DEPARTMENT OF THE ARMY TECHNICAL MANUAL

ORGANIZATIONAL, DS, GS, AND DEPOT MAINTENANCE MANUAL

CAMERA, STILL PICTURE KA-60B AND TEST SET CAMERA SYSTEM LS-71A

This copy is a reprint which includes current pages from Change 1.

HEADQUARTERS, DEPARTMENT OF THE ARMY
JULY 1967

TACO 6670A

WARNING

Be careful when working on the 115-volt ac connections. Serious injury or death may result from contact with these terminals.

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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *12 July 1967*

Organizational, Direct Support, General Support, and Depot Maintenance Manual

CAMERA, STILL PICTURE KA-60B AND TEST SET CAMERA SYSTEM LS-71A

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This is a first-edition manual covering Camera, Still Picture KA-60B (camera) and covers its installation, threading, functioning, and maintenance. The manual includes procedures for preflight and in-flight operation, preventive maintenance, cleaning, and inspection. and replacement of defective components.

b. The manual also contains the procedure for testing the camera with Test Set, Camera System LS-71A (test set), which is a go no-go type of test equipment. A schematic diagram of the test set is included.

c. The basic issue items list (BIIL) appears in appendix B; the maintenance allocation chart (MAC) appears in appendix C.

1.1 Indexes of Publications

a. DA Pant. 310-4. Refer to the latest issue of DA Pam 3104 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

2. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form (i (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58 (Army)/ NAVSUP PUB 378 (Navy)/AFR 71-4 (Air Force)/and -MCO P403().29 (Marine Corps).

c. Discrepancy in Shipment Report (DIS REP) (SF 361). Fill out and forward Discrepancy in Shipment Report (I)ISREP) (SF 361) as prescribed in AR 55-38 (Army)/NAVSUP PUB 459 (Navy)/AFM 75-34 (Air Force)/and MCO P4610.19 (Marine Corps).

2.1. Reporting of Errors

Tile reporting of errors, omissions. and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commander, US Army Electronics Command, ATTN: AMSELMA-S, Fort Monmouth, NJ 07703.

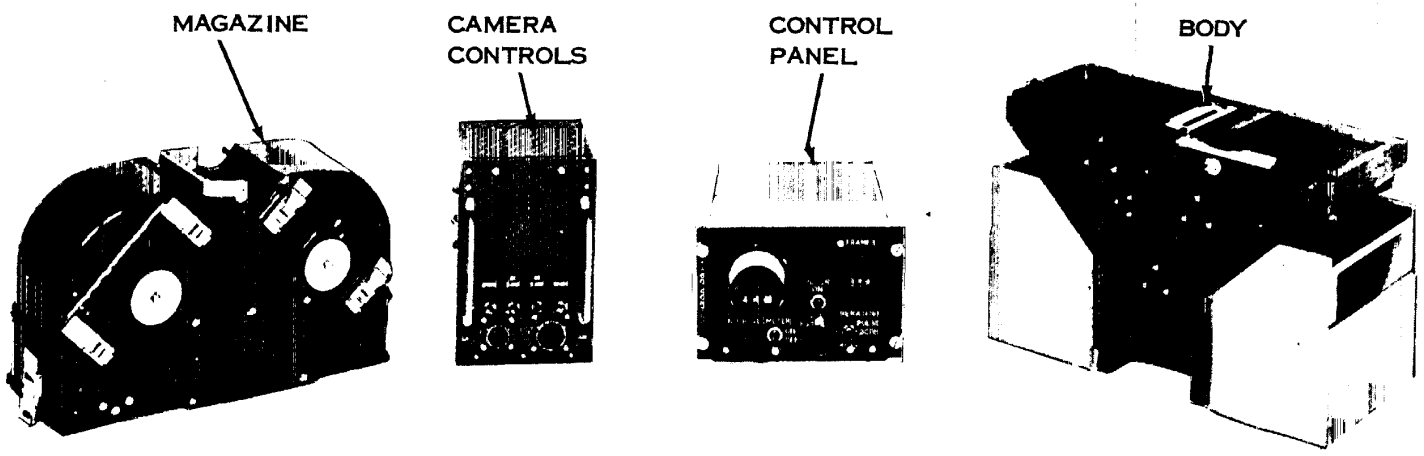


Figure 1. Camera, Still Picture KA-60B

Section II. DESCRIPTION AND DATA

3. Purpose and Use

a. Purpose. The purpose of the camera is to provide a panoramic, horizon-to-horizon reconnaissance capability specifically for high speed, low flying aircraft.

b. Use. The camera is used in the forward oblique position to present a sequence of photographs providing a complete presentation (in the flight direction) of the ground area directly beneath the aircraft to the forward horizon, and through both lateral horizons.

4. Technical Characteristics

Type	Rotary prism, panoramic.
Scan angle.	180°.
Format	2. 25 by 9.4 inches approx.
Operating voltage	+28 VDC and 115 VAC, 400 CPS.
DC current rating	2 amp average.
AC current rating.	2 amp average.
Modes of Operation.	Autocycle: 2 CPS and 4 CPS.
	Pulse: 1 CPS to 1 cycle/60 seconds.
Aperture range .	f /2.8 through f/22 continuous.
Slit width range	0. 200 inch through 0.020 inch continuous.
Relative shutter speed	1/100 through 1/4000 within limits established by cycling rate.
Temperature range	Operating: 0° through 120°F.
	Storage: -65° through 150°F.
Lens	3 inch (75 MM) f/2.8.
	Film:
Type.	70 MM, perforated, Aerecon Plus-X, Type 8401.
Capacity	250 feet nominal.

5. Items Comprising an Operable Equipment

Camera, Still Picture KA-60B and its components are shown in figure 1.

FSN	*Nomenclature, part No., and mfr code*	*Qty*	*Dimensions*			*Weight*
			Height	*Depth*	*Width*	*(lbs)*
	NOTE The part number is followed by the applicable 5-digit Federal supply code for manufacturers (FSCM) identified in SB 708-42 and used to identify manufacturer, distributor, or Government agency, etc.					
6720-936-5430	Camera, Still Picture KA-60B: 1093A1; 72314 consisting of:	1				
6720-978-7415	Camera, Body Assembly LA-378A: 109381; 72314	1	6.78	8.25	13	16
6760-937-1919	Camera, Magazine Assembly LA-379A: 1177C1-3; 72314	1	7.38	6.16	13	10
6720-978-7417	Camera, Control Junction Box: 1134H14-2; 72314	1	9.06	6.81	6.25	6.2
6720-978-7416	Camera, Control Panel LM-162A: 1093D1-2; 72314	1	3.75	6.50	5.75	4.5

6. Description of Camera

a. The camera is a moving film panoramic type, using a 3-inch f/2.8 lens, and is provided with automatic exposure control (AEC). The AEC function is implemented by slit width and aperture control. A 10.25 inch long by 2.25 inch wide frame is produced which provides 9.4 inches of image area, which corresponds to the 180° scan angles, and space for data recording.

b. The camera operates at 2 cps or 4 cps in the autocycle mode, and up to 1 cps maximum in pulse mode. Relative shutter speeds of 1/100 through 1/400 second, as function of slit width and cycling rate, are obtainable. These relative shutter speeds in conjunction with the aperture control, provide a wide AEC range.

c. The body (para 7) achieves the photographic coverage of the camera. The magazine (para 8), which includes the film format area, supplies fresh film to the focal plane where the film is exposed, and takes up the exposed film. The photocell is located on the lower portion of the body and monitors the terrain brightness. The photocell operates in conjunction with the control panel (para 9) and the camera controls (para 10) to automatically control film exposure.

7. Body (fig. 2)

The body includes the double dove prism, the lens, the aperture and slit mechanisms, the photocell, and the drive mechanisms. The aperture and slit mechanisms control the camera exposure (para 28), and drive mechanisms and rotates the prism (para 31). The body supports the magazine (para 8), and provides a linkage gear which mechanically couples the drive mechanism to the magazine. The lift cam is used to sequence film transport. Four latch hooks lock the magazine to the body, and the three trunnions allow the body to be rigidly mounted to an aircraft frame. Connector 2J1 electrically connects the body to the camera controls (para 10) and provides the necessary operating voltages to body components. A dust cover (not shown) is provided to protect the double dove prism from dirt, dust and damage.

8. Magazine (fig. 3)

The magazine provides space for the supply spool, takeup spool, film keeper, and the pressure roller. The supply spool stores 250 feet of film and mounts on two keyed shafts. The supply knob and two keyed shafts facilitate the supply spool mounting. The takeup knob and two keyed shafts allow the takeup spool to be mounted in the magazine.

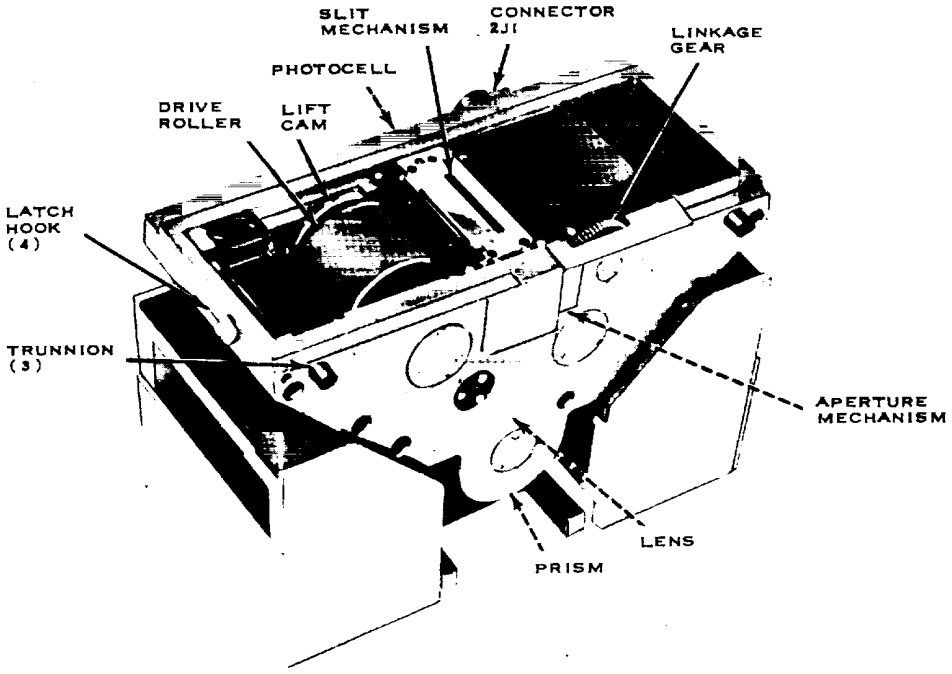


Figure 2. Body.

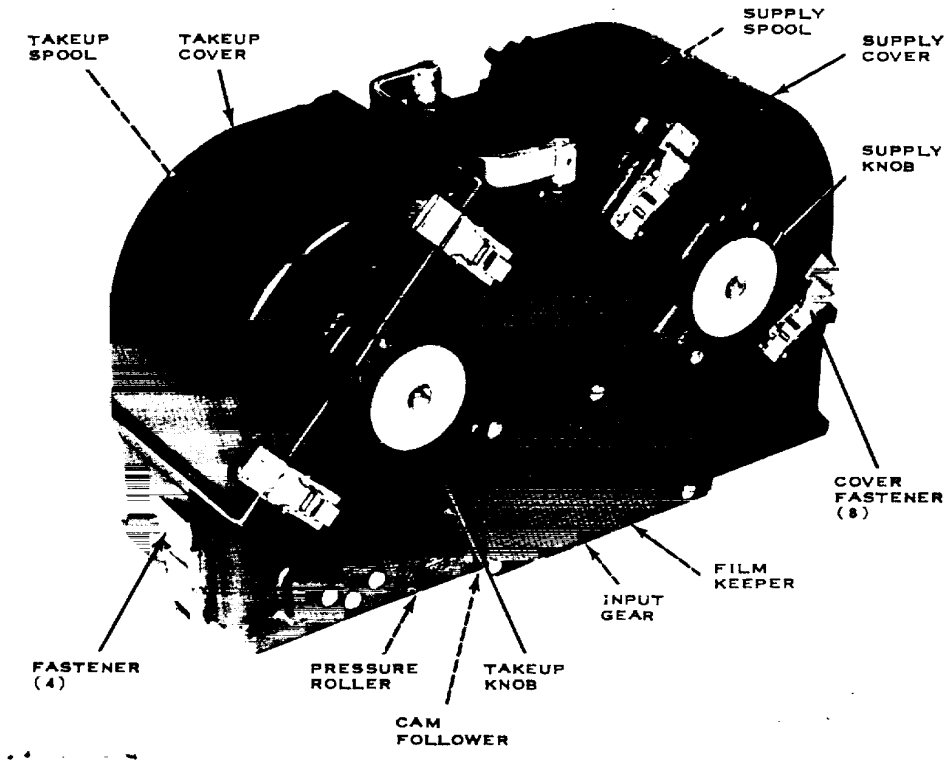


Figure 3. Magazine.

Four fasteners latch the magazine to the body, and eight cover fasteners latch the covers to the magazine. The input gear mates with the body linkage gear (para 7). The cam follower rests on the lift cam (para 7) for film transport.

9. Control Panel (fig. 4)

The control panel contains the controls and indicators of the camera. Internally, the control panel houses the intervalometer and V/H command circuitry. The INTERVALOMETER control knob and numerical readout indicate the PULSE mode cycle rate (para 30). The four Dzus fasteners facilitate mounting. Electrical connections to the control panel are made through rear connector 3J2, while primary power to the camera is applied through rear connector 3J1.

10. Camera Controls (fig. 5)

Electrical connections from the control panel (para 9) are made through connector lJ1 while electrical connections to the body (para 7) are made through connector 1J2. Two fuses, DC 5 AMP and AC 5 AMP, and two spare fuses are located on the front panel. The two handles and mounting plate (not shown but supplied) facilitate mounting. Connector 1J6 is used to facilitate camera testing with LS-71 Test Set (see appendix). Connector 1.T6 is located on the rear.

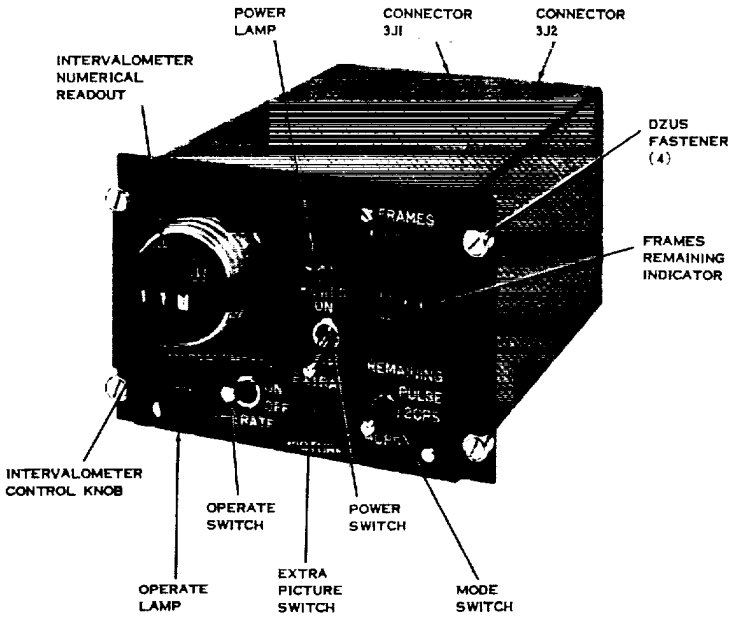


Figure 4. Control Panel.

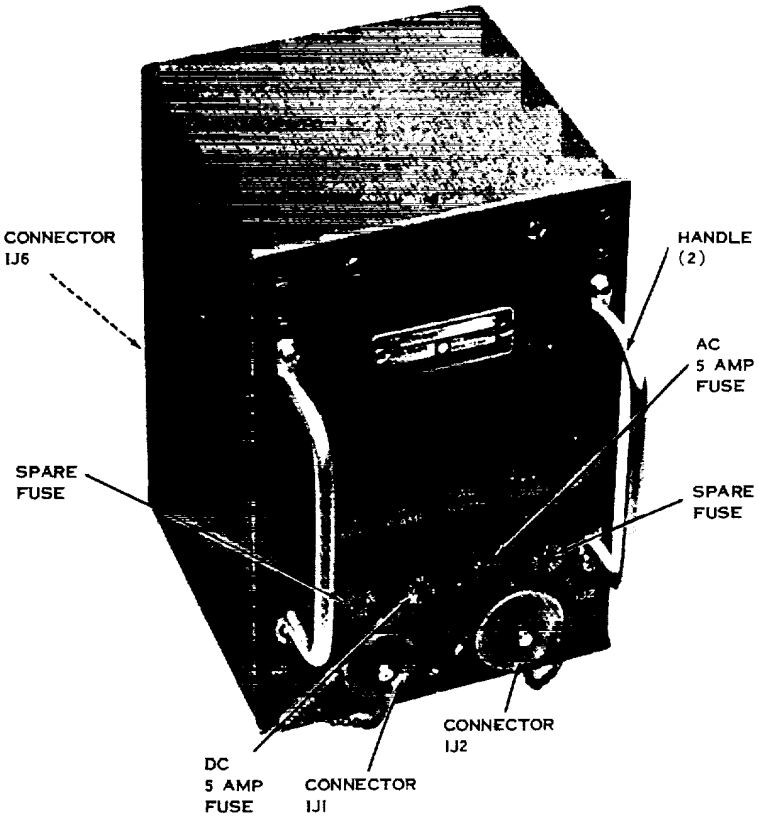


Figure 5. Camera Controls.

CHAPTER 2

INSTALLATION

11. Checking Unpacked Equipment

Check the equipment against the packing list. When no packing list accompanies the equipment, the table of components (para 5) may be used as a general check to determine if all components of the camera have been shipped.

a. Check the exposed surfaces of each component for scratches, nicks, dents, or other damage.

b. Check all fasteners to be sure that they are not bent, loose, or broken.

c. Check the overall equipment for any damage that may have occurred during shipment.

12. Installing Body

The body is rigidly mounted to the aircraft frame by means of the three trunnions (fig. 6). An optical window must be constructed on the underside of the aircraft, at the approximate location indicated in figure 6, to provide for horizon-to-horizon scan. After installation, connect the body cable to connector 2J1.

13. Installing Magazine

To install the magazine on the body perform the procedures outlined below.

Note: When necessary, load and thread the magazine (para 19) before performing the procedures outlined below.

a. Align the magazine input linkage gear (fig. 3) with the body linkage gear (fig. 2); mount the magazine on the body.

b. Fasten the magazine to the body by engaging the four latch hooks (fig. 2) with four magazine fasteners (fig. 3).

14. Installing Control Panel

The control panel is rigidly mounted to the aircraft frame by means of four Dzus fasteners (fig. 4) and the primary power cable mates with connector 3J1. Figure 7 indicates the dimensions of the control panel.

15. Installing Camera Controls

The camera controls are mounted by means of a wing nut and plate. Two cables are connected to connectors 1J1 and 1J2 on each unit. Figure 8 indicates the physical dimensions of the camera controls.

16. Interconnecting cables

Figures 9, 10, and 11 schematically show suggested camera system interconnecting cables and the RF shielding required.

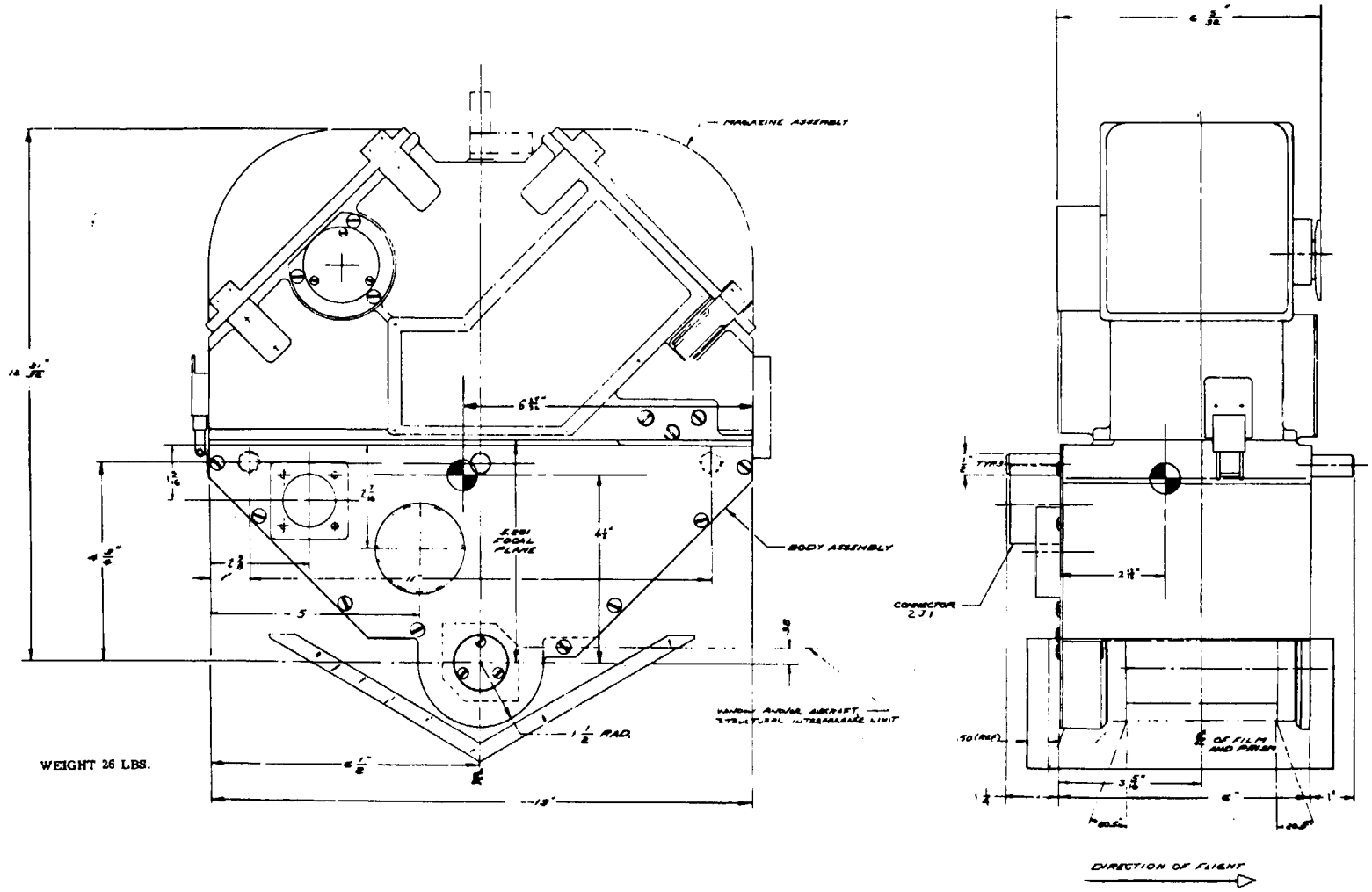


Figure 6. Body and Magazine Installation Specifications.

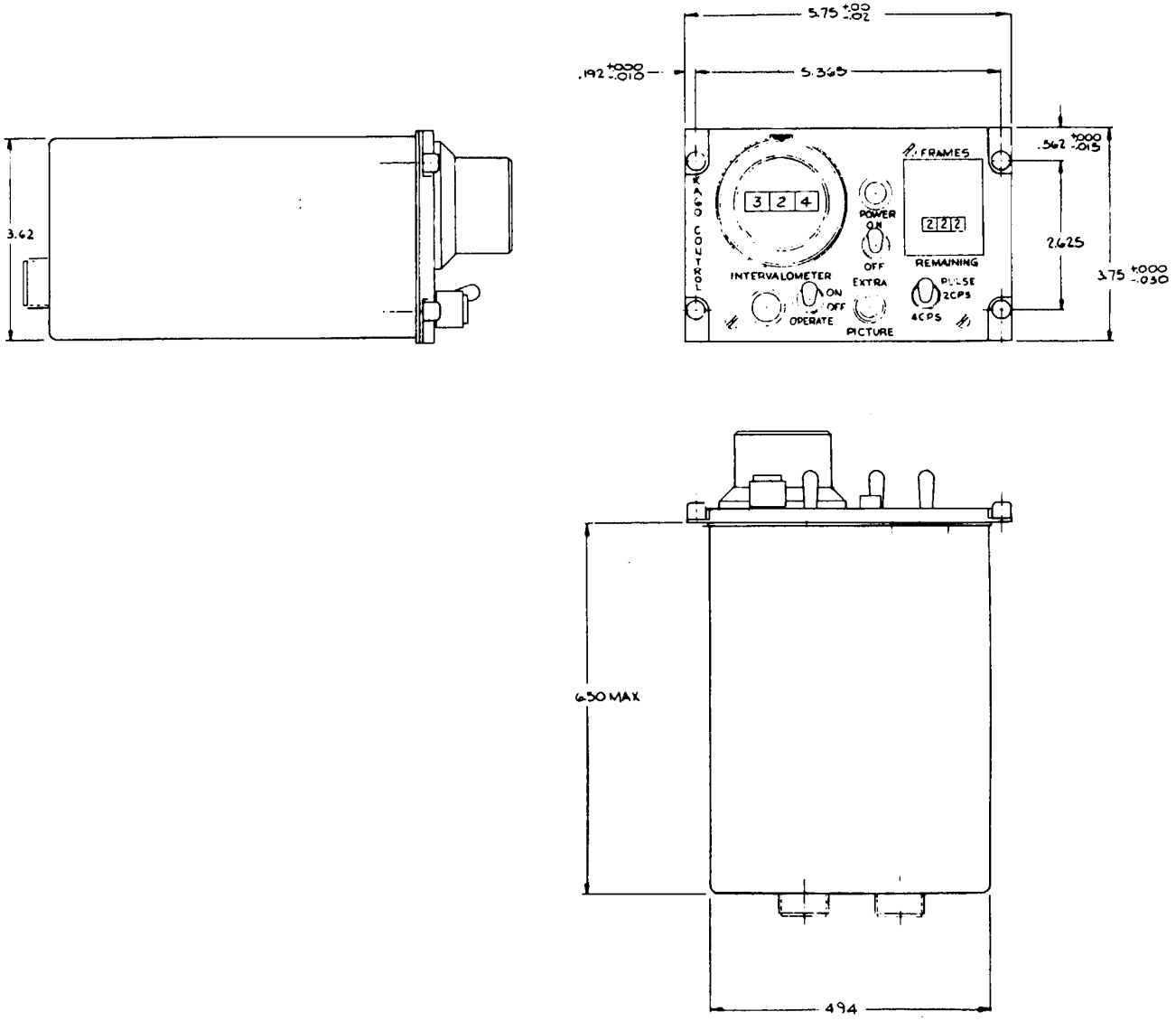


Figure 7. Control Panel Installation Specification.

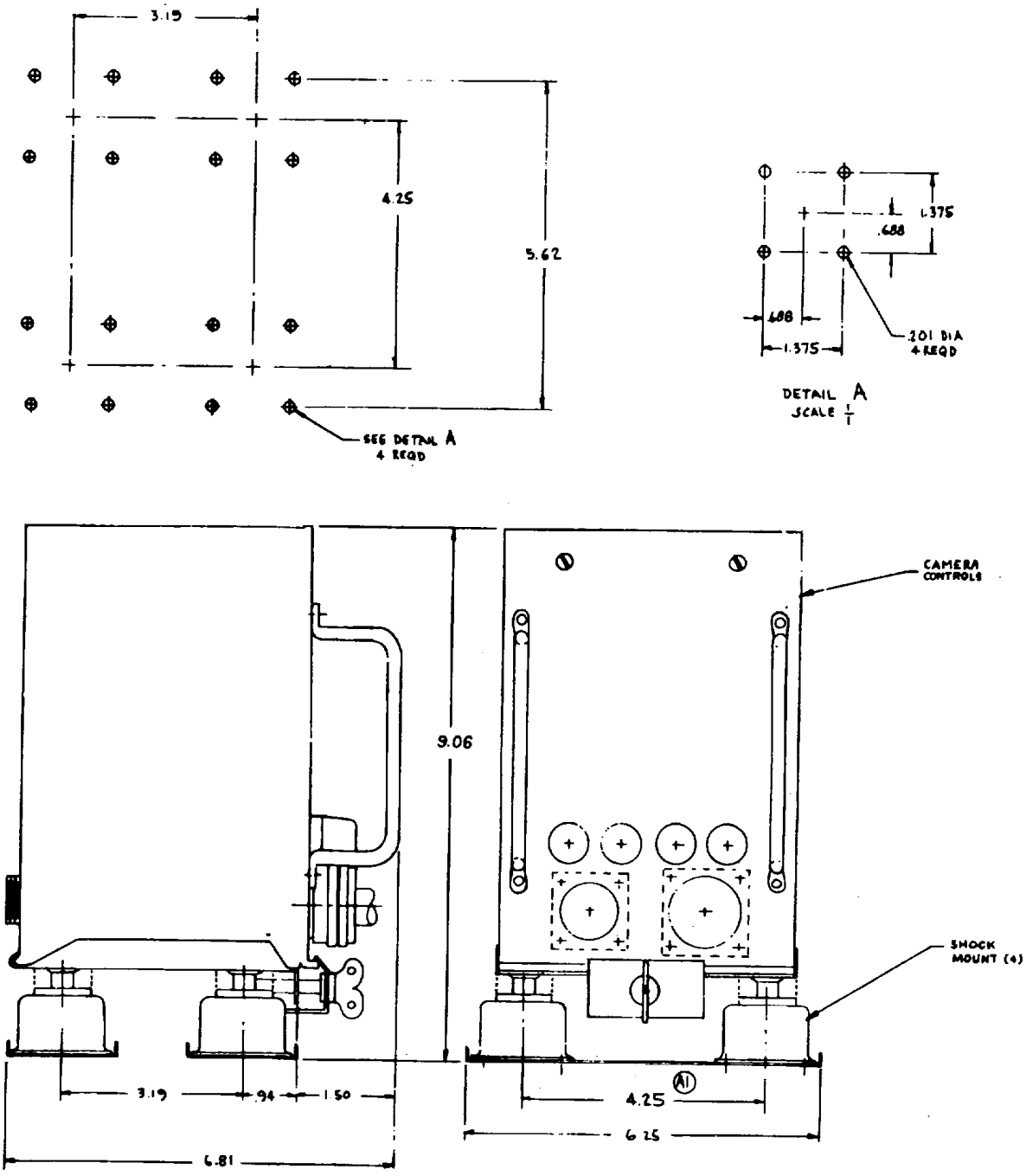


Figure 8. Camera Controls Installation Specifications.

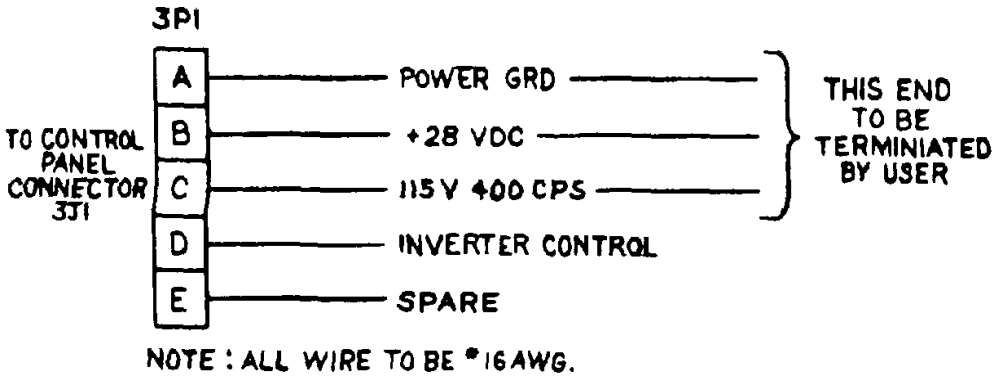


Figure 9. Primary Power Cable Diagram.

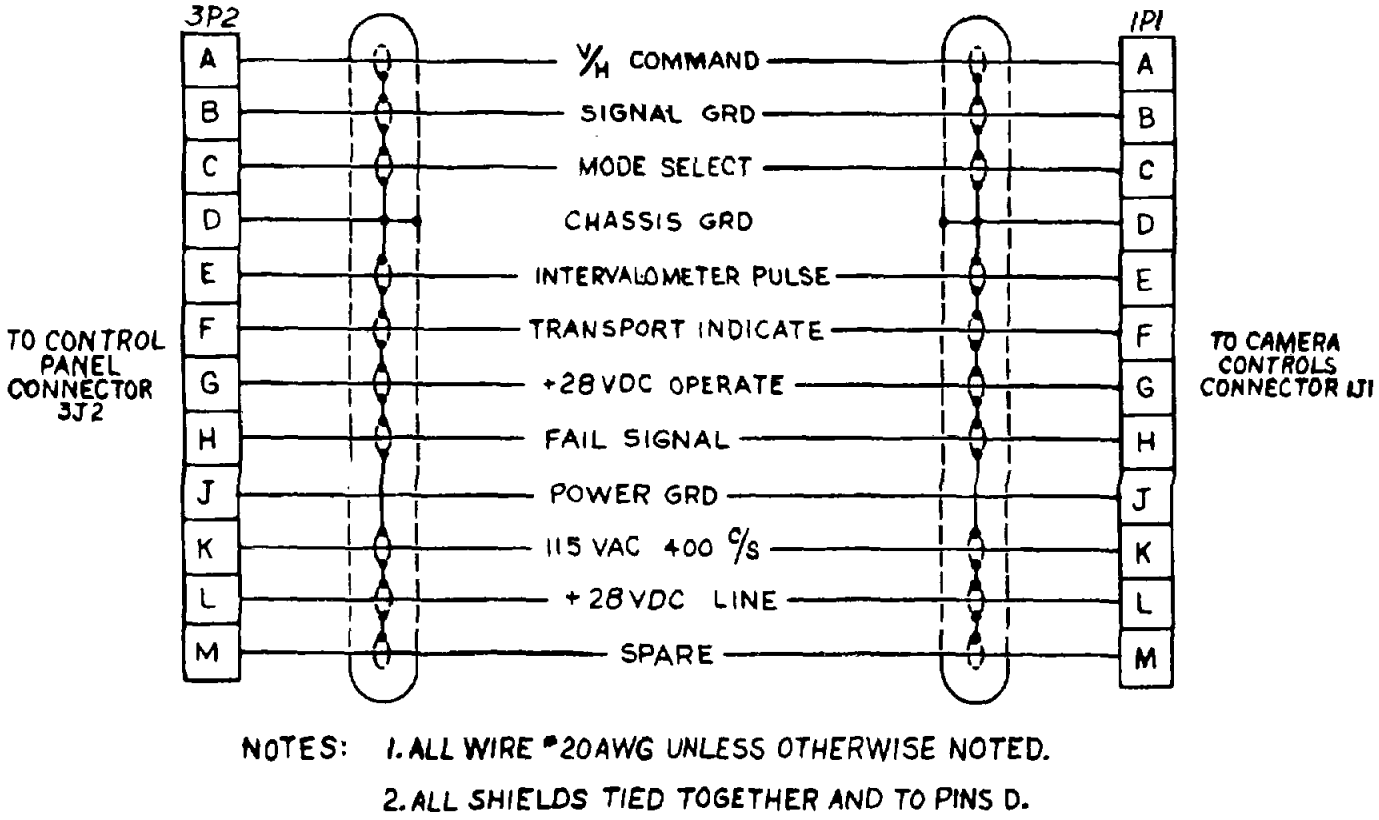


Figure 10. Control Panel and Camera Controls Interconnecting Cable Diagram.

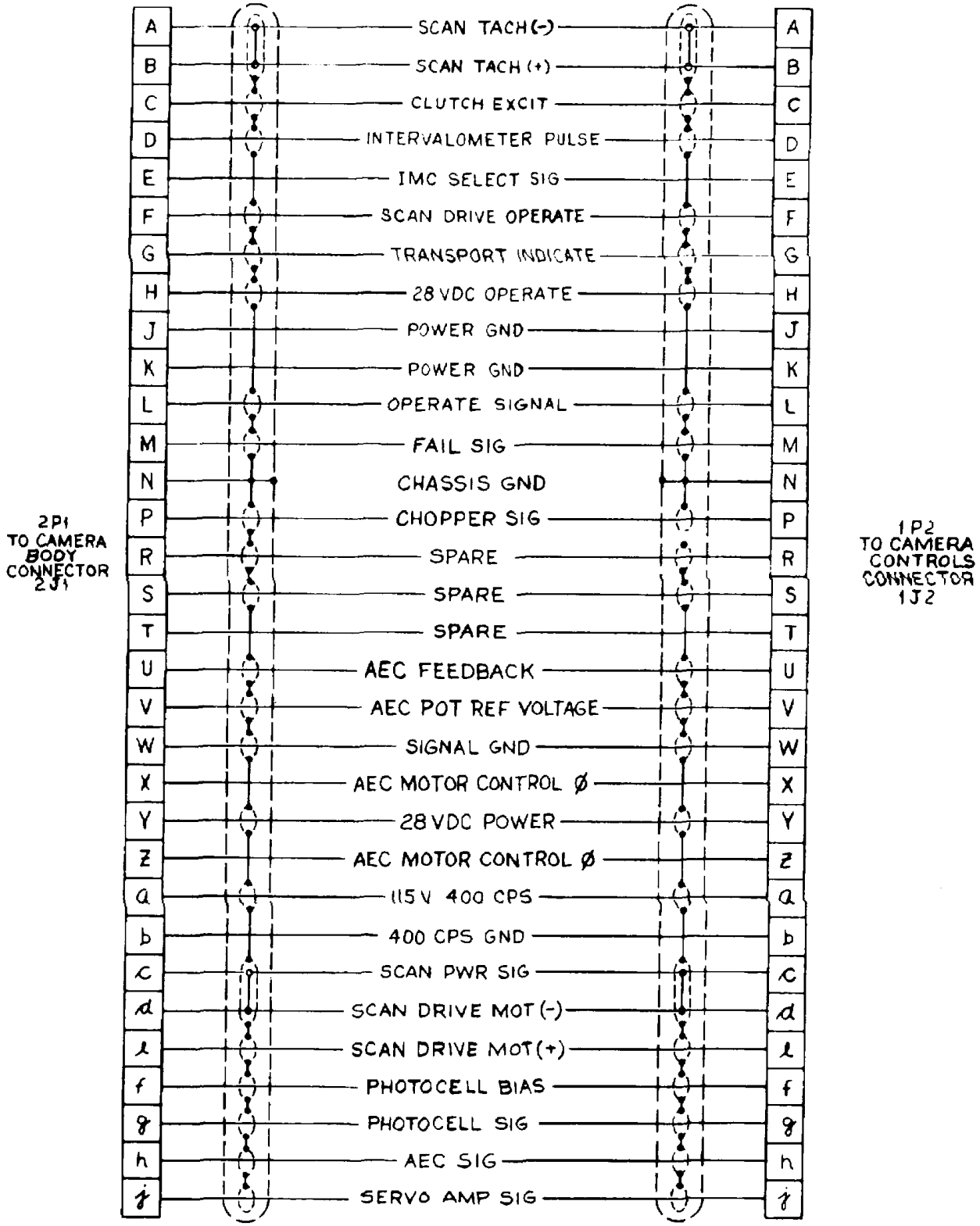


Figure 11. Camera Controls and Body Interconnecting Cable Diagram

CHAPTER 3

OPERATION

Section I. OPERATOR'S CONTROLS

17. Controls and Indicators (fig. 4)

The following chart lists the camera' s controls and indicators and describes their functions.

Control or Indicator	Function
POWER switch	Two position switch: Position — Function ON — Applies 115 VAC and 28 VDC to internal camera circuitry. OFF — Removes 115 VAC and 28 VDC from internal camera circuitry.
OPERATE switch	Two position switch: Position — Function ON — Applies 28 VDC operate voltage to internal circuitry. OFF — Removes 28 VDC operate voltage from internal circuitry.

Control or Indicator	Function
Mode switch	Three position switch: Position — Function 2 CPS — Sequences the camera to take two photographs per second. (Autocycle mode.) 4 CPS — Sequences the camera to take four photographs per second. (Autocycle mode.) PULSE — Sequences the camera to take photographs as pre-set on the Intervalometer. (Pulse mode.)
Intervalometer Control knob	Adjusted manually to sequence the camera to take photographs 1 per second through 1 every 60 seconds.
Intervalometer Readout	Indicates the cycle rate of the camera when in Pulse mode.
EXTRA PICTURE switch photographs between cycles.	Momentary on switch: allows camera to take (Pulse mode.)
FRAMES REMAINING indicator	Indicates the total remaining exposures in the camera.
POWER indicator lamp	Illuminates to indicate that +28 VDC is applied to the internal camera circuitry.
OPERATE indicator lamp	Blinks to indicate camera is operating. Remains illuminated when either film breakage or end of film occurs.

Section II. THREADING

18. General

Threading procedures are divided into three operations; namely, preliminary procedures (para 19), darkroom procedures (para 20), and subdued light procedures (para 21). The film path through the camera is illustrated in figure 23, and should be referred to before threading procedures are attempted. Procedures for removing exposed film from the camera are given in paragraph 22.

19. Preliminary Procedures

(fig. 12)

a. Unlatch the four magazine fasteners and remove the magazine from the body.

b. Rest the magazine, on its takeup cover and supply cover, on a clean flat surface.

c. Loosen the film keeper mounting bolt. Remove the film keeper from the magazine.

d. Place the magazine in an upright position.

e. Unlatch the four fasteners and remove the supply cover.

f. Pull the supply knob out as far as possible.

g. Unlatch the four fasteners and remove the takeup cover.

h. Pull the takeup knob out as far as possible.

20. Darkroom Procedures (fig. 13)

Note: Perform the following procedures in total darkness.

a. Unpackage the roll of film (supply spool) to be used.

b. Rest the magazine on its side with the drag clutch adjacent to the surface.

c. Place the supply spool next to the magazine supply side so that the film feeds from the spool top and the emulsion side faces away from the handle.

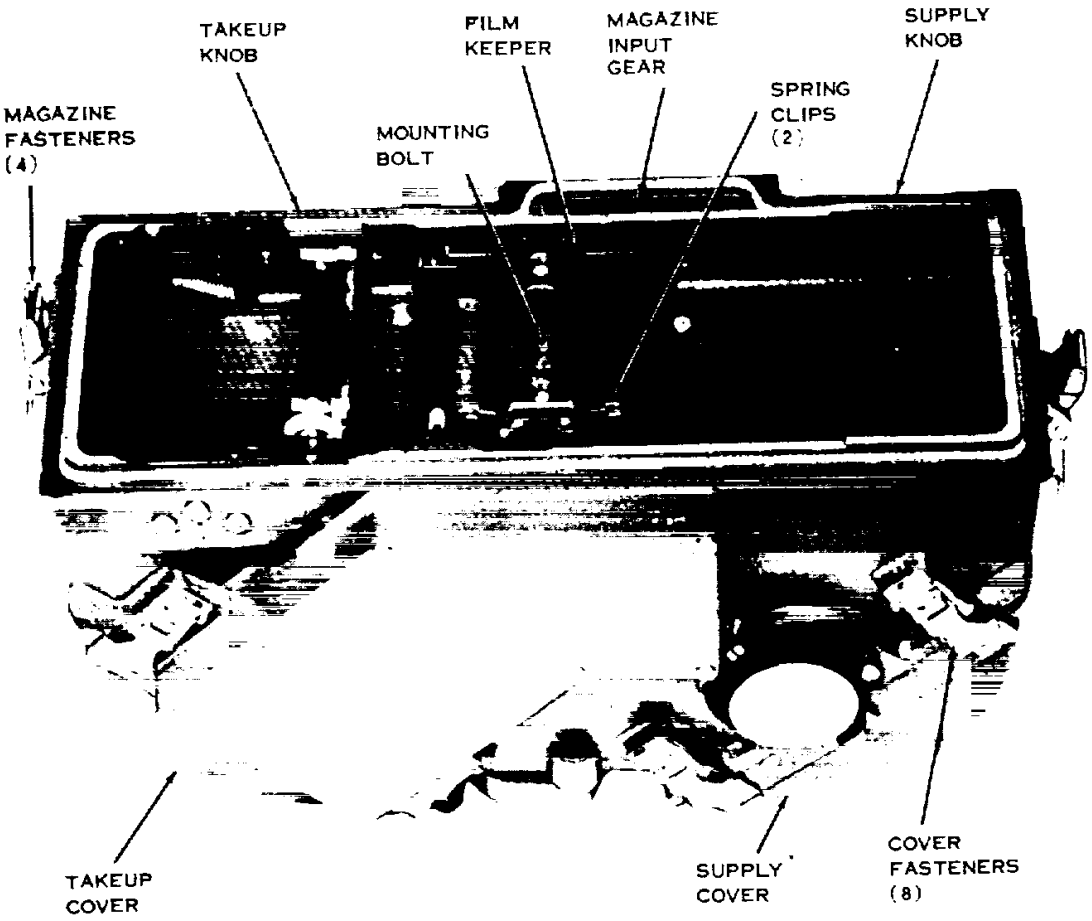


Figure 12. Camera Threading, Preliminary Procedures.

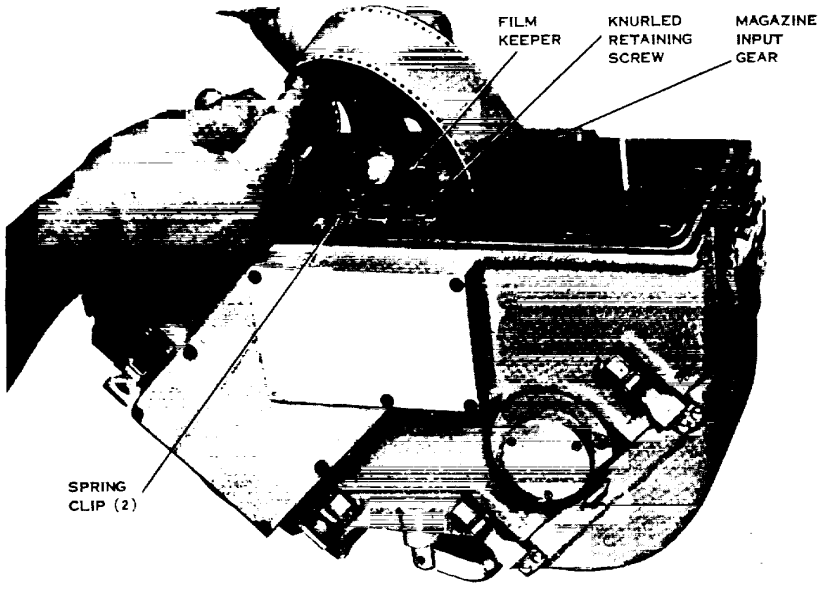


Figure 13. Camera Threading, Darkroom Procedures.

d. Feed the leading edge of the film between the supply idler roller and the supply slot until six inches of film protrudes beyond the slot.

e. Place the supply spool in the magazine and remove film slack by pulling the film protruding beyond the supply slot.

f. Mount the supply spool on the drag clutch keyed shaft.

g. Engage the supply knob keyed shaft with the supply spool.

h. Check that the supply spool is mounted properly by depressing the pin. If the pin does not retract repeat steps e, f, and g above.

Caution: In order to prevent film fogging, insure that the supply cover is properly mounted before exposing the magazine to light.

i. Mount the supply cover (not shown) on the magazine supply side and latch the four fasteners.

21. Subdued Light Procedures.

Note: Perform the following procedures in subdued light.

a. Rest the magazine on its supply cover and housing (fig. 14).

b. Pull the film protruding from the supply slot over the supply sprocket until three feet of film extends from the magazine supply side.

Caution: Do not twist the film or film damage will occur.

c. Feed the film leading edge over and around the pressure roller, then over the takeup sprocket and into the takeup slot. Insure that the film is routed over the takeup idler roller smoothly (fig. 15).

d. Pull the film leading edge until the film forms a supply loop adjacent to the loop guide marking. Make sure the film is routed tightly about the pressure roller (fig. 16).

e. Rest the film keeper in the magazine (fig. 17) so that its spring clips are located on the opposite side of magazine input gear.

f. Engage the film perforations with the supply sprocket and takeup sprocket teeth.

g. Tighten the film keeper mounting bolt.

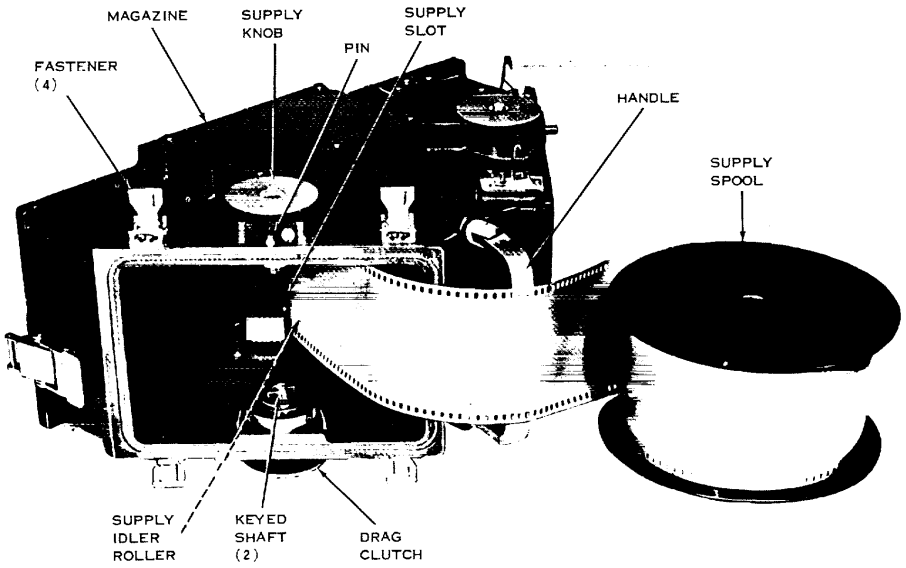


Figure 14. Camera Threading, Subdued Light Procedures (1).

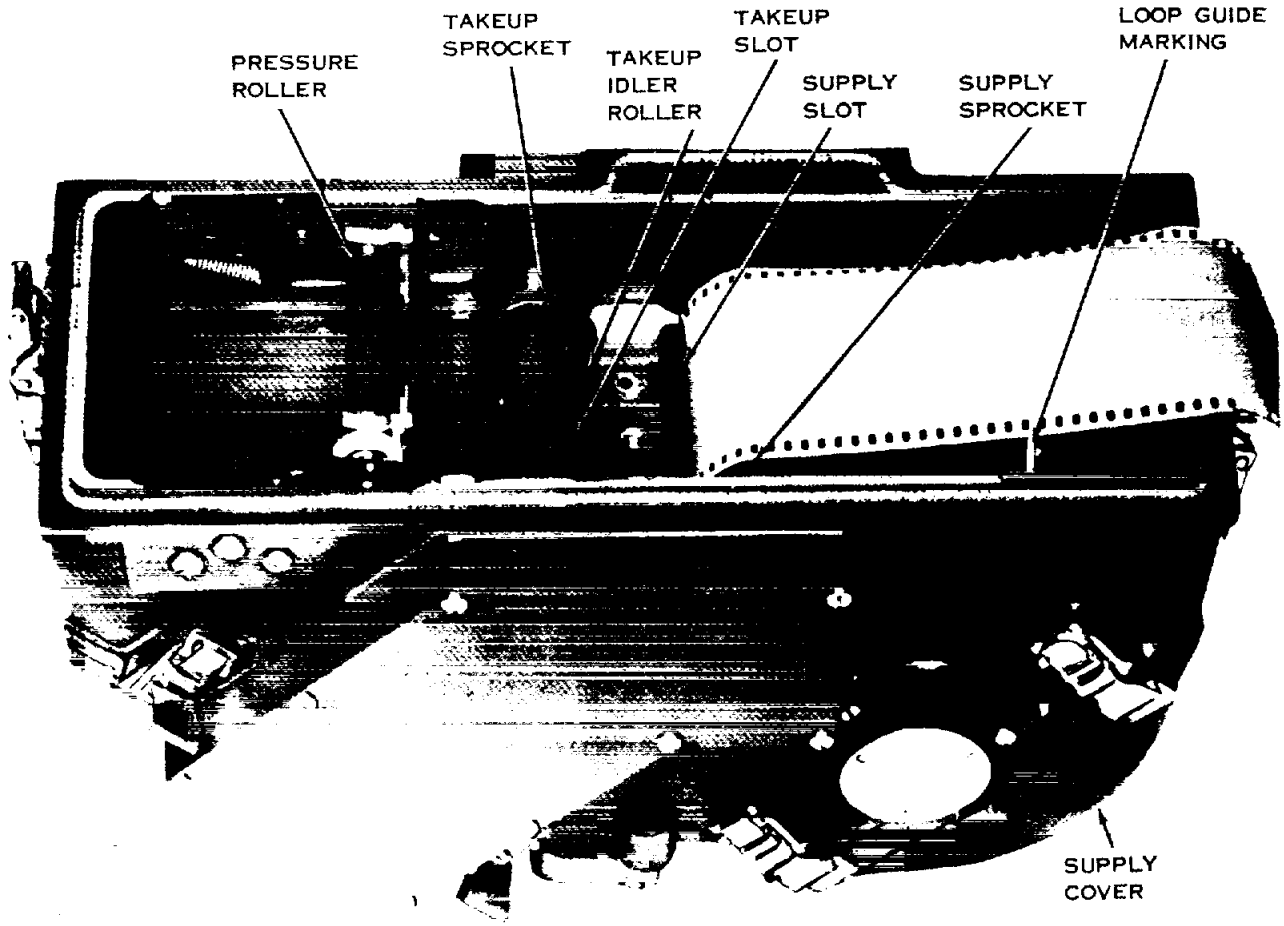


Figure 15. Routing of Film, Subdued Light Procedures (2).

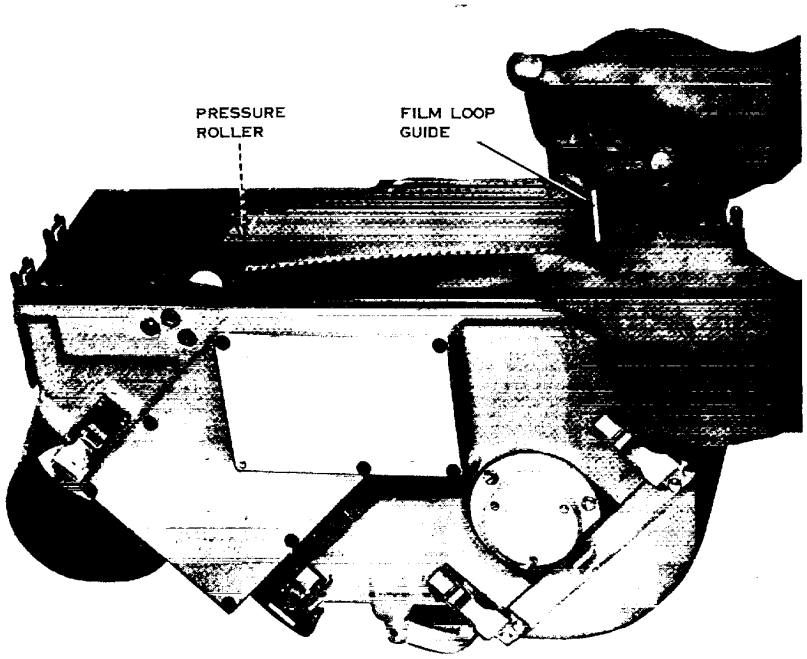


Figure 16. Forming Film Loop, Subdued Light Procedures (3).

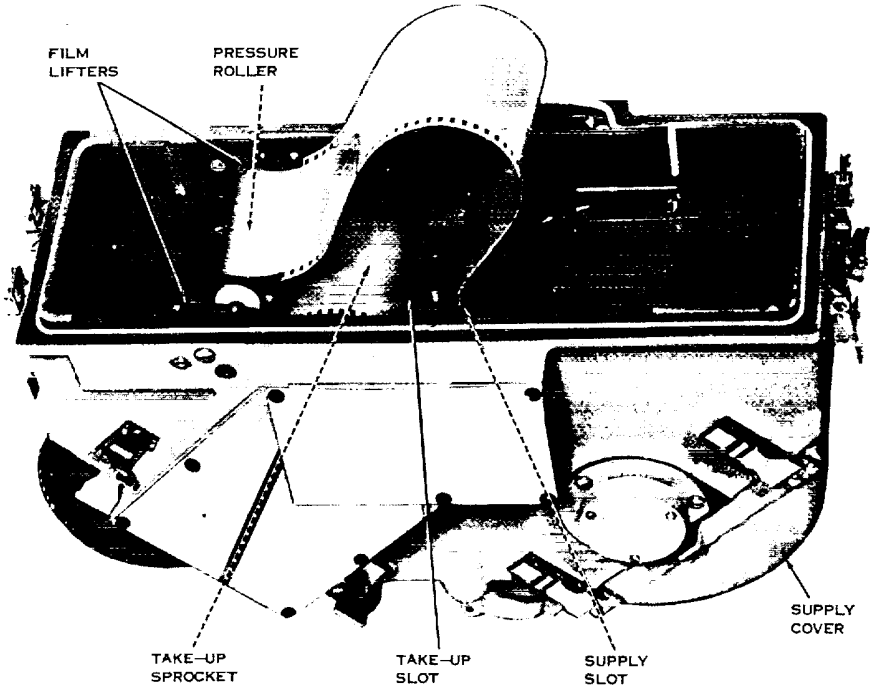


Figure 17. Installation of Film Keeper, Subdued Light Procedures (4).

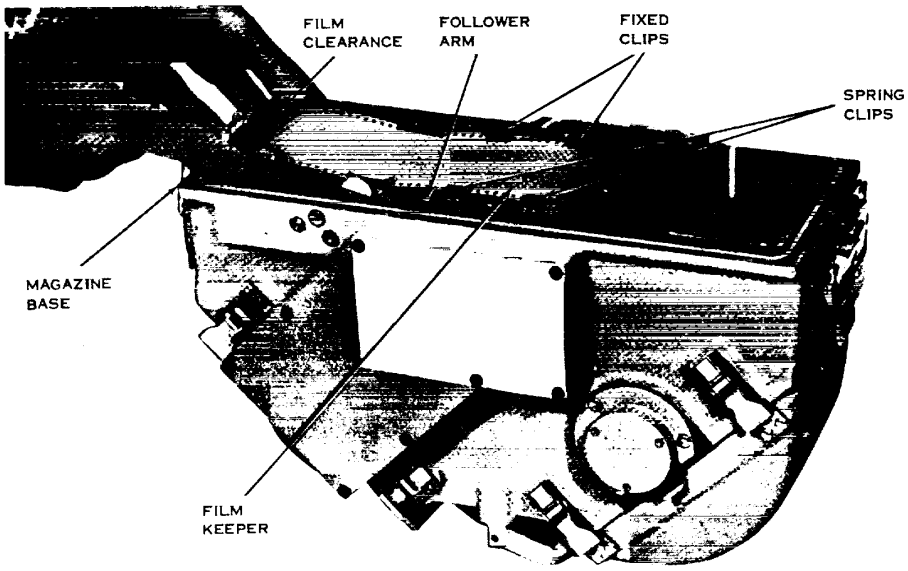


Figure 18. Checking Film Clearance, Subdued Light Procedures (5).

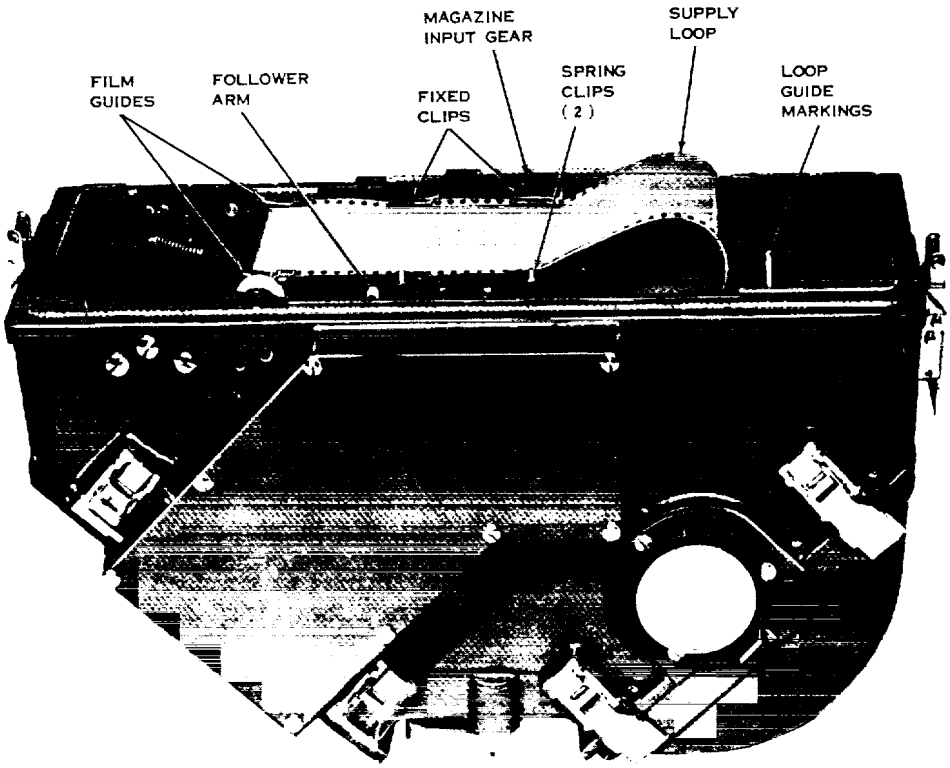


Figure 19. Camera Threading, Subdued Light Procedures (6).

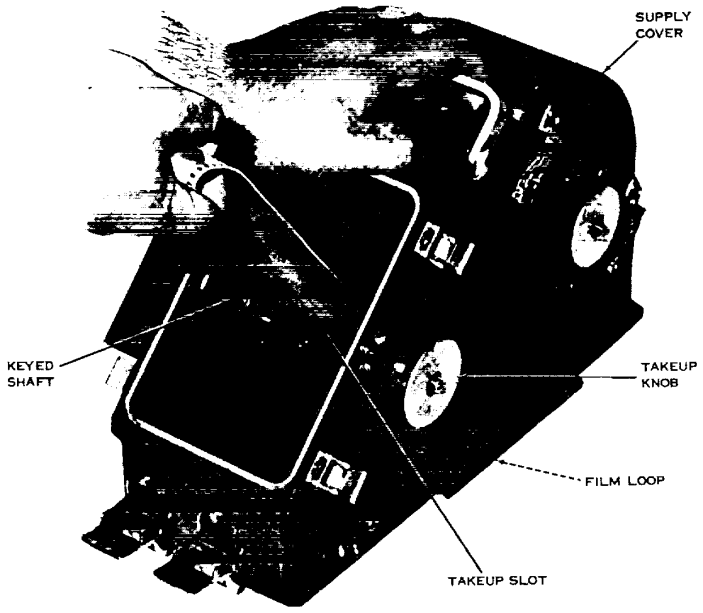


Figure 20. Checking Film Loop, Subdued Light Procedures (7).

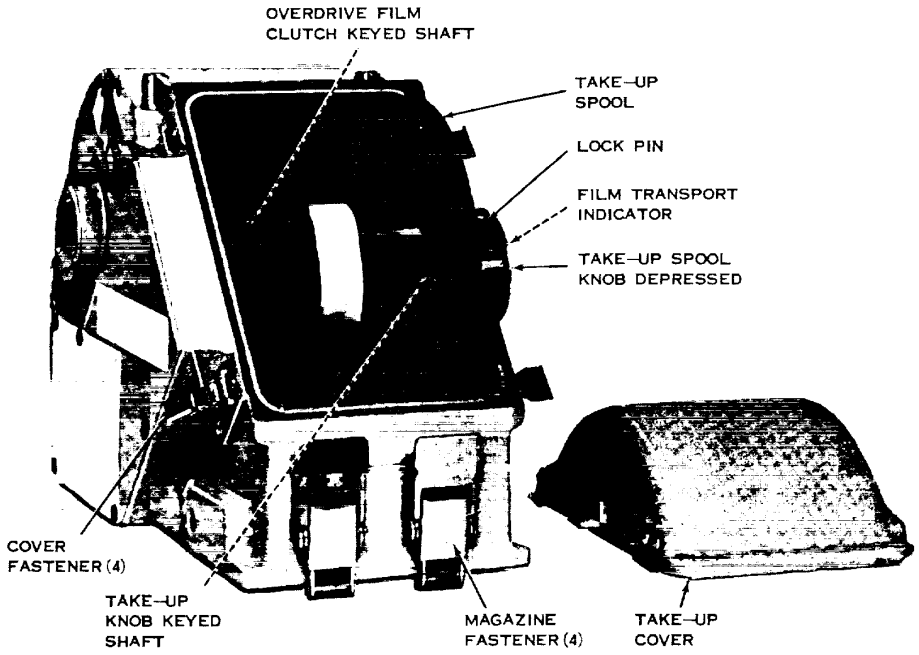


Figure 21. Installing Takeup Spool, Subdued Light Procedures (8).

h. Fit the film edge under the film keeper fixed clips (fig. 18).

i. Move the film keeper spring clips out and press the film flatly against the film keeper. Release the spring clips.

j. Insure that follower arm is under film edge (adjacent to non emulsion side of film) (fig. 19).

k. Fit the film edges under the pressure roller film guides.

l. Place the magazine in an upright position (fig. 20).

m. Holding magazine with one hand and grasping film with other hand, rapidly pull 18 to 24 inches of film from magazine takeup side. Check to insure that proper film loop exists on under side of magazine (fig. 19).

n. Mount the takeup spool on the keyed shaft (drag clutch side) (fig. 21).

o. Push in the takeup knob and engage its keyed shaft with the takeup spool.

p. Check that the takeup spool is mounted properly by depressing the takeup knob pin. If the pin does not retract repeat step o above.

q. Route the film leading edge over the takeup spool core. Thread the leading edge into the score slot.

r. Turn the takeup spool clockwise while holding the magazine input gear until the film in the magazine takeup side is collected.

Caution: Insure that the takeup cover is properly mounted. If it is not, film fogging will occur.

s. Mount the takeup cover on the magazine takeup side and latch the four fasteners.

t. Mount the magazine on the body making sure that the magazine input gear meshes with the body linkage gear (fig. 2).

u. Latch the four magazine fasteners to the body latch hooks (fig. 2).

22. Removing Exposed Film

To remove exposed film from the camera, proceed as follows:

a. Unlatch the four magazine fasteners (fig. 3) and remove the magazine from the body.

b. Cut the film at the supply loop (fig. 19).

Caution: The following procedures must be accomplished in total darkness since light will damage the exposed film.

c. Unlatch the four fasteners and remove the takeup cover (fig. 21).

d. Turn the takeup spool clockwise until the end of the film is about the take-up spool

e. Tape the loose end to the roll to prevent the film from accidentally unrolling.

f. Pull the takeup knob out as far as possible.

g. Remove the takeup spool from the magazine and place it in a light-tight container.

Section III. OPERATING INSTRUCTIONS

23. Preliminary Procedures

To be sure that the camera is ready for operation, proceed as follows:

a. Check to see that all camera components are installed and interconnected.

b. Check to see that the prism dust cover is removed.

c. Check to insure that the magazine has enough film to accomplish the mission.

d. Operate the control panel POWER switch (fig. 4) and OPERATE switch to OFF.

24. Preflight Operation

After performing the procedures outlined in paragraph 23, proceed as follows:

a. Operate the POWER switch(fig. 4) to ON. The POWER indicator lamp illuminates.

b. Operate the intervalometer control knob until numerical readout indicates to 5 seconds (050) .

c. Operate the mode switch to PULSE.

d. Set the FRAMES REMAINING counter to 000.

Note: Do not allow the procedure in step e below to have a duration of more than 10 seconds.

e. Operate the OPERATE switch to ON. The OPERATE indicator lamp blinks once every five seconds to indicate that a photograph is being taken. After two cycles of operation, operate the OPERATE switch to OFF.

f. Operate the mode switch to 2 CPS.

Note: Do not allow the procedure in step g, following, to have a duration of more than two seconds.

g. Operate the OPERATE switch to ON. The OPERATE indicator lamp blinks twice each second. After four cycles of operation, operate the OPERATE switch to OFF.

h. Operate the mode switch to 4 CPS.

Note: Do not allow the procedure in step i, below, to have a duration of more than two seconds.

i. Operate the OPERATE switch to ON. The OPERATE indicator lamp blinks four times each second. After eight cycles of operation, operate the OPERATE switch to OFF.

j. Operate the POWER switch to OFF.

25. Inflight Operation To operate the camera proceed as follows:

a. Operate the POWER switch (fig. 4) to ON.

b. Operate the mode switch to the desired mode of operation. If PULSE is selected, adjust the control knob until the numerical readout indicates the desired camera cycle rate.

c. When the aircraft is over the target area, operate the OPERATE switch to ON.

d. At the end of a photographic run, operate the OPERATE switch to OFF.

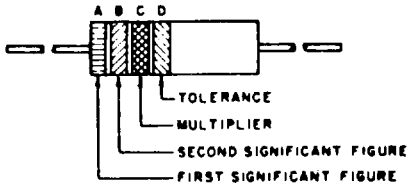
Note: If more than one photographic run is required, repeat steps c and d above for each additional run.

e. If extra photographs are required, depress the EXTRA PICTURE switch.

f. When no more photographic runs are to be made, operate the OPERATE switch to OFF and operate the POWER switch to OFF.

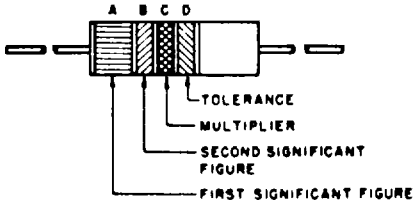
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS



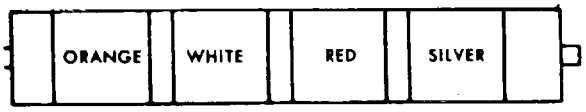
BAND A— Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING

BAND

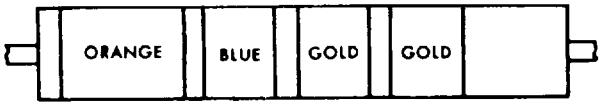


3 9 X100 ± 10%

NOMINAL RESISTANCE 3,900 Ohms

RESISTANCE TOLERANCE ± 10 percent

BAND



3 6 X0.1 ± 5%

3.6 Ohms

± 5 percent

STD-R2

*If Band D is omitted, the resistor tolerance is ± 20%, and the resistor is not Mil-Std.

CHAPTER 4

FUNCTIONING OF CAMERA, STILL PICTURE KA-60B 26.

26. General

The camera features a rotating double-dove prism to achieve panoramic photography. An operate command signal initiates the camera operation (para. 27). V/H command voltage is used to control the automatic exposure control (AEC) circuitry (para 28) and the cycling rate (para 29), when the camera mode is autocycle. When the camera mode is pulse, the cycling rate is determined by the intervalometer control knob setting (para 30) while the scan velocity is determined by the V/H and AEC inhibiting and scaling amplifier (scaling amplifier). The drive mechanism(para 31) transports film from the supply spool, through the film keeper (where the film is exposed), to the takeup spool.

27. Operate Command

(fig. 22)

When POWER switch S301 is set to ON, 28 vdc is applied to POWER lamp DS301 (causing the lamp to illuminate) and to the contacts of mode switch S303, OPERATE switch S304, and operate relay K102. The OPERATE switch, when set to ON, applies 28 vdc (operate command) through film switch S205 (when film is threaded through the magazine) to operate relay K102 (causing the relay to energize) and to the OPERATE lamp DS302. The OPERATE lamp illuminates to indicate either film transport, film breakage, or end-of-film, and extinguishes to indicate the time interval between film transports.

28. V/H Command (fig. 22)

a. Setting POWER switch S301 to ON causes 115 vac to be applied to the V/H generator. The V/H generator has two fixed output voltages; namely, V/H command voltages corresponding to a two cycles per second (2 cps) and a four cycles per second (4 cps) cycle rate. Setting mode switch to either 2 cps or 4 cps (autocycle mode) applies V/H command voltage to the input of the scaling amplifier. The mode switch also applies 28 vdc to the coil of mode relay K101, energizing the relay and causing it to apply the V/H command voltage to a scale network in the scaling amplifier. The AEC output voltage (dc) of the scaling amplifier is applied to the photocell and its associated circuit.

b. The photocell and its associated circuit act as a voltage divider network whose resistance varies inversely with light intensity. When a low-light condition exists, the network applies a large portion of the AEC output voltage (a above) to the chopper amplifier. As the light intensity increases the network applies a proportionately smaller portion of the AEC output voltage to the chopper amplifier.

c. For all light conditions, the chopper amplifier compares the AEC output voltage from the photocell with the feedback voltage (dc) from AEC feedback potentiometer R202. If these two dc voltages are not equal the chopper amplifier converts the difference voltage to an ac signal, and applies it to the input of the AEC servo amplifier. The amplified ac output voltage of the AEC servo amplifier is applied to motor B201 as an excitation voltage.

d. Increasing the light intensity to the photocell causes motor B201 to close the slit and reposition the arm of the AEC feedback potentiometer, thus changing the magnitude of the feedback voltage to the chopper amplifier. When the feedback voltage is equal in magnitude to the AEC output voltage applied to the chopper amplifier, the ac output voltage of the chopper amplifier is zero. This causes motor B201 operation to stop, holding the slit at an opening proportional to the amount of light and the V/H command voltage. When the slit reaches its minimum opening (0. 020 inch) the mechanical linkage starts to close the aperture. If the light intensity level is high and starts decreasing, the aperture opens until it reaches its maximum limit(f2.8). When the aperture reaches its maximum limit the mechanical linkage opens the slit.

e. When the mode switch is set to PULSE (pulse mode), mode relay deenergizes and a fixed dc voltage is applied through the scaling amplifier to the photocell as the AEC output voltage. The operation of the chopper amplifier and AEC servo amplifier are the same as discussed in paragraphs b, c, and d above.

29. Cycling Rate, Autocycle Mode (fig. 22)

a. When mode switch S303 is set to either 2 CPS or 4 CPS the proper V/H command voltage is applied to the scaling amplifier, and energized mode relay K101 applies the V/H command voltage to the scale network in the scaling amplifier (para 28). The scaling amplifier output voltage (V/H scan voltage) is applied through the contacts of energized operate relay K102 (para 27) to the input of scan driver amplifier. The scan drive amplifier also receives a dc feedback voltage from tachometer G201 which is proportional to the speed of motor B202 drive shaft. These two dc voltages are compared in the scan drive amplifier and their resultant voltage is applied to the power amplifier, amplified, and applied to motor B202 as an excitation voltage. The magnitude of the excitation voltage is proportional to the V/H command voltage.

b. The transistor switch, in order to apply an operational voltage to the clutchbrake coil L201, must receive two 28 vdc voltages. The 28 vdc line is continuously applied to the switch. When the camera mode is autocycle, the contacts of energized mode relay KO11 apply 28 vdc to the transistor switch. Thus, in autocycle mode the transistor switch output voltage is applied to clutch-brake coil L201, causing the clutch to engage and couple motor B202 rotating drive shaft to the drive mechanism. The clutch remains engaged during the autocycle mode.

c. Switch S203 is operated once each drive shaft revolution and applies 28 vdc to FRAMES REMAINING INDICATOR M302 to indicate the remaining exposures in the magazine.

30. Cycling Rate, Pulse Mode (fig. 22)

a. When the mode switch is set to PULSE, the V/H command voltage is not applied to the scaling amplifier; instead, a fixed dc voltage is applied. The output voltage of the scaling amplifier (V/H scan voltage) is applied through contacts of energized operate relay K102 (para 27) to the input of the scan drive amplifier. The scan drive amplifier also receives feedback voltage from tachometer G201 and compares it with the V/H scan voltage. The resultant output voltage of the scan drive amplifier is applied to the power amplifier, amplified, and applied to motor B202 as excitation voltage.
The excitation voltage to the motor is constant, causing the drive shaft rotation rate to be the same for each intervalometer setting (b below) .

b. The intervalometer, in pulse mode only, generates pulses at a rate preset by the intervalometer control knob. At the start of a cycle the intervalometer pulse is applied to the transistor switch together with the 28 vdc line voltage. This condition causes the transistor switch to energize the clutch-brake coil and engage the clutch, thus coupling the rotating drive shaft to the drive mechanism. The drive mechanism rotates the cams, closing switches S202 and S203. Switch S202 applies 28 vdc operate voltage from contacts of energized operate relay K102 (para 27) to the transistor switch, causing the switch to hold clutch-brake coil energized for the remainder of the cycle. Switch S203 applies the 28 vdc operate voltage to the FRAMES REMAINING indicator (para 29). When the drive mechanism completes a cycle, the cams open switches S202 and S203. The transistor switch output voltage deenergizes clutch-brake coil L201, causing the clutch to disengage and stop the drive mechanism rotation. The introduction of the next intervalometer pulse causes the drive mechanism operation to repeat.

c. Depressing EXTRA PICTURE switch S302 applies 28 vdc to the transistor switch. This condition overrides the intervalometer pulse sequence and causes the transistor switch to energize the clutch-brake coil once each drive mechanism cycle.

31. Drive Mechanism (fig. 23)

a. The drive mechanism which transports film and rotates the prism (17) is housed in the body and the magazine. Excitation voltage from the power amplifier (para 29) causes the motor B202 (6) to rotate the clutch input rear (4) and the clutch driving member (2) through a pinion gear (5). Another pinion gear is used to rotate the tach gear (7) causing the tachometer (8) to apply a voltage to chopper amplifier which is proportional to the speed of the motor drive shaft (pa-a 29 and 30). When the clutch engages, the driven member (3) rotates the drive output gear (1) and the film drive shaft (11).

b. Film is threaded through the camera as follows: fresh film from the supply spool (25) is threaded about the supply sprocket (35) and routed under the film keeper (33) forming the supply slack loop (24). The film from the film keeper (33) is routed between the pressure roller (32) and drive roller (13) (forming the takeup slack loop (31)), threaded about the takeup sprocket (30) and collected by the takeup spool (28).

c. Film transport is accomplished when the clutch engages. The film drive shaft (11) rotates the magazine input gear (27) through the linkage gear (10) causing the supply sprocket (35) to rotate in a clockwise direction. The supply sprocket (35) pulls film from the supply spool (25) and routes it to the supply slack loop (24) (increasing the supply slack loop size). The sprocket output gear (34) rotates the takeup spool (28) and takeup sprocket (30) in a clockwise direction through the timing beltgear train arrangement (36) allowing film to be collected from the takeup slack loop (31) (decreasing the takeup slack loop size). The two slack loop sizes change at the same rate.

d. The drive output gear (1) (a above) rotates the drive roller (13) through a gear train and the lift cam (12) through a timing belt (20) -gear train arrangement. As the supply slack loop (24) size increases the cam follower (21) rides on the high side of the lift cam (12). When the supply slack loop (24) increases a predetermined amount the cam follower (21) rides the low side of the lift cam (12). This condition causes the pressure roller (32) to press the film against the rotating drive roller (13), transporting the film from the supply slack loop (24) under the film keeper (33) and to the takeup slack loop (31). As the film passes under the film keeper (33) it is exposed to the target image. The prism(17) which is rotated by a gear train (at the same rate as the film is transported) transmits the target image through the lens, aperture, and slit (not shown) to the film.

e. When the cam follower (21) reaches the high side of the lift cam (12), the pressure roller (32) releases the film from the drive roller (13) and switch S202 (14) disengages the clutch (para 30) thus stopping film transport. The film transport cycle repeats each time the clutch engages. Cam switch S202 (14) is used to engage the clutch (pulse mode), and switch S203 (15) indicates film transport.
End of film switch S205 (9) is operated when no film appears under the follower arm (23).

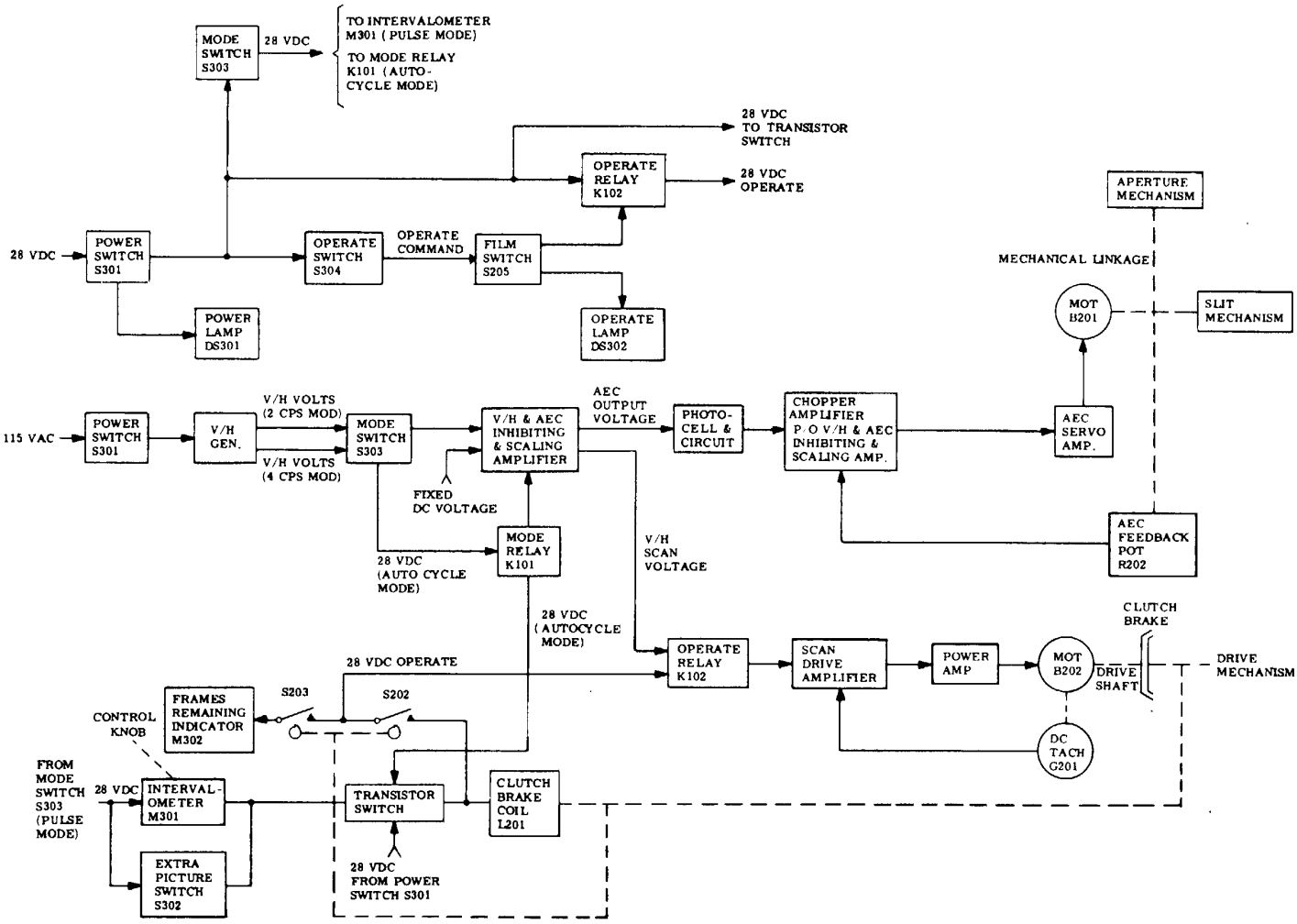


Figure 22. Electronic Block Diagram.

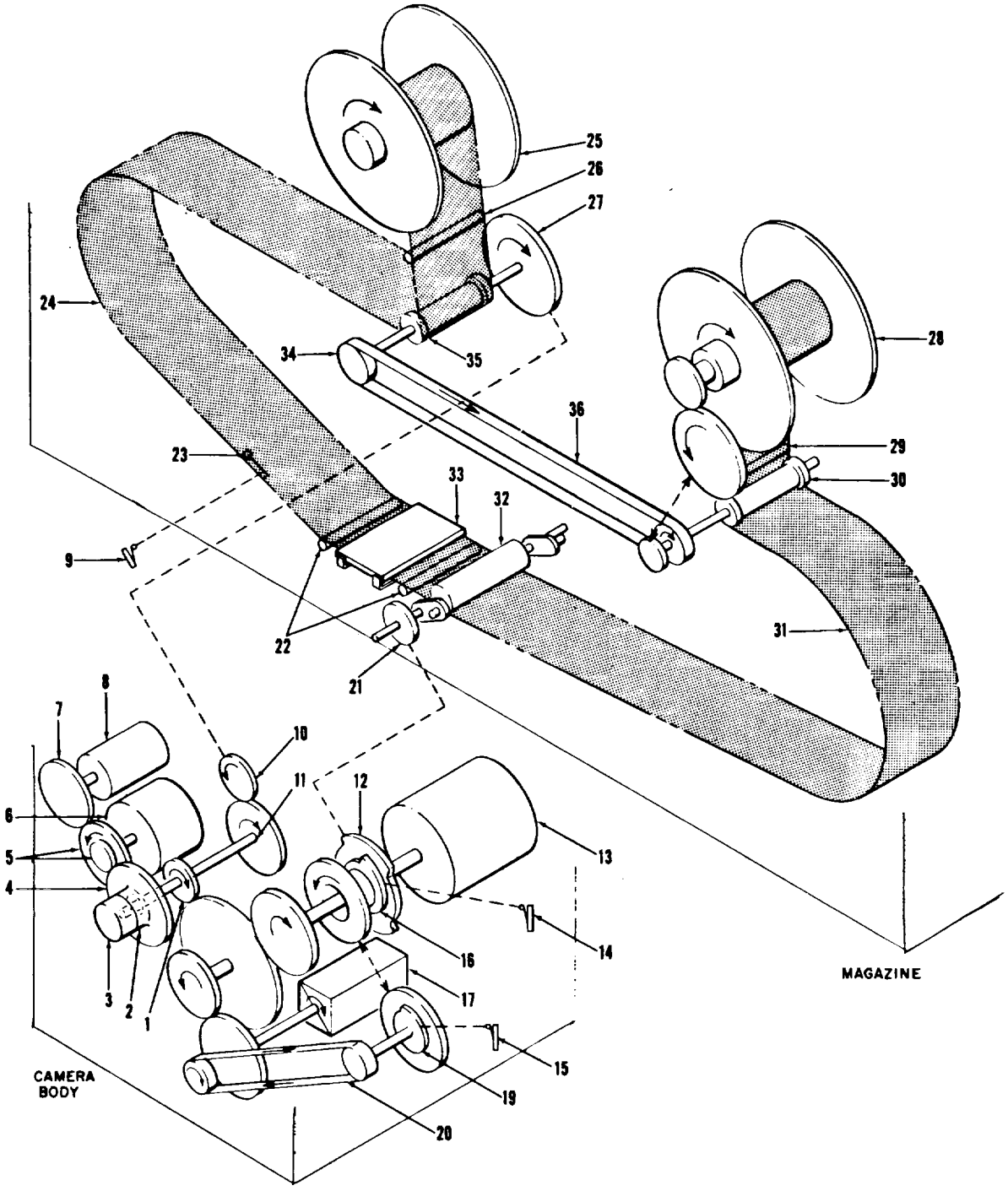


Figure 23. Mechanical Block Diagram.

Legend for Figure 23.

1. Drive output gear
2. Driving member (clutch)
3. Driven member (clutch)
4. Clutch input gear
5. Pinion gear (2)
6. Motor B202
7. Tachometer gear
8. Tachometer
9. Switch S205
10. Linkage gear
11. Film drive shaft
12. Lift cam
13. Drive roller
14. Switch S202
15. Switch S203
16. Cam
17. Prism
18. (NOT USED)
19. Cam
20. Timing belt
21. Cam follower
22. Idler rollers (2)
23. Follower Arm
24. Supply slack loop
25. Supply spool
26. Supply idler roller
27. Magazine input gear
28. Takeup spool
29. Takeup idler roller
30. Takeup sprocket
31. Takeup slack loop
32. Pressure roller
33. Film keeper
34. Sprocket output gear
35. Supply sprocket
36. Timing belt

CHAPTER 5

MAINTENANCE INSTRUCTIONS

32. General

The maintenance information in this chapter includes visual inspection (para 34), and cleaning (para 35). The tools and materials required to maintain the camera are listed in paragraph 33. Schematic diagrams for the camera are shown in figures 24 through 30.

33. Tools and Materials Required

The following tools and materials are required for the operators preventive maintenance schedule.

a. Camels - hair brush.

b. Cleaning compound.

c. Lint-free cloth.

d. Hand blower.

e. Lens cleaner.

f. Lens tissue.

34. Visual Inspection

a. Check the equipment (para 11).

b. Check exterior surfaces for cleanliness (para 35).

c. Check electrical connectors for damage.

d. Check the exterior surfaces of the prism and optical window for scratches, chips, cracks, or other defects.

e. Check the magazine covers for tight fit, and for freedom from dents or cracks.

f. Check that the body, magazine, control panel and camera controls (fig. 1) are properly installed.

g. Check the interconnecting cables for worn, frayed, or damaged insulation.

35. Cleaning

a. Optical Surfaces.

(1) Check all exposed optical surfaces for freedom from dust, dirt, and foreign matter.

(2) Carefully remove all dirt, dust, and foreign matter from the outer surfaces of the prism, use a camels -hair brush, hand blower, or a gentle blast of moisture-free compressed air.

(3) Remove stubborn dirt with lens tissue slightly dampened with lens cleaner((4) and (5) below).

Caution: Do not use lens tissue that contains silicone to clean optical surfaces.

(4) Gently wipe the exposed optical surface with the moistened lens tissue use a circular motion starting from the edge of the component and working toward the center.

(5) Dry the cleaned optical surface with clean, dry lens tissue using the circular motion described in (4) above.

b. Mechanical Surfaces

Caution: Do not allow cleaning compound to come in contact with optical or lubricated surfaces. Use cleaning compound sparingly.

(1) Clean all exposed metal parts of the equipment with a dry, lint-free cloth.

(2) Use a camels - hair brush or hand blower to remove dust, film chips, and foreign matter from hard-to-reach parts on the equipment.

Warning: Cleaning compound is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

(3) Remove grease, fungus, and ground-in dirt from metallic parts with a cloth dampened (not wet) with cleaning compound.

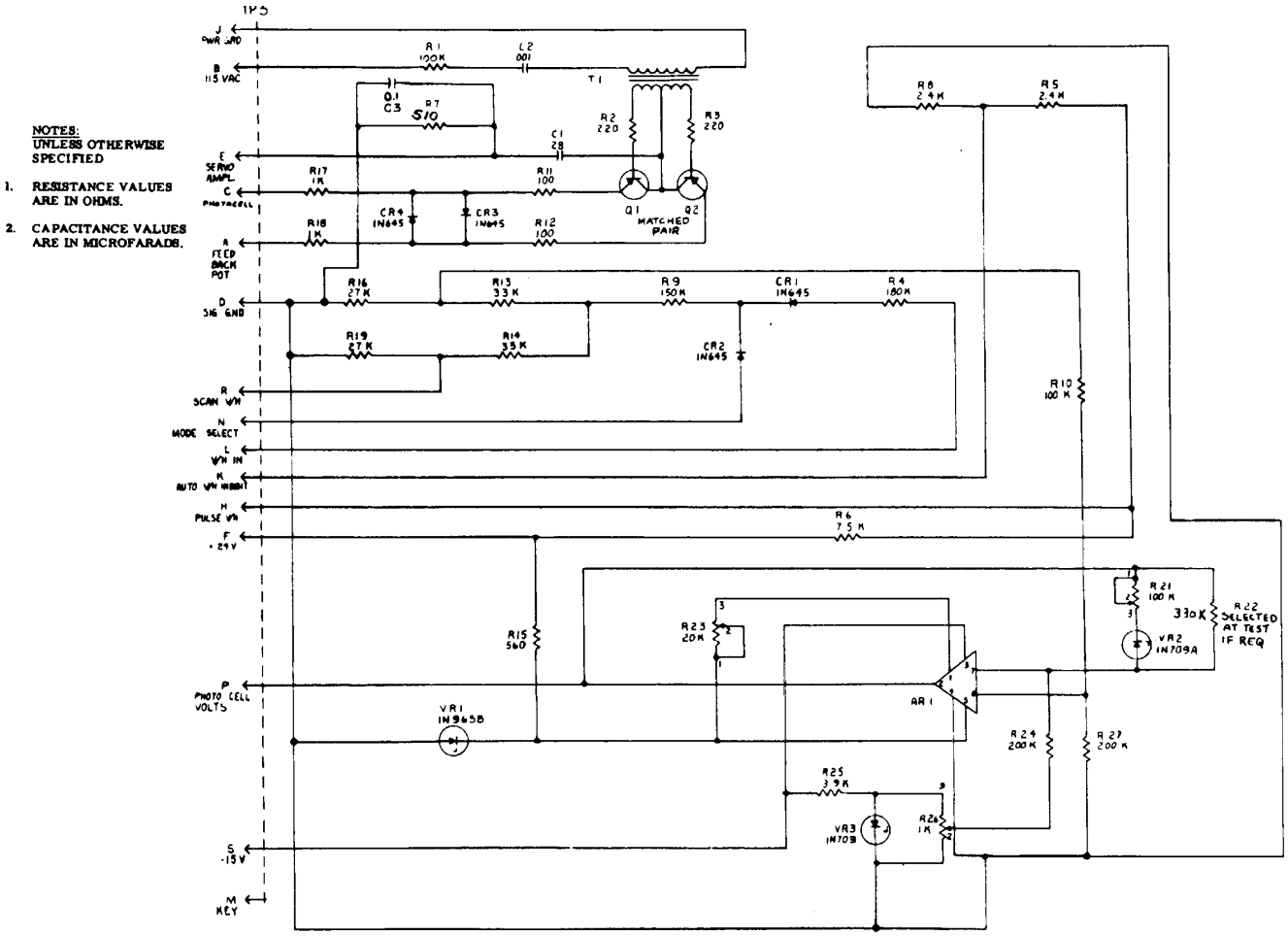


Figure 24. V/H and AEC Inhibiting and Scaling Amplifier Schematic Diagram.

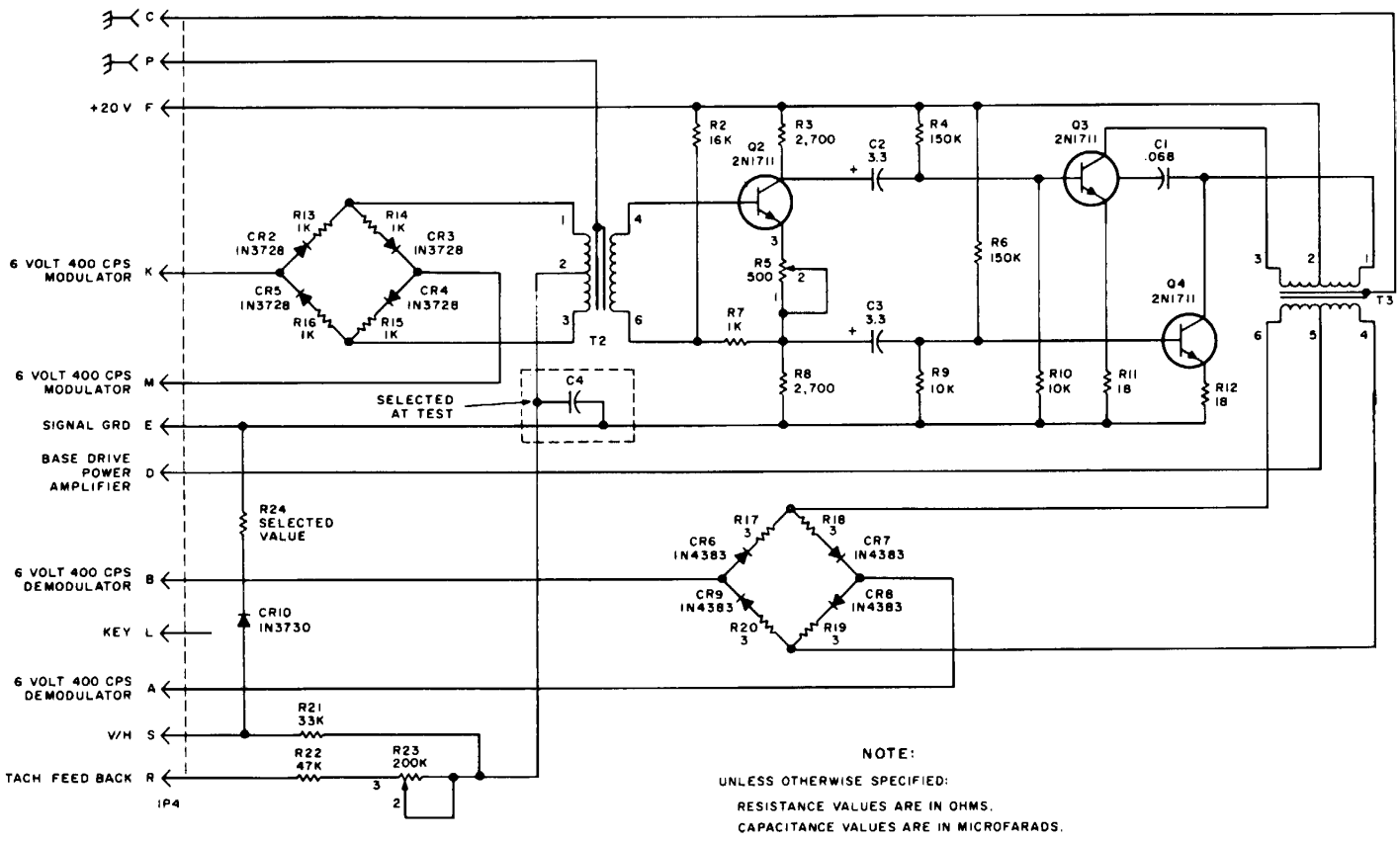


Figure 25. Scan Drive Amplifier, Schematic Diagram

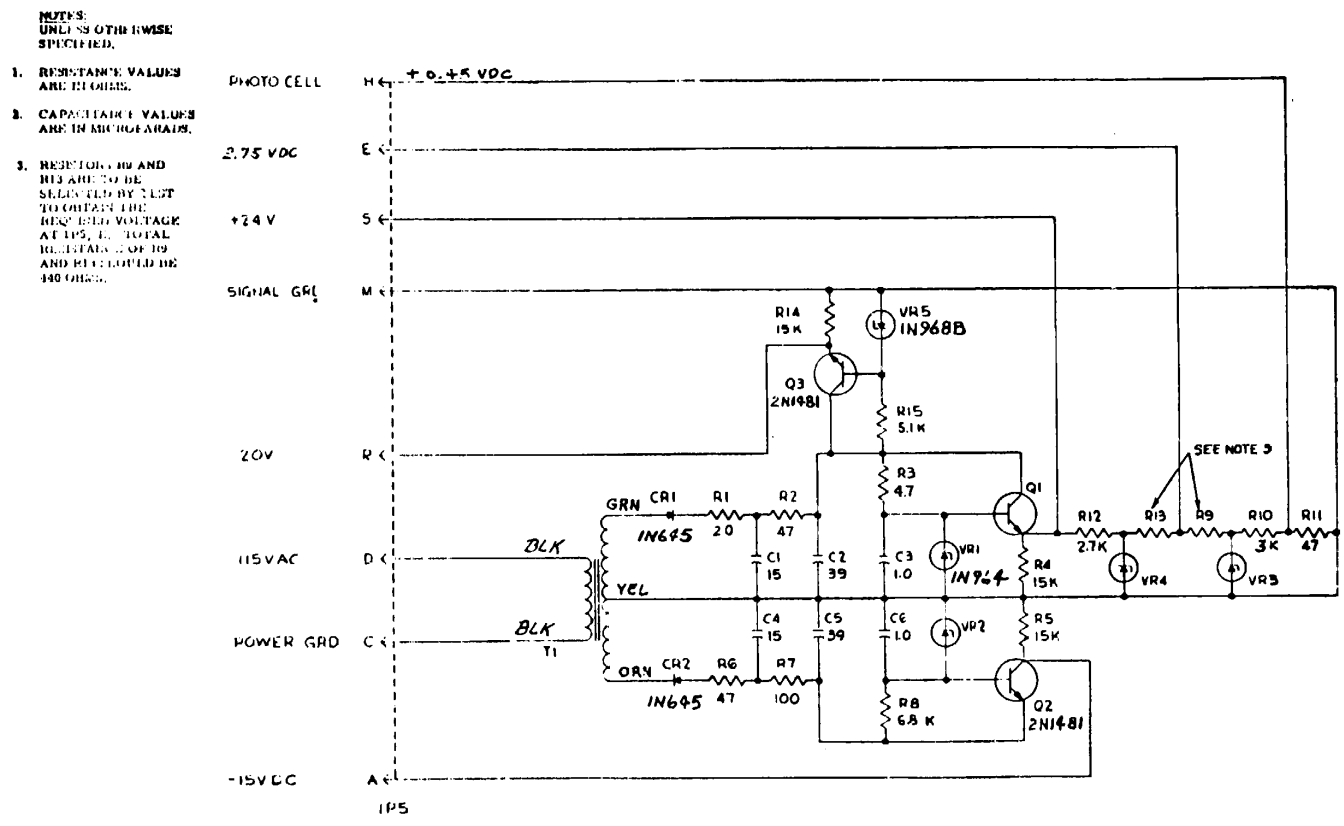


Figure 26. Power Supply Schematic diagram.

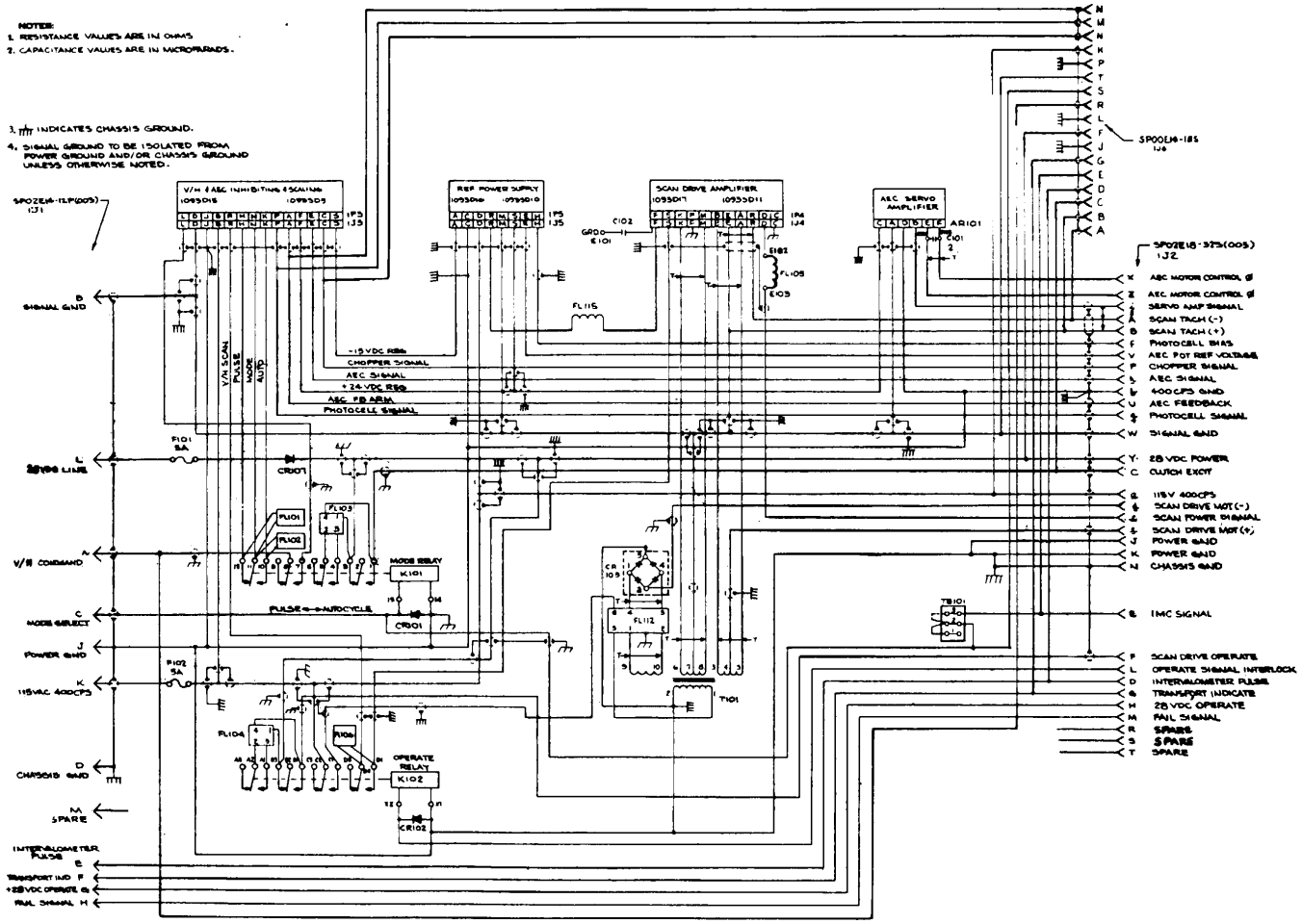


Figure 27. Camera Controls, Schematic Diagram.

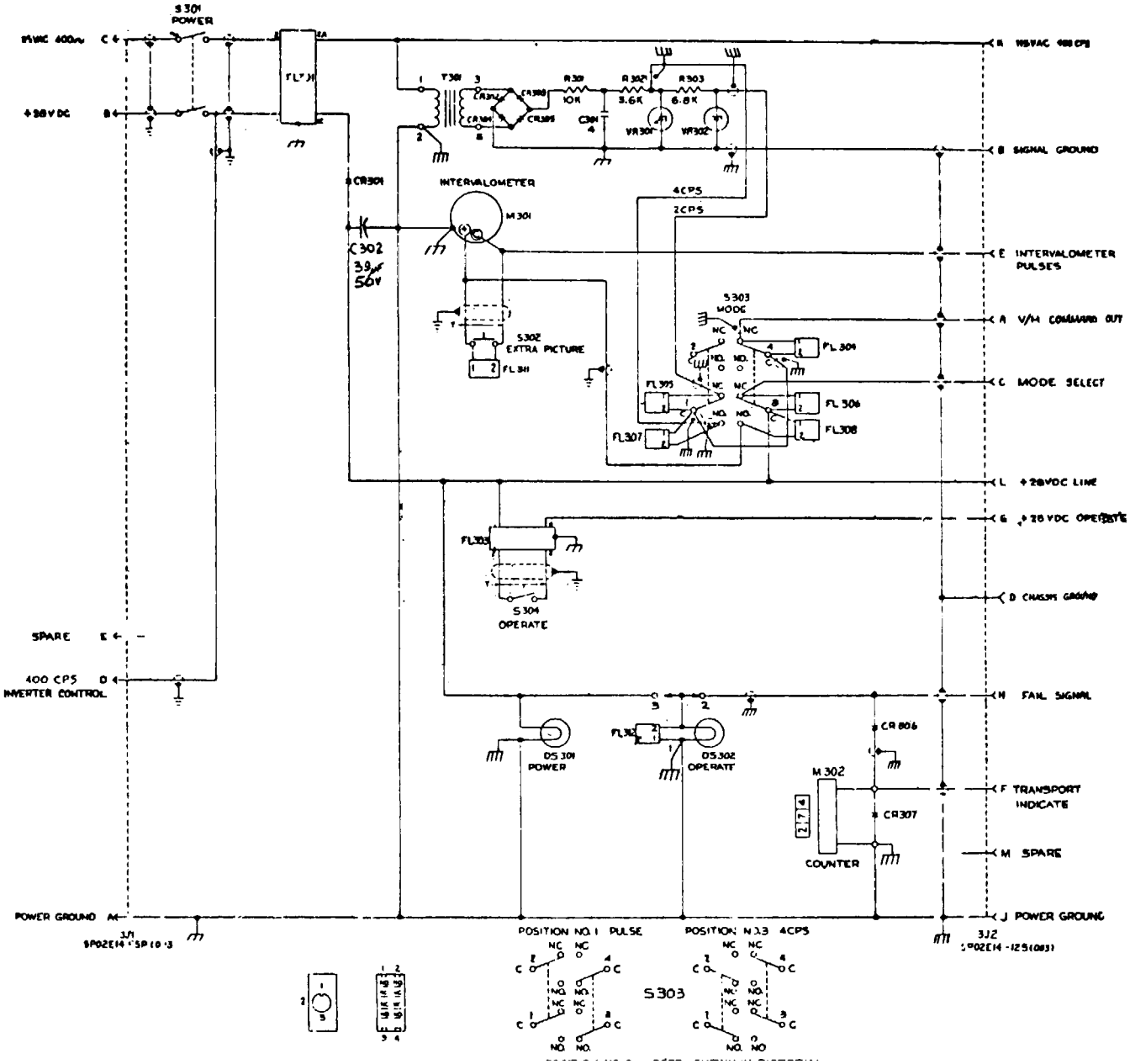


Figure 28. Control Panel Schematic Diagram.

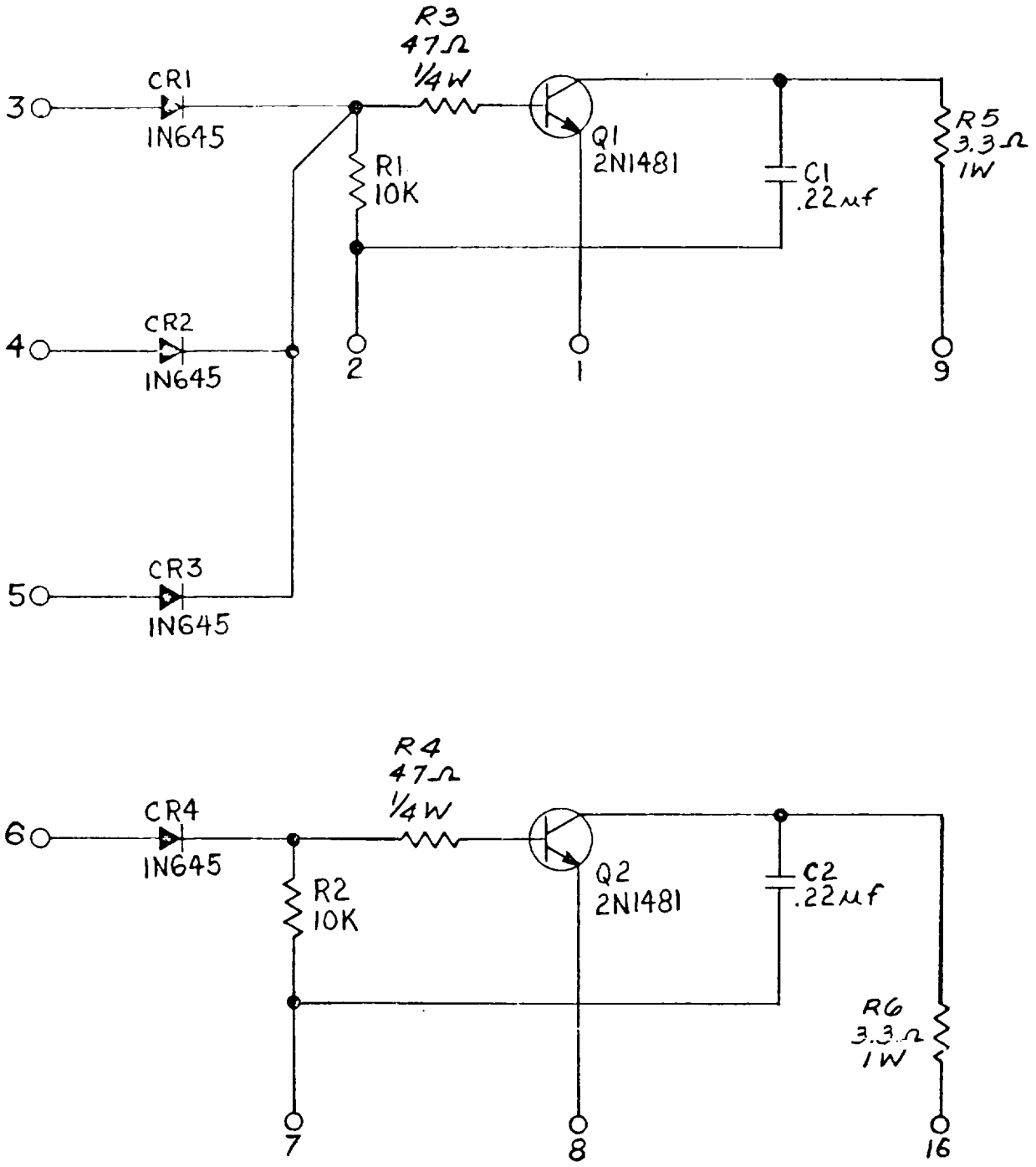


Figure 29. Transistor Switch Schematic Diagram.

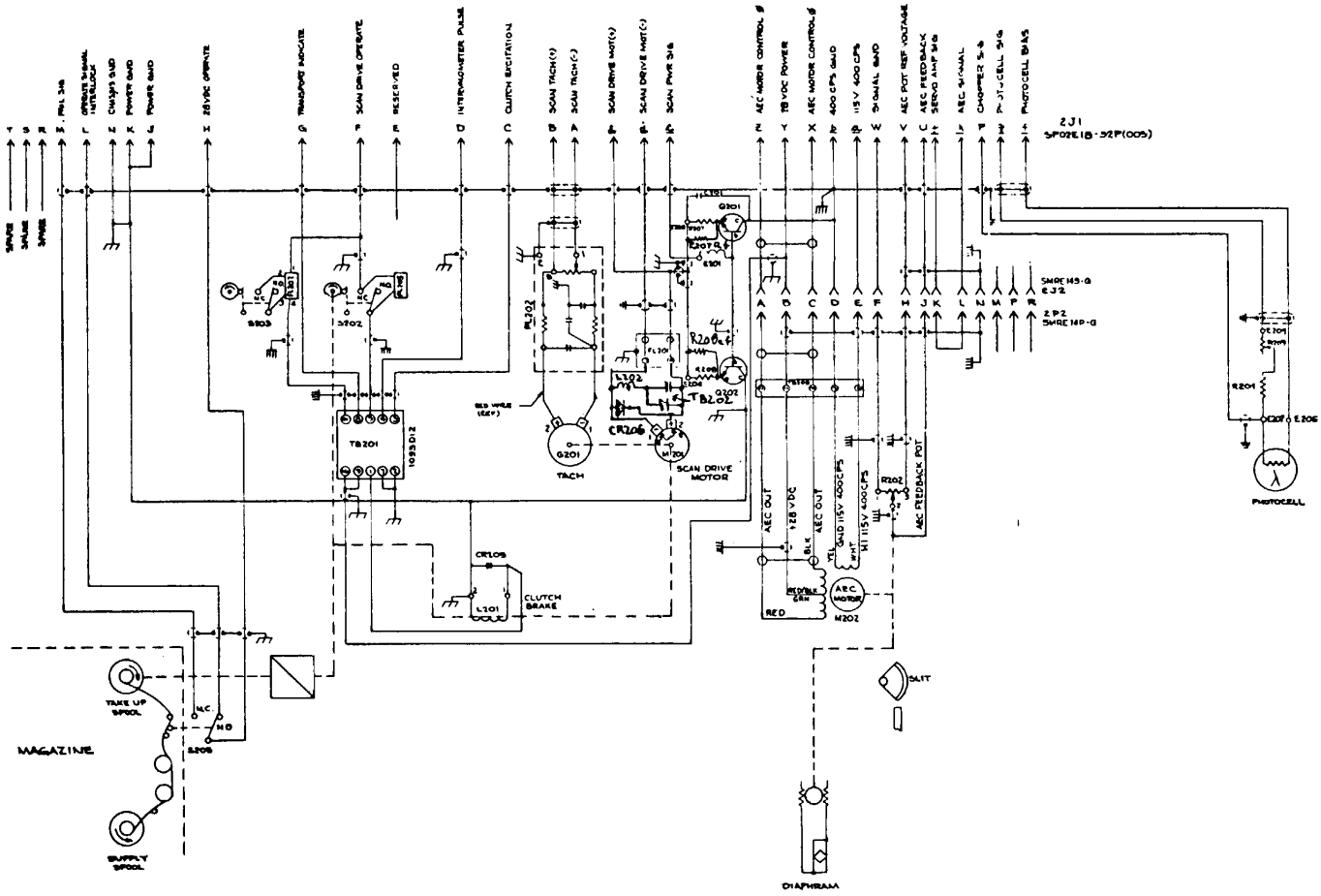


Figure 30. Body Schematic Diagram

CHAPTER 6

TESTING CAMERA SYSTEM WIT LS-71A

36. Test Set, Camera System LS-71A (fig. 31)

a. This chapter contains instructions far testing a camera with Test Set, Camera System LS-71A test set. Testing can be accomplished either on an aircraft as a preflight check or in a maintenance shop as a bench test.

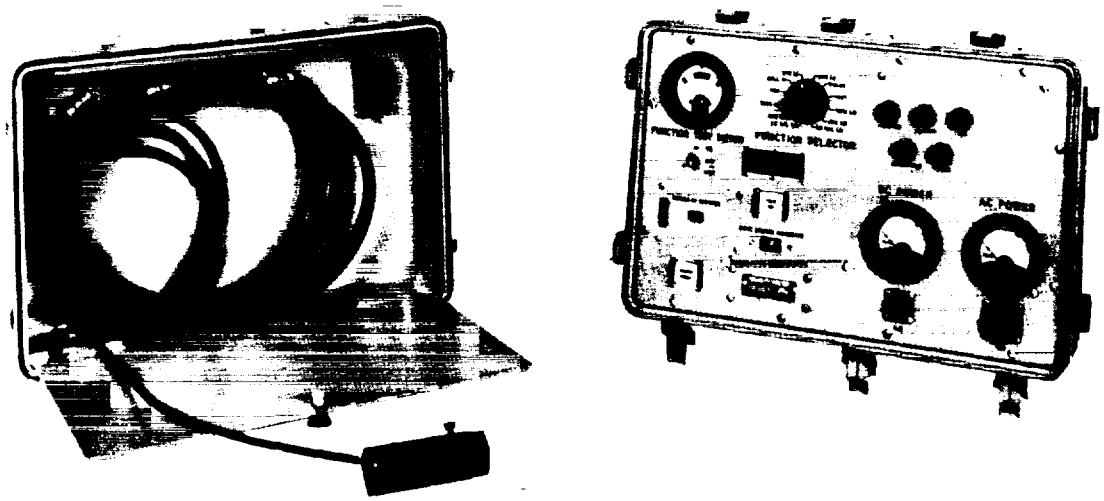


Figure 31. Test Set, Camera System LS-71A.

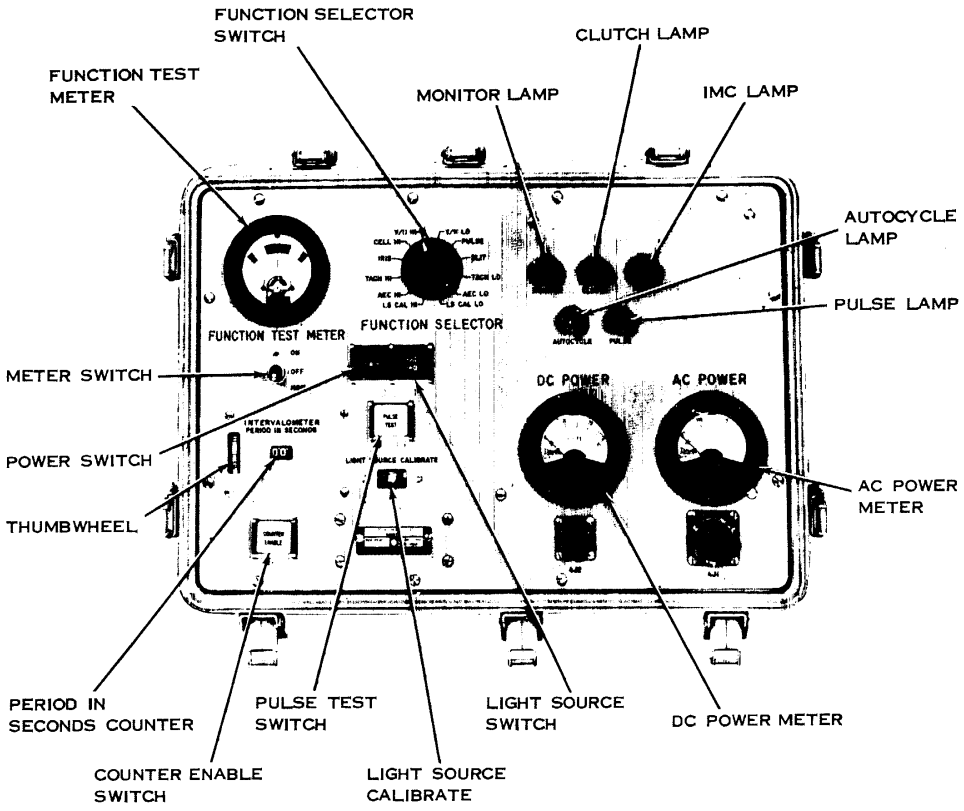


Figure 32. Test Set, Front Panel.

b. The following chart lists the test set's controls and indicators and describes their functions. For their locations, refer to figure 32.

Control or Indicator	*Function*
FUNCTION TEST METER	Displays camera functional voltages, selected by FUNCTION SELECTOR switch, to be monitored.
FUNCTION SELECTOR switch	Twelve position switch which selects specific camera functional voltages to be monitored on the FUNCTION TEST METER.
MONITOR lamp	Blinks to indicate that the camera is cycling.
CLUTCH lamp	Blinks to indicate that the camera body clutch is engaging and disengaging.
IMC lamp	Illuminates to indicate that ,IMC Mechanism operational voltage is present (Autocycle mode only).
AUTOCYCLE lamp	Illuminates when camera control panel mode switch is operated to AUTOCYCLE.
PULSE lamp	Illuminates when camera control panel mode switch is operated to PULSE.
AC POWER meter	Indicates camera internal ac voltage.
DC POWER meter	Indicates camera internal dc voltage.
Light source	Provides necessary illumination to test camera AEC circuitry.
LIGHT SOURCE CALIBRATE	Used to calibrate the light source between 100 and 800 foot-lamberts for camera AEC circuitry test.
PULSE TEST switch	When depressed illuminates to indicate that 28 vdc is applied to the camera control panel INTERVALOMETER output circuit. This condition causes the camera to operate for one cycle.

Control or Indicator	*Function*
LIGHT SOURCE switch	When depressed illuminates to Indicate that operating (voltage is applied to the light source.
POWER switch	When depressed illuminates to Indicate that operating power is applied to the Test Set.
COUNTER ENABLE switch	Depress to start camera cycle rate count, as displayed on the PERIOD IN SECONDS counter.
PERIOD IN SECONDS	Indicate camera picture-take rate after COUNTER ENABLES switch is depressed. Counter
Thumb wheel	Rotated to return PERIOD) IN SECONDS counter readout to zero.
Meter switch	Three position switch

Position	*Function*
ON	Continuously applies a voltage selected by FUNCTION SELECTOR switch to the FUNCTION TEST METER.
OFF	Removes all voltage from FUNCTION METER TEST.
MOM	Momentarily applies a voltage selected by FUNCTION SELECTOR switch to the FUNCTION TEST METER.

36.1 Item Comprising an Operable Equipment

Test set Camera System LS-71A (FSN 6760937-1918) comprises an operable equipment and is shown in figure 31.

37. Preliminary Testing Procedures

Before performing the testing procedures in paragraph 38, perform the procedure outlined below.

a. Load the magazine with at least 200 feet of dummy film (para 18).

b. Operate the control panel POWER and OPERATE switches to off.

c. Operate the camera control panel mode switch to 4 CPS.

d. Reset the test set on a flat surface.

Caution: Turn counterclockwise the pressure RELIEF VALVE to release air pressure before performing step e below.

e. Unlatch the fasteners and open the test set carrying case.

f. Separate the carrying case upper and lower sections.

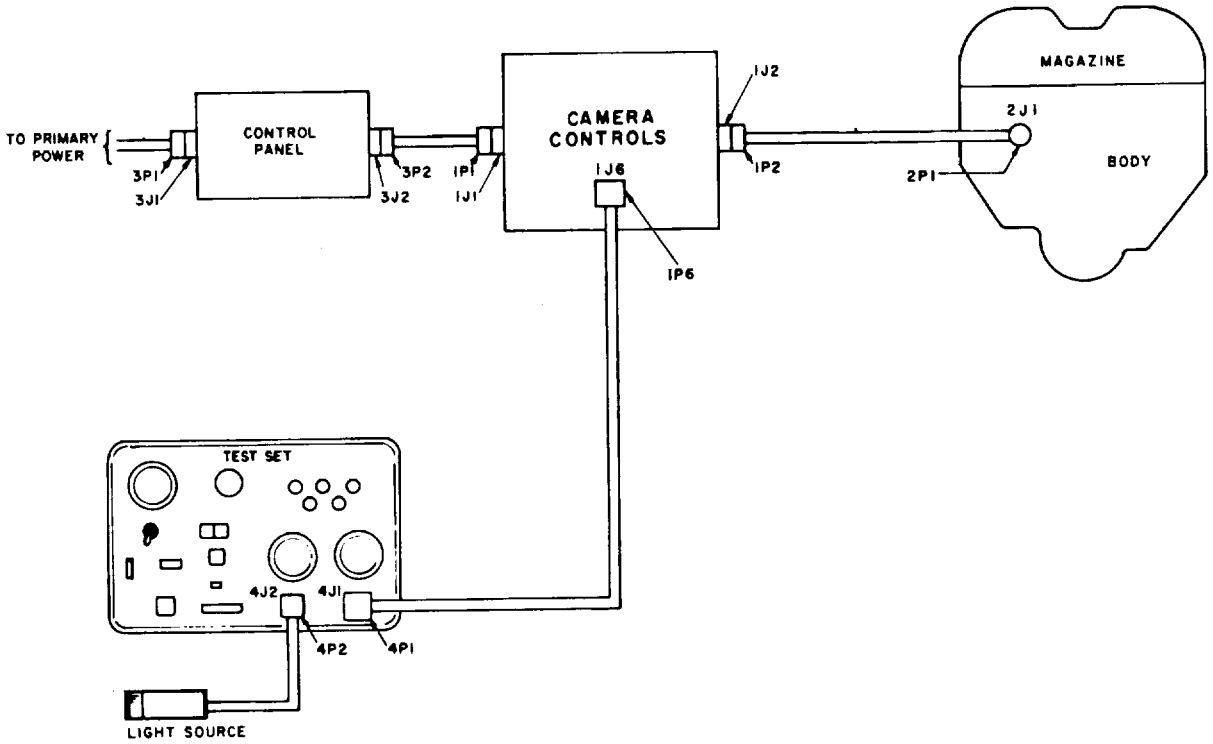


Figure 33. Test Set and Camera, Interconnecting Diagram.

g. Remove electrical cable from carrying case upper section.

h. Connect electrical cable between test set connector 4J1 and camera controls connector 1J6.

i. Remove light source from carrying case upper section and connect its cable to test set connector 4J2.

j. Insure that camera components are interconnected as shown in figure 33.

k. Operate the remote power switch to on. Note that the POWER, CLUTCH and AUTOCYCLE lamps illuminate and DC POWER and AC POWER meters indicates 23 to 26. 5 vdc and 107. 5 to 119. 5 vac, respectively. (Reading on DC Power meter shall conform to 23 through 26. 5 vdc limits. This range is lower than line specifications due to polarity protection and radio noise filtering. This drop is normal and takes into account operation within the above limits which will not adversely affect operation of the camera.) If control panel mode switch is in PULSE mode, and Test Set POWER switch is not depressed to on position, Test Set PULSE lamp does not illuminate.

38. Testing Procedure

After performing the procedures in paragraph 37, test the camera by performing the steps outlined in the chart below. The chart lists the camera and test set control settings, the test set indication (camera performance) and the cause if the camera malfunctions. Utilize the information in the chart in the order given.

Note: If during the test, the FUNCTION TEST METER needle rests in the yellow area, the unit under test is usable but it may result in degradation of photography; however, it should be replaced as soon as possible. If the needle rests in the red area the unit under test is defective and should be replaced before the start of the mission.

Control Panel Control Setting (fig. 4)	**Test Set (fig. 32)**		
	Control Setting	**Indication**	**See para 38 Note**
1. Operate mode switch to 4CPS. Set POWER switch to ON.	Depress POWER switch to on position. Note that switch illuminates. Operate FUNCTION SELECTOR switch to V/H HI. Operate meter switch to MOM.	FUNCTION TEST METER indicates in green area.	Defective control panel V/H generator and/or pot R304. Replace control panel.

Control Panel Control Setting (fig. 4)	Test Set (fig. 32) Control Setting	Indication	See para 38 Note
2.	Operate FUNCTION SELECTOR switch to TACH HI.		
Operate the OPERATE switch to ON.	Operate meter switch to MOM.	FUNCTION TEST METER indicates in green area.	Defective body tach G201. Replace body.
Operate OPERATE switch to OFF.			
	-Note -		
	If step 3, 4, 5 and 6 cannot be accomplished because of the body installation, use a flashlight as follows, Place the flashlight, as directed for light source to test set, and note the FUNCTION TEST METER indicator. Then place flashlight to camera body photocell and test set FUNCTION TEST METER should indicate approximately the same as noted above.		
3. None.	Operate FUNCTION SELECTOR switch to LS CAL HI. Depress LIGHT SOURCE switch to on position. Place light source adjacent to LIGHT SOURCE CALIBRATE window. Operate meter switch to ON. Adjust light source until FUNCTION TEST METER indicates in the green area.		

Control Panel Control Setting (fig. 4)	Test Set (fig. 32)		See para 38 Note
	Control Setting	Indication	
3. None (cont.)	Operate FUNCTION SE LE C - TOR switch to CELL HI		
	Place light source adjacent to camera body photocell.	FUNCTION TEST METER indicates in green area.	Defective body photocell. Replace body.
4. None	Operate FUNCTION SELECTOR switch to IRIS.	FUNCTION TEST METER indicates in green area.	Defective body AEC feedback pot R202. Replace body.
5. None	Operate FUNCTION SELECTOR switch to AEC HI.	FUNCTION TEST METER indicates in green area.	Defective camera controls. AEC amplifier. Replace camera controls
6. None	Depress the LIGHT SOURCE switch to OFF. Remove the light source from camera body photocell.		
7. Operate mode switch to 2CPS.	Operate meter switch to MOM.	FUNCTION TEST METER indicates in green area.	Defective control panel V/H generator and/or pot R304. Replace control panel.
8. Operate the OPERATE switch to ON.	Operate FUNCTION SELECTOR switch to TACH LO.		

Control Panel Control Setting (fig. 4)	Test Set (fig. 32) Control Setting	Indication	See para 38 Note
8. Operate the OPERATE switch to ON (cont). Operate the OPERATE switch to OFF.	Operate meter switch to MOM.	FUNCTION TEST METER indicates in green area.	Defective body tach G201. Replace body.

-Note-

If steps 9, 10, and 11 cannot be accomplished because of the body installation, use a flashlight as follows: Place the flashlight, as directed for the light source to the test set, and note the FUNCTION TEST METER indication. Then place flashlight to camera body photocell and the test set FUNCTION TEST METER should indicate approximately the same as noted above.

9. None	Operate FUNCTION SELECTOR switch to LS CAL LO. Depress LIGHT SOURCE switch to on position. Place light source adjacent to LIGHT SOURCE CALIBRATE window. Operate meter switch to ON. Adjust light source until FUNCTION TEST METER indicates in green area.		

Control Panel Control Setting (fig. 4)	Test Set (fig. 32)		See para 38 Note
	Control Setting	Indication	
9. None (cont.)	Operate FUNCTION SELECTOR switch to SLIT.		
	Place light source adjacent to camera body photocell.	FUNCTION TEST METER indicates in green area.	
10. None	Operate FUNCTION SELECTOR switch to AEC LO.	FUNCTION TEST METER indicates in green area.	Defective AEC printed circuit card. Replace camera controls.
	Operate meter switch to OFF.		
	Depress LIGHT SOURCES switch to OFF.		
11. None	Remove light source from camera body photocell.		
12. Operate the mode switch to PULSE.	Operate FUNC-'TION SELECTOR switch to PULSE.	PULSE lamp illuminates, IMC and AUTOCYCLE lamps extinguish.	
Operate INTERVALOMETER control knob to 6.			Defective body tach G201. Replace body.
Operate the OPERATE switch to ON.	Operate meter switch to ON.	FUNCTION TEST METER indicates in green area. (Once every six seconds when camera cycles). MONITOR lamp illuminates once every 6 seconds.	Defective control panel INTERVALOMETER. Replace control panel. Defective camera controls. Replace camera controls.

Control Panel Control Setting (fig. 4)	Test Set (fig. 32)		See para 38 Note
	Control Setting	Indication	
12. (cont.) Operate the OPERATE switch to OFF.			
13. Operate the OPERATE switch to ON.	Depress the PULSE TEST switch once every two seconds to on and off positions three times.	Each time the switch is depressed to the on position the camera cycles and the PULSE and MONITOR lamps illuminate.	
		With the switch in the off position the lamp extinguish.	Defective camera controls. Replace camera controls
Operate the OPERATE switch to OFF.			Defective body. Replace body.
14. Operate the INTERVALOMETER control knob to 10.	Turn the thumbwheel until PERIOD IN SECONDS counter indicates zero. Depress COUNTER ENABLE switch to on position.	None.	
15. Operate the OPERATE switch to ON.	None.	PERIOD IN SECONDS counter counts to 10, and then stop.	Defective control panel INTERVALOMETER. Replace control panel.
Operate the OPERATE switch to OFF.	Set POWER switch to OFF.		

39. Stopping Procedures
After completing the testing procedures, para 38, perform the following pro- cedures:

a. Operate the remote power switch to off.

b. Disconnect the test set cable 1134WD103 from the camera controls and the test set.

c. Disconnect the light source from the test set.

d. Place the test set cable 1134WD103 and the light source in the test set carrying case upper section.

e. Join the test set upper and lower halves and secure with latches.

40. Calibration Procedures
To calibrate the Test Set FUNCTION TEST METER Amplifier (AR1) circuit (figure 35) proceed as follows:

a. Remove the Test Set panel from the carrying case lower section by removing the twelve mounting screws.

b. Remove holding screws securing FUNCTION TEST METER Amplifier (AR1) circuit card to mounting posts.

c. Connect a jumper wire between pins 4, 6, and 7 of Amplifier AR1.

d. Apply 115 vac to connector 4J1 pins a and b, using pin b as ground. Apply 28 vdc to connector 4J1 pins y and j, using pin j as ground. Depress POWER switch to ON.

e. Adjust VTVM to indicate DC volts (approximately 50 vdc).

f. Adjust VTVM zero adjust so needle indicates (rests) at mid-scale.

g. Connect VTVM test probes between pins 2 and 4 of Amplifier AR1. Note that VTVM needle deflects either to the left or right of center.

h. Adjust potentiometer R7 until VTVM needle position (about center) reverses. (As R7 is adjusted the needle moves slowly to the left or right of zero before a dip occurs. This dip indicates proper amplifier operation and calibration.)

i. Remove the jumper wire from between pins 4, 6, and 7 of Amplifier AR1.

j. Operate Test Set meter switch to ON.

Note: All voltages to be applied must be me assured with an accurate voltmeter that indicates to ± 0.1 percent.

k. Operate FUNCTION SELECTOR switch to CELL HI.

l. Apply +0. 45 +0. 005 vdc to pin h of connector 4J1 (use pin W as ground).

m. Adjust potentiometer R28 until FUNCTION TEST METER indicates in the center of green area.

n. Remove dc voltage from pin h of connector 4J1.

o. Operate FUNCTION SELECTOR switch to AEC HI.

p. Apply + 4.2 ± 0.050 vdc to pin g of connector 4J1 (use pin W as ground).

q. Adjust potentiometer R20 until FUNCTION TEST METER indicates in the center of green area.

r. Remove dc voltage from pin g of connector 4J1.

s. Operate FUNCTION SELECTOR switch to V/H HI.

t. Apply + 35.7 ± 0.10 vdc to pin R of connector 4J1 (use pin W as ground).

u. Adjust potentiometer R19 until FUNCTION TEST METER indicates in the center of green area.

v. Remove all connections from the Test Set.

w. Reassemble Test Set.

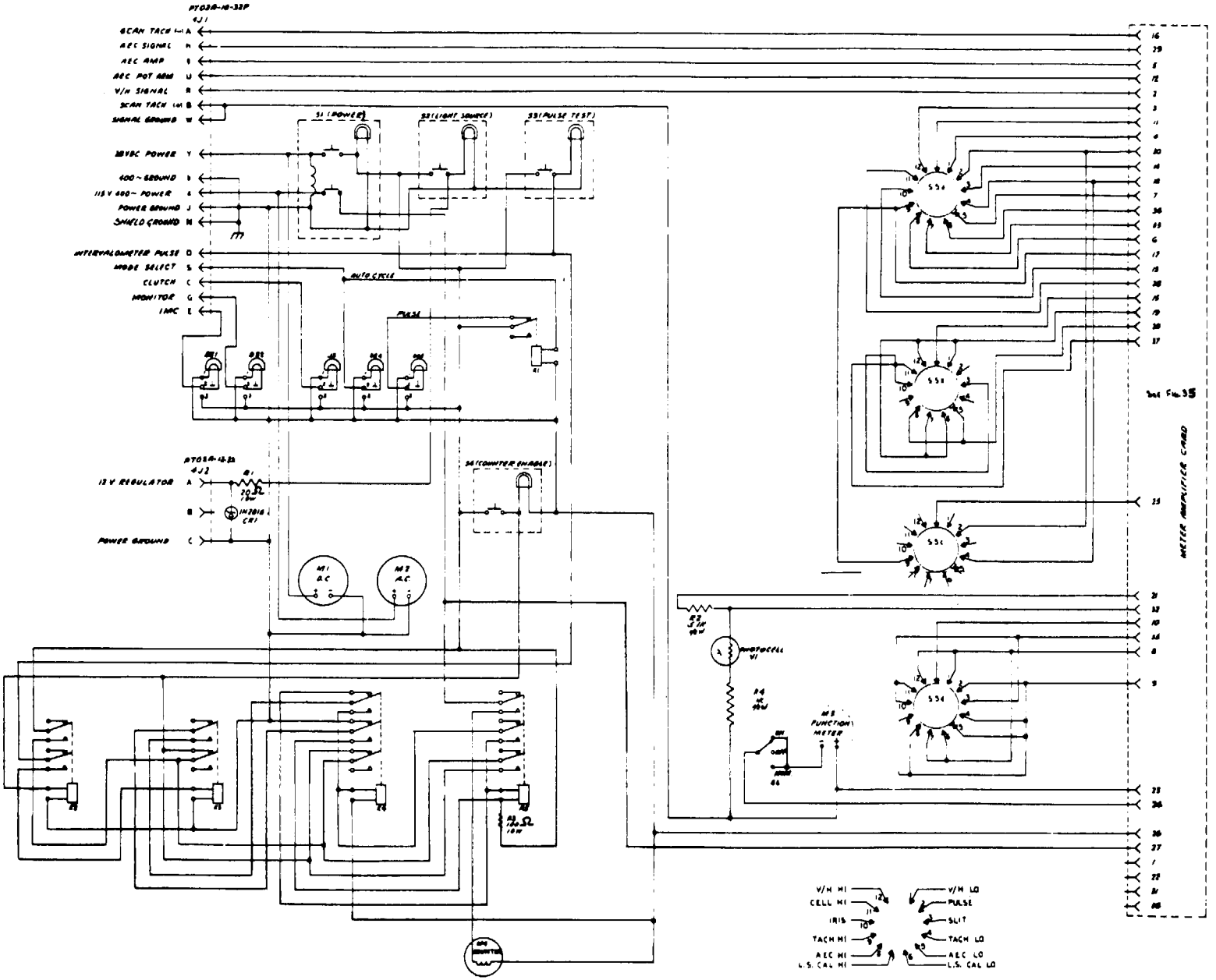


Figure 34. Test Set, Schematic Diagram (Sheet 1 of 2).

SCHEMATIC PARTS LIST

REFERENCE DESIGNATION	DESCRIPTION	VALUE	TOL	RATING	FCIC OR GOV PART NUMBER	
CR1	SEMICONDUCTOR DEVICE	IN2818			JAN IN2818B	MIL-S-19500/114
DS1	LAMP				MS25237-327	
DS2						
DS3						
DS4						
DS5	LAMP				MS25237-327	
J1	CONNECTOR				MS3112E-18-32P	
J2	CONNECTOR				MS3112E-12-3S	
	CONNECTOR				1093-670	
M1	METER				1093-669	
M2	METER				1093-668	
M3	METER				1093-667	
M4	COUNTER				1093-410	
R1	RESISTOR	20Ω	± 5%	10W	RW31G200	MIL-R-26
R2		5.1K		1/2W	RC20GF512J	MIL-R-11
R3		100Ω		10W	RW29V101	MIL-R-26
R4	RESISTOR	1K	± 5%	1/2W	RC20GF102J	MIL-R-11
S1	SWITCH				1093-414	
S2						
S3					1093-415-2	
S4					1093-415-1	
S5					MS16109-30-4-12N	
S6	SWITCH				MS35058-31	
K1	RELAY				1093-417	
K2					1093-417	
K3					1093-417	
K4					1093-416	
K5	RELAY				1093-416	
V1	PHOTOCELL				1093-412	

Figure 34. Test Set, Schematic Diagram (Sheet 2 of 2).

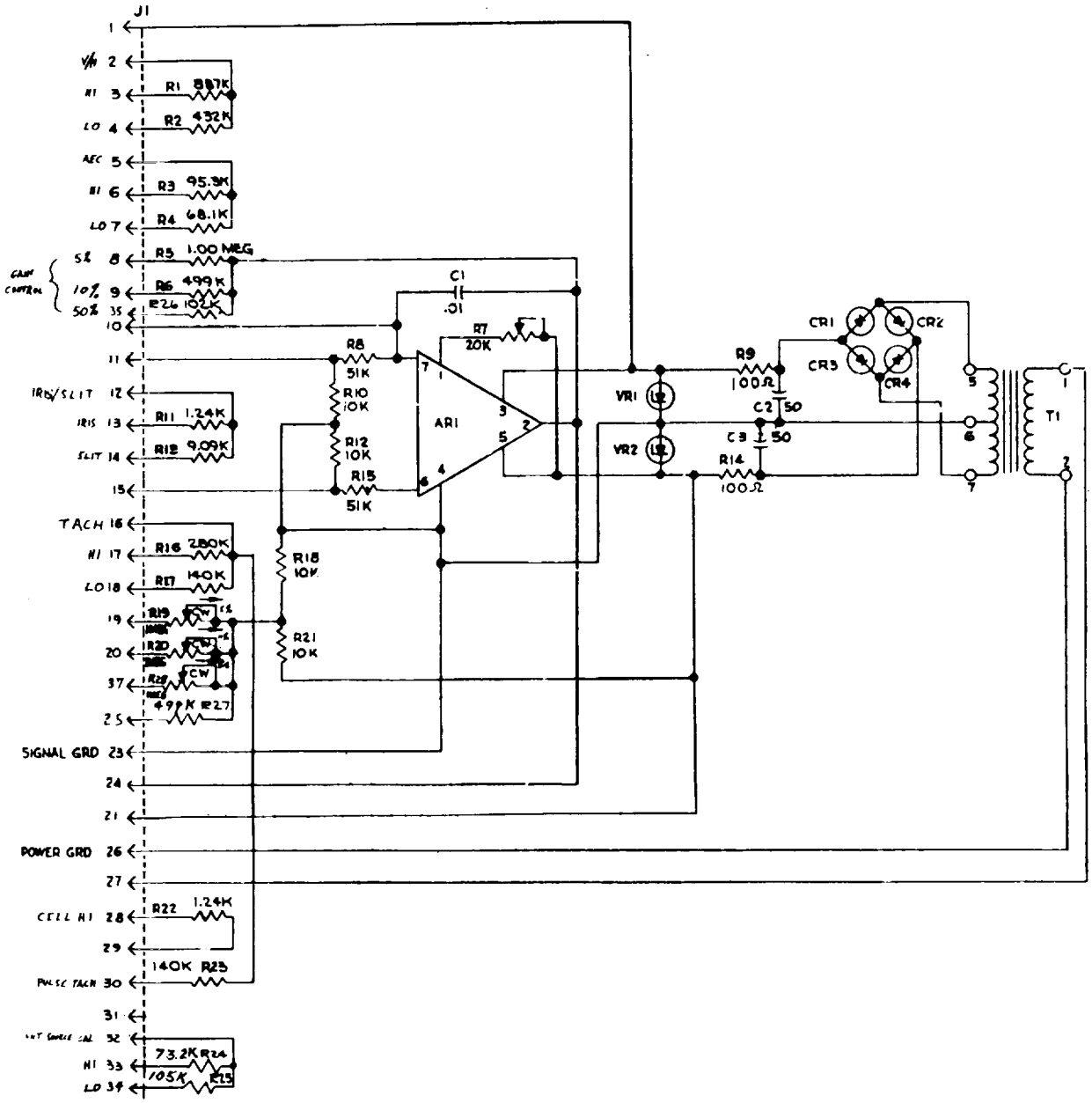


Figure 35. Meter Amplifier, Schematic Diagram (Sheet 1 of 2).

SCHEMATIC PARTS LIST

	DESCRIPTION	VALUE	TOL	RATING		
AR1	AMPLIFIER DIFF				1098-1414	
C1	CAPACITOR	.01µf	±10%	400V	CP05AIKE103K3	MIL-C-25
C2	CAPACITOR	50µf	+50 -15 %	60V	CL21CK500TP3	MIL-C-3965
C3	CAPACITOR	50µf	+50 -15 %	60V	CL21CK500TP3	MIL-C-3965
CR1	DIODE				JAN1N645	MIL-S-19500/240
CR2	DIODE				JAN1N645	MIL-S-19500/240
CR3	DIODE				JAN1N645	MIL-S-19500/240
CR4	DIODE				JAN1N645	MIL-S-19500/240
J1	CONNECTOR				1121-2031	
R1	RESISTOR	887K	±1%	0.5W	RN65C8873F	MIL-R-10509
R2		432K			RN65C4323F	
R3		95.3K			RN65C9532F	
R4		68.1K			RN65C6812F	
R5		1.60MEG			RN65C1604F	
R6		499K	±1%	0.5W	RN65C4993F	MIL-R-10509
R7	-VAR	20K			RT11C2L-203	MIL-R-27208
R8		51K	±5%	1/2W	RC20GF513J	MIL-R-11
R9		100Ω	±5%	1/2W	RC20GF101J	MIL-R-11
R10		10K	±1%	0.5W	RN65D1002F	MIL-R-10509
R11		1.24K			RN65C1241F	
R12		10K			RN65D1002F	
R13		9.09K	±1%	0.5W	RN65C9091F	MIL-R-10509
R14		100Ω	±5%	1/2W	RC20GF101J	MIL-R-11
R15		51K	±5%	1/2W	RC20GF513J	MIL-R-11
R16		200Ω	±1%	0.5W	RN65C2003F	MIL-R-10509
R17		140K	±1%	0.5W	RN65C1403F	MIL-R-10509
R18		10K	±1%	0.5W	RN65D1002F	MIL-R-10509
R19	-VAR	1MEG			RJ11CL105	MIL-R-27208
R20	-VAR	1MEG			RJ11CL105	MIL-R-27208
R21		10K	±1%	0.5W	RN65D1002F	MIL-R-10509
R22		1.24K			RN65C1241F	
R23		140K			RN65C1403F	
R24		73.2K			RN65C7322F	
R25		105K			RN65C1053F	
R26		102K			RN65C1023F	
R27		499K	±1%	0.5W	RN65C4993F	MIL-R-10509
R28	RESISTOR-VAR	1MEG			RT1IC2L-105	MIL-R-27208
T1	TRANSFORMER				1121-2039	
VR1	DIODE				1N3024B	MIL-S-19500/115
VR2	DIODE				1N3024B	MIL-S-19500/115

Figure 35. Meter Amplifier; Schematic Diagram (Sheet 2 of 2).

APPENDIX A

REFERENCES

The following publications contain information applicable to the operator and maintenance personnel of the camera:

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders.
DA Pam 310-7	Military Publications: Index of Modification Work Orders.
SB 38-100	Preservation, Packaging, and Packing Materials, Supplies, and Equipment Used by the Army.
TB SIG 364	Field Instructions for Painting and Preserving Electronics Command Equipment.
TM 9-213	Painting Instructions for Field Use.
TM 11-4010	Elements of Signal Photography.
TM 11-6625-203-12	Operator and Organizational Maintenance: Multimeter AN/URM-105, including Multimeter ME-77/U.
TM 11-6760-228-12	Organizational Maintenance Manual: Flasher System, Photographic Aircraft LS-59 Including Repair Parts and Special Tool Lists.
TM 38-750	Army Equipment Record Procedures.
TM 55-1510-204-10	Operator's Manual: OV-1 Aircraft.

APPENDIX B
BASIC ISSUE ITEMS LIST (BILL) AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST (ITIAL)

Section I. INTRODUCTION

B-1. General This appendix lists only basic issue items required by the crew/operator for installation, operation, and maintenance of Camera, Still Picture KA-60B.

B-2. Scope
This Basic Issue Items and Items Troop Installed or Authorized List is divided into the following sections:

a. Basic Issue Items List-Section II. A list, in alphabetical sequence, of items which are furnished with, and which must be turned in with the end item.

b. Items Troop Installed or Authorized List - Section III. Not applicable.

B-3. Explanation of Columns
The following provides an explanation of columns found in the tabular listings:

a. Illustration. Not applicable.

b. Federal Stock Number. Indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements, to identify an item or range of items.

d. Federal Supply Code for Manufacturer (FSCM). The FSCM is a 5-digit numeric code used to identify the manufacturer., distributor, or Government agency, etc., and is identified in SB 70842.

e. Description. Indicates the Federal item name and a minimum description required to identify the item.

f. Unit of Measure (U/M). Indicates the standard of basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation, (e.g.. ea, in., pi-, etc.). When the unit of measure differs from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

g. Quantity Furnished with Equipment (Basic Issue Items Only). Indicates the quantity of the basic issue item furnished with the equipment.

Section II. BASIC ISSUE ITEMS LIST

(A) Item Number	(B) Item Number	Federal Stock Number	Part Number	FSCM	DESCRIPTION	Unit of Meas	QTY Furn With Equip
		6720-978-7368 6720-978-7398	1177-B13 1177C-2-2 1093-B32-2	72314 72314 72314 72314	CASE CARRYING COVER, DUST, BODY COVER, DUST, MAGAZINE COVER, DUST, PRISM	EA EA EA EA	1 1 1 1

APPENDIX C

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

C-1. General

This appendix provides a summary of the maintenance operations covered in the equipment literature for Camera, Still Picture KA-60B. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

C-2. Explanation of Format for Maintenance Allocation Chart

a. Group Number. Group numbers correspond to the reference designation prefix assigned in accordance with ASA Y32.16, Electrical and Electronics Reference Designations. They indicate the relation of listed items to the next higher assembly.

b. Component Assembly Nomenclature. This column lists the item names of component units, assemblies, subassemblies, and modules on which maintenance is authorized.

c. Maintenance Function. This column indicates the maintenance category at which performance of the specific maintenance function is authorized. Authorization to perform a function at any category also includes authorization to perform that function at higher categories. The codes used represent the various maintenance categories as follows:

Code	Maintenance Category
C	Operator/Crew
O	Organizational Maintenance
F	Direct Support Maintenance
H	General Support Maintenance
D	Depot Maintenance

d. Tools and Equipment. The numbers appearing in this column refer to specific tools and equipment which are identified by these numbers in section III.

e. Remarks. Self explanatory.

C-3. Explanation of Format for Tool and Test Equipment Requirements

The columns in the tool and test equipment requirements chart are as follows:

a. Tools and Equipment. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool for the maintenance function.

b. Maintenance Category. The codes in this column indicate the maintenance category normally allocated the facility.

c. Nomenclature. This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

d. Federal Stock Number. This column lists the Federal stock number.

e. Tool Number. Not used.

SECTION II. MAINTENANCE ALLOCATION CHART

MAINTENANCE ALLOCATION CHART

GROUP NUMBER	COMPONENT ASSEMBLY NOMENCLATURE	MAINTENANCE FUNCTIONS											TOOLS AND EQUIPMENT	REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
1	CAMERA, STILL PICTURE KA-60B	C		C	C									Clean, lubricate and hand tighten, operational visual
			F										1,4,5	Continuity test
						H						D	1,2,3,4,5	Plus shop support
1.2	CAMERA BODY ASSY													
1.2.1	COVER ASSY, BODY								O	H			4,5	
1.2.2	PRISM COVER, DUSTRY								O	H			4,5	
1.3	MAGAZINE													
1.3.1	COVER TAKEUP								O	H			4,5	
1.3.2	COVER, SUPPLY								O	H			4,5	
1.3.3	SPOOL, ALUM, FILM								O					
1.3.4	COVER, DUST								O					
1.3.5	KEEPER, FILM ASSY								O	H			4,5	
2	CONTROL PANEL													
2.1	LAMP INCAND								O					
2.2	FRAME INDICATOR								O					
2.3	INTERVALOMETER								F				4,5	
3	CAMERA CONTROL													
3.1	FUSES								O					
3.2	COVER								O	H			4,5	
3.3	CARD, HOLDERS								O					
3.4	CIRCUIT CARDS								O					

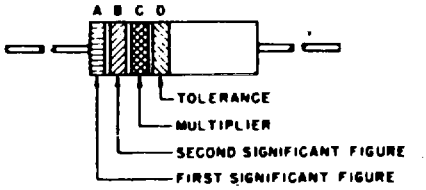
SECTION III. TOOL AND EQUIPMENT REQUIREMENTS

TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOLS AND EQUIPMENT	MAINTENANCE CATEGORY	NOMENCLATURE	FEDERAL STOCK NUMBER	TOOL NUMBER
		KA-60B & LS-71A (continued)		
1	F,H,D	MULTIMETER TS-352/U	6625-242-5023	
2	O,F,H,D	MULTIMETER, AN/URM-105	6625-581-2036	
3	O,F,H,D	TEST SET, CAMERA SYSTEM LS-71A	6760-937-1918	
4	O,F,H,D	TOOL KIT, PHOTOGRAPHIC REPAIRMAN TK-77/GF	5180-752-9068	
5	F,H,D	TOOL KIT, PHOTOGRAPHIC REPAIR TK-109/GF	5180-856-9653	

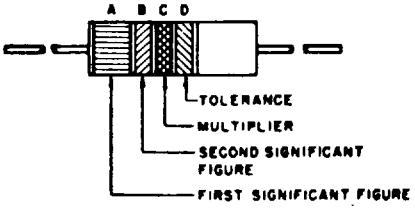
COLOR CODE MARKING FOR MILITARY RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

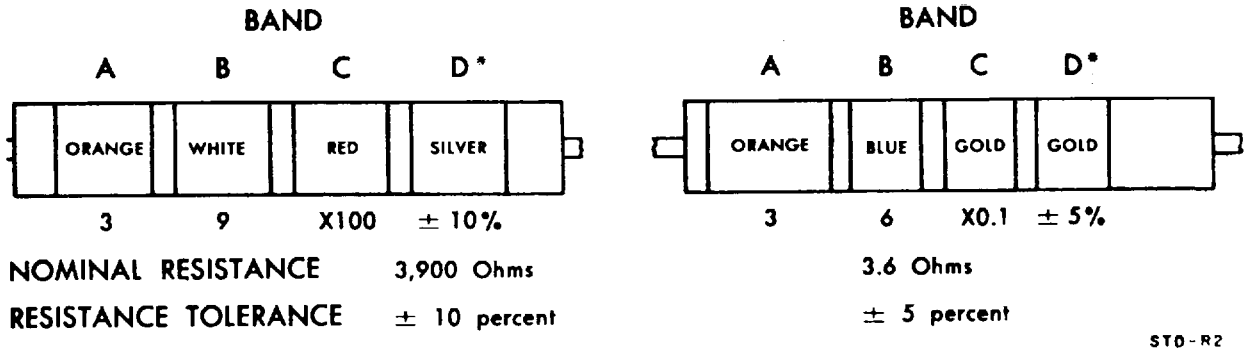


BAND A— Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING



*If Band D is omitted, the resistor tolerance is ± 20%, and the resistor is not Mil-Std.

Figure 36. Color code marking or MIL STD resistors

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

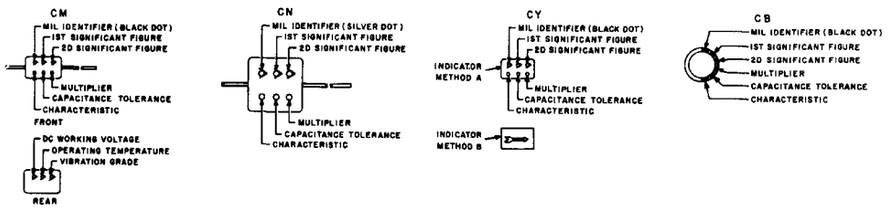
USASA (2)
CNGB (1)
CC-E (2)
Dir of Trans (1)
CofEngrs (1)
TSG (1)
CofsptS (1)
USACDCCEA (1)
USACDCCZA Ft Huachuca (1)
USAMB (10i
USAARENBD (2)
USAMC (2)
USCONARC (2)
ARADCOM (2)
ARADCOM Rgn (1)
USAECOM (2)
USAMICOM (2)
USASTRATCOM (2)
USAESC (70)
Armies (1)
1st Cav Div (2)
Svc Colleges (1)
USASCS (10)
USACDCEC (10)
29-134
Gen Dep (1)
Sig Sec, Cen Dep (4)
Sig Dep (6)
Army Dep (1) except
LBAD (14)
SAAD (30)
TOAD (14)
LEAD (7)
NAAD (3)
SVAD (3)
ATAD (10)
Ft Huachuca (5)
WSMR (2)
Fort Carson (7)
USAEDA (2)
USAERDAW (2)
MAAG (2)
Mil Men (2)
Units org under fol TOE(1 ea):
11-155
11-157
11-158
11-592
11-597

NG: None.
USAR: None.
For explanation of abbreviations used, see AR 320-50.

*U.S. GOVERNMENT PRINTING OFFICE: 1984 O - 421-647 (10321)

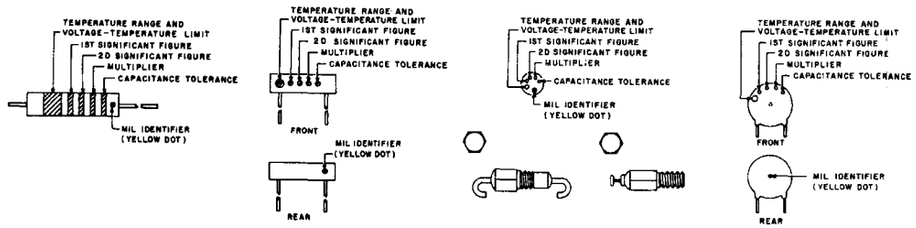
COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

GROUP I *Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB*



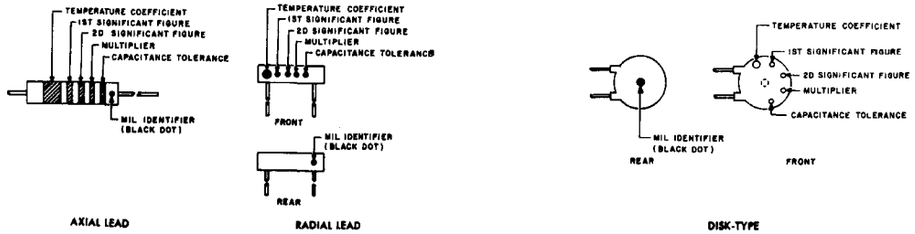
MICA-DIELECTRIC | PAPER-DIELECTRIC | GLASS-DIELECTRIC, GLASS CASE | MICA, BUTTON TYPE

GROUP II *Capacitors, Fixed Ceramic-Dielectric (General Purpose) Style CK*



AXIAL LEAD | RADIAL LEAD | FEED-THROUGH | STAND-OFF | DISK-TYPE

GROUP III *Capacitors, Fixed, Ceramic-Dielectric (Temperature Compensating) Style CC*



AXIAL LEAD | RADIAL LEAD | DISK-TYPE

COLOR CODE TABLES

TABLE I – For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]				DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
BLACK	CM, CY CB	0	0	1			± 20%	± 20%		A				−55° to +70°C	10–55 cps
BROWN		1	1	10					B	E		B			
RED		2	2	100	± 2%		± 2%	± 2%	C		C			−55° to +85°C	
ORANGE		3	3	1,000		± 30%			D			D	300		
YELLOW		4	4	10,000					E					−55° to +125°C	10–2,000 cps
GREEN		5	5		± 5%				F				500		
BLUE		6	6											−55° to +150°C	
PURPLE (VIOLET)		7	7												
GREY		8	8												
WHITE		9	9												
GOLD				0.1			± 5%	± 5%							
SILVER	CN				± 10%	± 10%	± 10%	± 10%							

TABLE II – For use with Group II, General Purpose, Style CK

COLOR	TEMP. RANGE AND VOLTAGE – TEMP. LIMITS[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

TABLE III – For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in uuf.
2. Letters indicate the Characteristics designated in applicable specifications: MIL–C–5, MIL–C–91, MIL–C–11272, and MIL–C–10950 respectively.
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL–C–11015.
4. Temperature coefficient in parts per million per degree centigrade.

Figure 37. Color code marking for MIL STD capacitors

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