

L02035
per contract

Approved For Release 2003/01/28 : CIA-RDP78B04770A002000019011-8

ADVANCED 918 LIGHT TABLE-4 PROPOSAL EVALUATION WORKSHEET

02038
per contract

COMPANY	COST ESTIMATE		TIME ESTIMATE		RATING												TOTALS				+ SCORING TYPE	COMMENTS
	BASIC PROTOTYPE	@ PRODUCTION UNIT (In a lot of 50)	TO DELIVER PROTOTYPE	TO DELIVER 50 UNITS (After proto-type)	A	B	B	C	D	E	F	F	F		G	H						
					Sturdiness & Reliability	Simplicity	Maintainability	Human Engineering	Weight & Compactness	Illumination System	Drive System	Tilt System	Other Considerations	Total Design Points	Cost Points	Management Points	Total Points	Ranking				
STAT			6mo.	6 mo	+4	0	+1	+2	-5	0	+2	0	0	+4	-26	+1	-21	4				
			7mo.	?	+3	+1	+2	0	+1	0	+1	0	0	+8	+10	+2	+20	1				
			120 days	?	0	+2	0	+1	0	0	-1	0	-4	-2	+22	-3	+17	2	*Proprietary, no product competition allowed			
		2 weeks	3mo. +	+2	+1	0	-2	+2	0	-1	0	0	+2	+2 (-1)*	0	+4 (+1)*	3	*Alternative drive: looks more feasible than basic				

NOTES:

- A) rating is from -5 pts (poor) to +5 pts(excellent) with 0 as satisfactory, -10 pts if completely unacceptable
 B) rating is from -3 pts (poor) to +3 pts(excellent) with 0 as satisfactory, -5 pts if completely unacceptable
 C) rating is from -3 pts (poor) to +3 pts(excellent) with 0 as just meets gross, -5 pts is completely unacceptable
 D) rating is from -5 pts (poor) to +5 pts(excellent) with 0 as 70 lbs weight & just meeting size specs, -10 pts is completely unacceptable
 E) rating is from -3 pts (poor) to +3 pts(excellent) with 0 as just meets specs, -10 pts if completely unacceptable with no hope of being modified to meet specs
 F) rating is from -5 pts (poor) to +5 pts(excellent) with 0 as satisfactory or none considered.
 G) add estimated cost of prototype to estimated cost of 50 production units 300K (rating 0 pts) is an estimate of expected cost, 310K rates -1 pt, 290K rates +1 pt, etc.
 H) rating is from -3 pts (poor) to +3 pts(excellent), 0 pts is average

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ADVANCED 978 LIGHT TABLE PROPOSAL EVALUATION WORKSHEET

STAT

COMPANY	COST ESTIMATE		TIME ESTIMATE		RATING										TOTALS			SCORING TYPE	COMMENTS
	BASIC PROTOTYPE	# PRODUCTION UNIT (in a lot of 50)	TO DELIVER PROTOTYPE	TO DELIVER 50 UNITS (After prototype)	A	B	B	C	D	E	F	F	F		G	H			
					Sturdiness & Reliability	Simplicity	Maintainability	Human Engineering	Weight & Compactness	Illumination System	Drive System	Tilt System	Other Considerations	Total Design Points	Cost Points	Management Points	Total Points	Ranking	
					+2	0	0	0	-2	+1	0	-1	0	0	-2	+1	-25	4	Fig. 4-2: Film Travel backwards
					+1	-1	0	+1	0	0	+1	+1	-1	+2	+10	+1	+13	2	Looks expensive
					0	+1	0	0	-1	0	-2	+1	0	-1	+22	-2	+19	1	Poor proposal
			22 wks		0	-1	0	-1	+2	0	0	+1	0	+1	+2	0	+3	3	Fig. 1: Handcranks? Spec. release knob in rear?

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ADVANCED 518 LIGHT TABLE - 1160 USAF EVALUATION WORKSHEET

COMPANY STAT	COST ESTIMATE		TIME ESTIMATE		RATING														← SCORING TYPE	COMMENTS
	BASIC PROTOTYPE	@ PRODUCTION UNIT (In a lot of 50)	TO DELIVER PROTOTYPE	TO DELIVER 50 UNITS (After prototype)	DESIGN										TOTALS					
					A Sturdiness & Reliability	B Simplicity	B Maintainability	C Human Engineering	D Weight & Compactness	E Illumination System	F Drive System	F Tilt System	F Other Considerations	Total Design Points	G Cost Points	H Management Points	Total Points	Ranking		
					+1	0	+1	+1	-3	-1	0	0	+1	0	-26	+2	-24	4		
					+1	0	0	0	0	0	+1	-1	-1	0	+10	0	+10	2		
					-2	+2	+1	-1	-1	-2	+1	-1	-1	-7	+22	-2	+13	1	rejected, do not believe price realistic	
					0	0	0	+1	+3	0	+1	0	+1	+6	+2	+1	9	3		

NOTES:

- rating is from -5 pts (poor) to +5 pts(excellent) with 0 as satisfactory, -10 pts if completely unacceptable
- rating is from -3 pts (poor) to +3 pts(excellent) with 0 as satisfactory, -5 pts if completely unacceptable
- rating is from -3 pts (poor) to +3 pts(excellent) with 0 as just meets gross, -5 pts is completely unacceptable
- rating is from -5 pts (poor) to +5 pts(excellent) with 0 as 70 lbs weight & just meeting size specs, -10 pts is completely unacceptable
- rating is from -3 pts (poor) to +3 pts(excellent) with 0 as just meets specs, -10 pts if completely unacceptable with no hope of being modified to meet specs
- rating is from -5 pts (poor) to +5 pts(excellent) with 0 as satisfactory or none considered.
- add estimated cost of prototype to estimated cost of 50 production units 300K (rating 0 pts) is our estimate of expected cost, 310K rates -1 pt, 290K rates +1 pr, etc.
- rating is from -3 pts (poor) to +3 pts(excellent), 0 pts is average

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ANNOUNCED For Release 2003/01/28 CIA-RDP78B014700020009100111-8																					
COST ESTIMATE		TIME ESTIMATE		RATING												TOTALS				+ SCORING TYPE	COMMENTS
				A	B	B	C	D	E	E	F	F	F	G	H						
COMPANY STAT	BASIC PROTOTYPE	# PRODUCTION UNIT (In a lot of 50)	TO DELIVER PROTOTYPE	TO DELIVER 50 UNITS (After pro- totype)	Sturdiness & Reliability	Simplicity	Maintainability	Human Engineering	Weight & Compactness	Illumination System	Drive System	Tilt System	Other Considerations	Total Design Points	Cost Points	Management Points	Total Points	Ranking			
					2	2	2	2	-2	2	1	0	0	9	-26	1	-16	4			
					2	1	1	2	1	1	1	1	0	11	+12	1	+23				
					2	2	1	2	1	1	1	1	0	11	+10	1	+22	1			
						2	1	1	0	-1	0	-1	-3	0	-1	+22	-1	+20			
						2	1	2	0	0	0	-1	-3	0	1	+22	-1	+22	2		
						2	2	2	2	2	1	2	-3	0	10	+2	0	12	3		

NOTES:

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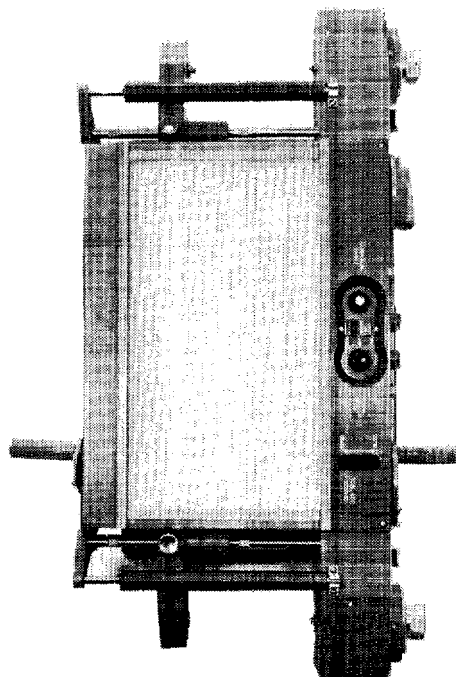
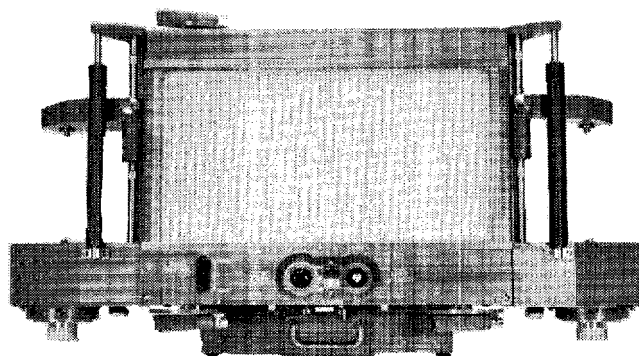
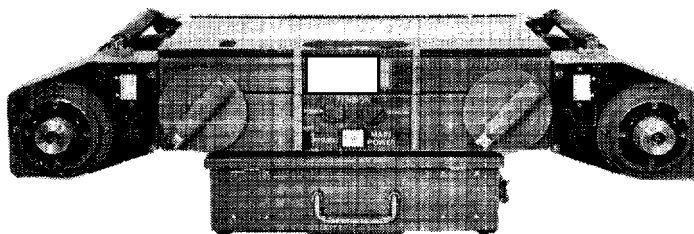
M-105-69
MAINTENANCE MANUAL
ADVANCED LIGHT TABLE PROTOTYPE
SERIAL NO. 100

April 1969



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Frontispiece

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INTRODUCTION

This publication is the basic maintenance manual for the [REDACTED]

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STAT [REDACTED] Advanced Light Table Prototype. This manual in conjunction with the operation manual (M-104-69) provides the necessary information for preparation, operation, and maintenance of the film viewing table.

The maintenance manual is written for use by personnel who are qualified technicians in the fields of mechanics and electronics.

The purpose of this manual is to provide the necessary instructions to properly perform routine preventative maintenance and to be able to quickly locate and repair or replace defective components.

SECTION 1

GENERAL MAINTENANCE

1.1 CLEANING

Exterior surfaces of the viewing table are in most cases, enamel or lacquer painted aluminum with stainless steel and anodized aluminum fittings. Clean with a damp cloth and if necessary, a mild detergent. The glass viewing surface and film rollers should be cleaned with warm water and a mild detergent daily or more often if required.

The film carriage support rods (Figure 2-1 (13)) should be kept free of dust and dirt to insure smooth operation of the film carriage.

All screened and slotted vent holes in the viewing assembly and base assembly must be kept free of any dust or lint to allow adequate cooling of electrical components.

The inlet filter screen to the cooling air blower (Figure 2-2 (1)) located on the lower surface of the viewing assembly should be visually inspected daily depending on operational environment. Check for any obstruction that might decrease the air flow. The screen may be cleaned by manually brushing off any foreign matter.

1.2 LUBRICATION

1.2.1 Upper Light Box Assembly (Figure 2-1 (22))

The shade assembly mechanism contains teflon bushing bearings and requires no lubrication.

1.2.2 Lower Light Box Assembly (Figure 2-4)

1) Manual film transport drive chain. At approximately 6 month intervals the chain mechanism should be lubricated with a good grade of light machine oil. Lubricate all chain roller and sprocket bearings. Roller chain should not be dry but should be lubricated very sparingly. All handwheel shafts have grease packed ball type bearings.

1.2.3 Motor Drive Housings (Figure 2-3 (6 & 9))

At approximately 6 month intervals lubricate the gear and sprocket jack shaft bearings, clutch rotor bearing, clutch armature bearing and the tach-generator bracket bearings. These bearings are all oil impregnated bushing type and require very little lubrication. The motor and clutch shaft support bearings are grease packed and require no lubrication. The tracking adjustment knob and mechanism will only require lubrication if it becomes hard to turn. Use Jet-Lube AP1 or MIL-G-3278 grease or equivalent.

1.2.4 Base Box Assembly (Figure 2-6)

The worm and worm gear on the tilt drive mechanism should be lubricated at 6 month intervals or oftener, depending on amount of use. Use Jet-Lube AP1 or MIL-G-3278 grease or equivalent. Apply a light machine oil to the worm thrust bearings, shaft support bearing and tilt plate hinge pins.

SECTION 2

FUNCTIONAL DESCRIPTION

2.1 GENERAL

The Advanced Light Table is a stable portable film viewing platform for photo interpretation operations. The viewing table will transport 500 ft spools of film in various widths of 9-1/2 inches through 70mm, both manually and by motor drive. The film may be transported at slewing speed for rapid rewind or at slow scanning speeds for photo interpretation. The viewing assembly may be tilted electrically from horizontal through 75° and rotated manually CCW through 90° for short axis viewing. The table consists of three basic sections (Figure 2-1): Upper light box assembly, lower light box assembly and the base box assembly.

2.2 UPPER LIGHT BOX ASSEMBLY

The upper light box assembly consists of the cold cathode lamp grid with reflector, diffuser and viewing glass, the shade assembly with it's operating mechanism and the upper control panel. Access to the bottom of the upper light box which is hinged to the lower light box can be obtained by the loosening of two hold down screws in the front corners of the upper control panel (Figure 2-1 (30)). For removal of the upper light box assembly see paragraph 6.1.

1) Lamp Grid Assembly. The lamp grid (L1) and reflector will be treated as one assembly for removal, replacement and maintenance. For removal of this assembly see paragraph 6.4.

2) Shade Assembly. The shade assembly is a manually operated mechanism consisting of a roller with shade, bead chain and sprocket drive and operating control wheel. The operating control wheel (Figure 2-1 (29)) is on the left of the upper control panel. The lamp grid assembly will have to be removed for access to the shade mechanism.

3) Upper Control Panel. The upper control panel consists of the light intensity control (potentiometer R6 Figure 2-3 (3)), film tension control (switch S2 Figure 2-3 (2)) and the film direction/speed control (potentiometers R3, R4 and R5 Figure 2-3 (1)). The electrical components are easily removed and replaced.

2.3 LOWER LIGHT BOX ASSEMBLY

The lower light box assembly supports through a hinge and two attachment screws, the upper light box assembly. The lower light box assembly consists of electrical components, manual handwheel drive mechanism and reversing switch, film spool motor drive housings, film spool support carriages and rods, film rollers, front control panel, and rotary joint with interconnecting rings.

2.3.1 Electrical Components (Refer to Wiring Diagram Figure 5-1)

1) Circuit Boards. There are 3 circuit boards as follows: Viewing light dimming (Figure 2-4 (10)), film transport logic and control (Figure 2-4 (17)) and film spool drive motor (Figure 2-4 (16)). These circuit boards will be removed and replaced for field maintenance (see paragraph 6.11). The basic function is described by their title.

2) Motor Capacitors C1, C2, C3, C4 (see Figure 2-5 (2)). Remove and replace for field maintenance.

3) Cooling Air Blower B4 (Figure 2-4 (8)). The cooling air blower pulls air in through the filter in the bottom of the lower light box and forces it into the slots in the light grid reflector and subsequently out through slots in the sides of the upper light box.

4) Manual Transport Reversing Switch S6 (Figure 2-4 (19)). This reversing switch senses the direction of rotation of the handwheels through a shaft mounted slip clutch (Figure 2-4 (20)) and imparts this information to the logic and control circuit board.

5) Terminal Blocks (Figure 2-4). The terminal blocks designated TB-2, -3, -4, -5 and -6 are designated and located in the lower light box assembly. For function see Wiring Diagram (Figure 5-1).

6) For other miscellaneous electrical components and their description see Wiring Diagram (Figure 5-1).

2.3.2 Manual Handwheel Film Drive Mechanism (Figure 2-5)

The manual handwheel film drive mechanism consists of 2 mechanical circuits driven by chain and connected through electrical clutches. The 3 handwheels are all connected by chain through a series of sprockets, idlers and shafts to form the first circuit. When any handwheel is rotated CW or CCW the other handwheels follow and also operate the manual transport reversing switch (paragraph 2.3.1 (4)) the second circuit connects both LH and RH film drive motor housings (Figure 2-5) through a series of sprockets and idlers. This circuit is driven by the first circuit through two electrically actuated clutches CL3 (LH) and CL4 (RH). These clutches are only used during manual transport operation and when de-energized disconnect the handwheel circuit.

2.3.3 Film Spool Drive Motor Housings (Figure 2-3 (6)). The film spool drive motor housing assemblies LH and RH are identical in operation and configuration. The drive assembly consists of a sprocket and gear jack shaft assembly, direct drive DC torque motor, electrically actuated clutch, motor armature and clutch supporting shaft with bearings, film spool drive spindle, tach-generator with belt drive system, film loading control and tracking mechanism.

1) Sprocket and Gear Shaft Assembly. The sprocket is part of the second circuit in paragraph 2.3.2 and connects this circuit to the armature and clutch shaft through a spur gear set and electrical clutches (CL1 and CL2). The mating spur gear is part of the clutch armature and only rotates when the clutch is energized during manual transport operation.

2) Direct Drive DC Torque Motor. The torque motor consists of 3 parts: super-saturated permanent magnet field assembly, armature assembly and brush rigging. The field assembly with brush rigging is fixed to the drive housing. The armature assembly is part of the armature and clutch support shaft. The motor supplies torque through the film spool drive spindle either for hold back tension or film spool drive.

3) Electrically Actuated Clutch. The clutch is energized during the manual transport operation and connects the clutch armature (with spur gear) through the clutch rotor to the support shaft and film spool drive spindle. The clutch is de-energized during the power mode of film transport operation. The tach-generator first stage drive pulley is assembled to the clutch rotor.

4) Motor armature and clutch supporting shaft with bearings. The shaft assembly supports the motor armature and electrical clutch. The shaft rotates during manual and power drive transport operation.

5) Film Spool Drive Spindle. This spindle is inside the support shaft and is rotated by it through drive pins. The spindle is moved axially for film tracking by rotation of the tracking knob.

6) Tach-generator. The tach-generator is mounted to the drive housing and is driven through a 2 stage pulley and belt system connected to the clutch rotor. The tach-generator supplies a feedback signal to the control and logic circuit board, which is relative to the film drive motor speed.

7) Film Loading Control S4 and S5 (Figure 2-1 (19)). The film loading control is a manually operated 2 position electrical switch. This switch selects through the logic and motor control circuits the film loading sequence desired or more specifically the rotation of the film drive spindle. During the "power" mode for film transport the switch obtains desired film loading by electrically reversing the motor direction. During the "manual" or "off" mode for manual operation of the film transport the switch obtains the desired film loading by selecting the electrical circuit which will energize the correct sequence of electrical clutches.

8) Tracking Mechanism. The tracking knob by rotation will move the film spool drive spindle and consequently the film spool at right angles to the film direction for correction of any misalignment. A pin moving circumferentially when the knob is rotated travels in a spiral groove in a bushing that will only move axially. As the knob is rotated and the bushing moves axially it in turn, displaces the drive spindle.

2.3.4 Film Spool Support Carriage (Figure 2-1 (1))

The film spool support carriage is movable along guide rods to adjust to and support various widths of 500 ft film spools. It has a free rotating spindle to mate with the film spool. A spring loaded detent locks the carriage in position by engaging notches in the rods. The carriage is spring loaded toward the motor drive housing with a "negator" type spring motor contained in the carriage housing.

2.3.5 Film Rollers (Figure 2-1 (2))

The film rollers consist of a hard anodized aluminum tube supported by teflon impregnated plastic bearings and running on a corrosion resistant steel shaft. The rollers are easily removed or installed by lifting out or inserting into the roller shaft supports. The rollers are aligned by adjusting the roller shaft support on the motor drive housing.

2.3.6 Front Control Panel (Figures 2-1 and 2-5)

The front control panel contains the following controls: power tension adjustment control, manual tension adjustment control, main power switch and the rotational lock lever.

- 1) Power Tension Adjustment Control (R1). Rotation of this potentiometer controls film tension in the "power" mode by applying reverse motor torque to the film spool drive opposite to the spool being driven.

- 2) Manual Tension Adjustment Control (R2). Rotation of this potentiometer controls film tension in the "manual" mode by applying reverse motor torque to the film spool drive opposite to the spool being driven.

3) Main Power Switch S1 (Figure 2-1 (24) and 2-5 (6)). The main power switch is a push "On", push "Off" type switch to connect line power to the light table circuits.

4) Rotational Lock Lever (Figure 2-1 (26)). The rotational lock lever is a manually operated lever that detents the viewing assembly with the base tilt plate in the two table positions of rotation (long axis and short axis). "Unlock" for rotation by lifting up and "lock" by pushing down.

2.3.7 Rotary Joint and Interconnecting Rings (Figures 2-2 (6) and 2-5 (9))

The viewing assembly is connected to the base box assembly by a rotary joint and interconnecting rings. The joint and rings tie the bottom of the lower light box assembly to the tilt plate on the base box assembly. The rotary joint bushing passes through the lower viewing box, Delrin spacer washers, the tilt plate and is secured by the bushing nut. The rotational friction can be set by the adjustment of this nut. The nut is locked by a nylon set screw. A bracket attached to the tilt plate and inserted into the bushing prevents rotation of the bushing. Electrical wiring from the base assembly to the viewing assembly passes through this protective bushing. The rings are interlocked to each other and provide stability with the base during rotation and tilting operations.

2.4 BASE BOX ASSEMBLY (FIGURE 2-5)

The base box assembly is made up of the following: tilt plate with hinges, tilt drive mechanism and electrical components.

2.4.1 Tilt Plate With Hinges

The tilt plate supports the viewing assembly and is hinged to the base box. The tilt plate is driven electrically through the hinge assembly, by the tilt drive mechanism.

2.4.2 Tilt Drive Mechanism

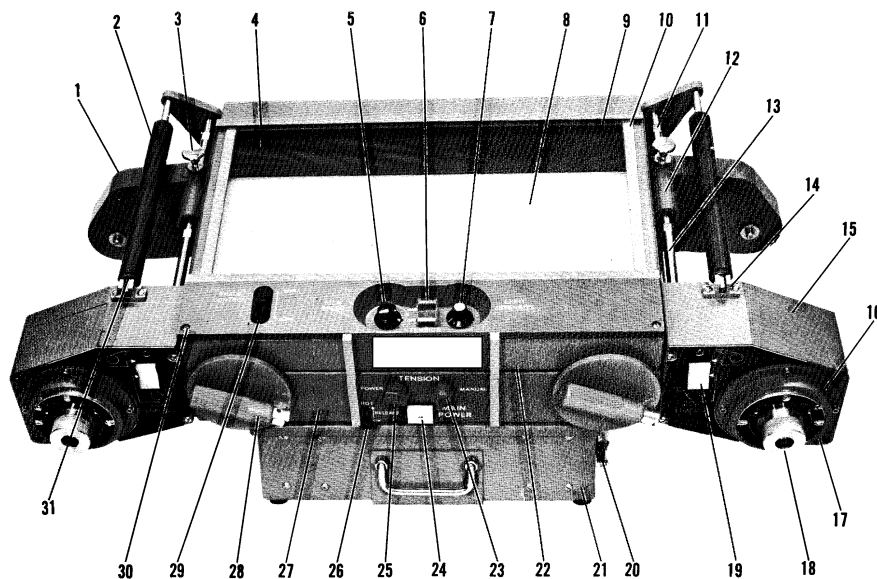
The electrically driven tilt mechanism consists of an electric motor with gear box, slip clutch, worms, worm gears, pulleys and timing belts. The electric motor is energized by an electrical switch on the right side of the base at the front (Figure 2-6 (20)). The motor-gear box drives the worm and worm gear through a slip clutch. The slip clutch will slip when the viewing assembly reaches its tilting or horizontal limit. Mechanical stops on the hinge assembly limit the light viewing assembly travel to 75° of tilt.

2.4.3 Electrical Components (Figure 2-5)

The electrical components in the base assembly are: power cord receptacle (P2), 15 amp fuse and fuse holder (FS1), power transformer (T1), lamp grid transformers (T2, T3, T4), tilt switch (S3), terminal blocks (TB1 and TB-8), tilt drive motor with gear box (B3) and miscellaneous components as shown in wiring diagram.

2.5 TECHNICAL AND DESIGN CHARACTERISTICS

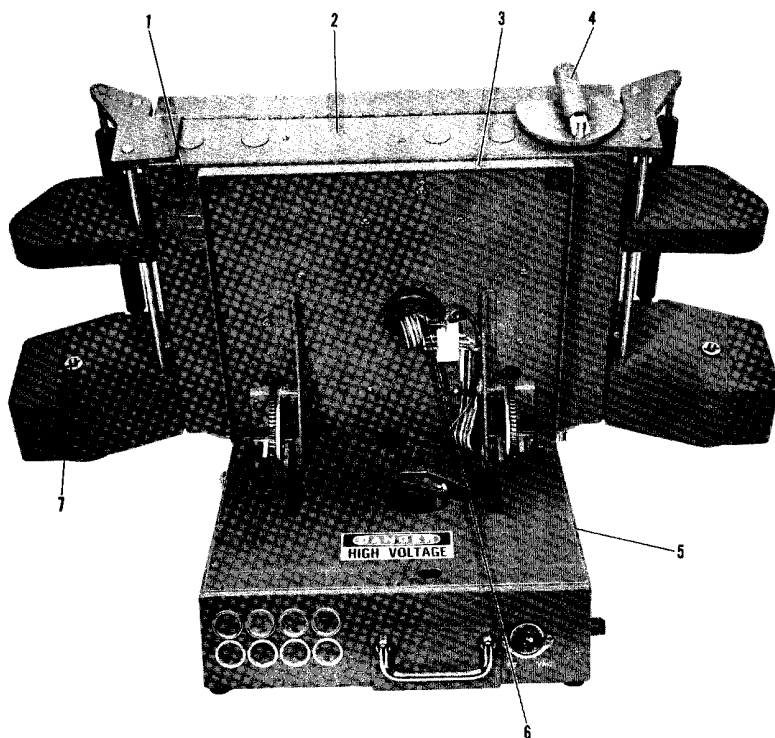
Electrical Power Required	117 VAC (+10V, -15V), 60 cycle, 1 phase
Circuit Protection	15 amp fuse
Film Capacity	500 ft spools in widths of 9-1/2 inch., 6.6 inch., 5.5 inch. and 70mm
Film Speed/Direction	0-250 ft/min in either direction
Viewing Assembly Tilt Angle	75° from horizontal
Viewing Assembly Rotation	90° CCW
Viewing Lamp Intensity	2300 to 10 ft-lamberts, 10% light uniformity
Weight	120 lbs approximately
Maximum Desired Ambient Temperature	80°F



KEY TO FIGURE 2-1

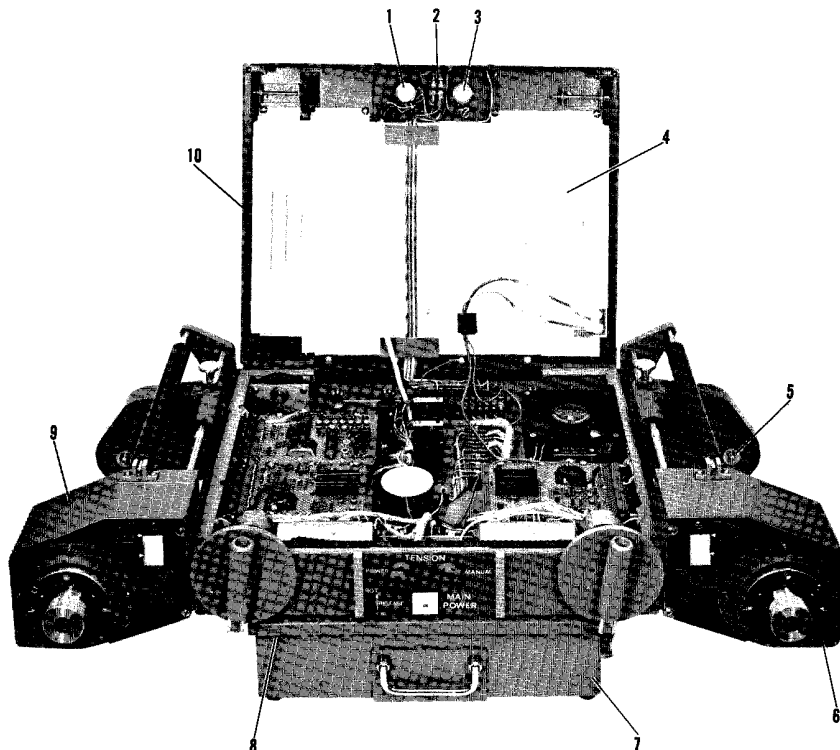
1. Movable Film Carriage
2. Film Roller
3. Carriage Lock Dent
Knob
Spring
Bearing
4. Shade Assembly
5. Film Direction/Speed Control (R3, R4, R5)
6. Film Tension Control (S2)
7. Light Intensity Control (R6)
8. Viewing Glass
9. Viewing Glass Cushion (Side)
10. Viewing Glass Cushion (End)
11. Fixed Rod Support
12. Movable Carriage Ball Bushing Bearing
13. Movable Carriage Support Rods
14. Roller Support Bracket
15. Film Drive Motor Housing
16. Tracking Knob Housing
17. Motor Housing Cover
18. Tracking Adjustment Knob
19. Film Loading Control (S4 & S5)
20. Tilt Control (S3)
21. Base Box Assembly
22. Upper Light Box Assembly
23. Manual Mode Tension Adjustment (R2)
24. Main Power Switch (S1)
25. Power Mode Tension Adjustment (R1)
26. Rotation Lock Lever
27. Lower Light Box Assembly
28. Manual Film Transport Handwheel
29. Shade Control Wheel
30. Upper Light Box Holddown screw
31. Film Roller Bearing

Figure 2-1. Advance Light Table, Components & Controls



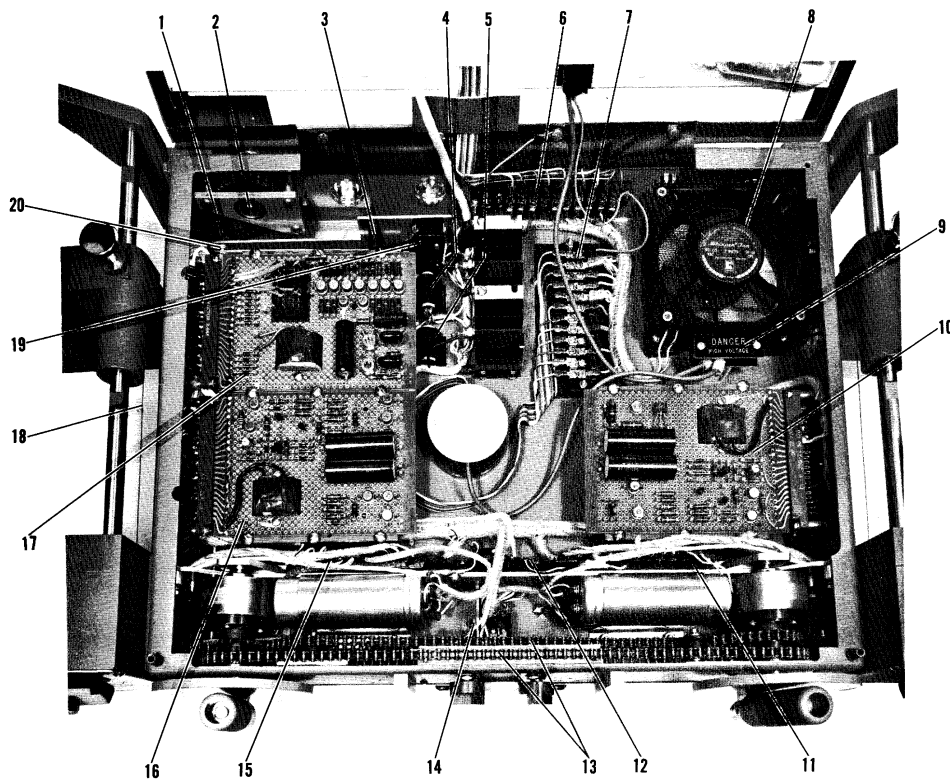
KEY TO FIGURE 2-1

1. Cooling Air Filter
2. Film Viewing Assembly
3. Tilt Plate Assembly
4. Manual Film Transport Handwheel
5. Base Box Assembly
6. Rotary Joint
7. Film Spool Drive Spindle



KEY TO FIGURE 2-3

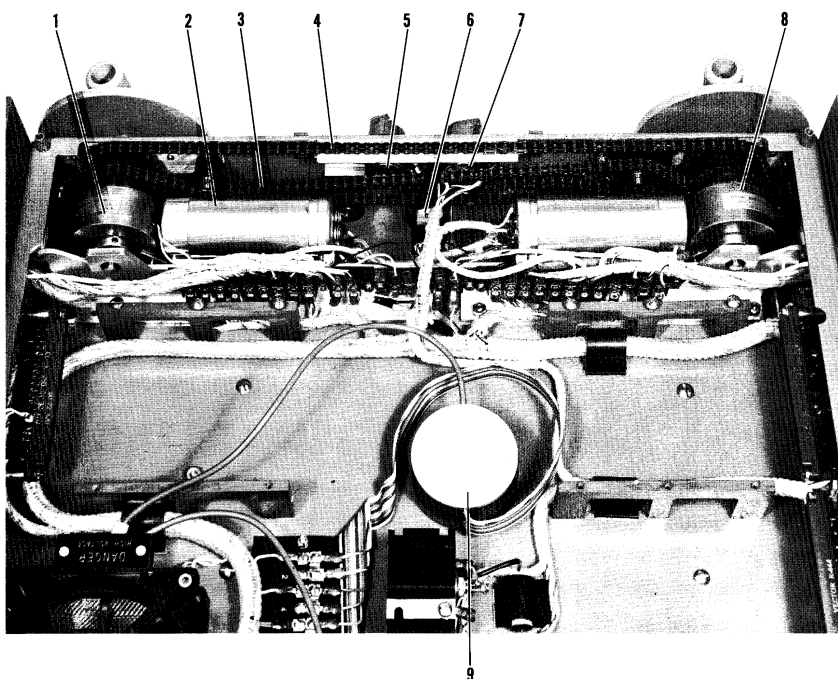
1. Film Direction/Speed Control Potentiometers (R3, R4, R5)
2. Film Tension Control Switch (S2)
3. Light Intensity Control Potentiometer (R6)
4. Light Grid & Reflector Assembly
5. SR6-PPD Bearing
6. R.H. Film Motor Housing
Torque Motor (B2)
Tach/Gen Assy (TG2)
6102 PP Bearing
SR6-PPD Bearing
568-028 Belt
568-041 Belt
Electrical Clutch (CL2)
Armature Assy
Rotor Assy
Coil Housing
SSR-PD Bearing
5100-37 Retaining Ring
7. Base Box Assembly
8. Tilt Hinge Pin & Retaining Rings
9. L.H. Film Motor Drive Housing
10. Upper Light Box Assembly (open position)



KEY TO FIGURE 2-4

1. SFR188PPEE Bearing
2. SFR6PPD Bearing
3. Bumper Tubing
4. Capacitor (C7)
5. Capacitor (C8)
6. Terminal Block (TB-3)
7. Terminal Block (TB-2)
8. Cooling Air Blower (B4)
9. Terminal Block (TB-7)
10. Light Dimming Control Circuit Board
11. Terminal Block (TB-5)
12. Terminal Block (TB-6)
13. Manual Film Transport Drive Chains
14. Rotation Lock Plunger
15. Terminal Block (TB-4)
16. Dual Motor Control Circuit Board
17. Logic & Control Circuit Board
18. Negator Spring Cable
19. Manual Transport Reversing Switch (S6)
20. Reversing Switch Slip Clutch

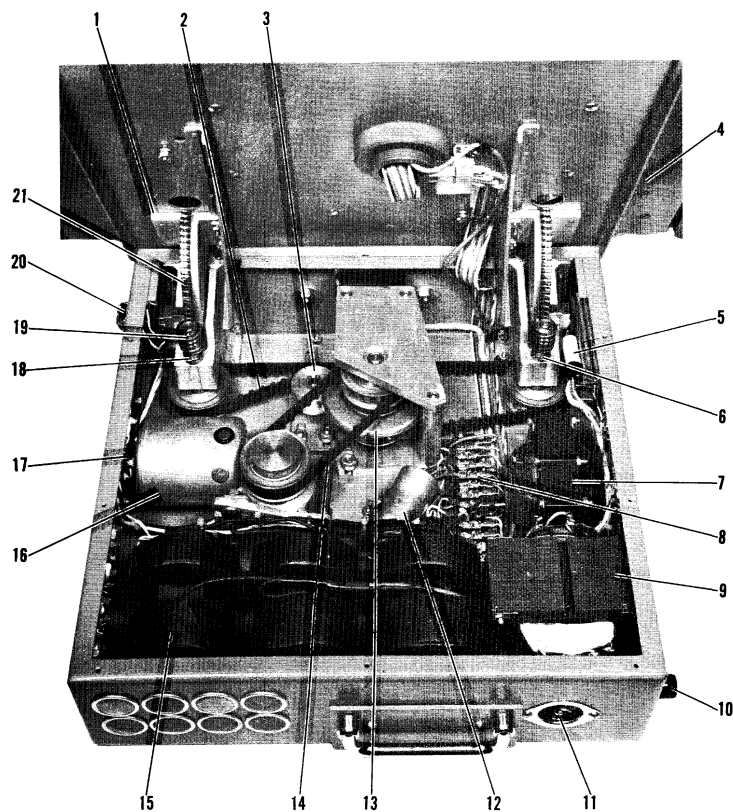
Figure 2-4. Advanced Light Table, Lower Light Box Assembly



KEY TO FIGURE 2-5

1. Electric Clutch (CL4)
2. Filter Capacitors (C1, C2, C3, C4)
3. L.H. & R.H. Drive Motor Housing Connecting Chain (Circuit 2)
4. Manual Drive Handwheel Connecting Chain (Circuit 1)
5. Manual Tension Adjustment Potentiometer (R2)
6. Main Power Switch (S1)
7. Power Tension Adjustment Potentiometer (R1)
8. Electric Clutch (CL3)
9. Rotary Joint Cover

Figure 2-5. Advanced Light Table, Front Section of Lower Light Box



KEY TO FIGURE 2-6

1. Movable Tilt Hinge Assembly
2. 300L050 Timing Belt
3. Timing Belt Idler Pulley
4. Tilt Plate Assembly
5. Capacitor (C6)
6. B57-10 Bearing
7. Choke (CH1)
8. Terminal Block (TB-1)
9. Power Transformer (T1)
10. Fuse Holder & Fuse (FS1)
11. Power Cord Receptacle (P2)
12. Noise Suppressor (NS1)
13. Tilt Drive Slip Clutch Assembly
14. 187L050 Timing Belt
15. Lamp Grid Transformers (T2, T3, T4)
16. Tilt Drive Motor & Gear Box (B3)
17. Terminal Block (TB-8)
18. AO8 Thrust Bearings
19. GLVH Worm
20. Tilt Switch (S3)
21. Worm Gear Segment

Figure 2-6. Advanced Light Table, Base Box Assembly

SECTION 3

OPERATIONAL CHECKOUT

3.1 OPERATIONAL CHECKS

The following operational checks are made to determine if the unit is functioning properly. Refer to Section 3 of the Operation Manual (M-104-69) for operating instructions. If performance is not as specified refer to Section 5 for troubleshooting information.

- 1) Power switch ON.
- 2) Light intensity knob turned up. Light should come on.
- 3) Rotate light intensity knob. Light intensity should vary.
- 4) Rotate knurled SHADE wheel. Shade mask should move across underside of glass viewing surface toward the operator.
- 5) Depress TILT switch. Table should tilt up to 75 degrees or to any intermediate position and stop when switch is released. Lower table by depressing switch in down position.
- 6) Raise manual rotation lock lever. Table can be rotated CCW 90 degrees and locked by depressing manual lock lever.
- 7) Load table with film. Set film loading switches to position corresponding to way film is wound on spool. Put MANUAL/POWER switch in power position. Transport film from supply to takeup reel and back to supply reel with FILM SPEED AND DIRECTION control. Adjust FILM TENSION control as required. Check entire speed range through both directions. Standoff film rollers should prevent film contact with light table surface. Adjust tracking knobs to provide proper

tracking as necessary. Change to manual drive by placing MANUAL/POWER switch in manual position. Adjust manual tension knob as required. Rotate table 90 degrees CCW and repeat above. Tilt table and repeat.

- 8) Repeat 7 with three other film sizes. Film transport system should work equally well with all four sizes of film.
- 9) Load all size film spools wound in the opposite direction and repeat 7 after setting FILM LOADING CONTROL switches. Film transport should work equally well in this configuration.

SECTION 4 INSPECTION

4.1 VISUAL

Unsatisfactory operation of various parts will result from conditions listed in Table 4-1. In general, the condition of mechanical parts may be determined by visual inspection.

TABLE 4-1
INSPECTION DATA

Part	Unsatisfactory Condition
Ball Bearings	Frozen or noisy.
Drive Belts	Frayed, cracked, elongated or teeth missing.
Pulleys	Worn or missing teeth.
Control Knobs	Broken, set screws loose or stripped.
Shade	Torn or edges damaged.
Viewing Glass	Scratched, chipped or cracked.
Springs	Loss of tension or broken.
Film Rollers	Nicked or dented.
Film Carriage Guide Rods	Nicked or bent.
Tilt Plate Hinges	Bent, broken or loose hinge pin.
Tilt Worm and Worm Gear	Broken or missing teeth.

SECTION 5 TROUBLESHOOTING

5.1 FILM TRANSPORT

The film transport diagram Figure 5-2, shows the motor drive and clutch operating sequence for the different modes of film transport.

5.2 TROUBLESHOOTING

See Table 5-1 for troubleshooting data. The electrical wiring diagram is shown in Figure 5-1.

TABLE 5-1
TROUBLESHOOTING DATA

TROUBLE	PROBABLE CAUSE	REMEDY
5-1.1 Power on, no light indication in switch S1	Fuse blown (FS1). No power. Bulb burned out in switch.	Replace fuse. Check power. Check power source. Replace bulb in switch.
5-1.2 No viewing light	Lamp grid broken. Open circuit to lamp transformers (T2, T3, T4). Intensity control (R6) inoperative. Dimming control circuit board.	Replace lamp grid. Check transformer circuit. Disconnect control and check resistance. Replace if open or noisy. Replace circuit board.
5-1.3 No film drive in power mode	Loose or open connections. Drive motors (B1, B2), tension adjustment controls (R1, R2), film tension control switch (S2), direction/speed control (R3, R4, R5), or tach-generators (TG1, TG2) inoperative. Logic circuit board or motor control circuit board malfunction.	Repair loose or open connections. Check motor drive voltage at TB-4 and TB-5. Replace motor if voltage is obtained but motor will not operate. Check continuity of switch (S2) and replace if necessary. Disconnect R1, R2, R3, R4, R5 and replace if resistance check shows noisy or open. Check tach-generator output at TB-6 while turning film spool drive spindle. Replace if no output and mechanical drive is intact. Replace circuit boards.

TABLE 5-1 (Continued)
TROUBLESHOOTING DATA

TROUBLE	PROBABLE CAUSE	REMEDY
5-1.4 Film drive operates in only one direction in power mode.	Same as 5-1.3	Same as 5-1.3
5-1.5 No film speed control in power mode.	Loose or open connections. Tension adjustment controls (R1,R2), film tension control switch (S2), direction/speed control (R3,R4,R5), or tach-generators (TG1,TG2) inoperative. Logic circuit board or motor control circuit board malfunction.	Repair loose or open connections. Check continuity of switch (S2) and replace if necessary. Disconnect R1,R2,R3,R4,R5 and replace if resistance check shows noisy or open. Check tach-generator output at TB-6 while turning film spool drive spindle. Replace if no output and mechanical drive is intact. Replace circuit boards.
5-1.6 Erratic speed control in power mode during slow speed scan.	Same as 5-1.3	Same as 5-1.3
5-1.7 No tension control in power mode.	Same as 5-1.3	Same as 5-1.3

TABLE 5-1 (Continued)
TROUBLESHOOTING DATA

TROUBLE	PROBABLE CAUSE	REMEDY
<p>5-1.8</p> <p>No film drive in manual mode. (See Figure 5-2)</p>	<p>Mechanical drive malfunction.</p> <p>Loose or open connections.</p> <p>Electrical clutch (CL1, CL2, CL3, CL4) or film loading switch (S4 and S5) malfunction.</p> <p>Manual transport drive reversing switch (S6) malfunction.</p> <p>Logic and control circuit board malfunction.</p>	<p>Check shafting and sprocket mechanism for broken parts, pins or loose set screws. Check for broken or disconnected chain. Check motor drive housings for broken gears, sprockets, shafts, pins or loose set screws.</p> <p>Repair loose or open connections.</p> <p>Check electrical circuits and replace clutches and/or switches.</p> <p>If no continuity check, replace switch.</p> <p>Replace circuit board.</p>
<p>5-1.9</p> <p>No tension control in manual mode.</p>	<p>Loose or open connections.</p> <p>Electrical clutch (CL1, CL2, CL3, CL4) or film loading switch (S4 and S5) malfunction.</p> <p>Manual transport drive reversing switch (S6) malfunction.</p> <p>Logic and control circuit board malfunction.</p>	<p>Repair loose or open connections.</p> <p>Check electrical circuits and replace clutches and/or switches.</p> <p>If no continuity check, replace switch.</p> <p>Replace circuit board.</p>

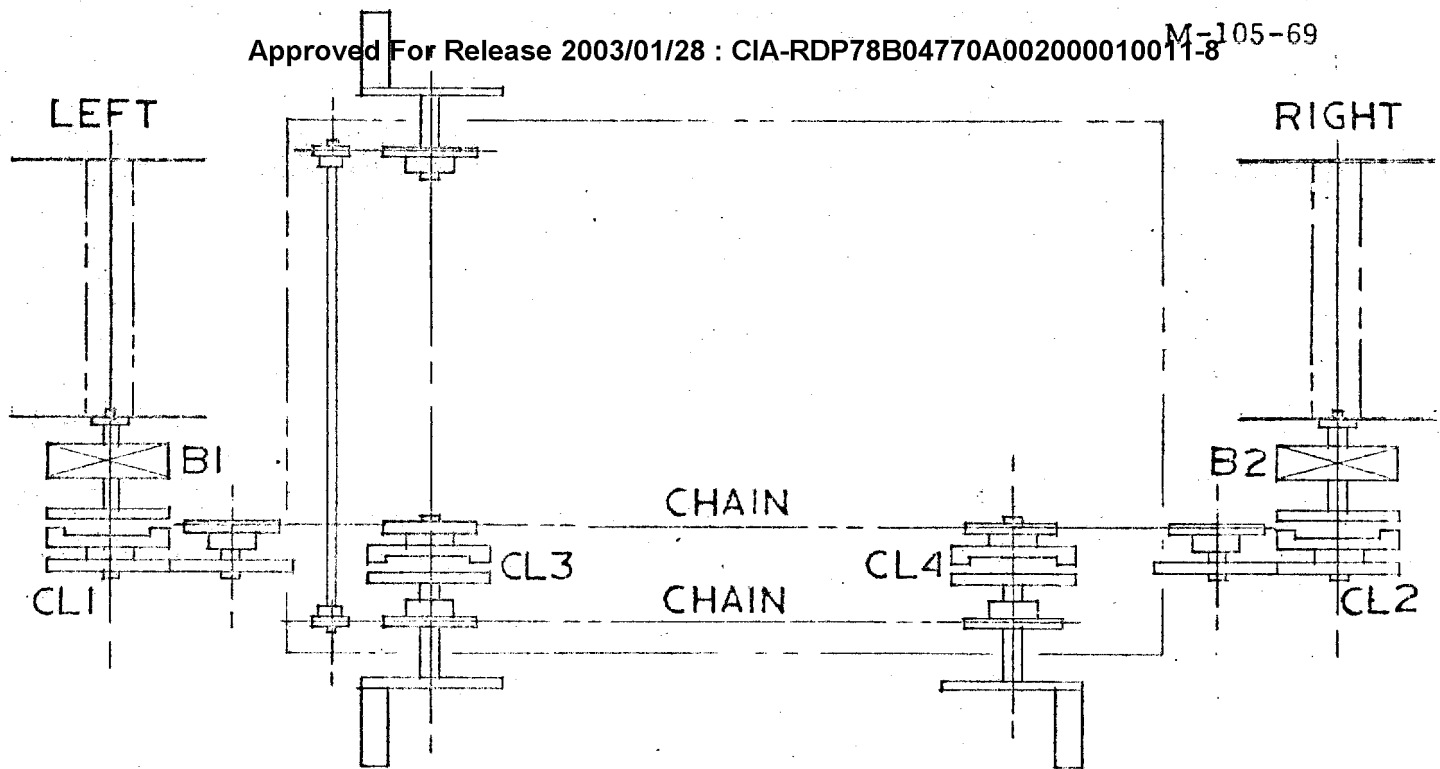
TABLE 5-1 (Continued)
TROUBLESHOOTING DATA

TROUBLE	PROBABLE CAUSE	REMEDY
5-1.10 Viewing assembly does not tilt.	Mechanical drive malfunction. Broken gears, pins sheared or belts loose. Clutch slipping. Electrical malfunction.	Replace damaged parts, tighten belts, re-adjust slip clutch. Check motor drive and electrical circuit. Replace motor.
5-1.11 Film not tracking.	Rollers misaligned.	Align rollers.
5-1.12 Film tracking control inoperative.	Snap ring out of groove, pin sheared, binding of bushing or film spindle shaft.	Replace snap ring or pins. Check for burrs and proper lubrication.
5-1.13 Viewing assembly rotates but does not lock.	Rotational lock lever mechanism binding or broken. Detent pin damaged or sheared.	Replace damaged or broken parts. Replace detent pin.
5-1.14 Movable film carriage does not lock.	Detent pin damaged or broken. Spring broken.	Replace damaged or broken parts.
5-1.15 No spring tension on movable film carriage.	Spring or cable on "negator" type spring motor broken.	Replace spring motor.

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Driven Spool	Driven Spool Rotation	Clutches				Motors	
		CL1	CL2	CL3	CL4	Drive	Tension
Right	CW	Open	Open	Open	Open	B2	B1
Right	CCW	Open	Open	Open	Open	B2	B1
Left	CCW	Open	Open	Open	Open	B1	B2
Left	CW	Open	Open	Open	Open	B1	B2
Right	CW	Open	Closed	Closed	Open	B2	B1
Right	CCW	Open	Closed	Open	Closed	B2	B1
Left	CCW	Closed	Open	Closed	Closed	B1	B2
Left	CW	Closed	Open	Open	Closed	B1	B2
"Off" Mode (Manual Drive)		Same as "Manual" Drive Mode except for <u>NO</u> film tension.					

Figure 5-2 Film Transport Diagram

SECTION 6

COMPONENT REPLACEMENT

Complete disassembly is neither anticipated nor recommended. Disassemble only that portion of the unit necessary for replacement of a particular faulty part. Refer to illustrations in Section 2 for identification and relationship of parts. In general, disassembly and reassembly procedures are straight forward and special instructions are not required.

Only common hand tools are necessary for repair or replacement. A keeper ring is furnished for the removal of the film drive motor armature (see paragraph 6.6.1).

Additional information is outlined in the following paragraphs.

6.1 REMOVAL OF UPPER LIGHT BOX

Replacement or repair of parts or assemblies in the upper light box necessitates its removal from the lower light box. The following describes the removal.

- 1) Loosen until disengaged, the two hold down screws in the front corners of the viewing assembly (Figure 2-1 (3))
- 2) Rotate the rear manual hand wheel until the flat edge of the hand wheel is facing up, then raise the upper viewing box to the open position.
- 3) Remove the knobs and mounting hardware on the light intensity control, direction/speed control and film tension control.
- 4) Remove controls leaving wiring connected.
- 5) Pull wire from back of lamp grid reflector assembly and lay controls in top of lower viewing box.

6) Disconnect the lamp grid green wire from terminal 12 of TB-2 and red wire from the TB-7 high voltage terminal.

7) Remove the light dimming circuit board. This will prevent any lamp supply voltage from being on if the table is operated without the lamp.

8) Hold the upper light box assembly securely and remove the hinge screws.

6.2 REPLACEMENT OF VIEWING GLASS

Remove upper viewing box assembly as outlined in paragraph 6.1, Steps 1 through 8. After removal of upper viewing box proceed as follows:

1) Take out remaining screws holding lamp grid and reflector assembly and remove assembly.

2) Remove diffuser assembly.

3) Take out screws (10) holding viewing glass retainers and remove viewing glass and mounting cushions.

4) Install new viewing glass.

NOTE

Viewing glass and diffuser must be kept free of all dirt and dust during reassembly.

6.3 REPLACEMENT OR REPAIR OF LIGHT SHADE AND/OR MECHANISM

Remove upper viewing box assembly as outlined in paragraph 6.1, Steps 1 through 8. Remove lamp grid and reflector assembly as outlined in paragraph 6.2.1, Steps 1 and 2. Light shade and mechanism is now accessible for maintenance.

6.4 REPLACEMENT OF LAMP GRID AND REFLECTOR ASSEMBLY

Remove upper viewing box assembly as outlined in paragraph 6.1, Steps 1 through 8. Remove lamp grid and reflector assembly as outlined in paragraph 6.2.1, Step 1. Send grid and reflector assembly to Houston Fearless Corporation for installation of new lamp grid in the reflector. Install new lamp grid and reflector assembly.

CAUTION

Avoid contact with pieces of broken glass as the phosphor coating is poisonous.

6.5 REMOVAL OF FILM DRIVE MOTOR HOUSING COVER

Replacement or repair of parts in the film drive motor housing assembly necessitates the removal of the housing cover. The following describes the removal.

- 1) Remove 4 socket head cap screws holding the tracking knob housing to the motor housing.

- 2) Remove snap ring from film drive spindle (through center hole in tracking knob).

- 3) Remove tracking knob housing very carefully making sure that pressure is applied to the end of the drive spindle (tracking knob end) so that the shaft assembly does not move out with cover. This will prevent the motor armature from contacting and damaging the motor brush rigging.

- 4) Remove 4 slotted round head screws on front of motor housing cover.

- 5) Raise upper light box to open position. See paragraph 6.1, Steps 1 and 2.

6) Remove 1 socket head cap screw that holds cover to lower light box.

7) Remove 2 screws that hold film loading switch to motor housing cover and remove cover.

6.6 REPLACEMENT OF DRIVE MOTOR

Remove drive motor housing cover as outlined in paragraph 6.5, Steps 1 through 7. After removal of the cover proceed as follows:

1) Remove sprocket and gear jack shaft (chain should slip off of sprocket).

2) Loosen set screws in both "V" groove pulleys in first and second stage tach-generator drive. Slide pulley shaft out of tach-generator mounting bracket letting "O" ring drive belt stay on clutch mounted pulley.

3) Remove tach-generator mounting bracket and move out of way leaving wire leads connected.

4) Disconnect motor brush leads from back of loading switch (S1 or S2). Remove 4 screws holding brush rigging and remove rigging. Remove 4 screws holding motor field assembly in motor housing.

5) Place the motor keeper ring on the motor field assembly (the ring replaces the brush rigging). The keeper ring is furnished as maintenance equipment. It's function is to provide the super saturated magnetic field with a low reluctance magnetic flux path so that the field will not lose it's magnetic saturation when the motor armature is removed.

CAUTION

Removal of the motor armature without the keeper ring in place will render the motor inoperative.

6) Remove the motor armature/shaft assembly and the motor field assembly.

7) Disassemble shaft assembly by removing in order, the thrust washer, clutch field housing, clutch rotor and clutch armature (with gear).

8) Remove 4 screws and retaining ring holding motor armature on shaft hub.

9) Press motor armature off of shaft hub.

NOTE

The motor comes in 3 matched pieces
and must be replaced as a unit.

10) Install new motor assembly.

6.7 REPLACEMENT OF TACH-GENERATOR

Remove drive motor housing cover as outlined in paragraph 6.5, Steps 1 through 7. Remove tach-generator bracket as outlined in paragraph 6.6.1, Steps 1 through 3. After removal of the tach-generator bracket, proceed as follows:

1) Remove "O" ring drive belt.

2) Unsolder wires from tach-generator and remove it from the bracket.

3) Press small "V" grooved pulley off of the tach-generator shaft.

4) install new tach-generator.

6.8 REPLACEMENT OF MOTOR HOUSING CLUTCH (CL1 OR CL2) OR CLUTCH COMPONENTS

Remove drive motor housing cover as outlined in paragraph 6.5, Steps 1 through 7. Follow procedure as outlined in paragraph 6.6.1, Steps 1 through 7. Replace clutch assembly or component and reassemble.

6.9 REPLACEMENT OF LOADING SWITCH (S4 OR S5)

Remove drive motor housing cover as outlined in paragraph 6.5, Steps 1 through 7. After removal of cover proceed as follows:

- 1) Disconnect all wiring from back of switch.
- 2) Install new switch.

6.10 REPLACEMENT OF MANUAL HANDWHEEL CLUTCHES (CL3 AND CL4)

Raise upper light box assembly as outlined in paragraph 6.1, Steps 1 and 2. Secure with prop to prevent closing. Proceed with clutch removal as follows:

- 1) Disconnect clutch electrical leads from terminal blocks TB-4 or TB-5 as applicable.
- 2) Loosen set screws (2) in hub of front chain sprocket.
- 3) Loosen set screws (2) in clutch field housing and rotor hub.
- 4) Pull handwheel and shaft out of box assembly. This will release the following parts in sequence starting at the back shaft support. Clutch field housing and rotor, clutch armature with sprocket, thrust washer, front chain sprocket and thrust washer. Reassembly will be the reverse of this sequence.
- 5) Install new clutch or components and reassemble.

6.11 REPLACEMENT OF CIRCUIT BOARDS

Replacement of 3 circuit boards, motor control, light dimming and logic control, is similar. Proceed as follows:

- 1) Raise upper light box assembly as outlined in paragraph 6.1, Steps 1 and 2. Secure with prop to prevent closing.
- 2) Remove circuit board retaining screws and carefully pull board out of the junction block.
- 3) Install new board.

6.12 REPLACEMENT OF VIEWING ASSEMBLY TILT DRIVE MOTOR/GEAR BOX

Proceed as follows:

- 1) Tilt viewing assembly electrically or by emergency manual hand crank to approximately 60° and disconnect electrical power. The bottom of the base assembly will have to be accessible for loosening of hardware.
- 2) Loosen drive belt idler pulley and slip clutch assembly housing.
- 3) Remove belt from motor gear box drive pulley.
- 4) Disconnect motor electrical leads from terminal board TB-8.
- 5) Remove motor/gear box support bracket attachment screws and remove motor/gear box assembly with support bracket from base box assembly.
- 6) Remove drive pulley from gear box shaft and install on new gear box by re-pinning.
- 7) Fasten new motor/gear box assembly on support bracket and install in base box assembly.

SECTION 7

PARTS LIST

7.1 SCOPE

Parts that may require replacement are listed by major assembly and/or subassembly groups and are identified by the manufacturer's part number and descriptive nomenclature. Reference location of parts is by item number in the applicable illustrations (Figures), and the quantity of a particular item is given in the units per assembly column.

Only the principle parts are listed for each assembly; commercial stock hardware items (screws, nuts, washers) are not listed. The listing does not necessarily reflect the sequence of assembly or disassembly. Parts not easily identifiable in the illustrations are listed with respect to the applicable assembly.

7.2 PARTS ORDERING INFORMATION

Replacement parts may be ordered by mail or telephone. When ordering parts be sure to include the part name, part number, its reference designator, quantity desired, and the equipment Model Number and Serial Number for which the parts are required. Mail or telephone Part Orders to Customer Service Department,

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7.3 PARTS LIST

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION	UNITS/ ASSY
2-1 (8)	B120248	Glass, Viewing	1
2-1 (9)	B120246	Cushion, Viewing Glass (Side)	2
2-1 (10)	B120254	Cushion, Viewing Glass (End)	2
2-3 (4)	D120250	Lamp Grid and Reflector Assembly	1
2-1 (4)	C120241	Light Shade Assembly	1
	3L1-FF	Nyliner (Bearing)	6
	#6	Metallic Bead Chain	A/R
2-1 (6)(24)	10-865-230	Switch, Rocker (S1, S2)	2
2-1 (5)	RB155-7	Knob, Direction/Speed Control	1
2-1 (7)	RB155	Knob, Light Intensity	1
2-5 (5)(7)	C120341	Potentiometer (Rework) (R1, R2)	2
2-3 (3)	C120341-1	Potentiometer (Rework) (R6)	1
2-3 (1)	C120341-2	Potentiometer (Rework) (R3, R4, R5)	1
2-1 (23)	B120342	Knob, Tension - Manual	1
2-1 (25)	B120343	Knob, Tension - Power	1
2-4 (20)	GM-B-302	Slip Clutch	1
2-5 (1)(8)	2.5 SMR	Clutch, 90V. (CL3, CL4)	2
2-4 (2)	SFR6PPD	Bearing, Flanged	4
2-4 (1)	SFR188PPEE	Bearing, Flanged	2
2-4 (19)	BZ-RW922-A2	Switch, Micro (S6)	1
2-4 (3)	3/8 I.D. x 1/32 W. x 1/2 Lg.	Tubing, Pure Gum Rubber, Amber, 30-40 SDH	2
2-4 (8)	65 CFM	Fan - 115 VAC, 18 db (B4)	1
2-4 (14)	B120361	Plunger, Lock - Table Rotation	1
2-5 (2)	36D	Filter - 5500 uf, 40 VDC (C1, C2, C3, C4)	4
2-4 (17)	D120249	Logic and Control Circuit Board	1
2-4 (16)	D120253	Motor Control Circuit Board, CKT. 25	1
2-4 (4)(5)	D6-504	Capacitor - 0.5 uf, 600 VAC (C7, C8)	2
2-1 (26)	B120441	Knob, Lever - Lock	1
2-5 (3)(4)	#25	Chain - Single Strand, Steel	A/R
2-1 (19)	4TP4-3	Switch, Rocker (S4, S5)	2
2-3 (6)	T-4036	Torque Motor - 1.8 lb-ft (B1, B2)	2
2-3 (6)	6102-PP	Bearing, Ball	2
2-3 (6)	B120436	Coil Housing, Clutch	2
2-3 (6)	B120411	Armature Assembly, Clutch	2
2-3 (6)	2086	Tach/Generator Assembly (TG1, TG2)	2
2-3 (6)	SR6-PPD	Bearing, Ball	6
2-3 (6)	S5R-PD	Bearing, Ball	2
	5100-37	Retaining Ring	2
2-3 (6)	B120437	Rotor, Clutch	2
2-3 (6)	568-028	Belt, Drive - Tach/Generator	2
2-3 (6)	568-041	Belt, Drive - Tach/Generator	2

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION	UNITS/ ASSY
2-1 (3)	B120321	Knob, Plunger	2
2-1 (3)	B120335	Spring	2
2-4 (18)	A2025-2	Negator Spring, "B" Motor	2
2-1 (12)	B81420	Ball Bushing	6
2-1 (2)	B120353	Roller, Film	2
2-1 (3)	F-037-1	Bearing, Bushing	4
2-6 (7)	C-2686	Choke (CH1)	1
2-6 (16)	A120294	Motor, Tilt (B3)	1
2-6 (9)	R206	Transformer (T1)	1
2-6 (15)	9T61Y5026	Transformer (T2, T3, T4)	3
2-6 (21)	C120365-1	Segment, Gear	1
2-6 (21)	C120365-2	Segment, Gear	1
2-6 (2)	300L-050	Timing Belt	1
2-6 (14)	187L-050	Timing Belt	1
2-3 (8)	5555-18	Retaining Ring	4
2-6 (18)	A08	Thrust Bearing	4
2-6 (6)	B57-10	Bearing	2
2-6 (19)	GLVH	Worm	2
2-6 (13)	C120374	Clutch Assembly, Tilt Drive	1
2-6 (11)	7486	Connector, Twist Lock (P2)	1
2-6 (12)	28A-354	Noise Suppressor (NS1)	1
2-6 (5)	D6-504	Capacitor - .05 uf, 600 V. (C6)	1
2-6 (10)	3AB	Fuse - 15 amp (FS1)	1
2-6 (20)	2TP4-3	Switch, Rocker - DPDT (S3)	1
	B120256	Power Cord Assembly (J2 - P1)	1
2-4 (10)	B120255	Light Dimming Circuit Board	1

STAT

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