp illumination for either ELT or ELE projection lamps, it is necessary to loosen screw on left hand side of lamp base (slotted side) and rotate lamp until maximum contrast is achieved. This adjustment may be necessary when relamping projector due to variations in lamp configurations.



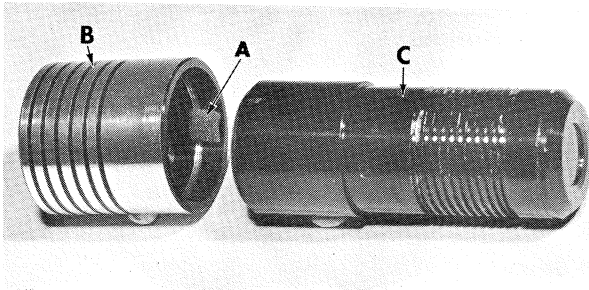
K-15.1

K-15 LAMP REMOVAL TOOL

Tungsten projection lamps can be removed from the projector with Tool P/N 575-101-T1, which will eliminate the danger of injuries caused by the lamp breaking. Insert rubber-covered pronged end of tool under glass shoulder of lamp at the base. Pull down on tool and leverage will loosen lamp.

K-16 ZOOM LENS DAMPENING

Some zoom lenses may require dampening to prevent the lens from inadvertently retracting when projector is elevated. This is accomplished by mounting a $\frac{1}{4} \times \frac{1}{4}$ inch piece of sponge tape (A), P/N 641-148, between the outer shell (B) and lens barrel (C) on loose acting zoom lenses. Light grease should be applied to the sponge before assembling lens.

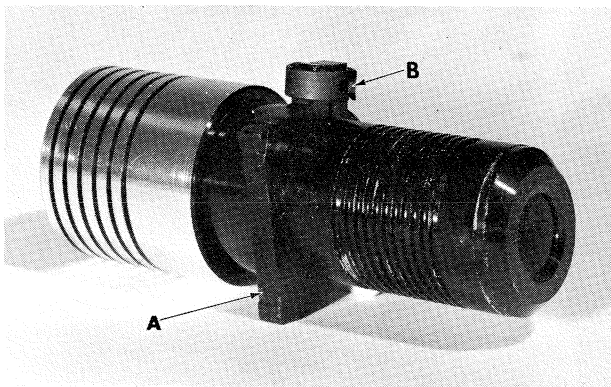


K-16.1

K-17 ZOOM LENS ASSEMBLY PROCEDURE

(For projectors with lever focus and zoom lens)

1. Assemble clamp ring (A) to zoom lens making sure zoom lens barrel is screwed tight to lens assembly.
2. Install lens, focus lever and lens housing on projector and push focus lever forward to within $\frac{1}{16}$ inch of stop.
3. Pull zoom barrel forward and project a still picture on a screen 36 inches from projector.
4. Turn zoom lens barrel until picture is in focus.
5. Remove lens housing and make sure clamp ring is still up against the shoulder of the lens and assemble lock ring (B). Replace lens housing.
6. When zoom lens barrel is moved from extreme forward to extreme rear position and back again, the focus lever must not move.



K-17.1

PROJECTED IMAGE	L
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L-1 TROUBLE SHOOTING

L

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	GHOSTING (IMAGE FLICKERS AND APPEARS TALLER)	SHUTTER OUT OF SYNC WITH CAM.	READJUST.	I
	RESOLUTION (RIGHT OR LEFT SIDE OF PICTURE OUT OF FOCUS)	APERTURE PLATE NOT PERPENDICULAR TO LENS.	RIGHT SIDE OUT OF FOCUS: BEND APERTURE PLATE FORWARD SLIGHTLY.	G
			LEFT SIDE OUT OF FOCUS: BEND APERTURE PLATE BACK SLIGHTLY.	
	FILM WOBBLE (ALL EDGES IN FOCUS, CENTER IN AND OUT OF FOCUS)	GAP BETWEEN PRESSURE AND APERTURE PLATES AT THE APERTURE	SQUEEZE PLATES TOGETHER AT APERTURE WITH FLAT BLADE PLIERS.	
	INTERMITTENT FILM WOBBLE	PRESSURE PLATE NOT CLOSING COMPLETELY EACH TIME CONTROL KNOB IS TURNED.	CHECK TOP AND BOTTOM PRESSURE PLATE SPRINGS FOR PROPER SEATING.	
			CHECK TOP AND BOTTOM OF SLIDING SURFACE ON FRAME FOR BURRS AND SMOOTHNESS.	
			ADJUST TOP AND BOTTOM PRESSURE PLATE TANGS FOR BINDING OR DRAG.	
	PICTURE NOT CENTERED.	FILM PERFORATIONS SHOWING ON RIGHT SIDE.	BEND FILM GUIDE ON LIGHT SHIELD IN TOWARD PROJECTOR.	I
		EDGE OF FILM SHOWING ON LEFT SIDE	BEND FILM GUIDE ON LIGHT SHIELD AWAY FROM PROJECTOR.	
	VERTICAL PICTURE JUMP IN FORWARD	LOOSE OR WORN CAM BUSHING.	IF PICTURE MOVES WHEN SHUTTER KNOB IS PUSHED DOWN, CAM OR BUSHING IS WORN. ADD SPRING AND PIN.	
		SUPPLY SPINDLE DRAGGING.	REEL DRAGGING ON FRAME CASTING.	C-2
		EXCESSIVE TORQUE ON FORWARD TAKE-UP SPINDLE.	ADJUST FORWARD TAKE-UP FOR .100± .025 GM. CN.	
CARTRIDGE PROJECTORS ONLY			SPRING NOT ON BRAKE SHOE MECHANISM OR BRAKE SHOE DRAGGING ON SPINDLE.	C-4
			REEL HITTING CARTRIDGE CLIPS.	

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
CARTRIDGE PROJECTORS ONLY		BUFFER SPRING MISSING.	REMOVE THREADER HOUSING AND INSTALL BUFFER SPRING.	D
		FILM DRAG IN CARTRIDGE.	REPLACE REEL IN CARTRIDGE OR REPLACE CARTRIDGE.	
ALL	VERTICAL PICTURE JUMP IN FORWARD AND REVERSE.	WEAK PRESSURE BETWEEN PRESSURE PLATE AND APERTURE PLATE.	MOVE APERTURE PLATE FORWARD TO INCREASE PRESSURE ON FILM. (IF PROJECTOR HAS AUTO REWIND, BE SURE CLAW EXTENDS THROUGH APERTURE PLATE ENOUGH TO TRIP AUTO REWIND.)	G
CARTRIDGE PROJECTORS ONLY		BRONZE BUFFER TANG IN MOVEMENT HOUSING RUBBING FILM OR CATCHING FILM PERFORATIONS.	REMOVE MOVEMENT HOUSING AND BEND BRONZE TANG TO THE RIGHT TO STAY CLEAR OF FILM.	D
ALL	VERTICAL PICTURE JUMP IN REVERSE ONLY.	EXCESSIVE SHUTTLE CLAW ENGAGEMENT WITH FILM.	BEND SHUTTLE CAM FOLLOWER FORWARD TO REDUCE ENGAGEMENT.	H
		FORWARD TAKE-UP SPINDLE NOT COMPLETELY DISENGAGED.	SHORTEN LINK BY BENDING SO TAKE-UP SPINDLE IS FREE TO ROTATE.	C-2
CARTRIDGE PROJECTORS ONLY		EXCESSIVE PUCK DRIVE PRESSURE.	DECREASE PRESSURE BETWEEN PUCK AND REEL BY RELAXING REVERSE SPRING.	C-4
ALL	FILM FAILS TO THREAD AND PICTURE NOT CENTERED.	SHUTTLE CLAW BENT TOWARD PROJECTOR.	BEND CLAW AWAY FROM PROJECTOR.	
	SHUTTLE NOISE (SHUTTLE CLAW NOT HITTING PLATES).	ROUGH CAM OR TIGHT SHUTTLE LEAF SPRINGS.	DE-BURR CAM BY FORCING SOME FILM BETWEEN LEAF SPRING AND CAM WHILE PROJECTOR IS RUNNING.	I
	PICTURE DARK OR DARK ONE SIDE.	LAMP MISALIGNED.	LOOSEN ONE SCREW FOR MAXIMUM EVEN BRIGHTNESS.	K
		MIRROR MISALIGNED.	BE SURE MIRROR IS IN SLOTS AND HELD SECURELY.	
	SHADOW ON EDGE OF PROJECTED PICTURE WITH SUPER 8MM FILM.	EDGES OF APERTURE MASK NOT CLEARING HOLE IN APERTURE PLATE.	REPLACE APERTURE PLATE.	G
	PROJECTED PICTURE SHORT WITH STANDARD 8MM FILM.	MASK NOT CENTERED VERTICALLY. BOTH TOP AND BOTTOM OF HOLE IN MASK MUST BE INSIDE HOLE IN APERTURE PLATE.	REPLACE APERTURE PLATE.	

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	PROJECTED PICTURE NARROW WITH STANDARD 8MM FILM.	MASK NOT CENTERED HORIZONTALLY. BOTH SIDES OF HOLE IN MASK MUST BE INSIDE OF HOLE IN APERTURE PLATE.	REPLACE APERTURE PLATE.	G
ALL WITH SLOW MOTION			MOVE APERTURE PLATE FORWARD TO REDUCE CLAW ENGAGEMENT.	
ALL	RAPID HORIZONTAL AND VERTICAL PICTURE JUMP AND NOISE.	SHUTTLE NOT BEING GUIDED.	REMOVE MOVEMENT HOUSING AND BE SURE SHUTTLE GUIDE IS TIGHT. TIGHTEN SCREW.	H
ALL	SHUTTLE NOISE AND HORIZONTAL PICTURE JUMP.	SHUTTLE CLAW BENT AWAY FROM PROJECTOR AND HITTING PLATES.	BEND SHUTTLE CLAW TOWARD PROJECTOR (BOTH SHUTTLE POINTS MUST BE VERTICAL).	
	HORIZONTAL PICTURE JUMP	FILM SELECT LEVER IMPROPERLY POSITIONED.	MOVE FILM SELECTOR ALL THE WAY FORWARD FOR STANDARD 8MM AND ALL THE WAY BACK FOR SUPER 8.	
		HORIZONTAL SPRING PRESSURE TOO WEAK.	BEND FILM GUIDE ON LIGHT SHIELD IN TOWARD PROJECTOR TO INCREASE SPRING PRESSURE.	D
ALL	LENS WOBBLE (PROJECTED IMAGE SHIFTS ON SCREEN WHEN FOCUSING)	LENS HOLDER NOT HOLDING LENS SECURE.	BE SURE LENS RETAINING SCREWS ARE TIGHT.	J
			REMOVE LENS AND BEND LENS RETAINER IN TOWARD PROJECTOR FRAME TO INCREASE SPRING PRESSURE.	
			REPLACE LENS RETAINER.	
	PROJECTOR WILL NOT FOCUS.	LENS BARREL NOT SHIFTING PROPERLY.	BE SURE LENS RETAINER ISN'T TOO LIGHT.	
ALL WITH KNOB FOCUS			REPLACE FOCUS KNOB IF NUB ON FOCUS CONTROL IS BROKEN OR DAMAGED.	
			ADJUST HEIGHT OF FOCUS NUB TO BE SURE IT ENGAGES FOCUS RING ON LENS BARREL.	
ALL	FILM BURNS.	FLAG INOPERATIVE.	BEND FLAG TO ALLOW MOVEMENT. OTHER ADJUSTMENT WILL REQUIRE LAMP BRACKET REMOVAL.	K

DRIVE MOTOR SYSTEM	M
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- M-1 TROUBLE SHOOTING
- M-2 SHUTTER AND SHUTTER DRIVE SYSTEMS
- M-3 DRIVE MOTOR AND ADJUSTMENTS (FORWARD ONLY PROJECTORS)
- M-4 DRIVE MOTOR AND ADJUSTMENTS (FORWARD, REVERSE, STILL, EARLY PULLEY DRIVE SYSTEM)
- M-5 DRIVE MOTOR AND ADJUSTMENTS (FORWARD, REVERSE, STILL, CURRENT PULLEY DRIVE SYSTEM)
- M-6 SHUTTER DRIVE SYSTEM REPAIR (FORWARD, REVERSE AND STILL PROJECTORS)
- M-7 TRANSMISSION ADJUSTMENTS (FORWARD, REVERSE AND STILL PROJECTORS)
- M-8 TRANSMISSION REMOVAL AND INSTALLATION (CARTRIDGE PROJECTORS ONLY)
- M-9 TRANSMISSION ADJUSTMENT (CARTRIDGE PROJECTORS ONLY)
- M-10 SHIFT BRACKET CLEARANCE PROBLEM
- M-11 SPECIAL MOTOR ASSEMBLY (FOR 1388 PROJECTORS STARTING CODE WEEK 357)
- M-12 MOTOR AND DRIVE PULLEY CHANGE (FORWARD ONLY PROJECTORS)
- M-13 MOTOR PULLEY CONVERSION (50/60 CYCLE PROJECTORS ONLY)
- M-14 OVERSIZED FANS
- M-15 TRANSMISSION CROSSED BELT WEAR (CARTRIDGE PROJECTORS PRIOR TO CODE WEEK 418)

M

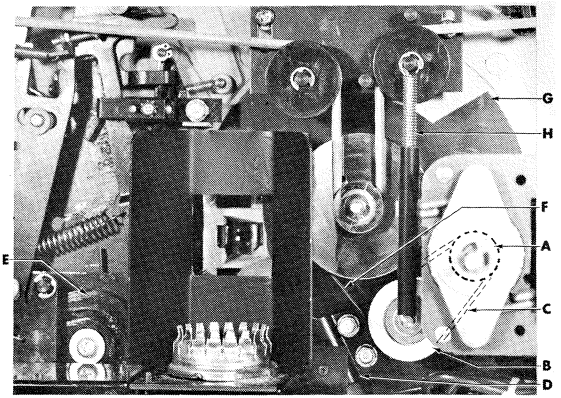
M-1 TROUBLE SHOOTING

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	NO DRIVE IN FAST FORWARD.	DRIVE BELT SLIPS ON MOVEMENT PULLEY.	REPOSITION IDLER PULLEY ON ARM.	K
			REPOSITION TRANSMISSION SPRING.	M
		IDLER PULLEY ARM BINDS.	STRAIGHTEN ARM SO CAM FOLLOWER RIDES IN CENTER OF CAM.	K
		TAKE-UP LINK NOT ENGAGING FORWARD TAKE-UP PULLEY PLATE.	READJUST (SHORTEN TAKE-UP LINK SPRING).	C-3
		OIL ON MOVEMENT PULLEY.	WIPE CLEAN.	—
		GROOVES WORN IN MOVEMENT PULLEY.	REPLACE MOVEMENT PULLEY.	I
		EXCESSIVE TORQUE TO ROTATE CAM SHAFT.	REDUCE TENSION OF TOP SHUTTLE SPRING.	H
		DRAG IN SPINDLE DRIVE SYSTEM.	CHECK ALL PULLEYS, SHAFTS AND GEARS FOR BINDING.	—
	WON'T DRIVE IN REWIND.	FLAT DRIVE BELT SLIPS.	ADJUST IDLER PULLEY.	K
			REPLACE FLAT BELT.	N
		REWIND PULLEY SLIPS ON SPINDLE.	READJUST REWIND LEVER.	C-6
		OIL ON DRIVE PULLEY.	REMOVE OIL.	—
	SHUTTLE WON'T DRIVE IN FORWARD.	FLAT DRIVE BELT SLIPS.	ADJUST. REPLACE FLAT BELT IF NECESSARY.	N
		DRIVE BELT SLIPS.	REPLACE.	
		IDLER PULLEY ARM BINDS.	READJUST.	K
		REWIND LEVER NOT ENGAGING TAKE-UP PULLEY PLATE.	READJUST.	C-6
	PROJECTOR DRIVES FORWARD OR REVERSE WHEN CONTROL SWITCH IS IN STILL POSITION.	TRANSMISSION OUT OF ADJUSTMENT.	READJUST.	M

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL CONT'D.	VIBRATION IN REVERSE OR FAST FORWARD.	EXCESSIVE CAM SHAFT END PLAY.	TIGHTEN MOVEMENT PULLEY ON CAM SHAFT (.003 to .005 END PLAY).	I
		EXCESSIVE MOTOR ARMATURE END PLAY.	ADD SPACERS TO FAN DRIVE SHAFT AS REQUIRED (.015 to .020 END PLAY).	M
		DRIVE BELT OUT OF GROOVED MOTOR PULLEY.	ALIGN MOTOR DRIVE PULLEY.	
		MOTOR DRIVE BELT STRETCHED.	REPLACE.	N
CARTRIDGE PROJECTORS ONLY	PUCK RUMBLE IN REVERSE.	REVERSE GEAR DISENGAGED FROM DOUBLE GEAR.	READJUST TRANSMISSION ASSEMBLY.	M
	GEAR NOISE IN FORWARD.	IMPROPER CLEARANCE BETWEEN REWIND AND DOUBLE GEARS.	READJUST, APPROXIMATELY 1/32 IN. BETWEEN GEARS.	

M-2 SHUTTER AND SHUTTER DRIVE SYSTEMS

The shutter assembly on all projectors consists of a 3-bladed shutter and pulley mounted on the cam shaft. Shutter function is to block light from the screen while the shuttle is advancing film. After the shuttle has advanced film one frame, and film has stopped moving, the shutter blade uncovers the light allowing projection of the picture. While film is motionless, the other two shutter blades block the light as the shuttle cycles back up and in. These two additional blades and resulting light brakes permit flicker-free projection. The shutter is fastened to a pulley on the cam shaft and timing between shutter blade and cam is extremely critical (see Section I, Cam and Shutter Timing).

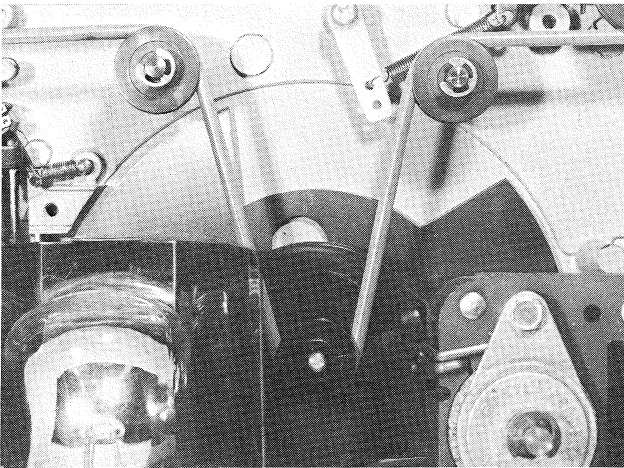


M-4.1

M-3 DRIVE MOTOR AND ADJUSTMENTS

(Forward Only Projectors)

Uses two O-ring drive belts. With no take-up or adjustment of any type provided or necessary. If motor drive belt slips, be sure that it is free of oil and grease, and that it has not stretched. Check shutter end play if belt still slips.



M-3.1

M-4 DRIVE MOTOR AND ADJUSTMENTS

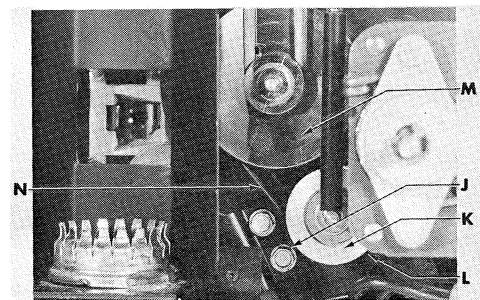
(Forward, Reverse, Still, Early Pulley Drive System)

Motor pulley (A) drives idler pulley (B) with an O-ring belt. Idler pulley is mounted on Reverse arm (D) which is operated by cam (E) on switch shaft. When cam moves pulley down, it tightens flat belt (F) which drives shutter in counterclockwise direction. When cam is rotated to a position allowing spring (H) to pull idler pulley up, O-ring drives against shutter pulley (I) driving the shutter clockwise. When cam positions idler pulley in an intermediate position, the motor rotates but does not drive the shutter in either direction. With control knob in Forward, Rewind or Fast Forward positions, the shutter rotates counterclockwise. With the control knob in Rewind or Reverse positions, the shutter rotates clockwise. In Still, Off or Stop positions, the shutter does not rotate. NOTE: Shutter rotations are seen from back of projector.

Adjustments:

1. Set control switch to Still position.
2. Loosen screw (J) and adjust idler pulley (K) so that belt (L) clears pulley (M) by approximately 1/32 inch. Tighten screws (J).
3. Check drive system operation in Forward and Reverse. If drive is improper in either position, re-adjust.
4. Check switch positions for the following requirements:

Control Switch Position	Requirements
Off, Still, Stop	Gap between O-ring belt (L) and Pulley (M). Flat belt (N) is slack.
Forward, Fast Forward, Rewind	Flat belt (N) tight and driving pulley (M).
Reverse, Fast Forward	O-ring belt (L) contacting and driving pulley (M).

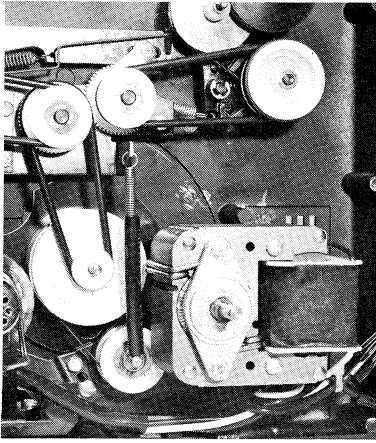


M-4.2

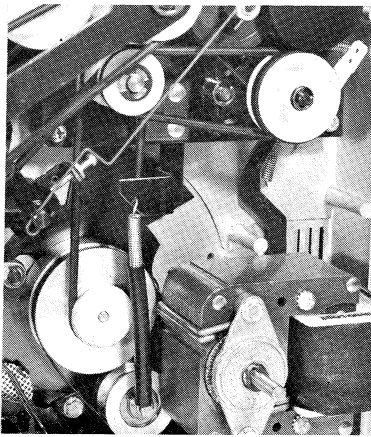
M-5 DRIVE MOTOR AND ADJUSTMENTS

(Forward, Reverse, Still, Current Gear Pulley System)

Similar operating principles to early pulley type system with the exception that film spillage has been eliminated by adding two idler pulleys which are geared together. Cartridge projectors operate the same as other Forward, Reverse and Still models with a different configuration.



M-5.1 STANDARD PROJECTOR SYSTEM



M-5.2 CARTRIDGE PROJECTOR SYSTEM

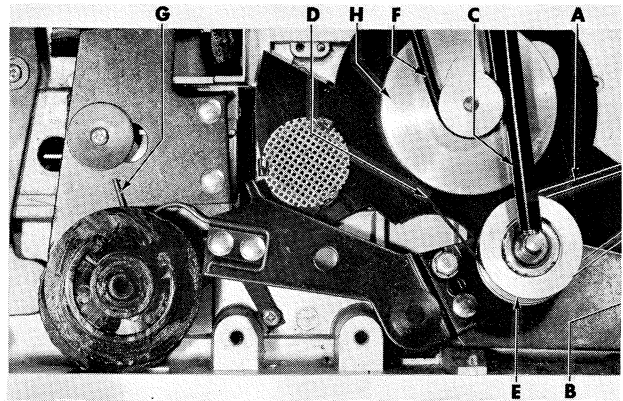
M-6 SHUTTER DRIVE SYSTEM REPAIR

(Forward, Reverse and Still Projectors)

It is advisable to replace both Forward and Reverse drive belts when repairing projectors. To replace Reverse drive belt (A), it is necessary to remove two motor mounting screws (B), Reverse spring (C) and flat belt (D). To install new belt (A), slip it onto flat belt groove on pulley (E), then move motor over and slip motor pulley into slack end of belt. Move the motor up to mounting studs by using it for leverage and secure top with screw (B). Pivot motor down and secure bottom screw (B). With a small screwdriver, slip belt (A) from flat belt groove over and back to its belt groove on pulley (E). Flat belt (D) can be changed by unhooking one end of reverse spring (C) and drive belt (F).

Whenever a projector is serviced, or new drive belts are installed, the transmission **MUST** be checked for maximum drive torque in Forward and Reverse. With control switch in Forward position, switch cam pushes wire spring (G) up pivoting transmission bar down tightening flat belt (D). When in Reverse position, switch cam allows wire spring (G) to drop down and Reverse spring (C) pulls transmission bar up making drive contact between belt (A) and shut-

ter pulley (H), changing direction of mechanism. When in Still position, flat belt (D) is slack and there is no contact between belt (A) and shutter pulley (H). If the projector runs in Still, the transmission has not been adjusted correctly.



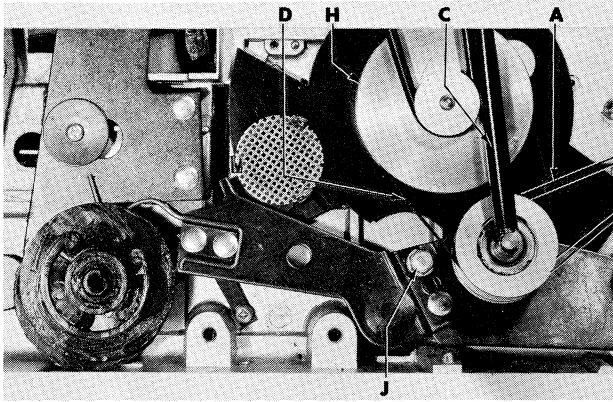
M-6.1

M-7 TRANSMISSION ADJUSTMENTS

(Forward, Reverse and Still Projectors)

With projector running in Forward position, press against shutter pulley (H); fan on motor should slow down and stop. Turn control switch to Reverse position and again press against shutter pulley (H); fan on motor should slow down and stop. To increase driving torque of flat belt (D) in Forward, turn switch to Reverse to slacken flat belt. Loosen adjusting screw (J) and move transmission bar down slightly. Tension of flat belt will be increased and with projector running in Forward position, the motor should now stall out when pressing down on shutter pulley (H). Turn switch to Reverse and repeat check. If motor does not stall out in Reverse, transmission bar was shifted down too far increasing flat belt (D) torque at the expense of Reverse torque of belt (A). Be sure both belts are in good condition and not greasy. Clean if necessary. Flat surface of shutter pulley (H) must be free of grease or black material from slipping against belt (A). Torque is usually easiest to adjust with Reverse spring (C) in middle hole of bracket. Repeat steps until a balance is obtained between Forward and Reverse drive and each position will stall out the motor. If one or the other position has to be favored, always provide extra torque to the Forward drive belt (D).

Transmission bar and switch cam are part of lamp bracket assembly. See Section K for adjustments or replacement.



M-7.1

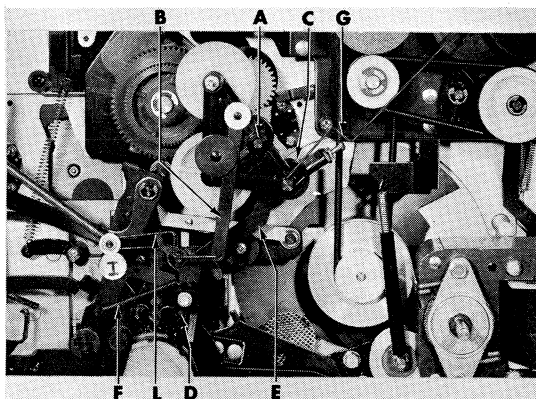
M-8 TRANSMISSION REMOVAL AND INSTALLATION

(Cartridge Projectors Only)

The transmission is serviced as a complete assembly. Removal should only be necessary if a new crossed belt is required or other components behind need to be replaced. Remove transmission by removing Auto Rewind links (L) and (G), spring (F) and E-ring on pin (A). Lift up arm (E) to slide out of switch cam and off of pin below screw (D). It is advisable to hold threader assembly up to provide more clearance when slipping the transmission assembly out.

When installing the transmission assembly, the projection lamp should be removed. Hold threader lifter bar up, position transmission on pivot pin (A), lift up on arm (E) and slip tip of arm into second cam groove before trying to slip transmission all the way onto the pin. Push bar (B) to the left to clear gear teeth and then push transmission all the way back on pivot pin (A). **DO NOT FORCE.**

Replace E-ring on pin (A) and wire links (L) and (G). Check to make sure belt drive is on both pulleys, spring (C) has not dropped off and tip of arm (E) is in second cam groove. Hook spring (F) on pin on arm (E). Be sure each end of spring (F) is in its spring groove on each pin.



M-8.1

M-9 TRANSMISSION ADJUSTMENT

(Cartridge Projectors Only)

1. Transmission must be free to rotate around pivot (A). With control switch in Reverse position, push bar (B) to the left and spring (C) should return transmission quickly to the right. If it does not, replace the transmission.

2. With projector running, turn control knob to Rewind and loosen screw (D). Slowly move lever (H) to the right raising arm (E) and starting to disengage teeth of Rewind gear and double gear. Disengaging gear teeth slightly provides needed gear backlash and when projector seems to run faster and quieter, secure screw (D). If projector does not have arm (H), loosen screw (D) and with projector running, lift up on arm (E). When desired backlash is obtained, hold arm (E) in position and slide stop down until it rests on pin. Tighten screw (D).

3. Turn control knob to Forward position. Loosen nut (J) if it is a regular nut. If it is a self-locking nut, it is not necessary to loosen. Advance screw (K) until approximately 1/32 inch clearance between Rewind gear and double gear. Gear teeth may occasionally touch causing gear noise in Forward position if less than 1/32 inch clearance. If clearance is more than 1/32 inch, gears may not completely engage during Auto Rewind causing gear noise.

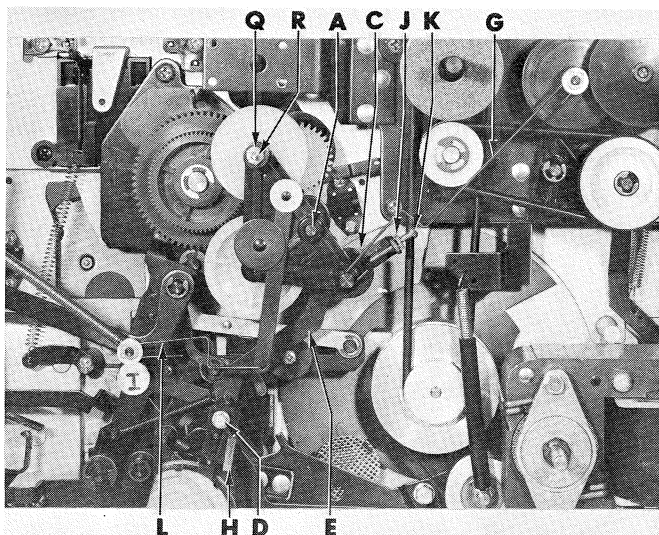
4. Turn control knob to Reverse position. Hook link (L) over pin which should move bar (B) slightly to the left. This slight movement of bar (B) provides backlash, or gear tooth clearance between Reverse gear and double gear. Bend link (L) to obtain correct tooth engagement. Reverse gear may disengage from double gear when a load is on the puck causing gear rumble in Reverse, if the link is excessively shortened.

5. NOTE: Before proceeding, be sure projector has been updated with Dual Rewind/Reverse system.

With projector running in Reverse position with a 50 or 400-foot reel, the puck should run much faster than the reel it is contacting and acts as a clutch by slipping on the reel. To increase torque and spring pressure of puck, loosen jam nut (Q) and turn screw (R) counterclockwise one turn while holding jam

nut. Tighten jam nut (Q). If projector is not equipped with jam nut (Q), remove E-ring and increase spring pressure by adding one washer. Replace E-ring. It may be easier to remove the transmission when adding this washer.

6. With control knob in Forward position, Auto Rewind link (G) should have about .020 end play from end to end. Bend link (G) at "Z" shape for adjustment. Take-up spindle will not disengage during auto rewinding resulting in Slow Rewind if end play is excessive.

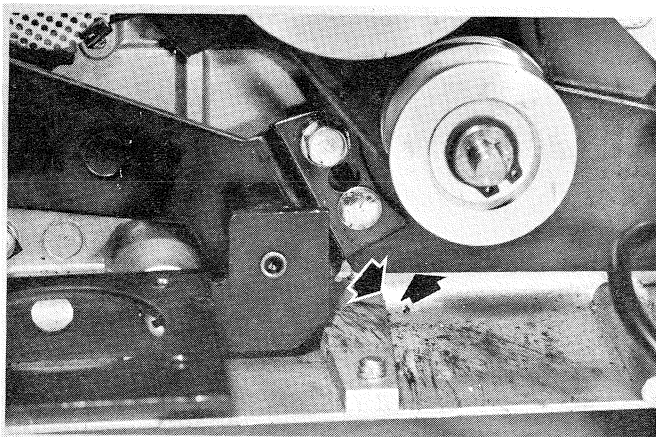


M-9.1

M-10 SHIFT BRACKET CLEARANCE PROBLEM

(On Some Projectors, Code Week 300 to 310 Inclusive, Frame Casting No. 15)

A limited number of projectors were manufactured with marginal clearance between the frame casting and motor shift bracket. It is possible for the bracket to bottom out on the frame allowing the flat belt to slip. If the flat belt cannot be adjusted, clearance can be obtained by filing the casting or shift bracket at the interference points.



M-10.1

M-11 SPECIAL MOTOR ASSEMBLY

(For 1388 Projectors Starting Code Week 357)

Some GAF® 1388 Projectors were manufactured with a special motor assembly, P/N 438-820, starting Code Week 357. This motor can be identified by an orange stripe painted on the top of the motor stack. These motors should be returned to the Portland Service Center if replaced.

M-12 MOTOR AND DRIVE PULLEY CHANGE

(Forward Only Projectors)

Motor and movement pulleys were changed on Forward Only projectors. New motor pulley can be identified by smaller outside diameter and movement pulley with a narrower and deeper motor belt groove.

Part Name	New P/N	Old P/N
Motor Pulley	802-483	411-420
Movement Pulley	802-482	468-467

For service, new motor pulley cannot be used with old movement pulley but old motor pulley can be used with new movement pulley. For simplification, both pulleys should be replaced as a set.

M-13 MOTOR PULLEY CONVERSION

(50/60 Cycle Projectors Only)

Some 50/60 cycle export projectors have been sold domestically and can be identified by a switch located near the lamp bracket at the back of the projector. Due to the motor pulley, these projectors will operate too fast, 20 frames per second, when used on 60-cycle 110-volt power. Projectors returned with this problem should have motor pulley, P/N 812-200, replaced with motor pulley, P/N 438-424.

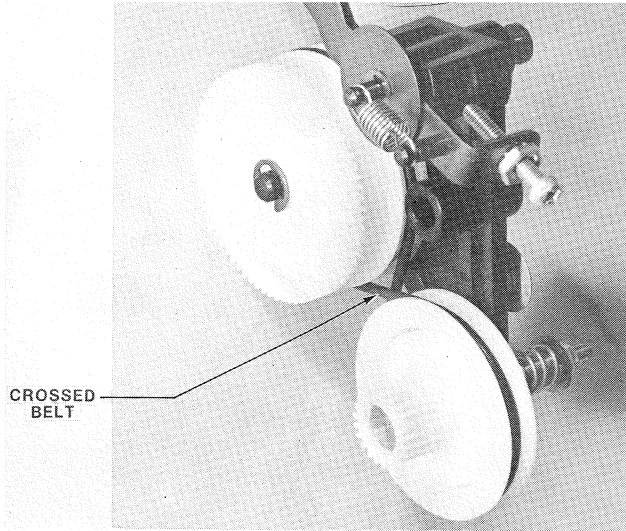
M-14 OVERSIZED FANS

Some projectors were manufactured using fan, P/N 438-861, which has a larger than normal outside diameter. When replacing fan on projectors with fiber baffle in rear cover, care should be taken to avoid using large outside diameter fan because it may rub against the baffle. There is no interference problem on projectors without baffle in rear cover. Some "Tec Air" fans may be oversized and can only be identified by comparing with older "Grish" fans for size (names are molded on fan hub).

M-15 TRANSMISSION CROSS BELT WEAR

(Cartridge Projectors Prior to Code Week 418)

Black powder or rubber residue on transmission pulleys indicates excessive wear of the crossed belt. Projectors manufactured prior to Code Week 418 must have larger belt, P/N 490-841, installed. To change this belt, it is necessary to remove the transmission (see M-8).



M-15.1

BELT REPLACEMENT	N
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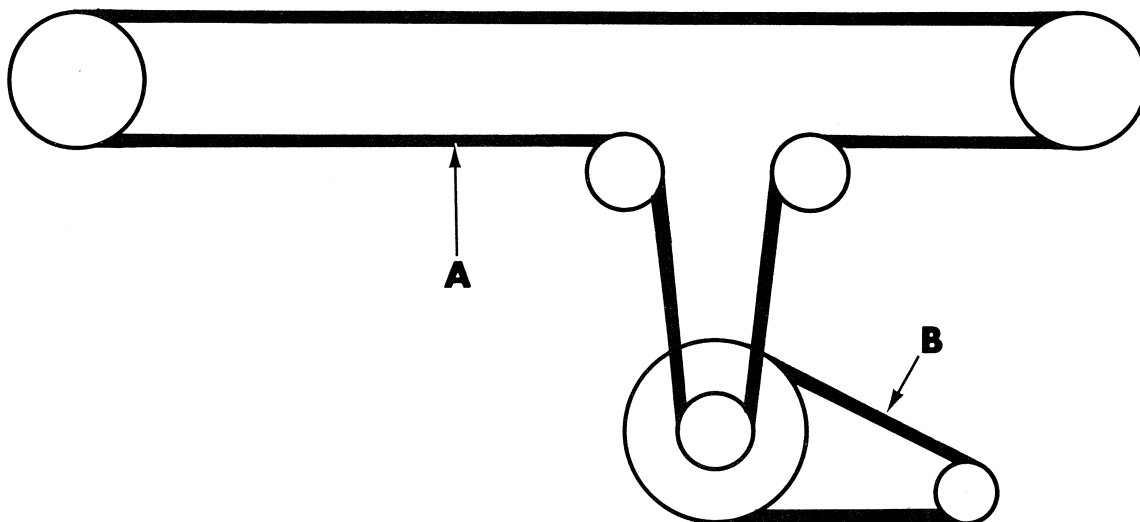
- N-1 DRIVE BELT REPLACEMENT PROCEDURE (FORWARD ONLY PROJECTORS)
- N-2 DRIVE BELT REPLACEMENT PROCEDURE (FORWARD, REVERSE, STILL PROJECTORS WITH EARLY PULLEY DRIVE SYSTEM)
- N-3 DRIVE BELT REPLACEMENT PROCEDURE (FORWARD, REVERSE, STILL PROJECTORS WITH CURRENT GEAR PULLEY SYSTEM)
- N-4 DRIVE BELT REPLACEMENT PROCEDURE (CARTRIDGE PROJECTORS ONLY)

N-1 DRIVE BELT REPLACEMENT PROCEDURE

(Forward Only Projectors)

1. Main Drive Belt (A) — Requires no projector disassembly. Work Belt (A) off of pulleys to remove and when replacing, be sure belt rides in pulley grooves.

2. Motor Drive Belt (B) — Requires removal of main drive belt (A) from shutter pulley and loosening of two motor mounting screws to provide clearance between motor pulley and shutter for replacement of motor drive belt (B).



N-1.1

N-2 DRIVE BELT REPLACEMENT PROCEDURE

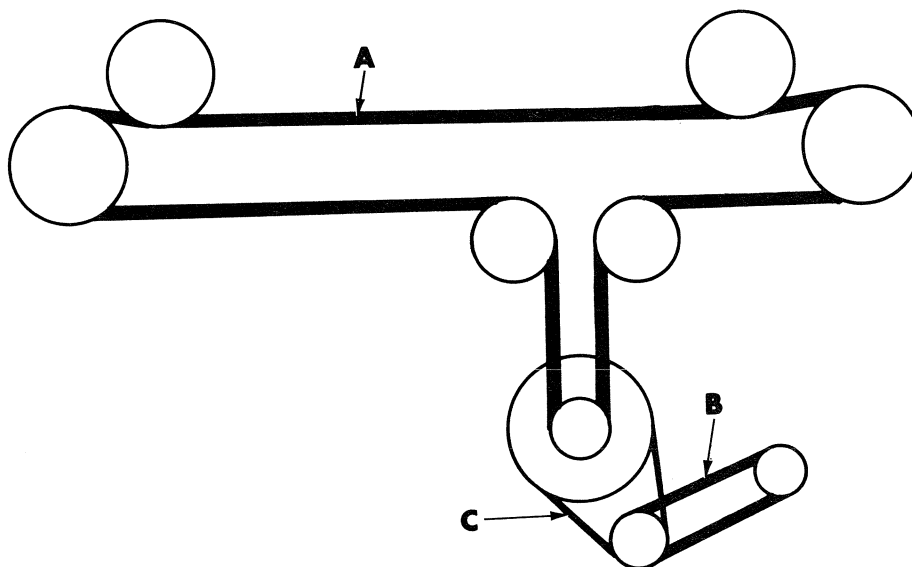
(Forward, Reverse and Still Projectors with Early Pulley Drive System)

1. Main Drive Belt (A) — Can be removed without projector disassembly. Work belt off of pulleys.

2. Motor Drive Belt (B) — Requires disconnecting transmission spring, removal of two motor mounting screws to obtain clearance to remove motor drive

belt (B) from motor pulley. When replacing, be sure belt is in motor pulley groove.

3. Forward Drive Flat Belt (C) — Requires disconnecting transmission spring, main drive belt (A) from movement pulley and motor drive belt (B) from clutch pulley. Work flat belt (C) off of pulleys. To obtain more clearance for removing flat belt (C), loosen or remove the motor.



N-2.1

N-3 DRIVE BELT REPLACEMENT PROCEDURE

(Forward, Reverse and Still Projectors with Current Gear Pulley System)

Both large and small frame configurations use the same methods for changing belts.

1. Front Drive Belt (A) — Can be removed without projector disassembly. Projectors with Auto Rewind will require removal of the solenoid switch cover and disconnecting of wires at the Auto Rewind switch.

2. Movement belt (B) — Located under front drive belt (A) and is accessible without projector disassembly. Will require removal of front drive belt (A) from gear pulley.

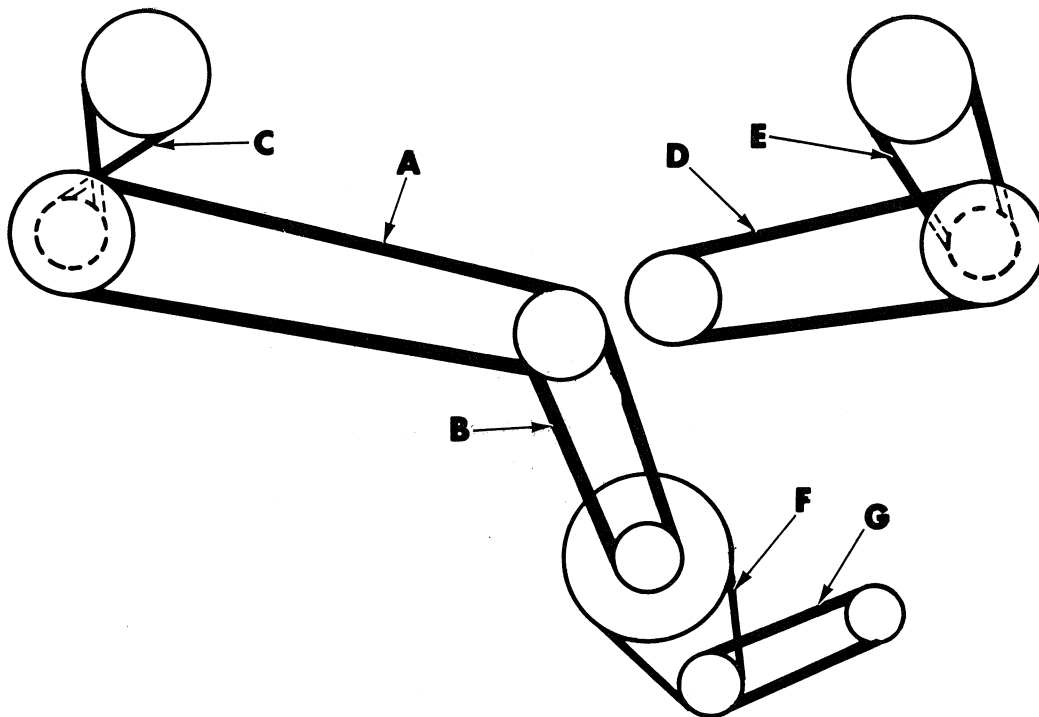
3. Reverse Take-up Belt (C) — Requires removal of E-ring and front drive pulley. Reverse take-up belt (C) is located behind front drive belt (A) and is figure-eighted around pulleys. When reinstalling, be sure belt (C) is located in drive pulley groove.

4. Rear Drive Belt (D) — Requires no projector disassembly. Work belt off of pulleys.

5. Forward Take-up Belt (E) — Remove E-ring and slide rear drive pulley from shaft. Forward take-up belt is located behind rear drive belt (D). Work belt off of pulleys. NOTE: When replacing belt (E) it is not figure-eighted.

6. Forward Drive Flat Belt (F) — Can be changed by disconnecting transmission spring and working belt off of pulleys and from behind motor. It is easier to remove the two motor mounting screws and move the motor to one side. Disconnect transmission spring and belt (B) from movement pulley and then work Forward flat belt (F) from pulleys. When reassembling, be sure motor drive belt (G) is in motor drive pulley groove.

7. Motor Drive Belt (G) — Located behind flat belt (F). Replace by removing transmission spring, belt (B), motor and flat belt (F) as in Item 6.

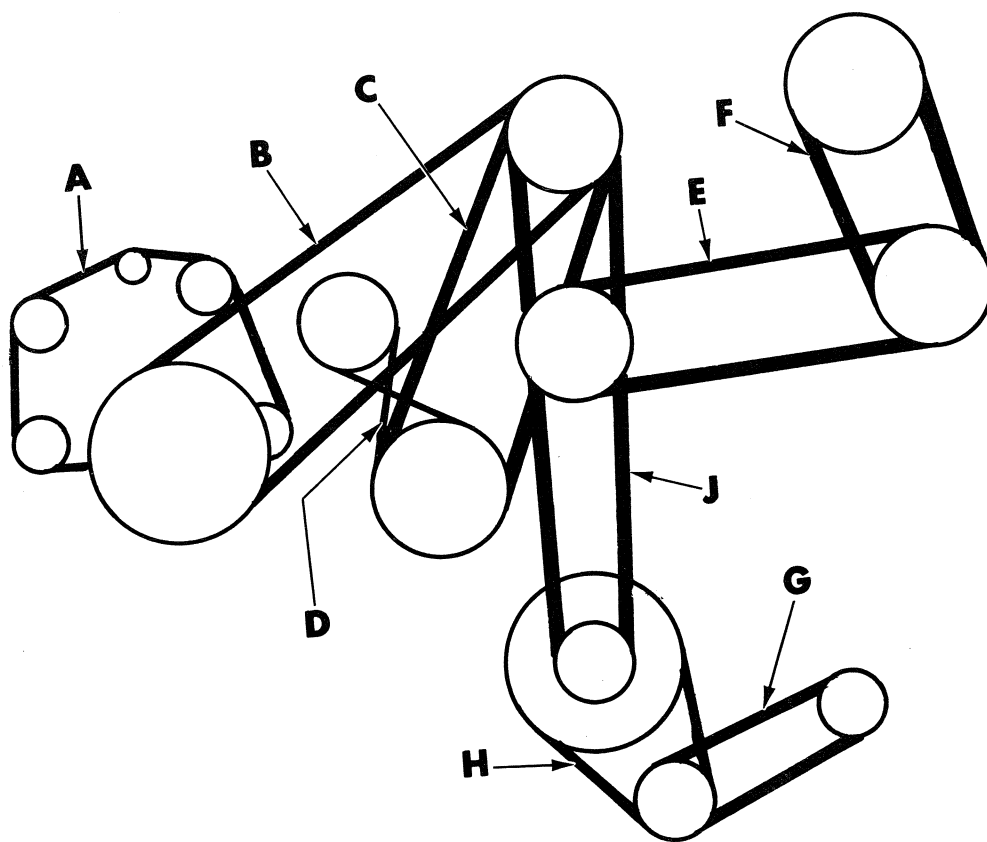


N-3.1

N-4 DRIVE BELT REPLACEMENT PROCEDURE

(Cartridge Projectors Only)

1. Threader Belt (A) — Serviced from front of projector with threader housing and film path removed (refer to Section F for threader information). Threader belt (A) cannot be removed from threader assembly without removing threader from projector.
2. Threader Drive Belt (B) — Removing belt (B) from pulleys requires no projector disassembly.
3. Transmission Belt (C) — Requires removal of the transmission (see Section M) and threader clutch and drive mechanism (see Section F).
4. Transmission Reverse Drive Belt (D) — Requires transmission removal (see Section M). When re-assembling, be sure belt (D) is figure-eighted.
5. Rear Drive Belt (E) — Requires no projector disassembly. Work belt (E) off of pulleys.
6. Forward Take-up Drive Belt (F) — Requires removal of E-ring and shims holding drive pulley, belt (E) and Auto Rewind link. Slide drive pulley off of
- shaft and work take-up drive belt (F) off of pulleys. Be sure belt (E) is in pulley groove when reinstalling drive pulley.
7. Motor Drive Belt (G) — Requires removal of two motor mounting screws and moving the motor to one side. Disconnect transmission spring from idler pulley and belt (J) from movement pulley. Remove flat belt (H) from idler pulley and motor drive belt (G) can now be removed. Be sure motor drive belt (G) is in motor pulley groove when installing motor.
8. Forward Drive Flat Belt (H) — Requires disconnecting transmission spring from idler pulley and belt (J) from movement pulley. Loosen or remove motor mounting screws and move motor to one side to obtain clearance so that flat belt (H) can be worked off of pulleys. Be sure belt (G) is in motor pulley groove when installing motor.
9. Main Transmission Belt (J) — Requires removal of the threader and threader arm (see Section F).



N-4.1

CORD REEL	0
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O-1 TROUBLE SHOOTING

O-2 GENERAL CORD REEL INFORMATION

O-3 REPLACING THE CORD REEL ASSEMBLY

O-4 POWER CORD

O-5 CORD REEL DISASSEMBLY AND REASSEMBLY

O-6 POWER CORD (NON-CORD REEL MODELS)

0-1 TROUBLE SHOOTING

MODEL	TROUBLE	CAUSE	REMEDY	SEE SECTION
ALL	NO POWER.	DEFECTIVE OR DISCONNECTED WIRING.	CHECK WIRING.	P
		DEFECTIVE POWER CORD.	REPLACE.	O-6
ALL WITH CORD REEL ASSEMBLY			REPAIR CORD IF EXTERNAL TO CORD REEL. REPLACE COMPLETE CORD REEL IF INTERNAL.	O-4
	CORD REEL STICKS OR LOCK SLIPS.	DIRTY OR SLIPPERY CORD.	PULL OUT CORD, CLEAN AND LIGHTLY WAX WITH "PLEDGE" OR EQUIVALENT.	—
		OIL ON CORD.	WIPE CORD CLEAN.	—
		LOCKING DEVICE MALFUNCTION.	CHECK CORD REEL SPRING. REQUIRES CORD REEL DISASSEMBLY.	O-5
		DAMAGED HOUSING OR BASE PLATE.	REPLACE BASE PLATE OR COMPLETE CORD REEL ASSEMBLY AS REQUIRED.	O-5
	CORD WON'T RETRACT.	TWISTED CORD.	STRAIGHTEN.	O-5
		BROKEN OR UNHOOKED SPRING.	REPLACE WITH NEW SPRING.	
		OVERLAPPED SPRING.	WORK SPRING LOOPS BACK INTO POSITION.	
			REPLACE BASE PLATE IF WARPED.	

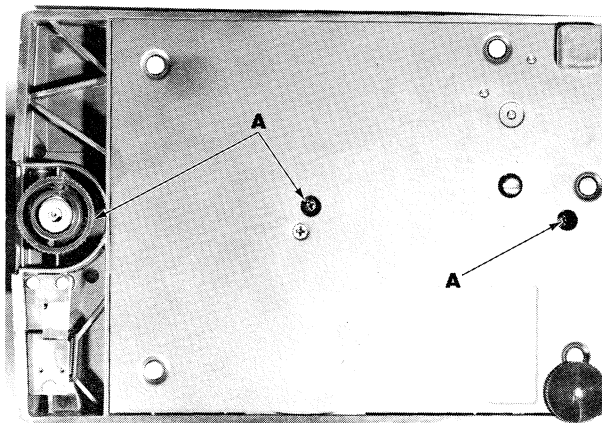
O-2 GENERAL CORD REEL INFORMATION

Only some model projectors are equipped with the cord reel assembly. Before attempting repairs to the cord reel assembly, first determine what the defect might be. Certain repairs are not economical in cost or time and it is recommended that in these cases the complete cord reel assembly be replaced with a new assembly.

Special Holt head screws are used to discourage customers from removing metal plate from bottom of cord reel. Plate removal can be hazardous because of the captive cord spring under the plate.

O-3 REPLACING THE CORD REEL ASSEMBLY

Take off back of projector and disconnect cord wires at two wire nuts near motor. From bottom of projector, remove three screws (A) which attach cord reel to the projector frame and carefully pull wires through installation and out of projector frame.



O-3.1

When reinstalling cord reel assembly, rotate control knob to be sure that there is no mechanical linkage interference with wire where it comes through the frame casting.

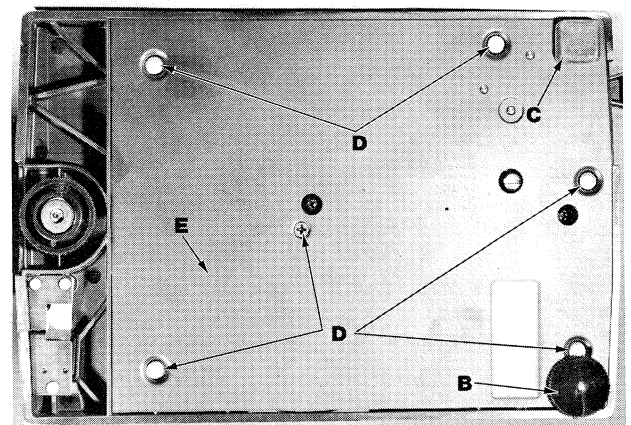
O-4 POWER CORD

If the problem is known to be in the electrical cord resulting in an open or short circuit internal to the cord reel, it is recommended that the complete cord reel assembly be replaced. If cord plug is defective, pull out cord slightly and lock in place. Cut off damaged plug, strip wires and attach new replacement plug.

Pull cord all the way out and check for twists and turns which may prevent cord from retracting into cord reel. This check may eliminate the necessity of disassembling the cord reel assembly.

O-5 CORD REEL DISASSEMBLY AND REASSEMBLY

1. Turn projector upside down and prop in a vertical position so that the metal base plate of the cord reel is up. NOTE: To repair cord reel, it is not necessary to remove it from the projector.
2. Remove leveling foot (B), rubber foot (C) and six screws (D). NOTE: Screws may have a Holt head which requires special Holt head driver for removing.



O-5.1

3. Carefully lift off sheet metal cover plate (E). Hold spring (F) in place with strip of rigid metal or flat of your hand. With light pressure on reel spring, pull power cord out and retract it slowly and watch for the trouble. NOTE: Some problems such as a broken or detached spring are obvious and this test is not necessary. Rollers (G) and cord grip (H) must freely rotate and pivot. Replace these parts if necessary.

4. Check reel spring (F) for the following defects:
 - a. Broken spring — Check spring hooks. If broken, replace spring (F).
 - b. Unhooked spring — Occasionally spring (F) becomes unhooked from tab (I) or mounting slot (J) and unwinds several turns. Without proper spring tension, the cord will not fully retract. **DO NOT ATTEMPT TO REWIND SPRING BUT REPLACE WITH NEW PRE-WOUND SPRING.**
 - c. Overlapped spring — Occasionally spring loops may become overlapped causing cord reel to bind. This may be the result of a bent or warped sheet metal cover plate (E) which must be replaced to reduce clearance and prevent spring loops from overlapping. With light pressure on spring (F), to keep it from popping out of position, work spring loops back into position. Holding spring in place, pull out on cord to insure that the mechanism is working properly.

5. Exercise caution when removing or replacing spring (F) as it is under tension and can snap loose if not properly handled. If spring is broken or unhooked, it will be partially unwound. Hold spring in place with strip of rigid metal or flat of hand and slip two retainer strips under spring at opposite sides. Fold ends of retainer strips up over top of spring and twist ends together. This will prevent the spring from uncoiling when ends are unhooked. Unhook spring ends at (I) and (J) and remove spring (F) from cord reel.

6. Replacement spring (F) is pre-wound with 19 turns and held in place with three ties. **DO NOT REMOVE SPRING TIES BEFORE INSTALLING SPRING IN CORD REEL ASSEMBLY.** If spring has come loose or has bunched up but still has ties in place, it should not be used.

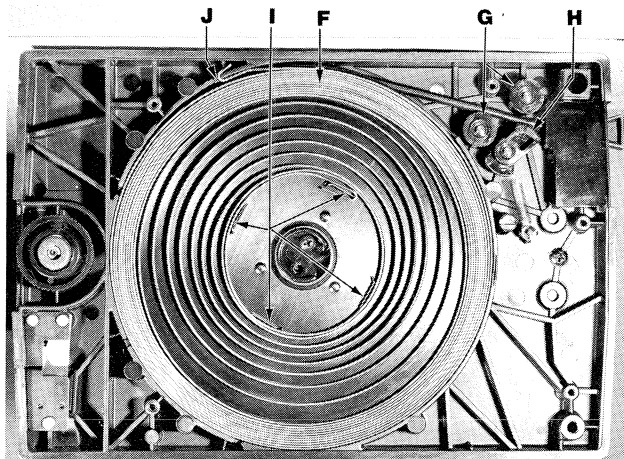
Carefully place new spring flat in cord reel with hook ends pointing as shown in illustration. With rigid strip of metal or flat of hand, exert light pressure on spring and attach inside spring hook on tab (I) and outside hook in slot (J). Still holding spring flat in plate, clip the three ties and remove them from under the spring. Pull cord out and retract slowly checking that the mechanism works properly. If spring requires more tension, hold spring in place, disengage inside spring end and pull until it can be hooked to the next tab. Repeat until tension is sufficient to retract cord.

7. Reassemble cord reel metal base (E) and test again with the projector in the upright position.

O-6 POWER CORD

(Non-Cord Reel Models)

If the power cord is found to be defective, it must be disconnected from the motor leads located below the motor at the rear of projector. With pliers, pull power cord grommet free from projector frame. When installing new cord, the grommet should be lubricated before attempting to pull it through projector frame (lubrication makes less friction).

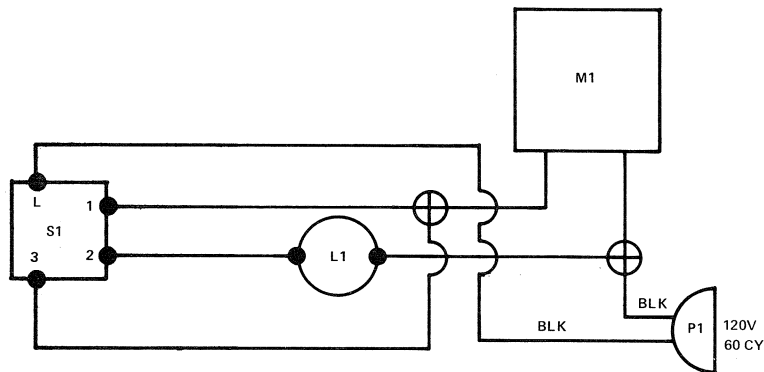


WIRING

P

FIG.	MODEL	FIG.	MODEL
P-1	FORWARD ONLY PROJECTORS		FORWARD, REVERSE PROJ. (CONT'D)
P-1.1	ANSCOVISION® 80	P-2.3	CRESTLINE® 148
P-1.2	ANSCOVISION 88	P-2.7	CRESTLINE 168
P-1.2	ANSCOVISION 188	P-2.2	EMDEKO 7000
P-1.2	ANSCOVISION 188Z	P-2.2	EMDEKO 9000
P-1.2	ANSCOVISION 333	P-2.3	GAF 1488
P-1.1	ANSCOVISION 388	P-2.9	GAF 1555DZ
P-1.2	ANSCOVISION 1388D	P-2.12	GAF 1564Z
P-1.1	CRESTLINE® S800	P-2.7	GAF 1588Z
P-1.2	GAF® 1333	P-2.10	GAF 1588Z (BELGIUM)
P-1.2	GAF 1372Z	P-2.7	GAF 1688Z
P-1.1	GAF 1388	P-2.10	GAF 1688Z (BELGIUM)
P-1.1	GAF 1388Z	P-2.8	GAF 1788Z
P-1.2	GAF 2388	P-2.11	GAF 2488
P-1.3	GAF 2388 (BELGIUM)	P-2.12	GAF 2588Z
P-1.2	GAF 2388Z	P-2.12	GAF 2688Z
P-1.2	MEMORY MASTER T.M.	P-2.13	GAF 2788Z
P-1.2	MEMORY MASTER II	P-2.2	SEARS 9230
P-1.1	SEARS 9828	P-2.11	SEARS 9232
P-1.1	VICEROY® S/800	P-2.1	VICEROY® 800R
P-1.2	VICEROY 811	P-2.1	VICEROY 800Z
P-1.1	WARDS 852	P-2.7	VICEROY 813
P-1.1	WARDS 853	P-2.11	WARDS 809
P-1.2	WARDS 808	P-2.11	WARDS 810
		P-2.1	WARDS 888
P-2	FORWARD, REVERSE PROJECTORS	P-2.2	WARDS 899
P-2.2	ANSCOVISION 488		
P-2.5	ANSCOVISION 555	P-3	CARTRIDGE PROJECTORS
P-2.5	ANSCOVISION 588	P-3.1	GAF 2500
P-2.5	ANSCOVISION 666	P-3.1	GAF 2600
P-2.5	ANSCOVISION 688	P-3.2	GAF 2700
P-2.6	ANSCOVISION 788	P-3.1	SEARS 9240

P-1 FORWARD ONLY PROJECTORS



P-1.1

ANSCOVISION® 80
ANSCOVISION 388
CRESTLINE® S/800

*GAF® 1388
GAF 1388Z
SEARS 9228
VICEROY® S/800
WARDS 852
WARDS 853

*115 VOLT 150W SYSTEM SEE P-1.2
FOR 30 VOLT 80 WATT SYSTEM

KEY:

C1 – CORD REEL

L1 – LAMP – PROJECTION (TUNGSTEN)

L2 – LAMP – PROJECTION (QUARTZ)

M1 – MOTOR

P1 – POWER CORD

S1 – SWITCH – CONTROL

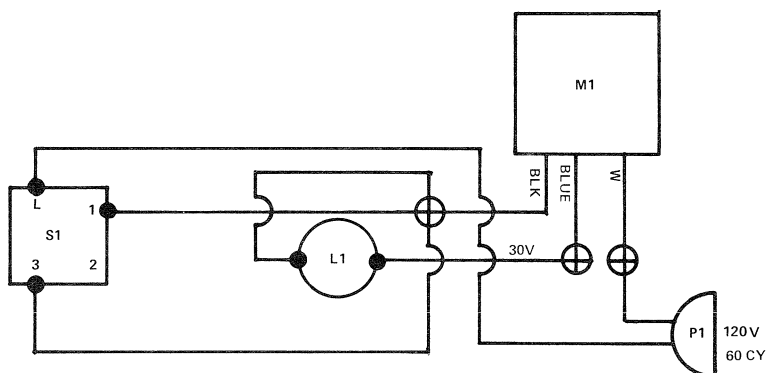
S2 – SWITCH – VOLTAGE

S3 – SWITCH – AUTO REWIND

S4 – SOLENOID – AUTO REWIND

S5 – SOCKET – ROOM LIGHT

⊕ – WIRENUT

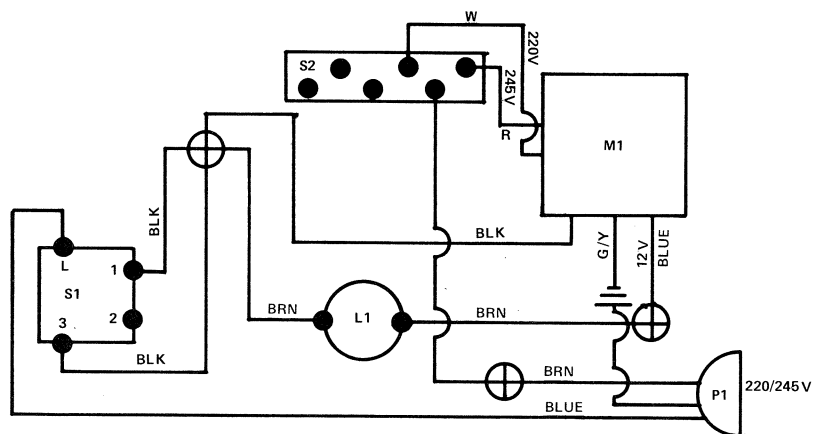


P-1.2

ANSCOVISION 88
ANSCOVISION 188
ANSCOVISION 188Z
ANSCOVISION 333
ANSCOVISION 1388D
GAF 1333
GAF 1372Z
GAF 1388
GAF 2388
GAF 2388Z
MEMORY MASTER^{T.M.}
MEMORY MASTER II
VICEROY 811
WARDS 808

P-1.3

GAF® 2388 (BELGIUM)



KEY:

C1 – CORD REEL

L1 – LAMP – PROJECTION (TUNGSTEN)

L2 – LAMP – PROJECTION (QUARTZ)

M1 – MOTOR

P1 – POWER CORD

S1 – SWITCH – CONTROL

S2 – SWITCH – VOLTAGE

S3 – SWITCH – AUTO REWIND

S4 – SOLENOID – AUTO REWIND

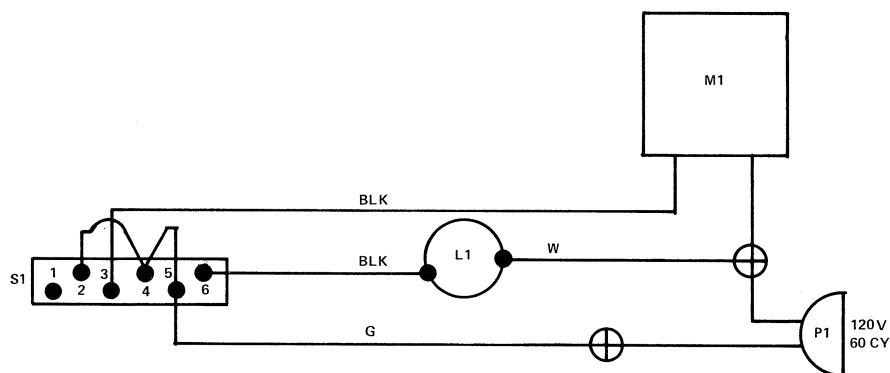
S5 – SOCKET – ROOM LIGHT

⊕ – WIRENUT

P-2 FORWARD REVERSE PROJECTORS

P-2.1

VICEROY® 800R
VICEROY 800Z
WARDS 888



NOTE: THIS SYSTEM
USED ON SOME
EARLY MODELS
– REWIRE EARLY
MODELS TO NEW
SYSTEM (P-2.2).

KEY:

C1 – CORD REEL

L1 – LAMP – PROJECTION (TUNGSTEN)

L2 – LAMP – PROJECTION (QUARTZ)

M1 – MOTOR

P1 – POWER CORD

S1 – SWITCH – CONTROL

S2 – SWITCH – VOLTAGE

S3 – SWITCH – AUTO REWIND

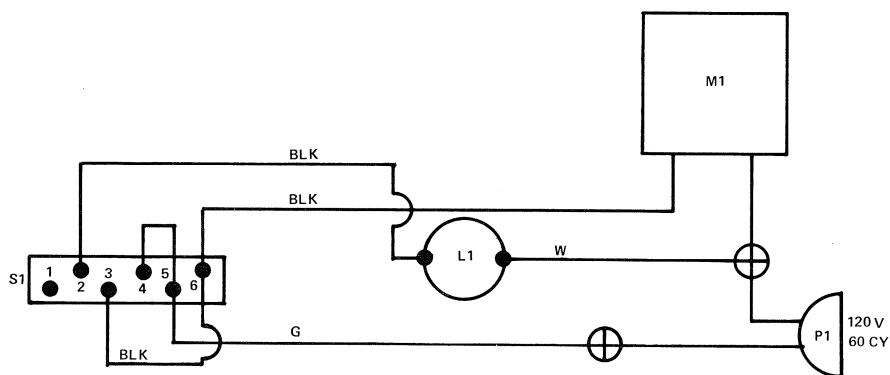
S4 – SOLENOID – AUTO REWIND

S5 – SOCKET – ROOM LIGHT

⊕ – WIRENUT

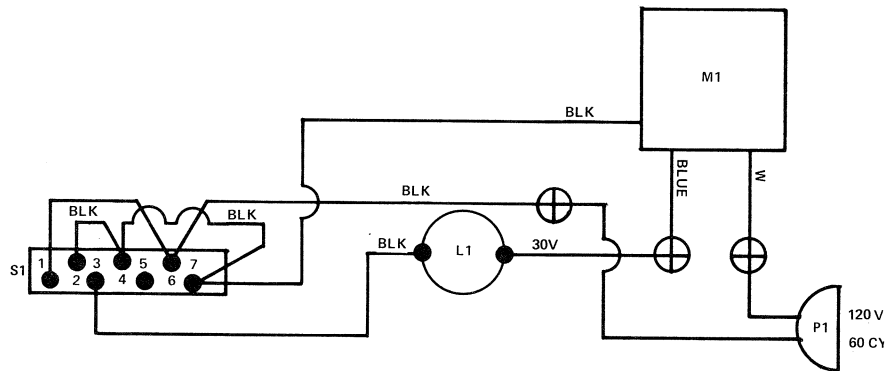
P-2.2

ANSCOVISION® 488
EMDEKO 7000
EMDEKO 9000
SEARS 9230
VICEROY® 800R
*VICEROY 800Z
WARDS 888
WARDS 899



*FOR EARLY MODEL ONLY. SEE P-2.4

P-2.3
CRESTLINE® 148
GAF® 1488



KEY:

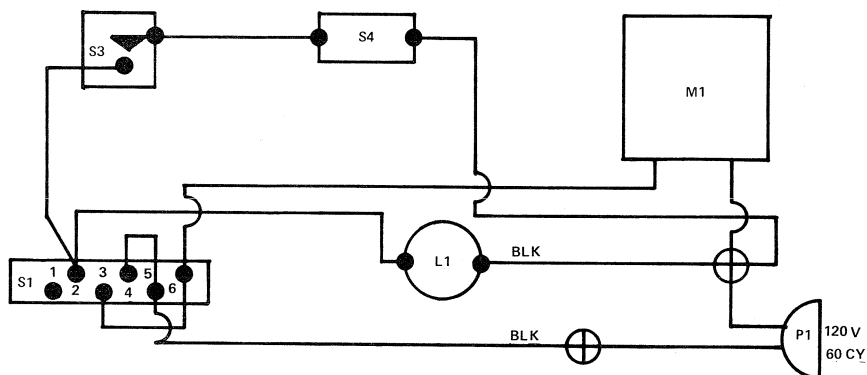
C1 – CORD REEL
L1 – LAMP – PROJECTION (TUNGSTEN)
L2 – LAMP – PROJECTION (QUARTZ)
M1 – MOTOR
P1 – POWER CORD

S1 – SWITCH – CONTROL
S2 – SWITCH – VOLTAGE
S3 – SWITCH – AUTO REWIND
S4 – SOLENOID – AUTO REWIND
S5 – SOCKET – ROOM LIGHT
⊕ – WIRENUT

P-2.4

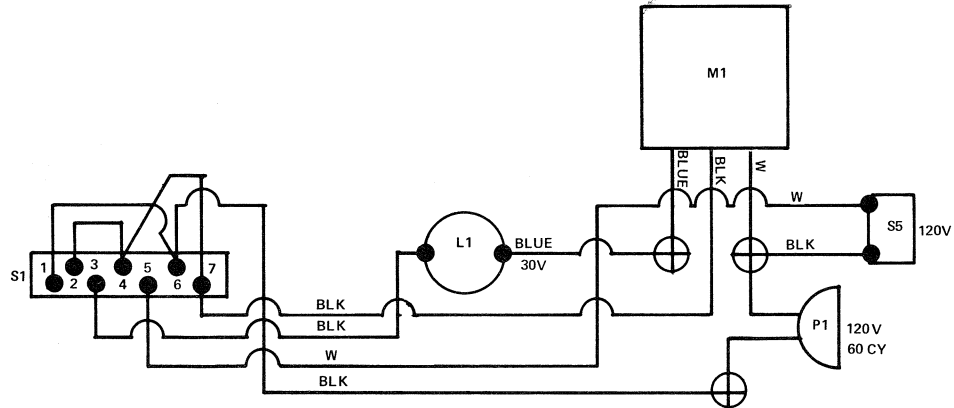
*VICEROY® 800Z

*THIS SYSTEM USED AFTER
CODE WEEK 343.



P-2.5

ANSCOVISION® 555
 ANSCOVISION 588
 ANSCOVISION 666
 ANSCOVISION 688



KEY:

C1 – CORD REEL

L1 – LAMP – PROJECTION (TUNGSTEN)

L2 – LAMP – PROJECTION (QUARTZ)

M1 – MOTOR

P1 – POWER CORD

S1 – SWITCH – CONTROL

S2 – SWITCH – VOLTAGE

S3 – SWITCH – AUTO REWIND

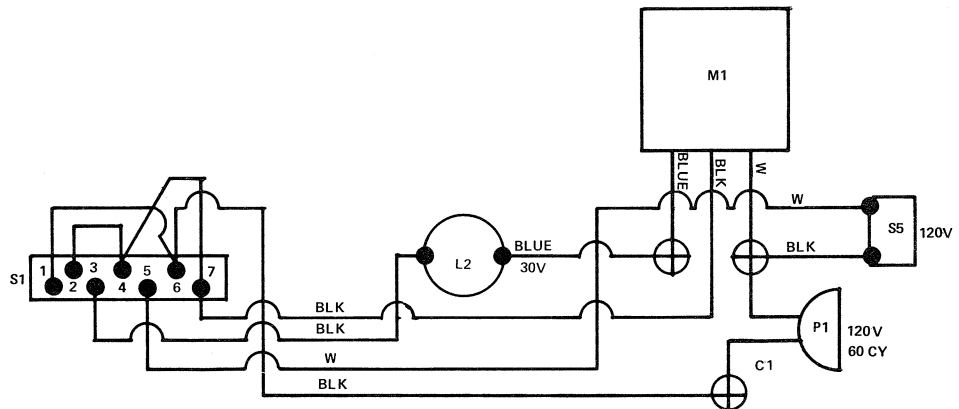
S4 – SOLENOID – AUTO REWIND

S5 – SOCKET – ROOM LIGHT

⊕ – WIRENUT

P-2.6

ANSCOVISION 788



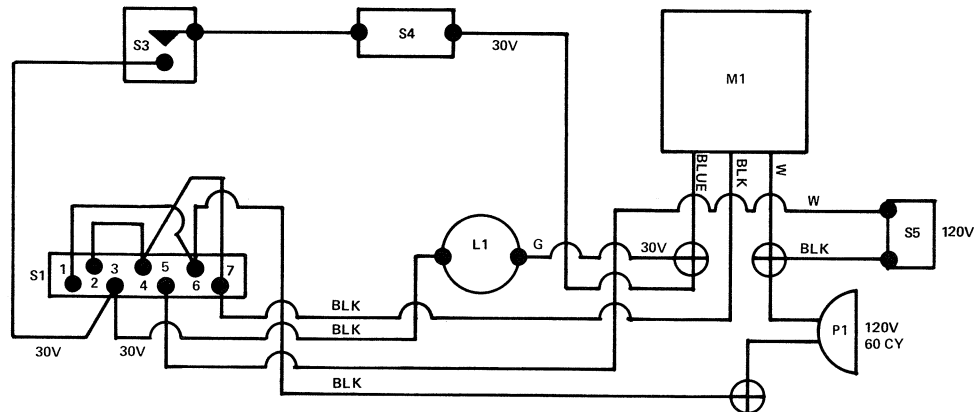
P-2.7

CRESTLINE® 168

GAF® 1588Z

GAF 1688Z

VICEROY® 813



KEY:

C1 – CORD REEL

L1 – LAMP – PROJECTION (TUNGSTEN)

L2 – LAMP – PROJECTION (QUARTZ)

M1 – MOTOR

P1 – POWER CORD

S1 – SWITCH – CONTROL

S2 – SWITCH – VOLTAGE

S3 – SWITCH – AUTO REWIND

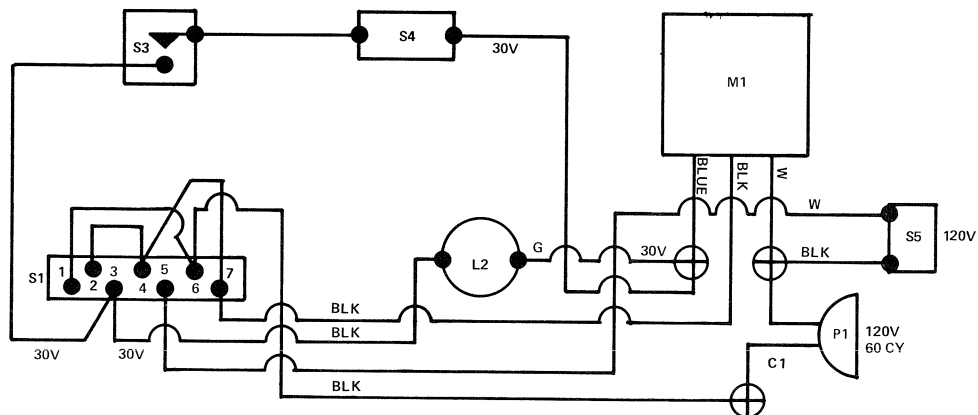
S4 – SOLENOID – AUTO REWIND

S5 – SOCKET – ROOM LIGHT

⊕ – WIRENUT

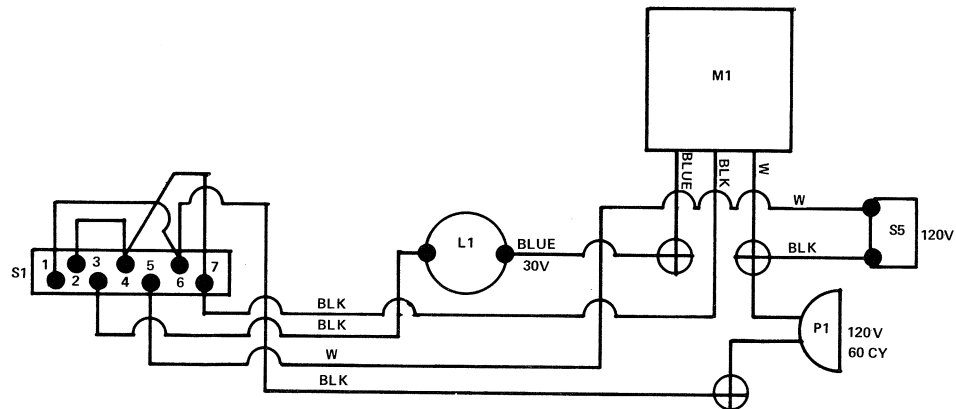
P-2.8

GAF® 1788Z



P-2.9

GAF® 1555DZ



KEY:

C1 – CORD REEL

L1 – LAMP – PROJECTION (TUNGSTEN)

L2 – LAMP – PROJECTION (QUARTZ)

M1 – MOTOR

P1 – POWER CORD

S1 – SWITCH – CONTROL

S2 – SWITCH – VOLTAGE

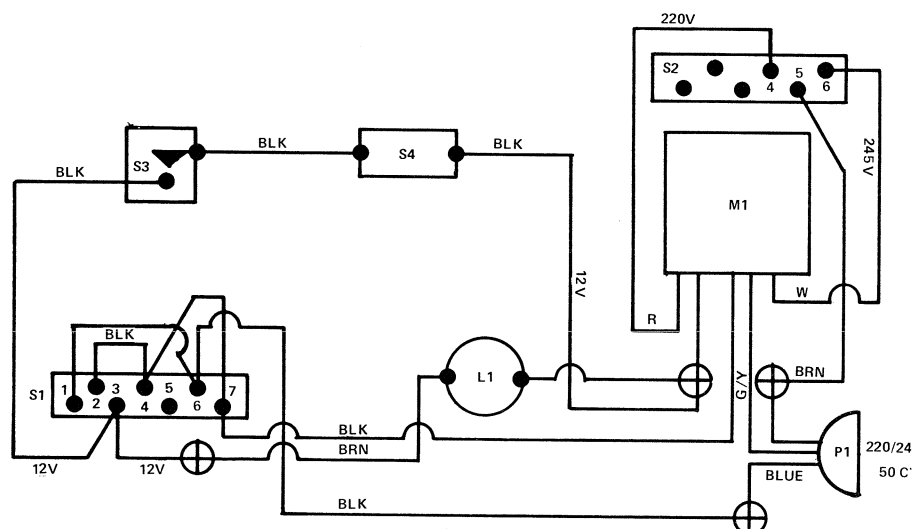
S3 – SWITCH – AUTO REWIND

S4 – SOLENOID – AUTO REWIND

S5 – SOCKET – ROOM LIGHT

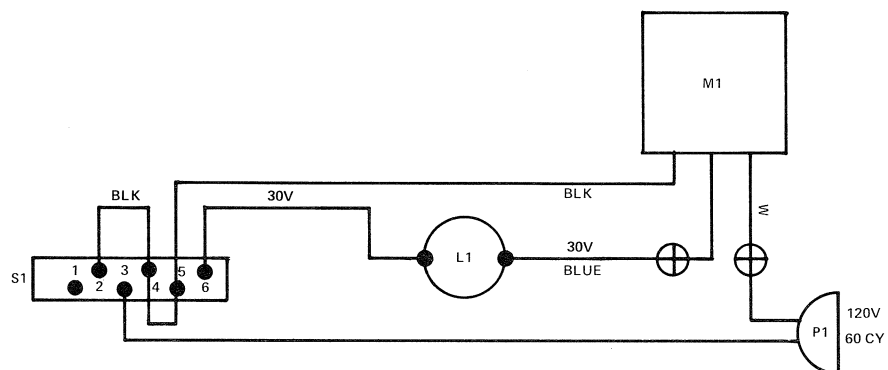
⊕ – WIRENUT

P-2.10

GAF® 1588Z (BELGIUM)
GAF 1688Z (BELGIUM)

P-2.11

GAF® 2488
SEARS 9232
WARDS 809
WARDS 810



KEY:

C1 – CORD REEL

L1 – LAMP – PROJECTION (TUNGSTEN)

L2 – LAMP – PROJECTION (QUARTZ)

M1 – MOTOR

P1 – POWER CORD

S1 – SWITCH – CONTROL

S2 – SWITCH – VOLTAGE

S3 – SWITCH – AUTO REWIND

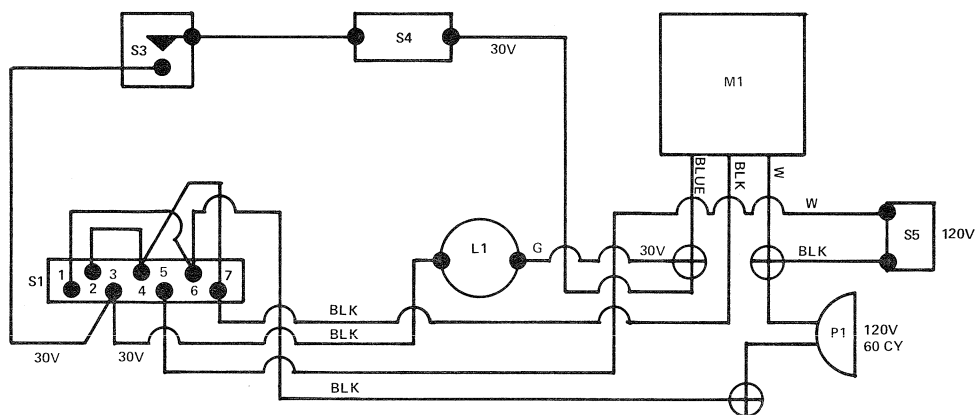
S4 – SOLENOID – AUTO REWIND

S5 – SOCKET – ROOM LIGHT

⊕ – WIRENUT

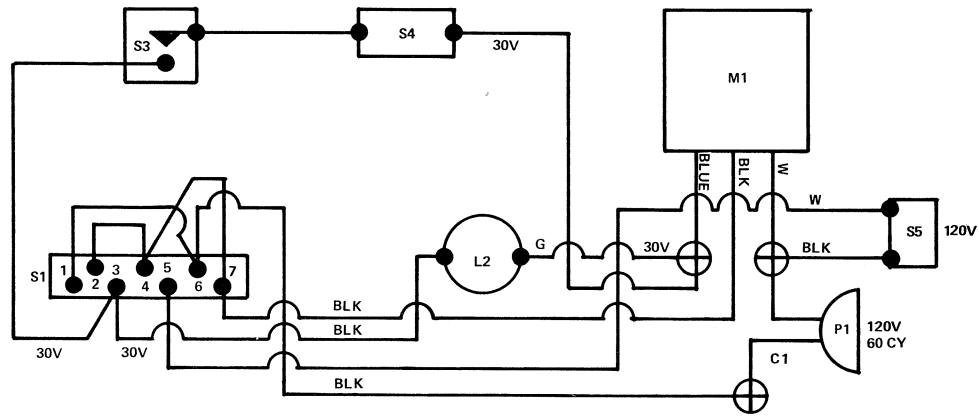
P-2.12

GAF 1564Z
GAF 2588Z
GAF 2688Z



P-2.13

GAF® 2788Z



KEY:

C1 – CORD REEL

L1 – LAMP – PROJECTION (TUNGSTEN)

L2 – LAMP – PROJECTION (QUARTZ)

M1 – MOTOR

P1 – POWER CORD

S1 – SWITCH – CONTROL

S2 – SWITCH – VOLTAGE

S3 – SWITCH – AUTO REWIND

S4 – SOLENOID – AUTO REWIND

S5 – SOCKET – ROOM LIGHT

⊕ – WIRENUT

- KEY:

C1 – CORD REEL

L1 – LAMP – PROJECTION (TUNGSTEN)

L2 – LAMP – PROJECTION (QUARTZ)

M1 – MOTOR

P1 – POWER CORD
- S1 – SWITCH – CONTROL

S2 – SWITCH – VOLTAGE

S3 – SWITCH – AUTO REWIND

S4 – SOLENOID – AUTO REWIND

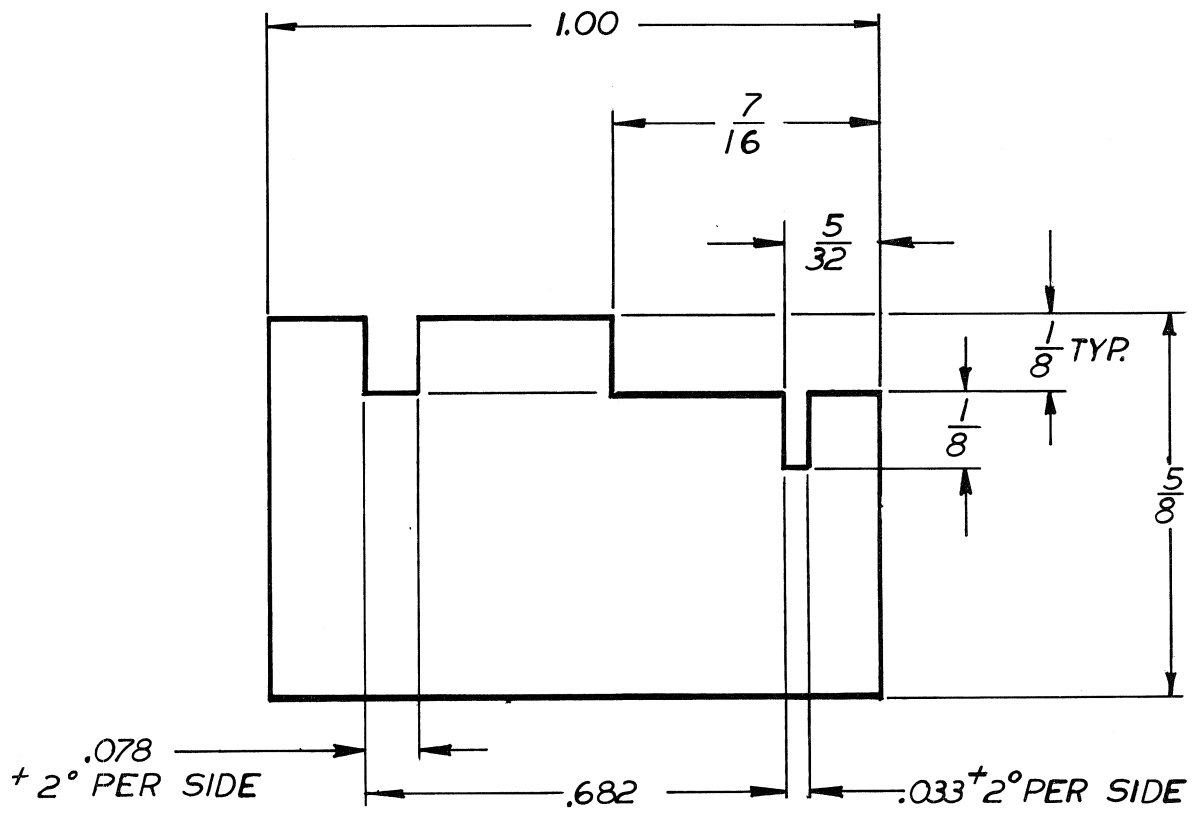
S5 – SOCKET – ROOM LIGHT

⊕ – WIRENUT

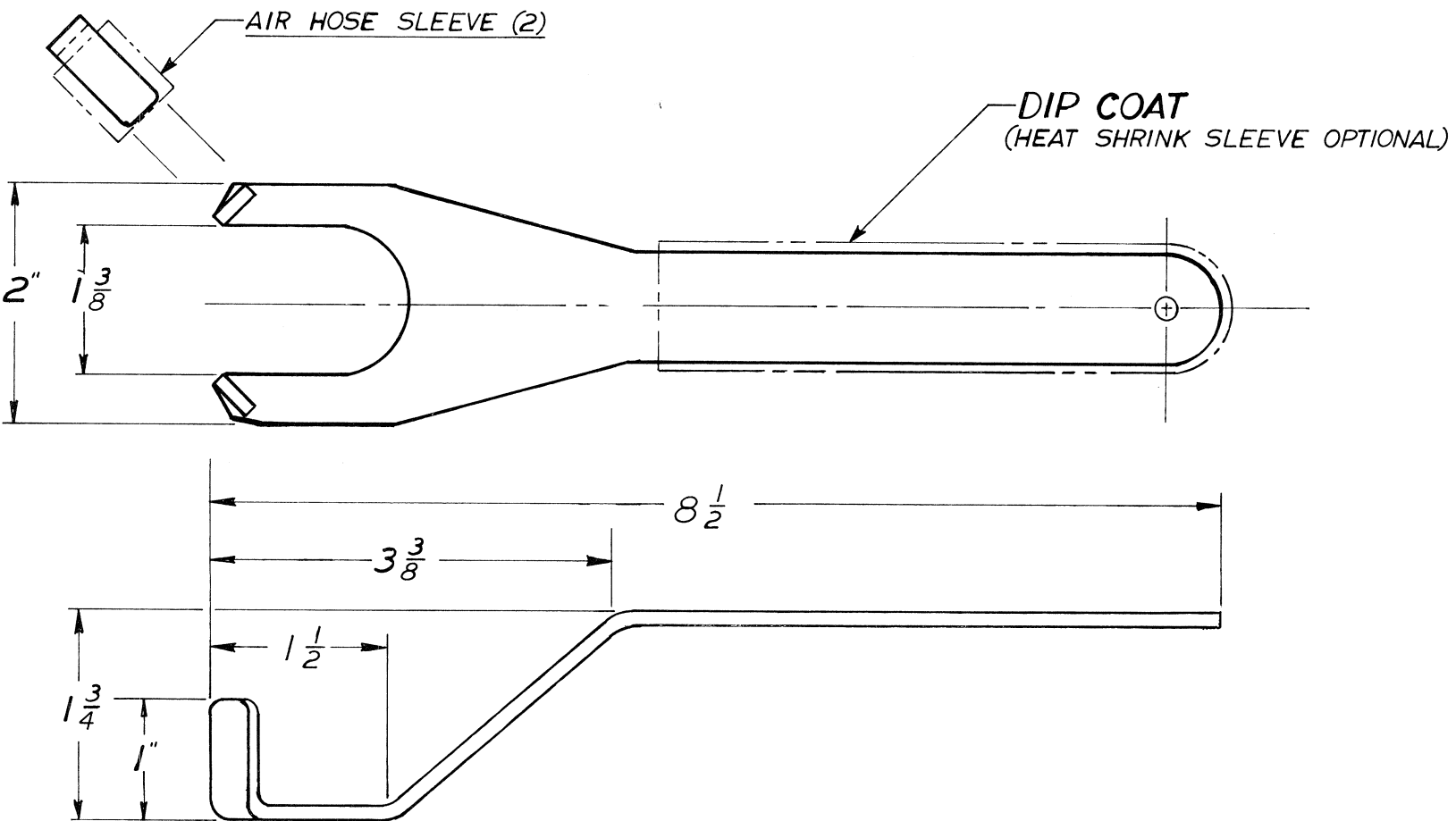
TOOLS	Q
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- Q-1 APERTURE PLATE ALIGNMENT
GAUGE 468-000-T1
- Q-2 LAMP REMOVAL TOOL 575-101-T1
- Q-3 SHUTTLE ADJUSTMENT PLIERS 468-101-T2
- Q-4 TIMING TOOL

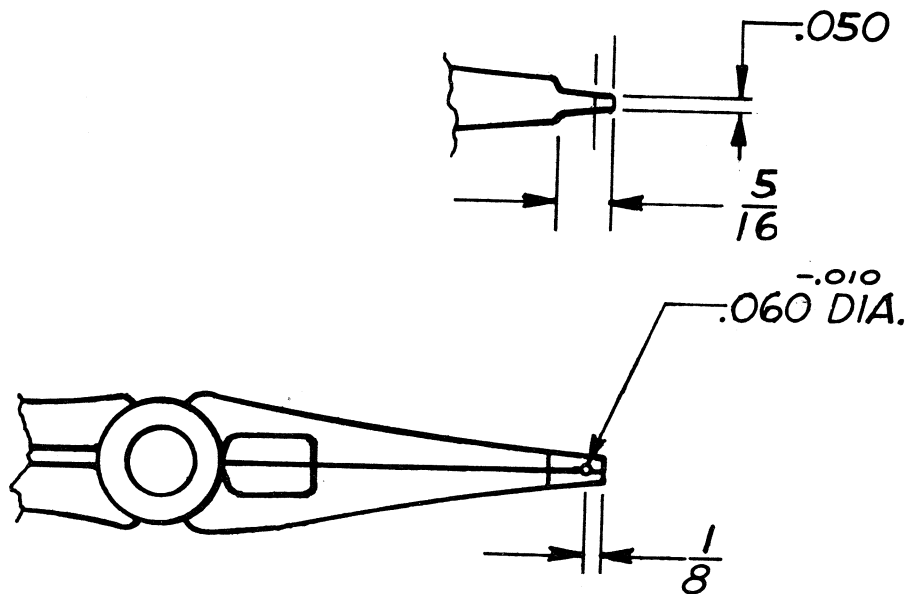
Q



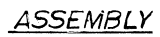
APERTURE PLATE ALIGNMENT
GAUGE 468-000-T1



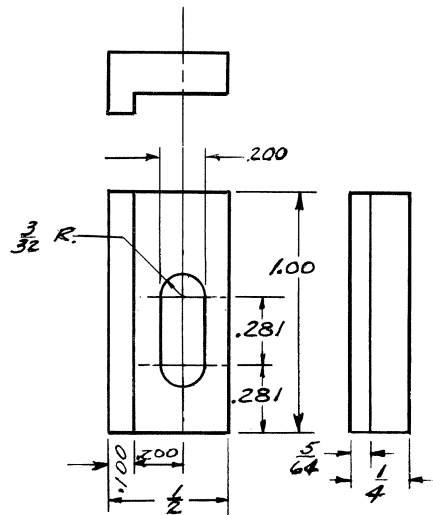
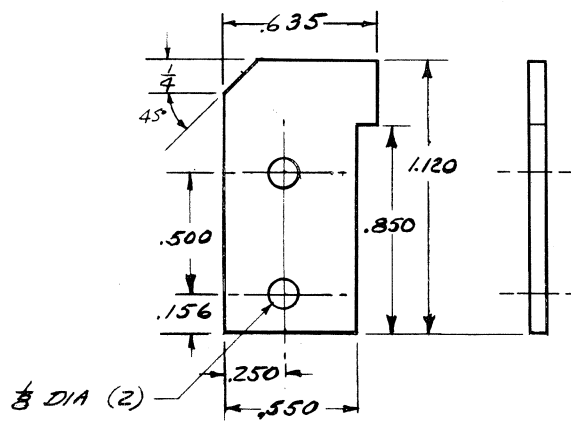
LAMP REMOVAL TOOL
575-101-T1



SHUTTLE ADJUSTMENT
PLIERS 468-101-T2



TIMING TOOL-ASSY GAGE
803-525-T1



LUBRICATION	R
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R-1 GENERAL INFORMATION

R

R-1 GENERAL INFORMATION

All 8mm projectors are lubricated at the factory and are manufactured with some oil-lite bushings which require no lubrication. It is considered that projectors are lubricated for the life of the projector. Projectors returned for service may be lubricated by using the following procedures if lubrication will facilitate repair.

1. Oil-lite bushings are impregnated with oil in the pores of the metal and **NO** additional oil is required. Examples of oil-lite bushings are: cam shaft, take-up spindle, motor and idler pulley bushings. Some bushings actually give off too much oil when running which may be visible inside movement housing or near idler pulley by oil spots which are thrown off. It is essential that these oil spots be removed and drive belts in the area be cleaned with a degreasing agent.

2. Use a light grease for lubrication if needed. Never use oil since it can be thrown onto drive belts by the moving parts.

3. Film carries a large amount of dust and foreign particles, much of which is displaced by a high volume of air that is moved by the fan and will build up on any greasy surface. Gear teeth must never be lubricated for this reason. Usually pulleys that rotate by pull from the film, such as Forward Take-up Spindle when projector is in Reverse, will spin free when dry without lubrication.

4. Gears and pulleys that are power driven should usually have a light coat of grease on their shafts when reassembling. Mechanical linkage which slides or rubs over another surface and is activated by a spring may also be lightly coated with grease.

5. Rubbing surfaces of control switch cam may be lubricated with a light coat of grease.

6. The following should **NOT** be lubricated:

- a. Aperture plate
- b. Pressure plate
- c. Film path buffers
- d. Solenoid or contacts
- e. Main control switch
- f. Driving surface of any pulley
- g. Gear teeth
- h. Film path buffers or rollers
- i. Flag
- j. Shutter
- k. Motor
- l. Oil-lite bushings



**8MM MOVIE
PROJECTORS**

Supplement No. 1

Date: 4/11/75

SUPPLEMENT TO SERVICE MANUAL NO. 803-950-1

ADDITION OF THERMAL FUSE

All 8MM projectors manufactured after December 1, 1974 have a 257° thermal fuse added to the motor assembly. All 8 MM motors, including service replacement motors, will include a thermal fuse. The thermal fuse cannot be serviced separately and motor replacement is ^{NOT} required if the fuse blows. Thermal fuse opens only after motor has been stalled with power on for approximately 15 minutes or if the projector has been operated for an extended period of time without a fan.

Fused motors can be used for service replacement of non-fused motors without interchangeability problems. Projectors manufactured prior to December 1974 do not require thermal fuses. Non-fused motors in stock should be used as replacements on units manufactured prior to December 1974 (Date code 565 or lower).

NOTE

The date code
is located under
the movement
housing cover.

This supplement should be placed at the beginning of Section 'M' in the 8 MM Movie Projector Service Manual, No. 803-950-01.