TM 11-6760-239-34

TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

TEST SET, ANALYZER, CAMERA LS-80A

(NSN 6760-00-878-0593)

HEADQUARTERS, DEPARTMENT OF THE ARMY
SEPTEMBER 1976

W A R N I N G

Be careful when working on the 115-volt, 400-Hz line connections. Serious injury or death may result from contact with these terminals.

DON'T TAKE CHANCES

Turn off all power before making any connections or doing any work inside the equipment.

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WASHINGTON. DC, 21 September 1976

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REPORTING OF ERRORS

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CHAPTER 1

INTRODUCTION

1-1. Scope

a. This manual contains direct support (DS) and general support (GS) maintenance instructions for Teat Set Analyzer, Camera LS-90A. It includes instructions appropriate to DS and GS maintenance for troubleshooting, testing, aligning, repairing the equipment, replacing maintenance parts, and repairing specified maintenance parts. It also lists the tools, materials, and teat equipment required to perform DS and GS maintenance

b. The complete technical manual for this equipment includes TM 11-6760-239-12.

NOTE

For applicable forms and records, refer to TM 11-6760-239-12.

1-2. Indexes of Publications

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

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

1-3. Common Names

Common names have been assigned to the items listed in table 1-1 below.

Table l-l Common Names

Common names	Nomenclature
Camera analyzer.	Test Set, Analyzer, Camera LS-80A
Test cable W1	Cable assembly, special purpose electrical (W1, right relay assembly test).
Test cable W2..	Cable assembly special purpose electrical (W2, left relay assembly test).
Test cable W3.	Cable assembly, special purpose, electrical: (W3, lens cone test).
Test cable W4.	Cable assembly, special purpose, electrical: (W4, camera body test).
Test cable W5 .. . . . ,	Cable assembly, special purpose, electrical: (W5, control 1).
Test cable W6.	Cable assembly, special purpose, electrical (W6, control 2).
Test cable W7	Cable assembly, special purpose, electrical: (W7, sensor test).
Test cable W8.	Cable assembly, special purpose, electrical: (W8, servo drive and S/C).
Power cable W9	Cable assembly, special purpose electrical: (W9, input power).
Camera test adapter. .	Adapter. Test, Camera LM-178A
Cone shutter test cable.	Cable assembly, special purpose, electrical: (coneshutter test).
Body shutter test cable.	Cable assembly, special purpose, electrical: (body-shutter test).

CHAPTER 2

FUNCTIONING OF EQUIPMENT

Section I. BLOCK DIAGRAM ANALYSIS

2-1. Camera Analyzer Functional Description (fig. 2-1)

a The camera analyzer consists of three main test sections and a MASTER section. The three main test sections are: CONTROL-POWER SUPPLY section, LENS CONE section, and CAMERA BODY section. The camera test adapter is an accessory equipment to the camera analyzer and its functional description is covered in paragraph 2-2. Figure 2-1 illustration the functional relationship of the camera analyzer test sections and MASTER section.

b. The MASTER section programs the camera analyzer for internal tests or for tests by one of the three test sections The MASTER section includes POWER switch S7, LAMP TEST switch S6, MASTER switch S1 and binding posts for connection of external test equipment POWER switch S7 controls application of 115 volts, 400 Hz and + 28 volts dc primary power to the camera analyzer. LAMP TEST switch S6 is a self-test feature which checks operation of the camera analyzer front panel lamps, except the primary power AC PWR and DC PWR indicators. The binding posts permit test equipment hookup to the camera analyzer for use during testing. MASTER switch S1 is a five-position switch, three positions of which are used to select one of the three test sections, a fourth to select INTERNAL TEST 1, and the fifth to select INTERNAL TEST 2.

c. The CONTROL-POWER SUPPLY section provides the control voltages and signals to test Control, Power Supply LA-406A, or the intervalometer, film drive amplifier, and PC board and component assembly modules of the LA-406A. The section includes the E V/H simulator circuit, the motor tachometer simulator circuit, MODULE TEST switch S1, TEST switch S2 and CONFIGURATION switch S3. The connectors associated with this section are CONTROL (J1) connector J9, CONTROL (J2) connector J10, and MODULES connector J11. During LA-406A tests connectors J9 and J10 are used to interconnect the LA-406A with the camera analyzer. Connector J11 is used when tests are performed on the intervalometer, film drive amplifier, and PC board and component assembly modules of the LA-406A.

d. The LENS CONE section provides the control voltages and signals to test Lens Cone, Camera, Aerial Reconnaissance LA-370A (1 3/4-inch, also called 44mm), LA-371A (3-inch), LA-374A 6-inch), and LA-372A (12-inch); Light Sensor, Aircraft Camera LA-407A; and the S/C switch and servo drive module of the lens cone The LENS CONE section includes an increase/decrease dc exposure circuit, a simulated exposure feedback circuit, a photocell output simulator circuit, and TEST switch S10. The connectors associated with this section are LENS CONE J6, SENSOR J7, and MODULE J8.

e. The CAMERA BODY section provides the control signals and voltages required to test Body Drive, Aircraft Camera LA-373A. The section includes a recycle initiate circuit, TEST LEFT ASSEMBLY switch S8, TEST RIGHT ASSEMBLY switch S9, and MODE switch S5. Connectors associated with this section are SYS SIMULATOR J2, BODY J3, LEFT ASSEMBLY J4, and RIGHT ASSEMBLY J5.

f. The INTERNAL TEST 1 position of MASTER switch S1 programs the camera analyzer to test the internal -28 volts dc power supply, simulated foot-lamberts, and recycle initiate simulator circuits of the camera analyzer.

g. The INTERNAL TEST 2 position of MASTER switch S1 programs a test for the E V/H simulator circuit of the camera analyzer.

2-2. Camera Test Adapter Functional Description

The camera test adapter is used to provide mode selection and exposure system signals for testing Camera, Still Picture KA-76A. The camera test adapter electronic package consists of: a camera mode selector circuit; an exposure control circuit; a camera cycle circuit; indicator lamp assembly circuits; a lamp test circuit, three test point circuits; and a power supply circuit

a Camera Mode Selector Circuit. This circuit selects different operating modes for the camera under test as well as compensates for differences that exist when the camera is operated with a 1 3/4-inch (44mm) 3-inch, 6-inch, or 12-inch lens cone assembly. Its operating principles are given in paragraph 2 -3a

b. Exposure Control Circuit This circuit develops exposure signals for testing the shutter and diaphragm response of the camera's lens cone assembly. Its operating principles are given in paragraph 2 -3b.

c. Camera Cycle Circuit. This circuit develops a

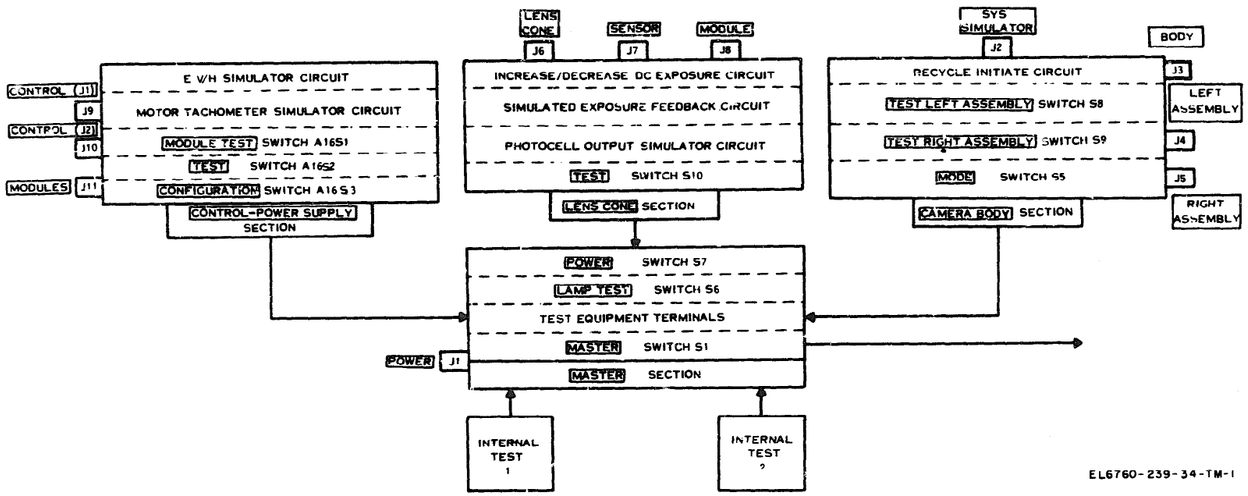


Figure 2-1. Camera analyzer, block diagram.

+28 vdc pulse for initiating a camera cycle. Its operating principles are given in paragraph 2 -3c.

d. Indicator Lamp Assembly Circuits. These circuits provide visual indications of normal camera operation as well as the application of dc power to the camera test adapter. Its operating principles are given in paragraph 2-3d.

e. Lamp Test Circuit. This circuit provides a means of testing the indicator lamp assemblies which provide indications of normal camera operation prior to a camera test. This insures correct indicator lamp operating during a camera test Its operating principles are given in paragraph 2 -3e.

f. Test Point Circuits. Three binding post test points are provided on the front panel of the camera test adapter. One test point is a common ground connection The remaining two test points are connected to signal lines in the camera. These test points permit checking internal circuits of the camera without disassembling the camera.

2-3. Camera Test Adapter Circuits

(figs. FO-1 and FO-15)

a. Camera Mode Selector Circuit. This circuit consists primarily of MODE switch S1. When MODE switch S1 is set at the AUTO position, switch contacts 1 and 2 (pin 1 is the switch common) are interrupted so the camera must be operated in the auto mode by Simulator, Control System, Camera LS-36A through the camera test adapter. The LS-36A together with Analyzer Set, Photographic Surveillance System LS-89A, is used in conjunction with the camera test adapter for DS and GS support maintenance. When MODE switch S1 is set at the PULSE, IMC PULSE, or NIGHT positions, the camera test adapter selects the camera's operating mode through switch contacts 1 and contacts 2, 3 and 4, respectively.

b. Exposure Control Circuit. This circuit consists of section B of EXPOSURE selector switch S2, an associated variable resistor network consisting of resistors R6 through R13, and EXPOSURE NORMAL-INCR toggle switch S3 and EXPOSURE OVER-NORMAL UNDER switch S4.

(1) Exposure selector switch S2. Section B of two position wafer switch S2 selects an exposure signal which is used to check the shutter and diaphragm response of the camera lens cone assembly. It selects between either of two different preset variable controls in a resistor network, or a photocell input that is produced by an external light source. Section A of EXPOSURE switch S2 completes the + 28 volt dc interlock circuit of the lens cone assembly to ensure operating power for testing the camera.

(a) When S2 is set at the 44 mmcal, 3-in. cal, 6-in. cal, or 12-in. cal position, the higher level exposure signal is selected from variable resistor R11 for testing purposes. (Compensation for differences in the signal requirements of the lens cone assemblies is made automatically through current limiting resistors R6 through R9 with switch section S2B.) When EXPOSURE switch S2 is set to the OPR ALL position, a portion of the dc voltage developed across variable resistor R12 is applied through resistor R10 and EXPOSURE switch section S2B to a summation point in the camera lens cone. At the summation point, the applied exposure signal current is summed with a dc feedback current from the diaphragm position potentiometer in the camera. The resultant current provides the error input to the camera exposure circuit The exposure circuit of the camera under test then causes operation of the shutter and lens cone diaphragm to null the error input resulting in the approximate shutter speed and aperture indicator positions shown below:

KA-76Camera *under* test with lens cane	S/C	Shutter speed indicator	Lens aperture indicator
13/4 in. (44 mm)	100	1/1500 to I/3000	FIXED (5.6)
3 in.	50	1/3000	About 5.6
6 in.	50	1/3000	5.6 to 6.7
12 in	50	1/3000	5.6 to 8.0

(b) When EXPOSURE switch S2 is set to the SEN position, exposure signals developed in the camem test adapter are disconnected from the camera. The SEN (sensitivity) switch position permits use of exposure signals developed by an external light source. This affords a means to qualitatively check the response of camera exposure circuits under changing light levels. If the light sensor is not available, photocell assembly PN 6680-930-1 (NSN 4920-00-867-0046) may be substituted and its resuits can be compared with the results obtained with light sensor PN 5526-100 (NSN 6760-00-070-4735) to determine whether the light sensor is defective. The approximate results obtained with EXPOSURE switch S2 set to the SEW position are as follows:

Camera with lens	Filter on light box	S/C SETTINGS	Shutter speed	Aperture
44mm (1 3/4 in)	None	25	1 - 1 / 1000 1500	5.6
	None	50	1 - 1 / 2000 3000	5.6
	25%	25	1 - 1 / 300 400	5.6
	25%	100	1 - 1 / 1000 1500	5.6
	25%	200	1 - 1 / 2000 3000	5.6
	8%	25	1 - 1 / 100 150	5.6
	8%	100	1 - 1 / 400 600	5.6
	8%	400	1 - 1 / 1500 2000	5.6
	1.56%	00	1/60	5.6

Camera with lens	Filter on light box	SC control settings	Shutter speed	Aperture
	1.56%	200	1/150 – 1/200	5.6
	1.56%	400	1/300 – 1/400	5.6
	0.5%	200	1/60	5.6
	0.5%	400	1/100	5.6
3 in.	None	12	1/1000	4.5
	None	25	1/2000	4.5
	None	37.5	1/3000	4.5
	None	75.0	1/3000	5.6–6.7
	None	200	1/3000	10.7
	25%	6	1/100	4.5
	25%	50	1/1000	4.5
	25%	150	1/3000	4.5
	25%	300	1/3000	5.6–6.7
	25%	400	1/3000	7.0
	8%	25	1/150	4.5
	8%	100	1/400–1/800	4.5
	8%	300	1/2000	4.5
	1.56%	50	1/60	4.5
	1.56%	200	1/300–1/300	4.5
	0.5%	150	1/60	4.5
	0.5%	400	1/200 – 1/300	4.5
6 in.	None	6	1/1000 – 1/1500	2.8
	None	25	1/3000	3.5–4.0
	None	50	1/3000	5/0–5.6
	None	100	1/300	6.7
	25%	37.5	1/2000	2.8
	25%	100	1/3000	3.5–4.0
	25%	200	1/3000	5.0–5.6
	8%	6	1/100	2.8
	8%	12	1/200	1.0
	8%	75	1/1000–1/1500	2.8
	8%	400	1/3000	4.0–4.5
	1.56%	150	1/500	2.8
	1/56%	300	1/1000	2.8
	0.8%	50	1/60	2.8
	0.8%	200	1/200	2.8
12 in.	None	6	1/800	3.5
	None	25	1/3000	3.5–4.0
	25%	12	1/400	3.5
	25%	37.5	1/1000 – 1/1500	3.5
	25%	50	1/1500 – 1/2000	3.5
	25%	100	1/3000	3.5–4.0
	25%	200	1/3000	5.0–5.6
	25%	400	1/3000	6.7
	8%	37.5	1/400	3.5
	8%	100	1/1000	3.5
	8%	150	1/1500 – 1/2000	3.5
	8%	300	1/3000	3.5–4.0
	8%	400	1/3000	4 0–4.5
	1.56%	25	1/60	3.5
	1.56%	50	1/100	3.5
	1/56%	100	1/200	3.5
	1/56%	400	1/800 – 1/1000	3.5
	0.5%	75	1/60	3.5
	0.5%	150	1/100	3.5
	0.5%	300	1/200	3.5

(2) NORM-INCR toggle switch S3. When switch S3 is set at the NORM position, its contacts are open Under these conditions, camera exposure circuits are controlled by EXPOSURE switch S2 or the LIGHT LEVEL switch on the light box. When switch S3 is set at the INCH position, a dc ground path is completed through the switch to increase exposure relay 1A3A2K4 in the camera which energizes. As a result, the shutter is set to its lowest speed and the lens cone aperture is driven to its widest opening.

(3) OVER-NORMAL-UNDER toggle switch S4. This switch simulates underexposed and overexposed signals. When switch S4 is set at the OVER position, a dc ground path is completed through the switch to energize over exposure relay lA3A2K1 in the camera. As a result, a camera exposure is increased one f/stop.

NOTE

If the increase in camera exposure is accomplished by the shutter rather than by the diaphragm, the fractional value of the shutter speed will be doubled. For example, the shutter speed may change from l/3000 to 1/1500. When switch S4 is set at the UNDER position, it completes a dc ground path which energizes underexposure relay 1A3A2K2 in the camera. As a result, the camera exposure is decreased one f/stop.

NOTE

If a decrease in camera exposure is affected by the shutter rather than by the diaphragm, the fractional value of the shutter speed will be halved. For example, the shutter speed may change from 1/1500 to l/3000. When switch S4 is set at the NORMAL position, it opens the dc ground path to the camera that is completed when the switch is set at either the OVER or UNDER exposure position.

c. Camera Cycle Circuit. This circuit consists of CYCLE pushbutton, switch S7. When switch S7 is momentarily depressed, it produces a momentary + 28 volts dc pulse which is coupled to the camera to initiate a shutter cycle in all modes except autocycle.

d. Indicator Lump Assembly Circuits. These circuits consist of two indicator lamp assemblies (Al and A2) and a single indicator lamp, DS1. Indicator lamp DS1

illuminates when + 28 volts dc is applied to the camera test adapter, provided POWER switch S6 is set at the ON position. Indicator lamp assembly Al has four sections, each of which illuminates to signify a camera event: namely, completion of the camera operate circuits by OPR ON lamp DS1; interruption of the film failure interlock switch by FILM FAIL lamp DS2 when film runout or breakage occurs or is simulate& completion of the + 28 volts dc interlock line between the systern simulator and the camera test adapter, and the camera, (provided pendant connector P2 is connected to the camera shutter assembly) by INTLK lamp DS3; and completion of the camera body night relay circuit by NIGHT lamp DS4. Similarly, indicator lamp assembly A2 has four sections which illuminate to signify the following camera events: actuation of the autocycle vacuum and autocycle trip switch by SYNC lamp DS1; actuation of the electronic flash switch for each camera cycle by FLASH lamp DS2; actuation of the data trip switch for each camera cycle by DATA lamp DS3; and actuation of the camera body - indicate switch for each camera cycle by CYCLE lamp DS4.

e. Lamp Test Circuit. This circuit consists of LAMP TEST pushbutton switch S5 and diode network R14 and R16 through R20. When S5 is depressed, +28 volts dc is applied in parallel through the diode network to all lamps in indicator lamp assemblies Al and A2, except lamps DS2 and DS3. These two lamps receive a ground through LAMP TEST switch S5 because they are normally connected to the +28 volts dc input line of the camera test adapter. In any event, all lamps of indicator lamp assemblies Al and A2 should illuminate when LAMP TEST pushbutton switch S5 is depressed. Power lamp DS1 is not a part of the lamp test circuit.

f. Test Point Circuits. Three binding post test points are provided on the front panel of the camera test adapter. One test point (J5) (black) is a common ground (COMMON) connection while the two remaining test points (J3 and J4) (red) permit measurement of signal circuits in the camera which are not accessible without disassembling the camera Test point J3 (EXPOSURE) is used to measure the error input to the exposure circuit in the camera lens cone assembly. Test: point J4 (-TACH) is used to measure the negative tach (generator) output voltage in the camera body.

Section II. CAMERA ANALYZER STAGE ANALYSIS

2-4. Camera Analyzer Power Distribution.

(fig. 2-2)

When POWER switch S7 is set to ON, primary power is applied to the camera analyzer. 115 VAC, 400 HZ power is applied through POWER connector J1, pin A, AC fuse F1, and one section of POWER switch S7 to AC POWER indicators DS1 and DS2 to illuminate these lamps; MASTER switch S1 for rerouting to connectors J1, J6, J9 and J11; and to transformer T1. The secondary windings of transformer T1 supply power to the E V/H simulator circuit and the photocell output simulator circuit. + 28 volts dc power is applied through POWER connector J1, pin J, DC fuse F2, and another section of POWER switch S7 to DC POWER indicators DS3 and DS4 to illuminate these lamps, to MASTER switch S1 to actuate one of the three test sections of the camera analyzer, and to LAMP TEST switch S6.

NOTE

The camera analyzer electronic circuit functions when testing LA-406A modules are described in paragraphs 2-5, 2-6, and 2-7.

2-5. LA-406A Intervalometer Module Test Circuits.

(fig FO-2)

The camera analyzer electronic circuit functions when performing tests on the intervalometer module of the LA-406A for each of the six INTVL positions of MODULE TEST switch S1 are described in the following subparagraphs. Tests which are conducted are: R9 BAL, R7 BAL, OPR, + 40VDC, - 40VDC, and TP3.

a. Power Application. When MASTER switch S1 (MASTER section) is set to CONTROL PWR SUPPLY, 115 volts, 400 Hz is applied through section G-Y and +28 volts dc is applied through section G-X of S1 to the intervalometer module.

b. R9BAL. When MODULE TEST switch (CONTROLPOWER SUPPLY section) S1 is set to R9BAL, the following circuit functions are completed:

(1) Intervalometer dc power (+28 volts dc through a thermistor in the intervalometer module) is applied to intervalometer indicator driver Q17 to forward-bias the driver into conduction. The driver, in turn, applies ground to MODULE INTVL indicator DS3 lighting the lamp. This ground also is applied through section A of MODULE TEST switch S1 and section C-X of MASTER switch E1 to DC VOLTS indicators DS3 and DS4, lighting these lamps.

(2) Circuit ground is applied through section E of MODULE TEST switch S1, normally closed contacts 13-2 of relay K3, and section F-Y of MASTER switch S1 to DC VOLTS GRD connector J19.

(3) Clip input from the intervalometer module is routed through section G of MODULE TEST switch S1, normally closed contacts 4-6 of relay K3, section F-X of MASTER switch S1 and resistor R13 to DC

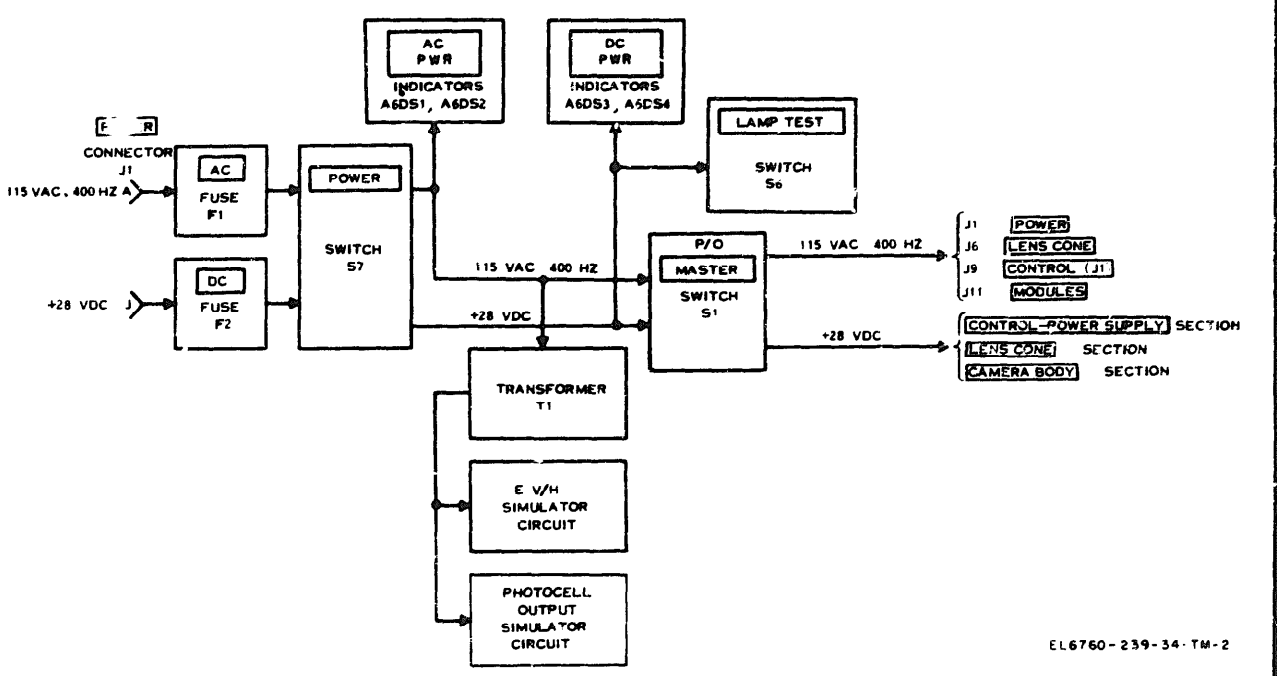


Figure 2-2. Camera analyzer, power distribution.

VOLTS INPUT connector J18.

(4) Intervalometer test point 3 is routed through section J. of MODULE TEST switch S1 to intervalometer test point 1.

(5) Circuit ground is applied through section L of MODULE TEST switch S1 to the E V/H input of the intervalometer module.

(6) Zener diode CR1.15 (33V) is connected through section K of MODULE TEST switch S1 to test point 2 of the intervalometer module.

c. R7BAL. When MODULE TEST switch S1 is set to R7BAL, the following circuit functions are completed:

(1) Intervalometer dc power (+28 volts dc through a thermistor in the intervalometer module) is applied to intervalometer indicator 'driver Q17 to forward-bias the driver into conduction. The driver, in turn, applies ground to MODULE INTVL indicator DS3, lighting the lamp. This ground is also applied through section A of MODULE TEST switch S1 and section C-X of MASTER switch S1 to DC VOLTS indicators DS3 and DS4, lighting these lamps.

(2) Circuit ground is applied through section E of MODULE TEST switch S1, normally closed contacts 13-2 of relay K3, and section F-Y of MASTER switch S1 to DC VOLTS GRD connector J19.

(3) Clip input is routed through section G of MODULE TEST switch S1, normally closed contacts 4-6 of relay K3, section F-X of MASTER switch S1 and resistor R13 to DC VOLTS INPUT connector J18.

(4) Intervalometer test point 3 is routed through section J of MODULE TEST switch S1 to intervalometer test point 1.

(5) Zener diode R115 (33V) is connected through section K of MODULE TEST switch S1 to intervalometer test point 2.

a. OPP. When MODULE TEST switch S1 is set to OPR, the following circuit functions are completed:

(1) Intervalometer dc power (+28 volts dc through a thermistor in the intervalometer module) is applied to intervalometer indicator driver Q17 to forward-bias the driver into conduction. The driver in turn, applies ground to MODULE INTVL indicator DS3 lighting the lamp. This ground is also applied through section A of MODULE TEST switch S1, and section B-Y of MASTER switch Sl to SCOPE indicator DSl, through section A-X of MASTER switch Sl to COUNTER WIDTH indicator DS3, and through switch A-Y of MASTER switch Al to COUNTER INTVL indicator DS4, lighting these lamps.

(2) Ground is applied through section F of MODULE TEST switch S1, and normally closed contacts 14-8 of relay K3 to SCOPE GRD connector J20.

(3) An intervalometer pulse input is applied through section I-I of MODULE TEST switch Sl, normally closed contacts l0-12 of relay K3, section II-Y of MASTER switch Sl, and resistor R14 to SCOPE VERT connector J21. The intervalometer pulse also is applied to INTERVAL PULSE indicators DSl and DS2, lighting these lamps for each pulse input and through section D-X of MASTER switch Sl and resistor R12 to PULSE TIMER PULSE connector J12.

Ground for PULSE TIMER GRD connector J13 is sup plied directly from the camera analyzer.

(4) The E V/H simulator circuit provides an output through section L of MODULE TEST switch Sl directly, and also through capacitor C3, to the intervalometer module.

e. +40VDC. When MODULE TEST switch Sl is sot to +40VDC, the following circuit functions are completed:

(1) Intervalometer dc power (+28 volts dc through a thermistor in the intervalometer module) is applied to intervalometer indicator driver Q17 to forward bias the driver into conduction. The driver, in turn, applies ground to MODULE INTVL indicator DS3, lighting the lamp. This ground is also applied through section C-X of MASTER switch Al to DC VOLTS indicators DS3 and DS4 and through section B-Y of MASTER switch Sl to SCOPE indicator DSl, lighting these lamps.

(2) Circuit ground is applied through section E of MODULE TEST switch S1, normally closed contacts 13-2 of relay K3, and section F-Y of MASTER switch Sl to DC VOLTS GRD connector J19.

(3) Ground is also applied through section F of MODULE TEST switch Sl and nomally closed contacts 14-8 of relay K3 to SCOPE GRD connector J20.

(4) Intervalometer test point 2 is routed through section G of MODULE TEST switch S1, normally closed contacts 4-6 of relay K3, and section F-X of MASTER switch S1 to DC VOLTS INPUT connector J18.

(5) Intervalometer test point 2 is also routed through section H of MODULE TEST switch Sl, normally closed contacts 10-12, of relay K3, section H-Y of MASTER switch Sl, and resistor Rl4 to SCOPE VERT connector J21,

(6) The E V/H simulator circuit provides an output through section L of MODULE TEST switch Sl directly, and also through capacitor C3, to the intervalometer module.

f. -4OVDC. When MODULE TEST switch Sl is set to -4OVDC, the following circuit functions are completed:

(1) Intervalometer dc power (+28 volts dc through a thermistor in the intervalometer module) is applied to intervalometer indicator driver Q17 to forward-bias the driver into conduction. The driver, in turn, applies ground to MODULE INTVL indicator DS3, lighting the lamp. This ground is also applied through section A of MODULE TEST switch Sl and section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4, and through section A of MODULE TEST switch Sl and section B-Y of MASTER switch Sl to SCOPE indicator DSl, lighting these lamps.

(2) Ground is applied through section E of MODULE TEST switch S1, normally closed contacts 13-2 of relay K3, and section F-Y of MASTER switch Sl to DC VOLTS GRD connector J19.

(3) Ground is also applied through section F of MODULE TEST switch Sl, and normally closed contacts 14-8 of relay K3, to SCOPE GRD connector J20.

(4) Intervalometer test point 1 is routed through section G of MODULE TEST switch Sl, normally closed contacts 4-6 of relay K3, and section F-X of MASTER switch Sl to DC VOLTS INPUT connector J18. Intervalometer test point 1 is also routed through section H of MODULE TEST switch Sl, normally closed contacts l0-12 of relay K3, and section H-Y of MASTER switch Sl to SCOPE VERT connector J21.

(5) The E V/H simulator circuit provides an output through section L of MODULE TEST switch Sl directly, and also through capacitor C3, to the intervalometer module.

g. TP3. When MODULE TEST switch Sl is set to TP3, the following circuit functions are completed:

(1) Intervalometer dc power (+28 volts dc through a thermistor in the intervalometer module) is applied to intervalometer indicator driver Ql7 to forward bias the driver into conduction The driver, in turn, applies ground to MODULE INTVL indicator DS3 lighting the lamp. This ground is also applied through section A of MODULE TEST switch Sl and section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4, and through section A of MODULE TEST switch Sl and section B-Y of MASTER switch Sl to SCOPE indicator DSl, lighting these lamps.

(2) Ground is applied through section E of MODULE TEST switch Sl, normally closed contacts 1.3-2 of relay K3, and section F-Y of MASTER switch Sl to DC VOLTS GRD connector J19.

(3) Ground is also applied through section F of MODULE TEST switch Sl, and normally closed contacts 14-8 of relay K3 to SCOPE GRD connector J20.

(4) Intervalometer test point 3 is routed through section G of MODULE TEST switch Sl, normally dosed contacts 4-6 of relay K3, and section F-X of MASTER switch Sl to DC VOLTS INPUT connector J18.

(5) Intervalometer test point 3 is also routed through section H of MODULE TEST switch Sl, normally closed contacts l0-12 of relay K3, section H-Y of MASTER switch Sl, and resistor R14 to SCOPE VERT connector J21.

(6) The E V/H simulator circuit provides an output through section L of MODULE TEST switch S1 directly, and also through capacitor C3 to the intervalometer module.

2-6. LA-406A Film Drive Amplifier Test Circuits (fig. FO-3)

The camera analyzer electronic circuit functions, when performing tests on the LA-406A film drive amplifier module for each of the six FDA positions of MODULE TEST switch S1 are described in the following subparagraphs. Tests which are conducted are: R13ADJ, R9ADJ, OPR, +6VDC, −6VDC, and TP2.

a. Power Application. When MASTER SWITCH Sl (MASTER section) is set to CONTROL PWR SUPPLY, 115 volts, 400 Hz is applied through section G-Y of Sl switch to the film drive amplifier module. +28 volts dc is applied through section G-X of Sl to the film drive amplifier module.

b. R13ADJ. When MODULE TEST switch Sl (CONTROL-POWER SUPPLY section) is set to Rl3ADJ, the following circuit functions are completed:

(1) Film drive amplifier dc power (+28 volts dc through a thermistor in the film drive amphlifier module) is applied to film drive indicator driver Ql6 to forward-bias the driver into conduction. The driver, in turn, applies ground to FILM DRIVE indicator DS4, lighting the lamp. This ground is also applied through section B of MODULE TEST switch Sl and section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4, righting these lamps.

(2) A ground is applied through section C of MODULE TEST switch Sl to the E V/H input of the film drive amphlifier.

(3) Input + and - film drive is applied to the motor tachometer simulator circuit, and its -tachometer feedback output is applied through OPERATE OFF switch S15 to the film drive amplifier.

(4) The - film drive input is also routed through section E of MODULE TEST switch Sl, normally closed contacts 13-2 of relay K3, and section F-Y of MASTER switch Sl to DC VOLTS GRD connector J19.

(5) The + film drive input is also routed through section G of MODULE TEST switch Sl, normally closed contacts 4-6 of relay K3, Section F-X of MASTER switch Sl, and resister R13 to DC VOLTS INPUT connector J18.

c. R9ADJ. When MODULE TEST switch S1 is set to R9ADJ, the following circuit functions are completed

(1) Film drive amplifier dc power (+ 28 volts dc through a thermistor in the film drive amplifier module) is applied to film drive indicator driver Q16 to forward-bias the driver into conduction. This applies ground to FILM DRIVE indicator DS4 lighting the lamp. This ground is also applied through section B of MODULE TEST switch Sl and section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4 lighting the lamps.

(2) Ground is applied to the -tachometer feedback input of the film drive amplifier through section C of MODULE TEST switch Sl and OPERATE OFF switch S15.

(3) Input + film drive is routed through section G of MODULE TEST switch Sl, normally closed contacts 4-6 of relay K3, section F-X of MASTER switch S1, and resistor R13 to DC VOLTS INPUT connector J18.

(4) Input - film drive is routed through section E of MODULE TEST switch Sl, normally closed contacts 13-2 of relay K3, and section F-Y of MASTER switch Sl to DC VOLTS GRD connector J19.

d. OPR. When MODULE TEST switch Sl is set to OPR, the following circuit functions are completed:

(1) Film drive amplifier dc power (+ 28 volts dc through a thermistor is the film drive amplifier module) is applied to film drive indicator driver Ql6 to forward-bias the driver into conduction. This applies ground to FILM DRIVE indicator S4 lighting the lamp. This ground is also applied through section B of MODULE TEST switch Sl and section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4, and through section B-Y of MASTER switch Sl to SCOPE indicator DSl, lighting these lamps.

(2) The output of the E V/H simulator circuit is routed through section D of MODULE TEST switch Sl to the film drive amplifier.

(3) Input - film drive is routed through section E of MODULE TEST switch Sl, normally closed contacts 13-2 of relay K3, and section F-Y of MASTER switch S1 to DC VOLTS GRD connector J19.

(4) Input + and - film drive is applied to the motor tachometer simulator circuit, and its output is routed through OPERATE OFF switch S15 to the - tachometer feedback input of the film drive amplifier module.

(5) The - tachometer feedback signal is also routed from OPERATE OFF switch Sl5 through PLUS OUTPUT switch S14, section G of MODULE TEST switch Sl, normally closed contacts 4-6 of relay K3, and section F-X of MASTER switch Sl to DC VOLTS INPUT connector Jl8.

(6) The - film drive input is also routed through section F of MODULE TEST switch Sl. normally closed contacts 14-8 of relay K3 to SCOPE GRD connector J20

(7) The + film drive input is also routed through section H of MODULE TEST switch Sl, normally closed contacts 10-12 of relay K3, and section H-Y of MASTER switch S1 to SCOPE VERT connector J21.

e. +6VDC. When MODULE TEST switch S1 is set to +6VDC, the following circuit functions are completed:

(1) Film drive amplifier dc power (+28 volts dc

through a thermistor in the film drive: amplifier module) is applied to film drive indicator driver Ql6 to forward bias the driver into conduction. This applies ground to FILM DRIVE indicator DS4, lighting the lamp. This ground is also applied through section B of MODULE TEST switch Sl and section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4, and through section B-Y of MASTER switch Sl to SCOPE indicator DSl, lighting these lamps.

(2) The output of the E V/H simulator circuit is applied through section D of MODULE TEST switch Sl to the film drive amplifier module.

(3) Input - film drive is routed through section E of MODULE TEST switch Sl, normally closed contacts 13-2 of relay K3, and section F-Y of MASTER switch S1 to DC VOLTS GRD connector J19.

(4) Input - film drive is also routed through section F of MODULE TEST switch Sl, and normally closed contacts 14-8 of relay K3 to SCOPE GRD connecter J20.

(5) Film drive amplifier test point 3 is routed through section G of MODULE TEST switch Sl, normally closed contacts 4-6 of relay K3, section F-X of MASTER switch Sl, and resistor Rl3 to DC VOLTS INPUT connector J18.

(6) Test point 3 is also routed through section B of MODULE TEST switch Sl, normally closed contacts l0-12 of relay K3, section H-Y of MASTER switch Sl, and resistor R14 to SCOPE VERT connector J21.

f. -6VDC. When MODULE TEST switch Sl is set to -6VDC, the following circuit functions are completed:

(1) Film drive amplifier dc power (+ 28 volts dc through a thermistor in the film drive amplifier module) is applied to film drive indicator driver Ql6 to forward bias the driver into conduction This applies ground to FILM DRIVE indicator DS4 and the lamp lights. The ground is also applied through section B of MODULE TEST switch Sl and section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4 and through section B-Y of MASTER switch Sl to SCOPE indicator DSl, lighting these lamps

(2) The output of the E V/H simulator circuit is routed through section D of MODULE TEST switch Sl to the film drive amplifier module.

(3) -Film drive is routed through section E of MODULE TEST switch Sl, normally closed contacts 13-2 of relay K3, and section F-Y of MASTER switch S1 to DC VOLTS GRD connector J19.

(4) -Film drive is also routed through section F of MODULE TEST switch Sl and normally closed contacts 14 -8 of relay K3 to SCOPE GRD connector J20.

(5) Film drive amplifier test point 4 is routed through section G of MODULE TEST switch Sl, normally closed contacts 4-6 of relay K3 and section F-X of MASTER switch Sl to DC VOLTS INPUT connector J18.

(6) Test point 4 is also routed through section H of MODULE TEST switch Sl, normally closed contacts l0-12 of relay K3, and section H-Y of MASTER switch Sl to SCOPE VERT connector J21.

g. TP2. When MODULE TEST switch Sl is set to TP2, the following circuit functions are completed

(1) Film drive amplifier dc power (+ 28 volts dc through a thermistor in the film drive amplifier module) is applied to film drive indicator driver Q16 to forward bias the driver into conduction. This applies ground to FILM DRIVE indicator DS4, lighting the lamp. This ground is also applied through section B of MODULE TEST switch Sl and section B-Y of MASTER switch Sl to SCOPE indicator DSl, lighting the lamp.

(2) The output of the E V/H simulator circuit is applied through section D of MODULE TEST switch Sl to the film drive amplifier module.

(3) -Film drive is routed through section F of MODULE TEST switch Sl and normally closed contacts 14-8 of relay K3 to SCOPE GRD connector J20.

(4) Test point 2 of the film drive amplifier module is routed through section H of MODULE TEST switch Sl, normally-closed contacts l0-12 of relay K3, and section H-Y of MASTER switch Sl to SCOPE VERT connector J21.

2-7. LA-406A PC Board and Component Assembly Module Test Circuits

(fig. FO-4)

The camera analyzer electronic circuit functions when performing tests on the PC board component assembly module for each of the two AUX BD positions of TEST switch S2 are described in the following subparagraphs. Tests which are conducted include all of the CONFIGURATION switch S3 positions for each AUX BD position of TEST switch S2.

a Power Application. When MASTER switch Sl is set to CONTROL PWR SUPPLY, +28 volts dc is applied through section G-X of Sl to the PC board and component assembly module.

b. INTVL-AUX BD. When TEST switch S2 is set to INTVL AUX BD, the following circuit functions are completed:

(1) Circuit ground is routed through section A of TEST switch S2 and section E-X of MASTER switch Sl to R/C BRDG indicators DSl and DS2, lighting the lamps, and to section A of CONFIGURATION switch S3, whose function for PC board and component assembly tests is described in d through m below.

(2) IntervalometerE V/H input is routed through section C of TEST switch S2 and section E-Y of MASTER switch Sl to R/C BRDG + connector J16.

c. FDA AUX BD. When TEST switch S2 is set to FDA AUX BD, the following circuit functions are com-

pleted

(1) Circuit ground is routed through section A of TEST switch S2 and section E-X of MASTER switch S1 to R/C BRDG indicators DSl and DS2 lighting the lamps and to R/C BRDG - connector J17. The ground is also applied through section A of TEST switch S2 to section A of CONFIGURATION switch S3, whose function for PC board and component assembly module tests is described in d through m below.

(2) Film drive amplifier E V/H input is routed through section C of TEST S2 and section E-Y of MASTER switch Sl to R/C GRDG + connector J16.

d. 44MM VERT. When CONFIGURATION switch S3 is set to 44mm VERT, the following circuit functions are completed.

(1) The ground applied through section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 to the 44 mm length ground input of the PC beard and component assembly module.

(2) A mount vertical reference volts ground input is applied to input 14 of NOR gate Al. A vertical doors open ground input is applied to input 1 of NOR gate Al. A positive (logic 1) input is present at input 8 of NOR gate Al, whose output 5 is a ground (logic 0) to input 2 of NOR gate Al. As a result, NOR gate Al develops a positive (logic 1) output which forward-biases vertical position indicator driver Q13, which in turn conducts to apply a ground to VERT POS indicator DS3, lighting the lamp.

e. 3 in. 15ºR. When CONFIGURATION switch S3 is set to 3 IN. 15º R, the following circuit functions are completed:

(1) The ground applied through section A of TEST switch S2 is routed through section A of CONFIGUATION switch S3 to' the mount swing 15º right input, and also the 3-inch focal length ground input of the PC board and component assembly module.

(2) A right door open ground input is routed through section B of CONFIGURATION switch S3 to input 10 of NOR gate Al. A mount 15º right reference volts ground input is routed through section C of CONFIGURATION switch S3 to input 12 of NOR gate Al. A 15º relays ground input is routed through section D of CONFIGURATION switch S3 to input 13 of NOR gate Al. As a result, NOR gate Al develops a positive (logic 1) output 9 to forward-bias relay operate indicator driver Ql4 which, in turn conducts to apply a ground to RELAY OPR indicator DS4, lighting the lamp.

(3) Ground is applied to MOUNT AC indicator DSl, lighting the lamp.

f. 3 IN. 30° R. When CONFIGURATION switch S3 is set to 3 IN. 30° R, the following circuit functions are completed:

(1) The ground applied through section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 as mount swing 30° right, and 3-inch focal length ground inputs to the PC board and component assembly module.

(2) A right door open ground input is routed through section B of CONFIGURATION switch S3 to input 10 of NOR gate Al. A mount 30° right reference volts ground input is routed through section C of CONFIGURATION switch S3 to input 12 of NOR gate Al. A 30º relays ground input is routed through section D of CONFIGURATION switch S3 to input 13 of NOR gate Al. As a result, the gate develops a positive (logic 1) at output 9 to forward-bias relay operate indicator driver Ql4 which, in turn conducts to apply ground to RELAY OPR indicator DS4, lighting the lamp.

(3) Ground is applied to MOUNT AC indicator DSl, lighting the lamp.

g. 3 IN VERT. When CONFIGURATION switch S3 is set to 3 IN. VERT, the following circuit functions are completed:

(1) The ground applied through section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 to the 3-inch focal length ground input of the PC board and component assembly module.

(2) A mount vertical reference volts ground input is applied to input 14 of NOR gate Al. A vertical doors open ground input is applied to input 1 of NOR gate Al. A positive (logic 1) input is present at input 8 of NOR gate Al, whose output 5 is a ground (logic 0) to input 2 of NOR gate Al. As a result, NOR gate Al develops a positive (logic 1) output which forward-biases vertical position indicator driver Q13, which in turn, conducts to apply a ground to VERT POS indicator DS3, lighting the lamp.

(3) Ground is applied to MOUNT AC indicator DSl, lighting the lamp.

h. 6 IN. 15º L. When CONFIGURATION switch S3 is set to 6 IN. 15º L, the following circuit functions are completed:

(1) The ground applied through section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 to the mount switch 15º left ground input of the auxiliary board module.

(2) A left door open ground input is routed through section B of CONFIGURATION switch S3 to input 10 of NOR gate Al. A mount 15º left reference volts ground input is routed through section C of CONFIGURATION switch A3 to input 12 of NOR gate A1. A 15º relays ground input is routed through section D of CONFIGURATION switch S3 to input 13 of NOR gate Al. As a result, the gate develops a positive (logic 1) output 9 to forward-bias relay operate indicator driver Q14 which, in turn, conducts to apply a ground to RELAY OPR indicator DS4, lighting the lamp.

(3) Ground in applied to MOUNT AC indicator DSl, lighting the lamp.

i. 6 IN. 30° L. When CONFIGURATION switch A3

is set to 6 IN. 30° L, the following circuit functions are completed:

(1) The ground applied through section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 to the mount switch 30° left input of the PC board and component assembly module

(2) A left door open ground input is routed through section B of CONFIGURATION switch S3 to input 10 of NOR gate Al. A mount 30° left reference volts ground input is routed through section C of CONFIGURATION switch A3 to input 12 of NOR gate Al. A 30° relays ground input is routed through section D of CONFIGURATION switch A3 to input of NOR gate Al. As a result, the gate develops a positive (logic 1) at output 9 to forward-bias relay operate indicator driver Q14 which, in turn, conducts to apply a ground to RELAY OPR indicator DS4, lighting the lamp.

(3) Ground is applied to MOUNT AC indicator DS1, lighting the lamp.

j. 6 IN. VERT. A mount vertical reference volts ground input is applied to input 14 of NOR gate Al. A vertical doors open ground input is applied to input 1 of NOR gate Al. A positive (logic 1) input is present at input 8 of NOR gate Al, whose output 5 is ground (logic 0) to input 2 of NOR gate Al. As a result, NOR gate Al develops a positive (logic 1) output which forward-biases vertical position indicator driver Q13, which in turn, conducts to supply a ground to VERT POS indicator DS3, lighting the lamp.

k. 12 IN. 15° L. When CONFIGURATION switch S3 is set to 12 IN. 15° L, the following circuit functions are completed:

(1) The ground applied through section A of TEST switch S2 is-routed through section A of CONFIGURATION switch S3 to the mount switch 15° left and 12-inch focal length ground inputs of the PC board and component assembly module.

(2) A left door open ground input is routed through section B of CONFIGURATION switch S3 to input 10 of NOR gate Al. A mount 15° left reference volts ground input is routed through C of CONFIGURATION switch A3 to input 12 of NOR gate Al. A 15° relays ground input is routed through section D of CONFIGURATION switch S3 to input 13 of NOR gate A1. As a result, the gate develops a positive (logic 1) output 9 to forward-bias relay operate indicator driver Q14 which, in turn conducts to apply a ground to RELAY OPR indicator DS4, lighting the lamp.

(3) Ground is applied to MOUNT AC indicator DSl lighting the lamp.

l 12 IN 30° L. When CONFIGURATION switch S3 is set to 12 IN. 30° L, the following circuit functions are completed:

(1) The ground applied through section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 to the mount switch 30° left and 12-inch focal length ground inputs of the PC board and component assembly module.

(2) A left door open ground input is routed through section B of CONFIGURATION switch S3 to input 10 of NOR gate Al. A mount 30° left reference volts ground input is routed through section C of CONFIGURATION switch A3 to input 12 of NOR gate Al. A 30° relays ground input is routed through section D of C0NFIGURATION switch S3 to input 13 of NOR gate Al. As a result, the gate develops a positive (logic 1) output 9 to forward-bias relay operate indicator driver Q14 which, in turn conducts to apply ground to RELAY OPER indicator DS4, lighting the lamp.

(3) Ground is applied to MOUNT AC indicator DSl, lighting the lamp.

m. 12 IN. VERT. When CONFIGURATION switch S3 is set to 12 IN. VERT, the following circuits are completed:

(1) The ground applied through section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 to the 12-inch focal length ground input of the PC board and component assembly module

(2) A mount vertical reference volts ground input is applied to input 14 of NOR gate Al. A vertical doors open ground input is applied to input 1 of NOR gate Al. A positive (logic 1) input is present at input 8 of NOR gate Al, whose output 5 is a ground (logic 0) to input 2 of NOR gate Al. As a result, NOR gate Al develops a positive (logic 1) output which forward-biases vertical position indicator driver Q13, which in turn, conducts to apply a ground to VERT POS indicator DS3, lighting the lamp.

(3) Ground is applied to MOUNT AC indicator DSl, lighting the lamp.

2-8. LA-406A Test Circuits (fig. FO-5)

The camera analyzer electronic circuit functions when performing LA-406A tests for each SYSTEM position of TEST switch S2 are described in the following sub paragraphs. Tests which are conducted are: RDY GRD OFF, RDY GRD ON, OPERATE, MAN PIC, NIGHT FLASH, AND FLASH RDY.

a Power Application. When MASTER switch Sl is set to CONTROL PWR SUPPLY, 115 volts, 100 Hz is applied through section G-Y of Sl and +28 volts dc is applied through section G-X of Sl to the LA-406A.

b. RDY GRD OFF. When TEST switch S2 is set to RDY GRD OFF, the following circuit functions, although these are not considered during actual testing of the LA-406A, are completed.

(1) Cable interlock ground is routed through section C-X of MASTER switch Sl to DC VOLTS indica-

tors DS3 and DS4, lighting the lamps. This ground is also applied through section B-Y **of** MASTER switch Sl to SCOPE indicator DSl, through **section** A-X of MASTER switch Sl to WIDTH indicators DS3, and also through section A-Y of MASTER switch Sl to INTVL indicator DS4, lighting these lamps

(2) Flash trigger 1 ground is applied to rely K3, and the relay is energized.

(3) Circuit ground is routed through normally **open** contacts 3-2 of relay A16K3 and section F-Y of MASTER switch Sl to DC VOLTS GRD connector J19, and through normally open contacts 9-8 of relay K3 to SCOPE GRD connector J20. Circuit ground is routed through OPERATE OFF switch Sl5 as an **oper**-ate ground input to the LA-406A.

(4) The output of the E V/H simulator circuit is applied to the LA-406A.

c. RDY GRD ON. When TEST switch S2 is set to RDY GRD ON, the following circuit functions are completed:

(1) Cable interlock ground is routed through section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4, through section B-Y of MASTER switch Sl to SCOPE indicator DSl, through section A-X of MASTER switch to WIDTH indicator DS3, and also through section A-Y of MASTER switch Sl to INTVL indicator DS4, lighting these lamps

(2) Flash trigger 1 ground is applied to relay K3, and the relay is energized.

(3) Circuit ground is routed through normally open contacts 3-2 of relay K3 and section F-Y of MASTER switch Sl to DC VOLTS GRD connector J19, and through normally open contacts 9-8 of relay K3 to SCOPE GRD connector J20.

(4) Film drive is supplied from the control-power supply to the motor tachometer simulator circuit, whose - tachometer feedback output is routed through OPERATE OFF switch S15 to the control-power sup ply, and also from the OPERATE OFF switch S15 through PLUS OUTPUT switch S14, normally open contacts 5-6 of relay K3, section F-X of MASTER switch Sl. and resistor R13 to DC VOLTS INPUT connector J18. Depressing OPERATE OFF switch S14 disconnects the -tachometer feedback output of the motor tachometer simulator circuit from both the input to the control-power supply and DC VOLTS IN-PUT connector J18 and, in addition, the operate ground to the LA-406A. Depressing PLUS OUTPUT switch S14 disconnects the - tachometer feedback output of the motor tachometer simulator circuit from DC VOLTS INPUT connector J18, and routes a portion of the + film drive input of the LA-406A through normally open contacts 5-6 of relay K3, section F-X of MASTER switch Sl, and resistor R13 to the DC VOLTS INPUT connector J18.

(5) Camera +28 volts dc is applied to CAMR 28V indicator DS3, lighting the lamp.

(6) Scanner @B 115 volts, 400 Hz is applied to AC **@B indicator DS4, li**ghting the lamp.

(7) Scanner @A 115 volts, 400 Hz is applied to AC @A indicator DS2, lighting the lamp.

(8) Ground is applied to MOUNT AC indicator DSl, lighting the lamp.

(9) A cycle pulse input from the LA-406A is applied to INTVL PULSE indicator DSl to pulse the lamp, and through normally open contacts 11-12 of relay K3, section II-Y of MASTER switch Sl, and resistor R14 to SCOPE VERT connector J21. The cycle pulse input is also routed through section D-X of MASTER switch Sl, and resistor R12 to PULSE TIMER PULSE connector J12. Circuit ground is present at PULSE TIMER GRD connector J13.

(10) The output of the E V/H simulator circuit is applied to the LA-406A.

(11) Circuit ground is routed through section A of TEST switch S2 as a ready ground input to the LA-406A.

d. OPERATE. When TEST switch S2 is set to OP-ERATE, the following circuit functions are completed:

(1) Circuit ground is routed through section A of TEST switch S2 as a cable interlock input, a mount ready ground input a doors open input, and a ready ground input to the control-power supply, and also to section A of CONFIGURATION switch S3. Subparagraphs (2) through (11) below describe circuit functions completed for each position of CONFIGURA-TION switch S3.

(2) When CONFIGURATION switch S3 is set to 44MM VERT, the circuit ground from section A of TEST switch S2 and section A of CONFIGURATION switch S3 is applied as a 44mm focal length ground input to the LA-406A. A vertical door open ground input is applied to input 1 of NOR gate Al. A mount vertical reference volts ground input is applied to input 14 of NOR gate Al. A positive (logic 1) input is present at input 8 of NOR gate Al, whose output 5 is a ground (logic 0) at input 2 of NOR gate Al. As a result, the gate develops a positive (logic 1) output to vertical position indicator driver Q13, which conducts to apply a ground to VERT POS indicator DS3, lighting the lamp.

(3) When CONFIGURATION switch S3 is set to 3 IN. 15° R, the circuit ground from section A of TEST switch S2 is routed through section A of CONFIGUR-ATION switch S3 as a 3-inch focal length ground and a mount swing 15° right ground input to the LA-406A. A right door open ground is routed through section B of CONFIGURATION switch S3 to input 10 of NOR gate Al. A mount 15° right reference volts ground input is routed through section C of CONFIGURATION switch S3 to input 12 of NOR gate Al. A data request N.C. ground input is routed through section D of

CONFIGURATION switch S3 to input 13 of NOR gate Al. As a result, NOR gate Al develop a positive output (logic 1) which forward-biases relay operate indicator driver Q14. The indicator driver, in turn, supplies a ground to RELAY OPR indicator DS4, lighting the lamp.

(4) When CONFIGURATION switch S3 is set to 3 IN. 30° R, the circuit ground from section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 as a mount swing 30° right and a 3-inch focal length ground input to the control-power supply. A right door open ground is routed through section B of CONFIGURATION switch S3 to input 10 of NOR gate Al. A mount 30° right reference volts ground is routed through section C of CONFIGURATION switch S3 to input 12 of NOR gate Al. A data request common ground input is routed through section D of CONFIGURATION switch S3 to input 13 of NOR gate Al. As a result, a positive (logic 1) output is developed at output 9 of the gate which forward-biases relay operate indicator driver Q14. The driver, in turn, supplies a ground to RELAY OPR indicator DS4, lighting the lamp.

(5) When CONFIGURATION switch S3 is set to 3 IN. VERT, the circuit ground from section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 as a 3-inch focal length ground output to the LA-406A. Following this, NOR gate Al operates as described in (2) above to produce a positive (logic 1) output at its pin 3 which enables VERT POS indicator lamp DS3 to light

(6) When CONFIGURATION switch S3 is set to 6 IN. l5° L, the circuit ground from section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 as a mount swing 15° left ground input to the LA-406A. A left door open ground input is applied through section B of CONFIGURATION switch S3 as input 10 of NOR gate Al. A mount 15° left reference volts ground input is routed through section C of CONFIGURATION switch S3 to input 12 of NOR gate Al. A data request ground is routed through section D of CONFIGURATION switch S3 to input 13 of NOR gate Al. As a result, the gate develops a positive (logic 1) output to relay operate indicate driver Q14, which forward-biases the driver into conduction to apply ground to RELAY OPR indicator DS4, lighting the lamp.

(7) When CONFIGURATION switch S3 is set to 6 IN. 30° L, the circuit ground from section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 as a mount swing 30° left ground input to the control-power supply. A left door open ground is routed through section B of CONFIGURATION switch S3 to input 10 of NOR gate Al. A mount 30° left reference volts ground input is routed through section C of CONFIGURATION switch S3 to input 12 of NOR gate Al. A data request common ground input is routed through section D of CONFIGURATION switch S3 to input 13 of NOR gate Al. As a result, the gate develops a positive (logic 1) output to relay operate indicator driver Q14, which forward-biases the driver into conduction to apply ground to RELAY OPR indicator DS4, lighting the lamp.

(8) When CONFIGURATION switch S3 is set to 6 IN. VERT, NOR gate Al operates as described in (2) above to produce a positive (logic 1) output at its pin 3 which enables VERT POS indicator lamp DS3 to light.

(9) When CONFIGURATION switch S3 is set to 12 IN. 15° L, the circuit ground from section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 as mount swing 15° left and 12-inch focal length ground inputs to the LA-406A. Following this, NOR gate Al operates as described in (6) above to produce a positive (logic 1) output at its pin 9 which enables RELAY OPR indicator lamp DS4 to light.

(10) When CONFIGURATION switch S3 is set to 12 IN. 30° L, the circuit ground from section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 as a 12-inch focal length ground and a mount swing 30° left ground input to the LA-406A. Following this, NOR gate Al operates as described in (7) above to produce a positive (logic 1) output at its pin 9 which enables RELAY OPR indicator lamp DS4 to light

(11) When CONFIGURATION switch S3 is set to 12 IN. VERT, the circuit ground from section A of TEST switch S2 is routed through section A of CONFIGURATION switch S3 as a 12-inch focal length ground input to the LA-406A. A vertical doors open ground input is applied at input 1 of NOR gate Al. A mount vertical reference volts ground input is applied at input 14 of NOR gate Al. A positive (logic 1) input is present at input 8 of NOR gate Al, whose output 5 is a ground (logic 0) at input 2 of NOR gate Al. As a result, the gate develops a positive (logic 1) output to vertical position indicator driver Q13, which conducts to apply a ground to VERT POS indicator DS3, light ing the lamp.

(12) +28 volts dc is routed through section B of TEST switch S2 as a camera 28 VDC interlock input to the LA-406A.

(13) Operate ground is supplied to one side and ready indicate (28 volts dc) is applied to the other side of SYS RDY indicator DSl by the LA-406A, lighting the lamp.

(14) Camera + 28 volts dc is applied to CAM 28V indicator DS3, lighting the lamp.

(15) Scanner ØB 115 volts, 400 Hz is applied to AC ØB indicator DS4, lighting the lamp.

(16) Scanner ØA 115 volts, 400 Hz is applied to AC ØA indicator DS2, lighting the lamp.

(17) Ground is applied to MOUNT AC indicator DSl lighting the lamp.

(18) Cable interlock ground is routed through section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4, lighting the lamps. This ground is also applied through section B-Y of MASTER switch S1 to SCOPE indicator DSl, and through section A-X of MASTER switch Sl to WIDTH indicator DS3, and also through section A-Y of MASTER switch Sl to INTVL indicator DS4, lighting these lamps.

(19) Flash trigger 1 ground is applied to relay K3 and the relay is energized.

(20) Circuit ground is routed through normally open contacts 3-2 of relay K3 and section F-Y of MASTER switch Sl to DC VOLTS GRD connector J19.

(21) ± Film drive from the LA-406A is applied to the motor tachometer simulator circuit, and its -tachometer feedback output is routed through OPERATE OFF switch S15 to the LA-406A, and also through PLUS OUTPUT switch S14, normally open contacts 5-6 of relay K3, section F-X of MASTER switch Sl, and resistor R13 to DC VOLTS INPUT connector J18. Depressing OPERATE OFF switch disconnects the output of the motor tachometer simulator circuit from the LA-406A and DC VOLTS INPUT connector J18, and also circuit ground as the operate ground input to the control-power supply. Depressing PLUS OUTPUT switch S14 disconnects the - tachometer feedback signal from the DC VOLTS INPUT connector J18 and connects the + film drive input to the connector.

(22) Ground is routed through normally open contacts 9 -8 of relay K3 to SCOPE GRD connector J20.

(23) A cycle pulse input from the LA-406A is routed to INTVL PULSE indicator DSl, lighting the lamp for each pulse. The cycle pulse is also routed through normally open contacts 11-12 of relay K3, section H-Y of MASTER switch Sl, and resistor R14 to SCOPE VERT connector J21, and through section D-X of MASTER switch Sl and resistor R12 to PULSE TIMER PULSE connector J12. Ground is present at PULSE TIMER GRD connector J13.

(24) The output of the E V/H simulator circuit is applied to the LA-406A.

e. MAN PIC When TEST switch S2 is set to MAN PIC, the following circuit functions are completed.

(1) Circuit ground is routed through section A of TEST switch S2 as a manual picture, mount ready ground, doors open interlock, and ready ground input to the LA-406A.

(2) Operation thereafter is identical to d (12) through (24) above except that circuit ground **is** removed from the input of manual picture indicator driver Ql5, to permit +28 volts dc to forward-bias the driver into conduction which, in turn, places a ground on MAN PIC indicator DS2, lighting the lamp.

f. NIGHT FLASH. When TEST switch S2 is set to NIGHT FLASH, the following circuit functions are completed

(1) Circuit ground is routed through section A of TEST switch S2 as a night mode ground, a mount ready ground, a doors open interlock, and a ready ground input to the LA-406A.

(2) Aside from following steps (3) through (5) operation thereafter is identical to d(l2) through (24) above.

(3) Flasher 115 volts, 400 Hz is applied to FLASH AC indicator DS2, lighting the lamp.

(4) A night exposure ground is applied to NIGHT EXP indicator, DS3, lighting the lamp.

(5) Flasher + 28 volts dc is applied to FLASH DC indicator DS4, lighting the lamp.

g. FLASH RDY. When TEST switch S2 is set to FLASH RDY, the circuit functions are identical to those given for night flash operation (f above) with the single exception that +28 volts dc is routed through section B of TEST switch S2 as both flasher ready and camera + 28 volts dc interlocks to the LA-406A.

2-9. Lens Cone S/C Test Circuits (fig. FO-6)

The camera analyzer electronic circuit functions when performing tests on the S/C switch module of the lens cone, are described in the following subparagraphs. Tests which are conducted are S/C A and S/C B.

a. Power Application. When MASTER switch Sl is set to LENS CONES, +28 volts dc is applied through section G-X of the switch to the S/C switch module under test.

8. S/CA. When TEST switch S10 is set to S/C A, the following circuit functions are completed:

(1) S/C resistors A input from the S/C switch module is routed through section A-X of TEST switch S10 and section E-Y of MASTER switch Sl to R/C BRDG + connector J16.

(2) Circuit ground is routed through section A-Y of TEST switch S10 and section E-X of MASTER switch Sl to R/C BRDG indicators DSl and DS2 which illuminate and also to R/C BRDG - connector J17.

c. S/C B. When TEST switch Sl0 is set to SIC B, the following circuit functions are completed.

(1) S/C resistors B input from the S/C switch module is routed through section A-X of TEST switch Sl0 and section E-Y of MASTER switch Sl to R/C BRDG + connector J16.

(2) Circuit ground is routed through section A-Y of TEST switch Sl0 and section E-X of MASTER switch Sl to R/C BRDG indicators DSl and DS2 which illuminate, and to R/C BRDG - connector J17.

2-10. Lens Cone Calibrate Test Circuits (fig. FO-6)

The camera analyzer electronic circuit functions when performing calibration tests on the lens cone are described in the following subparagraphs.

a Power Application. When MASTER switch Sl is set to LENS CONES, 115 volts, 400 Hz is applied through section G-Y of the switch and + 28 volts dc is applied through section G-X of the switch to the lens cone.

b. CAL. When TEST switch Sl0 is set to CAL, the following circuit functions are completed:

(1) Circuit ground is routed through section A-Y of TEST switch Sl0 and section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4, lighting the lamps.

(2) The test point input from the lens cone is routed through section B-X of TEST switch Sl0, section F-X MASTER switch Sl, and resistor R13 to DC VOLTS INPUT connector J18.

(3) The output of the simulated exposure feedback circuit is routed through section B-Y of TEST switch Sl0 as an exposure test point input to the lens cone.

(4) The output of the photocell output simulator circuit is applied through FOOT-LAMBERTS resistor R4 and RANGE switch S11 and an exposure signal input to the lens cone.

(5) When testing a 44mm lens cone, a 44mm focal length ground input is applied to 44 mm indicator DSl, lighting the lamp.

(6) When testing a 3-inch lens cone, a 3-inch focal length ground input is applied to 3 IN. indicator DS2, lighting the lamp.

(7) When testing a 12-inch lens cone, a 12-inch focal length ground input is applied to 12 IN. indicator DS4, lighting the lamps.

(8) When testing a 6-inch lens cone, no grounds are present at the 44mm, 3-inch or 12-inch focal length inputs; as a result, 6-inch indicator driver Q5 is forward-biased and conducts to apply a ground to 6 IN. indicator DS3, lighting the lamp.

(9) When calibrating the camera analyzer, RANGE switch S11 is set to the 0-100 position and the digital voltmeter is nulled by adjusting FOOT-LAMBERTS resistor R4. When FOOT-LAMBERTS resistor R4 is increased from the null point by 1.2 foot-lamberts, a slit width limit common ground input is applied to decrease indicator driver Q9, and + 28 volts dc (slit width limit Sl) through the slit width drive motor in the lens cone is also applied to the indicator driver. As a result, the driver is forward-biased into conduction and applies ground to DECR indicator DS4, lighting the lamp. When FOOT-LAMBERTS resister R4 is decreased from the null point by 1.2 foot lamberts, +28 volts dc is applied to INCR indicator DS3, lighting the lamp.

2-11. Lens Cone Operate Test Circuits (fig. FO-6)

The camera analyzer electronic circuit functions when performing operational tests on either the servo drive assembly or the lens cone are described in the following subparagraphs.

a. Power Application. #en MASTER switch Sl is set to LENS CONES, 115 volts, 400 Hz is applied through section G-Y and +28 volts dc is applied through section G-X of the switch to the lens cone. When operate tests are performed on the servo drive assembly, + 28 volts dc is applied through section G-X of the MASTER switch to the servo drive assembly.

b. Servo Drive Assembly OPERATE Test. When TEST switch Sl0 is set to OPERATE when performing tests on the servo drive assembly, the following circuits functions are completed:

(1) A servo drive potentiometer input is routed through section A-X of TEST switch S10 and section E-Y of MASTER switch Sl to R/C BRDG + connector J16.

(2) A cable interlock + 28 volts dc input is applied to the base, and circuit ground through section A-Y of TEST switch Sl0 is applied to the emitter of R/C bridge indicator driver Ql to forward-bias the driver into conduction. The driver, in turn, applies a ground through section E-X of MASTER switch Sl to R/C BRDG indicators DSl and DS2, lighting the lamps, and to R/C BRDG - connector J17.

(3) Circuit ground is routed through section A-Y of TEST switch Sl0 and section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4, lighting the lamps.

(4) When DC EXPOSURE switch S13 is set to INCREASE, circuit ground is routed through one section of LAMP TEST switch S6 and closed contacts of DC EXPOSURE switch S13 to the exposure decrease input of the servo drive assembly; +28 volts dc is routed through another section of S6 and S13 to the exposure increase input of the servo drive assembly.

(5) A slit width limit S1 +28 volts dc input is applied to INCR indicator DS3, and the lamp lights as long as the slit width drive motor is being driven in the increase direction.

(6) When the slit width limit is reached, the +28 volts dc slit width limit Sl input is removed and INCR indicator DS3 extinguishes. A slit width limit S8 ground input is applied to one side, and a + 28 volts dc slit width drive motor input is applied to the other side of INCR LIM indicator DSl, lighting the lamp.

(7) When DC EXPOSURE switch S13 is set to DECREASE, circuit ground is routed through one section of LAMP TEST switch S6 and closed contacts of DC EXPOSURE switch S13 to the exposure increase input of the servo drive assembly; +28 volts dc is routed through another section of S6 and S13 to the exposure

decrease input of the servo drive assembly.

(8) A slit width limit ground input and a +28 volts dc slit width limit Sl input through the slit width drive motor is applied to decrease indicator driver Q9 to forward-bias the driver into conduction. As a result, ground is applied to DECR indicator DS4, and the lamp lights as long as the slit width drive motor is being driven in the decrease direction.

(9) When the slit width is reached, the slit width limit ground is removed from Q9 and the lamp extinguishes. The slit width limit Sl +28 volts dc input is routed to the increase/decrease exposure circuit. The circuit develops a -28 volts dc output which is routed through LAMP TEST switch S6 to DECR LIM indicator DS2, lighting the lamp.

c. Lens Cone OPERATE Tests. When TEST switch S10 i. set to OPERATE when performing tests on the lens cone, the following circuit functions are completed:

(1) The exposure test point input from the lens cone is routed through section B-X of TEST switch S10, section F-X of MASTER switch S1, and resistor R13 to DC VOLTS INPUT connector J18.

(2) Circuit ground is routed through section A-Y of TEST switch S10 and section C-X of MASTER switch S1 to DC VOLTS indicators DS3 and DS4, lighting the lamps.

(3) When testing a 44mm lens cone, a 44mm focal length interlock ground input from the lens cone is applied to 44mm indicator DS1, lighting the lamp. The ground is also applied to 6-inch lamp driver Q5, maintaining the driver cutoff to prevent lighting 6 IN. indicator DS3.

(4) When testing a 3-inch lens cone, 3-inch focal length interlock ground input from the lens cone is applied to 3 IN. indicator DS2, lighting the lamp. The ground also is applied to 6-inch lamp driver Q5, maintaining the driver cutoff to prevent lighting 6 IN. indicator DS3.

(5) When testing a 12-inch lens cone, a l2-inch focal length interlock ground input from the lens cone is applied to 12 IN. indicator DS4, lighting the lamp. The ground is also applied to the 6-inch lamp driver Q5, maintaining the driver cutoff to prevent lighting 6 IN, indicator DS3.

(6) When testing a 6-inch lens cone, no focal length interlock ground inputs are received. Six-inch indicator driver Q5 is forward-biased into conduction by +28 volts dc applied to its base. As a result, the driver applies ground to 6 IN. indicator DS3, lighting the lamp.

(7) The output of the photocell output simulator circuit is applied through FOOT-LAMBERTS resistor R4 and RANGE switch S11 as an exposure signal input to the lens cone.

(8) Circuit ground is routed through LAMP TEST switch S6 as a +28 volts dc return input to the lens cone.

(9) When EXPOSURE switch S12 is set to OVER, an over exposure ground is applied to the lens cone. As a result, a + 20 volts dc input from the lens cone is applied to over indicator driver Q6 and under indicator gate Q7. The input forward-biases the driver into conduction to apply a ground to OVER indicators DSl and DS2, lighting the lamps. The input also forward-biases the gate into conduction; as a result, a ground is applied to under indicator driver Q8 in its output to maintain the drive cut off to prevent lighting UNDER indicators DS3 and DS4.

(10) When EXPOSURE switch S12 is set to UNDER, under exposure ground is applied to the lens cone. As a result, a +5 volts dc input from the lens cone is applied to over indicator driver Q6 and under indicator gate Q7. The input is insufficient to drive either the gate or driver into conduction As a result, OVER indicators DSl and DS2 extinguish Under indicator driver Q8, however, becomes self-biased into conduction to apply a ground to UNDER indicators DS3 and DS4, lighting the lamps

(11) When EXPOSURE switch S12 is at the center position, a + 10 volts dc input from the lens cone is insufficient to affect driver Ql6, but is sufficient enough to forward-bias gate Q7 into conduction to apply ground to driver Q8. The ground maintains the driver in cutoff to prevent lighting UNDER indicators DS3 and DS4.

(12) When DC EXPOSURE switch S13 is set to INCREASE, circuit ground is routed through one section of LAMP TEST switch S6 and the closed contacts of Sl3 to test point 3 on the lens cone. In addition, +28 volts dc is routed through another section of LAMP TEST switch S6 and the closed contacts of S13 to test point 4 on the lens cone.

(13) A slit width limit Sl + 27 volts dc input is applied to INCR indicator DS3, and the lamp lights as long as the slit width drive motor is being driven in the increase direction.

(14) When the slit width limit is reached, the + 28 volts dc slit width limit S1 input is disconnected and INCR indicator DS3 extinguishes. A slit width limit S8 ground input is applied to one side and a + 28 volts dc slit width drive motor input is applied to the other side of INCR LIM indicator DS1, lighting the lamp.

(15) When DC EXPOSURE switch S13 is set to DECREASE, circuit ground is routed through one section of LAMP TEST switch S6 and the closed contacts of S13 to the exposure increase input of the lens cone. In addition, +28 volts dc is routed through another section of LAMP TEST switch S6 and the closed contacts of S13 to the exposure decrease input of the lens cone.

(16) A slit width limit ground input and a + 28

volts dc slit width limit Sl. input through the slit width drive motor is applied to decrease indicator driver Q9 to forward-bias the driver into conduction. As a result, ground is applied to DECR indicator DS4 and the lamp lights as long as the slit width drive motor is being driven in the decrease direction

(17) When the slit width limit is reached, the slit width limit ground input is disconnected from decrease indicator driver Q9 and the lamp extinguishes. The slit width limit Sl + 28 volts dc input is routed to the increase/decrease exposure circuit. This circuit develops a -28 volts dc output which is routed through LAMP TEST switch S6 to DECR LIM indicator DS2, lighting the lamp.

2-12. Lens Cone Photo Sensor Test Circuits

(fig. FO-6)

The camera analyzer electronic circuit functions when forming operational tests on the photo sensor are described in the following subparagraphs.

a. Circuit ground is routed through section A-Y of TEST switch Sl0 and section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4, lighting the lamps.

b. The output of the photocell output simulator circuit is applied through FOOT-LAMBERTS resistor R4 and RANGE switch S11 as an exposure signal input to the photo sensor, and also through section B-X of TEST switch S10, section F-X of MASTER switch S1, and resistor R13 to DC VOLTS INPUT connector J18.

2-13. Camera Body Test Circuits

(fig. FO-7)

The camera analyzer electronic circuit functions when performing tests on the camera body, or the left and right assembly modules, are described in the following subparagraphs. Tests which are conducted on the camera body are: AUTO, PULSE, PULSE IMC, and NIGHT.

a. Power Application. When MASTER switch Sl is set to CAMERA BODY, + 28 volts dc is applied through section G-X of the switch to the camera body or the right or left module assembly.

b. AUTO. When MODE switch S5 is set to AUTO, the following circuit functions are completed:

(1) Circuit ground is routed through section C-Y of MODE switch S5 to the junction of three lamp circuits: through section A-X of MASTER switch S1 to WIDTH indicator DS3, lighting the lamp; through section A-Y of MASTER switch S1 to INTVL indicator DS4, lighting the lamp; and through section B-Y of MASTER switch Sl to SCOPE indicator DSl, lighting the lamp.

(2) An auto trip input from the camera body is routed through section C-X of MODE switch S5 to AUTO TRIP indicator DS2, lighting the lamp.

(3) A cycle pulse input from the LS-36A is routed to CYCLE PULSE switch S2. When S2 is set to AUTO, the cycle pulse input is applied to the junction of three circuits: to CYCLE PULSE indicators DSl and DS2, lighting the lamps for each cycle pulse received, through section A-Y of MODE switch S5 as a cycle pulse input to the camera body; through section D-X of Sl and resistor R12 to PULSE TIMER PULSE connector J12 and through section H-Y of Sl and resistor R14 to SCOPE VERT connector J21. Placing CYCLE PULSE switch S2 in MANUAL performs the same function as the cycle pulse input from LS-36A.

(4) A shutter trip input from the camera body is applied to the recycle initiate simulator circuit, which develops a recycle initiate ground output to the camera body, and also applies a +28 volts dc pulsed output to RECYCLE INITIATE indicators DS3 and DS4, lighting the lamps.

(5) ± Film drive from the LS-36A is applied to the camera body.

(6) -Tachometer feedback from the camera body is applied to the system simulator and also routed through section F-X of MASTER switch Sl and resistor R13 to DC VOLTS INPUT connector J18.

(7) When SIM OPR switch S3 is set to ON, circuit ground is applied through the switch to the system simulator and to SIM OPR indicator DS2, lighting the lamp.

(8) When the camera body is operating, a +28 volts dc ready input is applied to BODY RDY indicator DS3, lighting the lamp.

(9) When the camera body operates, a +28 volts dc operate input is applied to BODY OPR indicator DS4, lighting the lamp.

(10) When an exposure reset condition exists, a +28 volts dc exposure reset input is applied to EXP RESET indicator DSl, lighting the lamp.

(11) Should a film failure occur, a + 28 volt dc film failure input is applied to FILM FAIL indicator DSl, lighting the lamp.

c. PULSE. When MODE switch S5 is set to PULSE, the following circuit functions are completed:

(1) Circuit ground is routed through section A-X of MODE switch S5 as a pulse input to the camera body.

(2) Operation thereafter is identical to b(4) through (11) above.

d. PULSE IMC. When MODE switch S5 is set to PULSE IMC, the following circuit functions are completed:

(1) Circuit ground is routed through section A-X of MODE switch S5 as a pulse input to the camera body.

(2) A shutter trip input from the camera body is applied to the recycle initiate simulator circuit, which

develops a recycle initiate ground output to the camera body and also applies a +28 volts dc pulse output to RECYCLE INITIATE indicators DS3 and DS4, lighting the lamps.

(3) Circuit ground is routed through section B-X of MODE switch S5 as a pulse input to the camera body.

(4) Circuit ground is routed through section C-Y of MODE swtich S5 and section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4, lighting the lamps.

(5) ± Film drive from the LS-36A is applied to the camera body.

(6) -Tachometer feedback from the camera body is applied to the LS-36A and also routed through section F-X of MASTER switch S1 and resistor R13 to DC VOLTS INPUT connector J18.

(7) When SIM OPR switch S3 is set to ON, circuit ground is applied through the switch to the LS-36A and to SIM OPR indicator DS2, lighting the lamp.

e. NIGHT. When MODE switch S5 is set to NIGHT, the following circuit functions are completed:

(1) Circuit ground is routed through section A-X of MODE switch S5 as a pulse input to the camera body.

(2) Circuit ground is routed through section B-X of MODE switch S5 as a pulse input to the camera body.

(3) Circuit ground is routed through section B-Y of MODE switch S5 as a night input to the camera body.

(4) A night +28 volts dc input is applied to NIGHT indicator DS4, lighting the lamp.

(5) A night interlock + 28 volts dc input is applied to NIGHT INTLK indicator DS3, lighting the lamp.

f. Test Left Assembly. TEST LEFT ASSEMBLY switch S8 is a five-section switch used to test the left assembly module of the camera body. The first three sections are used to check continuity between connector pins on the module and the fourth and fifth sections provide a circuit path to LEFT A and LEFT B indicators DSl and DS3, respectively. The lamps light when continuity conditions are normal

g. Test Right Assembly. TEST RIGHT ASSEMBLY switch S9 is a four-section switch used to test the right assembly module of the camera body. The first two sections are used to check continuity between connector pins on the module and the third and fourth sections provide a circuit path to RIGHT A and RIGHT B indicators DS2 and DS4, respectively. The lamps light when continuity conditions are normal.

2-14. Internal Test Circuits (fig. FO-8)

The camera analyzer electronic circuit functions when performing internal' tests are described in the following paragraphs. Tests which are conducted are: INTERNAL TEST 1 and INTERNAL TEST 2.

a. INTERNAL TEST 1. When MASTER switch Sl is set to INTERNAL TEST 1, the following circuit functions are completed:

(1) Circuit ground is routed through section A-Y of MASTER switch Sl to INTVL indicator DS4. lighting the lamp.

(2) Circuit ground is routed through section B-X of MASTER switch Sl to VOM DC indicator DS2, lighting the lamp.

(3) Circuit ground is routed through section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4, lighting the lamps.

(4) The output of the -28 volts dc supply is routed through sections C-Y and D-Y of MASTER switch S1 to VOM + connector J14. Ground is present at VOM - connector J15.

(5) The output of the photocell output simulator is routed through section F-X of MASTER switch Sl and resistor R13 to DC VOLTS INPUT connector J18.

(6) Circuit ground is routed through section F-Y of MASTER switch Sl to DC VOLTS GRD connector J19.

(7) Internal +28 volts dc is routed through section G-X of MASTER switch S1 to CYCLE PULSE switch S2. The output of S2 is applied to CYCLE PULSE indicators DS1 and DS2 and through section A-Y of MODE switch S5 (in AUTO, PULSE or PULSE IMC positions), and section H-X of MASTER switch S1 to the recycle initiate simulator circuit and BODY connector J3, pin J. The output of the recycle initiate simulator circuit is routed through section D-X of MASTER switch Sl and resistor R12 to PULSE TIMER PULSE connector J12. Internal equipment ground is present at PULSE TIMER GRD connector J13. Testing is conducted in the following manner. When CYCLE PULSE switch S2 is momentarily set to MANUAL, +28 volts dc is routed to the recycle initiate simulator circuit and BODY connector J3, pin J. This constitutes a start pulse and the recycle initiate circuit recycles. During recycle, the circuit provides an output which is routed through section D-X of MASTER switch Sl and resistor R12 to PULSE TIMER PULSE connector J12. This output constitutes a stop pulse. A pulse timer connected between J3, pin J and J12 measures the time between start and stop pulses.

b. INTERNAL TEST 2. When MASTER switch Sl is set to INTERNAL TEST 2, the following circuit functions are completed:

(1) Circuit ground is routed through section C-X of MASTER switch Sl to DC VOLTS indicators DS3 and DS4, lighting the lamps.

(2) The output of the E V/H simulator circuit is routed through section F-X of MASTER switch Sl

and resistor R13 to DC VOLTS INPUT connector J18.

(3) Circuit ground is routed through section F-Y of MASTER switch Sl to DC VOLTS GRD connector J19.

2-15. Recycle Initiate Simulator Circuit Operation (fig. 2-3)

The recycle initiate simulator circuit provides a ground signal to the camera body which simulates actuation of the recycle initiate switch in the camera shutter assembly. The ground signal, supplied through BODY connector J3, pin R when relay K1 is energized, causes the recycle solenoid and recycle relay in the camera body to energize, thereby initiating recycle operation. The recycle initiate simulator consists of unijunction transistor Q1, relays K1 and K2, and associated circuitry. The. circuit is placed into operation by application of + 28 volts dc to the junction of resistors R2 and R3 through normally open contacts of the shutter trip relay in the camera body, J3, pin J, and normally closed contacts B2-B3 of relay K2 in the camera analyzer. When this happens, capacitor C2 charges towards +28 volts dc. When the charges on capacitor C2 reaches the unijunction peak-point voltage, unijunction transistor Ql is triggered "on." Relay Kl is then energized by current flow through the unijunction transistor. Transferred contacts A1-A2 of relay K1 route ground through J3, pin R, which is a simulated recycle initiate signal to the camera body. Transferred contacts B1-B2 of relay Ml apply +28 volts dc to J3, pin W and J3, pin E through diode CR9 to illuminate RECYCLE INITIATE indicator lamps DS3 and DS4, and also through diode CR12 to relay K2, which energizes the relay. Transferred contacts B1-B2 of relay K2 open the +28 volt dc path to the junction of resistors R2 and R3. As a result, unijunction transistor Ql is placed in cut off, relay Kl deenergizes, and capacitor C2 discharges through resistor R4 to ground. Contacts Bl-B2 also provide relay K2 with holding voltage to keep unijunction transistor Ql in a quiescent state until the shutter trip relay in the camera body deenergizes. The circuit actions described above are accomplished during each operating cycle of the camera body.

2-16. Under and Over Exposure Circuit Operation (fig. 2-4)

a The under and over exposure circuit consists of UNDER and OVER indicator lamps DS1 through DS4, transistors Q6 through Q8, and associated circuitry. The under and over exposure circuit is used with EXPOSURE switch S12 to check operation of the underexposure and overexposure relays, and also the +5, +10 and +20-volt dc outputs, developed in the

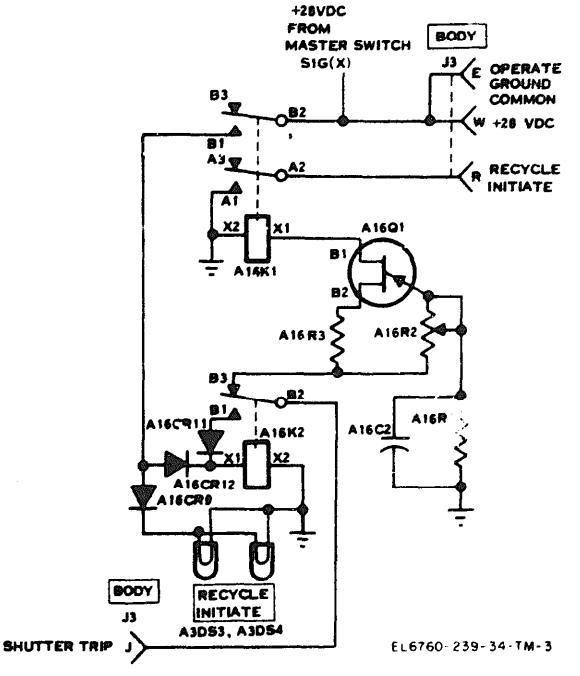


Figure 2-3. Camera analyzer, recycle initiate circuit, simplified schematic diagram.

power supply of the lens cone under test. Any one of the dc outputs selected be the position of EXPOSURE switch S12 is supplied directly through LENS CONE connector J6, pin F. The selected dc output is also applied across a voltage divider network consisting of resistor R28 in the camera analyzer and the diaphragm position potentiometer and exposure system trim potentiometer in the lens cone. Resistor R28 is used to substitute for the slit position potentiometer in the shutter assembly to complete the +5, +10, or +20 vdc circuit. A portion of the voltage dropped across the diaphragm position potenitometer, summed with the light sensor output, provides the input to the exposure loop in the lens cone. The +10 volt dc output provides a nominal exposure reference voltage. The +5 volts and +10 volts dc outputs are used to cause a change in exposure setting one f/stop below or above the setting determined by the light sensor. The under and over exposure circuit operates as follows:

b. When EXPOSURE switch S12 is set to OVER, a dc ground path is completed through LENS CONE connector J6, pin M to the overexposure relay in the lens cone. The overexposure relay energizes and its transferred contacts apply the +20 volts dc output to the voltage divider network. The +20 volts dc output is also applied through LENS CONE connector J6, pin F to the junction of resistors R27 and R30 in the over

and under exposure circuit. The +20 volts dc exceeds the Zener voltage of diodes CR50 and CR51, so transistors Q6 and Q7 are forward-biased into conduction Transistor Q6 provides a ground to OVER indicators DS1 and DS2, causing the lamps to light. Transistor Q7 provides a ground. for the base of transistor Q8. Transistor Q8 is thereby held in a cut off condition and the ground return path to the UNDER indicators is kept open.

c. When EXPOSURE switch S12 is returned to the center position, the dc ground path to the overexposure relay through LENS CONE connector J6, pin M is opened causing the relay to deenergize. The +10 volts dc output is now applied through normally closed contacts of underexposure and overexposure relays to the voltage divider. The + 10 volts dc output is also applied through LENS CONE connector J6, pin F to the junction of resistors R27 and R30 in the camera analyzer. The + 10 volts dc exceeds the Zener voltage of diode CR51 so transistor Q7 remains forward-biased to keep the base of transistor Q8 grounded. Transistor Q8 is held in cutoff and the UNDER indicator lamps remain extinguished However, the + 10 volts dc is below the Zener voltage of diode CR50, so transistor Q6 is cut off and the OVER lamps are extinguished.

d. When EXPOSURE switch S12 is set to UNDER, a dc ground path is completed to the underexposure relay in the lens cone through LENS CONE connector J6, pin L. The underexposure relay energizes and its transferred contacts apply the +5 volt dc output to the voltage divider network, and to the junction of resistors R27 and R30 in the over and under exposure circuit of the camera analyzer. Since this voltage is below the Zener voltage of diode CR51, transistor Q7 is cut off to remove ground from the base of transistor Q8 allowing it to be forward-biased by +28 volts dc through resistor R32. Now, transistor Q8 conducts and grounds UNDER lamps DS3 and DS4 causing the lamps to light

2-17. Increase and Decrease Exposure Circuit Operation (fig. 2-5)

a. The increase and decrease exposure circuit consists of the INCR LIM DS1, DECR LIM DS2, INCR DS3, and DECR DS4 indicator lamps; transistors Q9 through Q12; and associated circuitry. The increase and decrease exposure circuit is used with DC EXPOSURE switch S13 to check the operation of the servo drive module and relays K3 and K4 in the lens cones under test The servo drive module and the relays are tested when the lens cone is connected to the camera analyzer with test cable W3 at LENS CONE

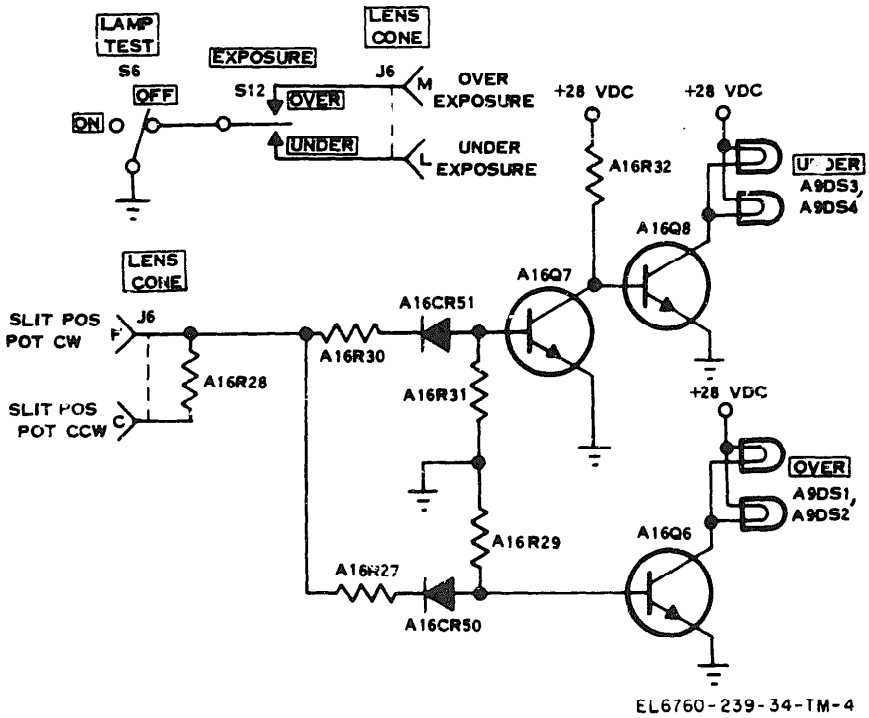


Figure 2-4. Camera analyzer, under and over exposure circuit, simplified schematic diagram.

connector J6, and the servo drive module is tested when the module is connected to the camera analyzer with test cable W8 at MODULE connector J8. The indicator lamps on the camera analyzer indicate the direction of servo drive, and correspond to the position of the DC EXPOSURE switch. When the increase or decrease drive limit is reached, the corresponding INCR LIM or DECR LIM lamp lights. Increase and de crease exposure circuit operation is given in b through g below.

b. When DC EXPOSURE switch S13 is set to INCREASE with a 3-inch, 6-inch, or 12-inch lens cone connected to the camera analyzer, a ground connection is completed through diode CR5 and LENS CONE connector J6, pin H to relay K4 in the lens cone, causing the relay to energize. The transferred contacts of the relay apply + 28 volts dc across the servo drive motor as to cause the motor to drive in a direction which increases the width of the shutter slit The relay also applies +28 volts dc through LENS CONE connector J6, pin T to the junction of resistor R40 and diode CR60 The +28 volts dc is applied through diodes CR58 through CR60 to INCR indicator DS3, causing the lamp to light.

c. When the slit width reaches its maximum increase limit, a limit switch in the servo drive module is mechanically actuated to disconnect the +28 volts dc to the drive motor and also from LENS CONE connector J6, pin T. This causes the motor to stop and INCR lamp DS3 in the camera analyzer to extinguish The limit switch applies the +28 volts dc to LENS CONE connector J6, pin S and INCR LIM indicator DS1, and the lamp lights.

d. The 44mm lens cone does not contain a slit width drive motor. Therefore, when DC EXPOSURE switch S13 is set to INCREASE with a 44mm lens cone under test, the ground connection is completed from LENS CONE connector J6, pin H to relay K4 in the lens cone, causing the relay to energize. The transferred contacts of the relay apply +28 volts dc to LENS CONE connector J6, pin S and to INCR LIM indicator DS1 lighting the lamp. Ground interlock applied through LENS CONK connector J6, pin b forward--biases transistor Q3 into conduction, which places its collector at +28 volts dc. As result, transistor Q11 is also forward-biased into conduction to hold transistor Q10 in cut-off and keep DECR LIM lamp DS2 extinguished.

e. When DC EXPOSURE switch S13 is set to DECREASE with a 3-inch, 6-inch, or 12-inch lens cone connected to the camera analyzer, a ground connection is completed through diode CR6 and LENS CONE connector J6, pin X to relay K3 in lens cone under test, causing the relay to energize. The transferred contacts of the relay apply +28 volts dc across the servo drive motor, and through LENS CONE connector J6, pin T to the junction of resistor R40 and diode CR62. A +28 volt dc return (ground) path is also completed from LENS CONE connector J6, pin A to the normally closed contacts of relay K4 in the lens cone to LENS CONE connector J6, pin U to the junction of diode CR63 and the emitter of transistor Q9. This completes the power circuit to the drive, motor as as to cause the motor to drive in a direction which decreases the width of the shutter slit The voltage drop across diodes CR62 and CR63 forward-biases transistor Q9 into conduction which grounds DECR indicator DS4, causing the lamp to light

f. When the slit width reaches its maximum de crease limit, a limit switch in the servo drive module is mechanically actuated. The switch disconnects the +28 volts dc return from LENS CONE connector J6, pin T, which causes the drive motor in the lens cone to stop and transistor Q9 in the camera analyzer to cut off and extinguish the DECR lamp. At the same time, transistor Q11 is cut off, allowing Q10 to be forward-biased by the -28 volts dc potential on its emitter and power ground applied through diode CR64 to its base. As a result, transistor Q10 conducts to provide -28 volts dc to the DECR LIM indicator through contacts of LAMP TEST switch S6, lighting the lamp.

g. When DC EXPOSURE switch S13 is set to DE CREASE with a 44mm lens cone under test, a ground connection is completed through CR6 and LENS CONE connector J6, pin X to relay K3 in the lens cone, causing the relay to energize. The transferred contacts of the relay apply +28 volts dc to LENS CONE connector J6, pin R and to the cathode of Zener diode CR66. The +28 volts dc at the cathode of Zener diode CR66 and the -28 volts dc at the emitter of transistor Q12 exceeds the Zener voltage of diode CR66 and transister Q12 is forward-biased into conduction The conduction of transistor Q12 overrides the effect of transistor Q3 conducting and forces transistor Q11 to cutoff. This action permits transistors Q10 to be forward-biased and apply -28 volts dc to DECR LIM indicator DS2 through normally closed contacts of LAMP TEST switch S6, lighting the lamp.

Section III. CAMERA TEST ADAPTER STAGE ANALYSIS

2-18. Camera Test Adapter Power Distribution (fig. 2-6)

a. 115-Vac, 400-Hz Power. With POWER switch S6 on the camera test adapter and the PANEL POWER and CAMERAS POWER switches on the LS-3oA set at their ON positions, 115-volt ac, 400-Hz power is applied as follows:

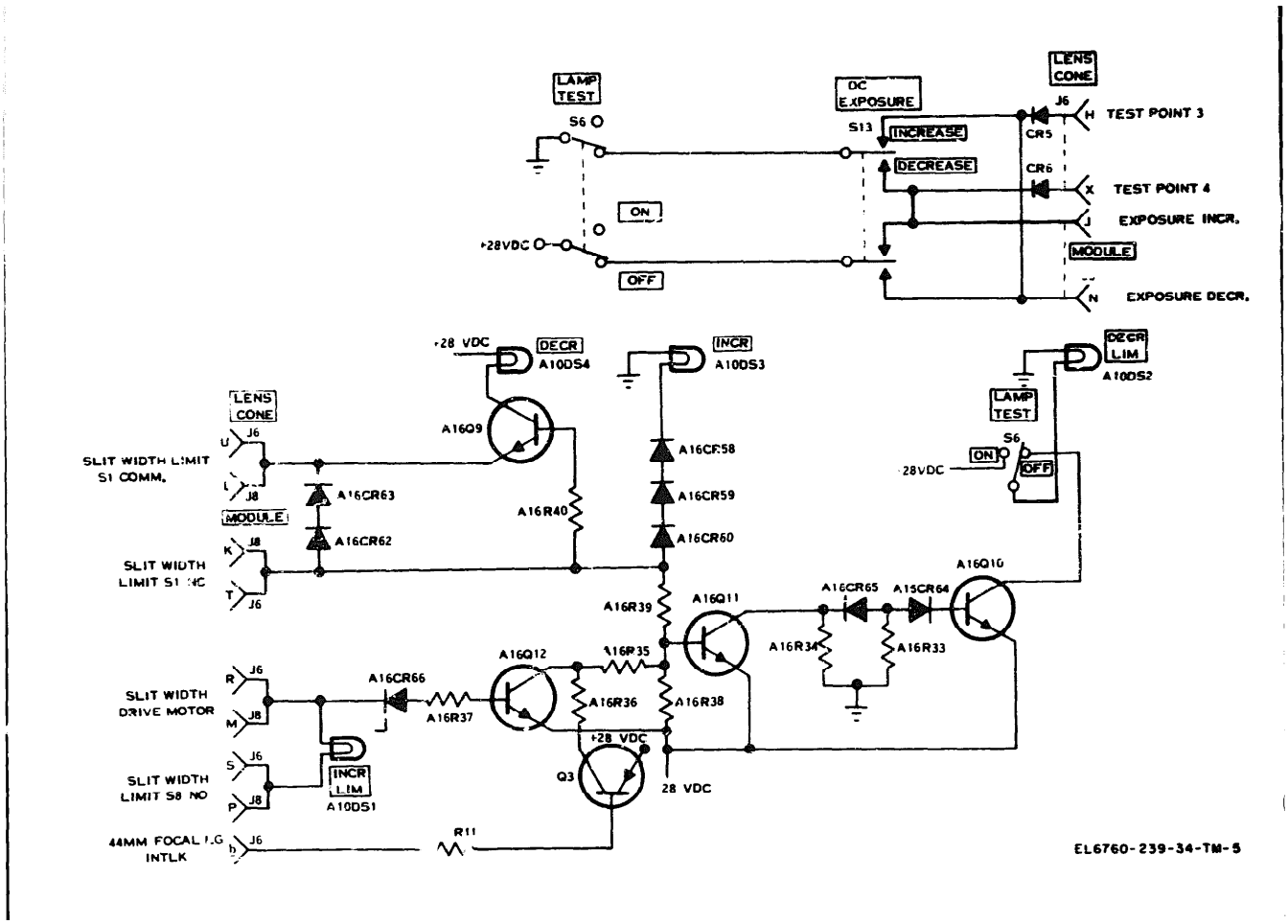


Figure 2-5. Camera analyzer, increase and decrease exposure circuit, simplified schematic diagram

(1) Through pin B of connector J705 on the LS-36A, filter FL703, 3-amp fuse F702, PANEL POWER switch S711 contacts 4 and 2, and resistor R734 to AC lamp DS709, causing it to illuminate.

(2) Simultaneously, the ac output from S711 is applied through CAMERAS POWER switch S710 contacts 1 and 2, and pin K of connector J706 to pin K of connector P3 on the camera test adapter.

(3) The ac input at pin K of connector P3 on the camera test adapter is applied through POWER switch S6 contacts to transformer A3T1 and to pin S of connector P2 for application to the camera under test

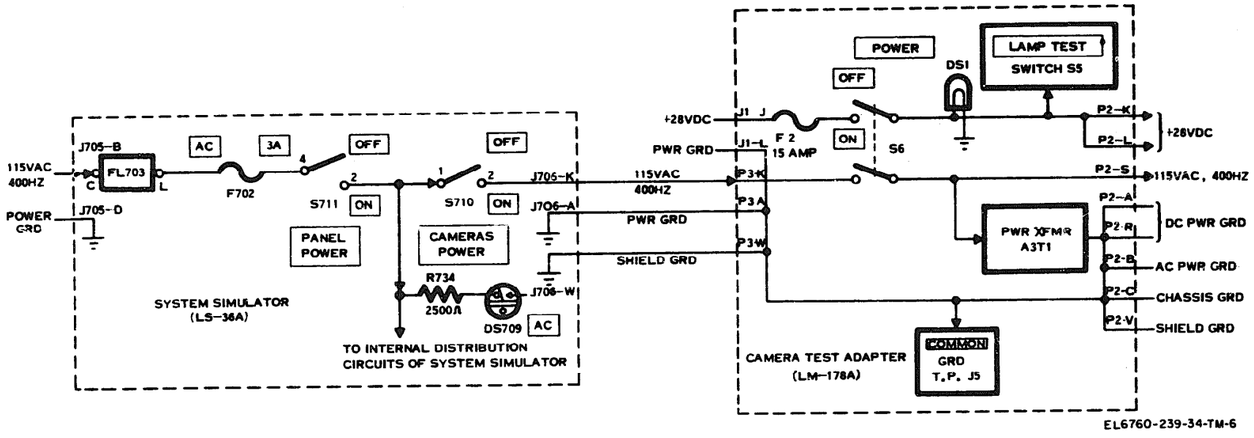
b. 28-Vdc Power. When the POWER switch on the camera test adapter is set to ON, 28-volts dc power is applied through pin J of connector J1, 15 ampere fuse F2 and POWER switch S6 contacts to power indicator lamp DS1, LAMP TEST switch S5, and to pins K and L of connector P2 for application to the camera under test.

2-19. Camera Test Adapter Power Supply Circuit

(fig. 2-7)

This circuit develops a constant 5.1-volts dc operating voltage for the exposure control circuit on the camera test adapter. The power supply circuit consists of: an ac input coupling transformer, T1; a full-wave bridge rectifier circuit, CR10 through CR13; current limiting resistor R15; an output voltage filtering circuit, capacitors Cl and C2, Zener diodes CR8 and CR9; and output divider network resistors R11 through R14.

a. Output Circuit. The dc output voltage of the power supply is developed across variable resistors R11 and R12, and resistors R13 and R14. When EXPOSURE switch S2 is set at the 44MM (1-3/4 inch) CAL and 3, 6, and 12 IN. CAL positions, a portion of the power supply output is taken from variable resistor R11 for use as an exposure test signal (The actual voltage level is determined by the setting of R11.) This



EL6760-239-34-TM-6

Figure 2-6. Camera test adapter, power distribution.

signal then is coupled to the exposure circuit of the camera under test for setting its shutter speed and lens aperture as indicated in the following chart. When EXPOSURE switch S2 is set at the OPR ALL position, operation is the same as described for the CAL positions except that a lower level exposure test voltage is coupled to the camera from variable resistor R12.

EXPOSURE switch S2	*Camera under test*	*Shutter speed*	*APERTURE indication*
44mm (1¾ in)	KA-76A	1/100	Fixed (f/5.6)
3 in.	KA-76A	1/100	f/2.8
6 in	KA-76A	1/100	f/3.5
12 in.	KA-76A	1/100	f/4.5

NOTE

Resistors R6 through R9 are provided to compensate for differences in the camera exposure circuits necessitated by the different maximum effective apertures of the camera lenses.

b. Input Circuit.

(1) The input circuit for the power supply consists of 1.5 ampere fuse F1, relays K1 and K2, dc blocking diodes CR4 through CR7, and EXPOSURE switch S2. When POWER switch S6 is set to ON, 115-volt ac operating voltage is applied to the primary windings of power transformer T1 through contacts Al and A2 of relay K2, provided K2 is energized Simultaneously, the primary windings of power transformer T1 is grounded through contacts B1 and B2 of relay K2.

(2) Relay K2 normally has positive 28-volts dc applied to contact Xl on its solenoid from the camera's positive 28-volt dc interlock line through pin J of connector P2. Thus, it can he seen that whether relay K2 is energized to activate the power supply or not is de pendent upon the position of EXPOSURE switch S2A, which provides a ground return for relay K2. EXPOSURE switch S2A is grounded for all positions except the SEN (last) position, provided the camera is equipped with the appropriate lens cone that corresponds to the switch position The SEN position of switch S2A does not energize K2 because d photocell input is used at this time in place of an exposure signal, therefore power supply operation is not required.

NOTE

In the paragraphs that follow, discussion of camera test adapter circuit operation is related to operation of a KA-76A connected into the test system as shown in referenced drawings. Control and oneration of KA-76A with the 1 3/4, 3, 6, or l2-inch lens cone is similar except where noted otherwise.

2-20. Camera Test Adapter System Power Turn-On Conditions (fig. FO-1 and FO-15)

When POWER switch S6 is set to ON, the camera test adapter and camera circuits are activated for operation in the selected mode. The camera then remains in a static (ready) condition until cycle operation is initiated by application of an operate ground signal or an operate ground signal followed by a cycle pulse. At this time, the application of 28-volt dc and 115-volt ac, 400-Hz power establishes the following conditions:

a Positive 28 volts dc is applied to power indicator lamp DS1 in the camera test adapter, illuminating lamp DS1 to signify the presence of dc power.

b. A dc ground path is completed to relay K1 in the camera test adapter through the 44mm (1 3/4), 3, or 12-

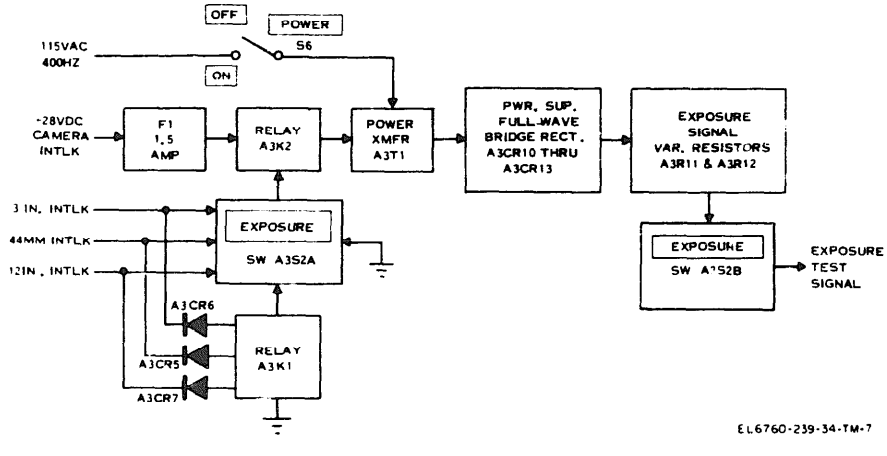


Figure 2-7. Camera test adapter, powersupply, block diagram.

inch interlock lines, energizing relay K1. (Positive 28 volts dc is applied to relay K1 from the +28-volt dc camera interlock line.) When relay K1 is energized, its contacts A2 and A3 are interrupted to remove ground from contact 3 of EXPOSURE switch S2A. This disables the exposure test circuit and power supply circuit to prevent invalid indications that would be obtained if other than a KA-76A camera with a 6-inch lens cone were connected into the test system and testing were attempted with EXPOSURE switch S2A set to the 6 IN. CAL position.

NOTE

When KA-76A is operated with a 6-inch lens cone, relay K1 remains de-energized after primary ac and dc power is applied. Contacts A2 and A3 of relay K1 remain closed to apply ground to contact 3 of EXPOSURE switch S2A so the power supply can be activated to produce exposure test signals when switch S2 is set at the 6 IN. CAL position.

c. Positive 28 volts dc is applied to INTLK indicator DS3 in the camera test adapter through camera film failure switch 1A1A5S2 and camera cassette interlock switch 1A1A5S1, illuminating lamp DS3. This signifies that film is properly installed in the cassettes and that the cassettes are properly installed on the camera.

d. A dc ground path is completed to relay K2 through EXPOSURE switch S2A in the camera test adapter, energizing the relay. As a result, transferred contacts of relay K2 apply 115-volt ac, 400-Hz power to the primary winding of power transformer T1 to develop exposure test signals.

e. Positive 28 volts dc is applied from POWER switch S6 of the camera test adapter to the camera shutter drive motors (fig. FO-9) through camera fuse 1A1F1. The shutter drive motors operate to cock the shutter and place the camera in a ready condition.

f. The 115-volt, 400-Hz power is applied from POWER switch S6 of the camera test adapter to the camera lens cone power supply to develop voltages for the exposure control circuits (fig. FO-9).

2-21. AUTO Mode

(fig. FO-1 and FO-9

NOTE

When the camera and camera test adapter are interconnected, MODE switch A3Sl in the camera test adapter is connected in parallel with the camera mode switch lAlA3Sl. Therefore, setting the camera mode switch to AUTO permits the camera test adapter MODE switch to select any mode of camera operation.

Camera operation in the auto mode is initiated when OPERATE switch S705 on the LS-36A is set to ON. At this time, an operate ground signal is applied from the OPERATE switch through the camera test adapter to camera operate relay lAlA3K3 which energizes causing the camera to operate in the autucycle mode. Circuit operations and indications are as follows:

a. Transferred contacts of the operate relay apply + 28 volts dc to OPR ON lamp DS1 lighting the lamp.

b. Positive and negative drive voltages developed in the system simulator servo power unit are applied to the motor section of camera motor-generator lAlA2MG1. This starts the motor, forcing it to drive its generator section. The generator output (tach voltage) is applied through the camera test adapter to the LS-36A servo power unit. Here, it is applied through the focal length resistors and summed with the modified E V/H signal applied through the depression angle resistors. The resultant voltage then is applied as an error signal to the film drive amplifier in the LS-36A servo power unit, completing a servo loop which causes the motor to operate at IMC speed.

c Autocycle vacuum switch 1A1S2 and autocycle trip switch 1A1S3 are actuated by the shuttle cam in the camera When this occurs, SYNC lamp DS1 in the camera test adapter flashes momentarily as a result of a +28-volt dc pulse (SYNC) applied through the autocycle vacuum and autocycle trip switches.

d. The positive 28-volt dc pulse which illuminates the SYNC lamp also is coupled to shutter trip relay lAlA3K2, causing it to energize and initiate a shutter exposure cycle. This is accomplished through the autocycle vacuum switch lAlS2, autocycle trip switch lAlS3, normally closed contacts of auto-pulse transfer relay lAlAlK5, normally closed contacts of pulse relay lAlAK4, normally closed contacts of night relay lAlA3K1, the normally open contacts of operate relay lAlA3K3, and normally closed contacts of recycle lockout relay lAlAK1.

e. Electronic flash switch lA2A2S2 in the camera is mechanically actuated during the shutter exposure cycle. When this occurs, a 28-volt. dc pulse is produced by switch lA2A2S2 which forward-biases inverter-stretcher stage Ql in the camera test adapter which functions as a pulse stretcher. When Ql first turns on FLASH indicator lamp DS2 illuminates momentarily.

f. Data trip switch lA2A2S9 in the camera is me chanically actuated during the shutter exposure cycle. When this occurs, a + 28 vdc data pulse is transferred from the normally closed (NC) contacts of the data trip switch to its normally closed (NO) contacts and inverter-stretcher Q2 in the camera test adapter. This forward-biases Q2 which conducts to illuminate DATA lamp DS3.

g. Operate indicate switch lA2A2S4 in the camera is mechanically actuated during the shutter exposure cycle. When this occurs, a + 28-volt dc pulse is coupled from switch lA2A2S4 to CYCLE indicator lamp DS4

in the camera test adapter, illuminating it momentarily.

h. Operation in autocycle mode is repeated as described above until the operate ground is removed by setting the OPERATE switch on the system simulator to OFF.

i. If film runs out or breaks during camera operation, a + 28-volt dc path is completed through film failure switch lA1A5S2 in the camera which illuminates FILM FAIL indicator DS2 in the camera test adapter.

2-22. PULSE Mode

(figs. FO-1 and FO-10)

Pulse mode operation of the camera is selected by Setting MODE switch S1 on the camera test adapter PULSE. When POWER switch S6 is set to ON, **operation** occurs as described in paragraph 2-20. However, before the camera can be cycled, the OPERATE **switch** on the system simulator must be set at ON to produce an operate ground signal which energizes camera operate ***relay*** lAlA3K3. When this happens, the camera circuits operate as described in the following

a. When CYCLE pushbutton switch S7 on the camera test adapter is momentarily depressed, a +28-volt dc pulse is produced which energizes shutter trip relay lAlA3K2. This is accomplished through connector pin P2-N of the camera test adapter, connector-pin ***J2-N*** of the camera, NO contacts of pulse relay lAlAlK4, NC contacts of night relay lAlA3K1, NO contacts of operate relay lAlA3K4, and NC contacts of recycle lockout relay 1AlAlKl. The +28-volt dc cycle pulse also is applied through normally open contacts of the pulse relay to SYNC indicator lamp DSl, on the camera test adapter causing the lamp to illuminate momentarily.

b. When camera shutter trip relay lAlA3K2 ***energizes,*** shutter (exposure) operation occurs,

c. Electronic flash switch 1A2A2S2 in the camera is mechanically actuated during the shutter exposure cycle. This is signified by the momentary illumination of FLASH indicator lamp DS2 on the camera test adapter.

d. Data trip switch lA2A2S9 in the camera is mechanically actuated during the shutter exposure cycle. This is signified by the momentary illumination of DATA indicator lamp DS3 on the camera test adapter (para 2-21f).

e. Operate indicate switch lA2A2S4 in the camera is mechanically actuated during the shutter exposure cycle. 'This is signified by the momentary illumination of CYCLE indicator lamp DS4 on the camera test adapter.

f Film is automatically recycled and the camera shutter is cocked in readiness for the next cycle pulse.

NOTE

If film breaks or runs out during this mode of operation, FILM FAIL indicator lamp DS2 on the camera test adapter illuminates (para 2-21i).

2-23. IMC PULSE Mode

(figs. FO-1 and FO-10)

IMC PULSE mode operation of the camera is selected by setting MODE switch A3Sl on the camera test adapter to IMC PULSE. Application of power and operate ground places the camera in a ready condition as described in paragraph and cycle operation is initiated by momentarily depressing CYCLE pushbutton switch S7 on the camera test adapter. IMC pulse mode operation is similar to pulse mode operation (para ***2-22)*** except that during the shutter exposure cycle, film is transported at the IMC film speed rate. This is achieved by application of plus and minus film drive from the system simulator to the camera through the camera test adapter. The rate of IMC film speed is controlled by adjustment of the CAMERA COMMAND switch on the system simulator. The camera undergoes ***one exposure*** cycle each time CYCLE pushbutton switch S7 on the camera test adapter is momentarily depressed.

2-24. Night Mode

(figs. FO-1 and FO-11)

Night ***mode*** (night open shutter) operation of the camera is selected by setting MODE switch Sl on the camera test adapter to NIGHT. Operation and control of the camera in night mode is the same as IMC PULSE mode (para 2-23) except as follows:

a. When camera test adapter MODE switch Sl is set to NIGHT, a dc ground path is completed to night relay lAlA3Kl in the camera through connector-pin Pl-K of the camera test adapter and connector-pin Jl-K of the camera. The relay energizes and its transferred contacts complete a +28-volt dc path to NIGHT indicator lamp DS4 of the camera test adapter, illuminating lamp DS4.

b. After power is applied and the camera shutter cocks, the operator must set the CURTAIN LATCH control on the camera shutter. **This** action mechanically actuates day-open switch 1A2A2S5 in the camera and latches the trailing curtain in the open position. This switch completes the ground path to night transfer relay lA2A2Kl which energizes to complete the night mode circuits.

c. When the OPERATE switch on the system simulator is set to ON, operate ground is applied as previously described through the camera test adapter to operate relay lAlA3K3 which energizes. The camera unwinds the leading curtain, thereby opening the shutter and placing the camera in a ready condition for cycle operation in the night mode.

d. Cycle operation is initiated by momentarily

depressing CYCLE pushbutton switch S7 on the camera test adapter. This couples a +28-volt dc shutter close pulse to the camera causing the leading curtain to close. The camera then automatically recycles film and opens the leading curtain to prepare the camera for the next shutter close pulse.

CHAPTER 3

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

3-1. Scope of Direct Support Maintenance

This chapter contains the following direct support maintenance functions for the camera analyzer and camera test adapter: bench testing, troubleshooting, voltage and resistance measurements, disassembly, reassembly, and direct support testing procedures. The direct support maintenance procedures supplement the maintenance procedures contains in TM 11-6760-239-12.

3-2. Organization of Direct Support (DS) Maintenance

The maintenance duties of the direct support repairmen for the camera analyzer and camera test adapter are contained in a and b below together with referencea to the paragraphs covering the specific maintenance function.

a. Camera Analyzer.

(1) Bench test (para 3-7b).
(2) Troubleshooting procedures (para 3-7c).
(3) Voltage and resistance measurements (para 3-8).
(4) Replacement procedures (para 3-13).
(5) Adjustments (para 3-15).
(6) Cleaning (para 3-16).
(7) Physical tests and inspection (para 3-24).
(8) Electrical test (para 3-25).

b. Camera Test Adapter.

(1) Bench test (para 3-9a).
(2) Troubleshooting procedures (para 3-9 b).
(3) Voltage and resistance measurements (para 3-10).
(4) Replacement procedures (para 3-19).
(5) Cleaning (para 3-20).
(6) Physical tests and inspection (para 3-26).
(7) Electrical test (para 3-27).

Section II. TOOLS AND EQUIPMENT (DS)

3-3. Tools and Test Equipment Required for Direct Support Maintenance

Refer to the maintenance allocation chart (app B, TM 11-6760-239-12) for a listing of tools and test equipment required to perform the maintenance functions outlined in paragraph 3-2.

3-4. Materials Required for Direct Support Maintenance

The materials required for direct support maintenance are listed in table 3-1.

Table 3-1. Materials Required For Direct Support Maintenance

Item	Quantity	National stock number
Trichloroethane	As required	6810-00-664-0273
Solder	As required	3439-00-194 -9727
Lint-free cloth	As required	8305-00-170-5062
Fungus removal solution (Mixture of Isopropyl alcohol 65% and Freon 35%)	As required	6850-00-133-0695
Sandpaper, fine	As required	5350-00-235-0124
Test drive generator fabrication (used for bench test (para 3-7b)):		
Diode JAN 1 N654	1	5961-00-577-6084
Fuse FHN 26W	1	5920-00-952-9029
Connector MS3126F-22-55PX	1	5935-00-902-1818
Resistor RW33V150	1	5905-00-843-2809
Switch MS24655-221	1	5930-00-892 -9550
Wiring No. 18 AWC	Asrequired	6145-00-805-1720

Section III. DS TROUBLESHOOTING

Be extremely careful when troubleshooting or making repairs on the camera analyzer or camera test adapter. Use insulated test probes when making voltage measurements. Disconnect the power cable from the equipment before touching internal parts.

a. **Troubleshooting at the direct** support maintenance includes all the techniques outlined for organizational maintenance and any special or additional techniques required to isolate a defective part. The direct support maintenance procedures are not complete in themselves but supplement the procedures

outlined in TM 11-6760 -239-12.

b. Troubleshooting may be performed while the equipment is operating or if necessary, after the equipment (or parts of it) has been removed from service. When trouble occurs, certain observations and measurements can be made that will help to determine the source of trouble. Paragraph 3-6 describes the systematic procedure to be followed which will enable the maintenance personnel to isolate the cause of the trouble and correct the fault.

3-6. Organization of DS Troubleshooting Procedures

a. General. Three steps are used in troubleshooting equipment. They are: sectionalization, localization, and isolation. Sectionalization means tracing the fault to the major unit Refer to TM 11-6760-239-12 for sectionalization procedures. Localization means tracing the fault to the defective section or stage within an assembly or subassembly. Isolation means tracing the fault to the defective part. Some faults can often be located by sight, touch, or hearing. The majority of faults, however, must be isolated by detailed electrical, mechanical, and electronic checks.

b. Sectionalization Checks. Sectionalization of troubles is started with a troubleshooting chart in TM 11-6760-239-12.

c. Localization Checks. After the trouble has been sectionalized, perform the bench tests (para 3-76 and 3-9a) on the equipment. The bench tests serve as a check of the localization technique. In addition, assemblies or subassemblies, in some cases parts, can be localized within the equipment by the methods listed (1) through (4) below.

(1) Visual inspection. The purpose of visual inspection is to locate faults without testing or measuring circuits or components. All visual signs should be analyzed to help locate the fault to a particular sub chassis, stage, or part. Mechanical faults are most often localized through visual inspection.

(2) Pluck-out parts. Defective pluck-out parts will be the cause of many troubles. Remove and test all pluck-out parts suspected of being faulty. Replace each defective part with an identical part known to be good.

(3) Troubleshooting tables. The trouble symptoms listed in troubleshooting tables will aid in localizing trouble to a component part, subassembly, or assembly.

(4) Signal substitution. Signal substitution procedures quickly enable localization of a trouble. An oscilloscope, rc bridge, or differential voltmeter may be used in signal substitution procedures.

d. Isolation Checks. Isolation checks for individual assemblies and subassemblies will not be performed at the direct support maintenance level. Defective parts can be isolated by the methods in (1) and (2) below.

(1) Voltage and resistance measurements. This equipment is transistorized. Observe all cautions given to prevent transistor damage. Make voltage and resistance measurements in this equipment only as speci fied. When measuring voltages, use tape or sleeving to insulate the entire test prod except for the extreme tip. A momentary short circuit can ruin the transistor. (For example, if the bias is shorted out, excessive current between the emitter and the base would ruin the transistor.) Use resistor, inductor, and capacitor color codes (fig. FO-20) to determine values of components, Use voltage and resistance tables to find normal readings, and compare them with readings taken

(2) Intermittent troubles. In all tests, the possibility of intermittent troubles should not be overlooked. If present, this trouble often is made evident by tap ping the front panel. Check wiring and connections to assemblies and subassemblies within the equipment

CAUTION

The equipment is transistorized. To prevent possible damage or destruction of transistors by excessive current, use only the R x 100 range on the multimeter to make circuit resistance measurements.

3-7. Camera Analyzer DS Troubleshooting

a Preliminary Procedures (fig. 3 -2).

(1) Fabricate the test drive generator in accordance with figure 3-1.

(2) Set all controls and switches to their off, neutral, or counterclockwise positions.

(3) Connect Multimeter TS-352B/U (multimeter) to the VOM+ and -terminals. Observe polarity as marked. Adjust the multimeter to indicate a negative voltage.

(4) Connect Voltmeter, Electronic ME-202A/U (vtvm) to the DC VOLTS INPUT and GRD, terminals.

(5) Connect BNC adapter 1269 (part of the camera analyzer) to the PULSE TIMER PULSE and GRD terminals.

(6) Connect the B input of Timer, Digital, Electronic LA-387A (digital timer) to BNC adapter 1269.

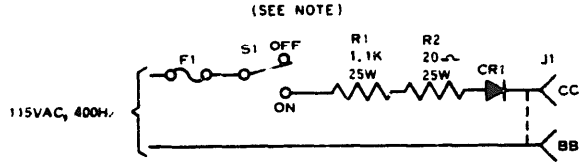
(7) Connect the A input of the digital timer to the SCOPE VERT terminal.

(8) Connect Oscilloscope AN/USM 281A (oscilloscope) to the SCOPE VERT and GRD terminals.

(9) Connect the test drive generator (fig. 3-1) to MODULES connector J11. Do not connect the test drive generator to power source until directed in, the bench test

(10) Connect power cable W9 to primary power source and to POWER connector J1.

b. Camera Analyzer Bench Test. Perform the camera analyzer bench test in the sequence given in table 3-2.



NOTE: PARTS REQUIRED

REF DES	MIL PN	NSN
CR1	JAN 1N645	5961-00-577-6084
F1	FHN 26W	5920-00-952-9029
J1	MS 3126F-22-55PX	5935-00-902-1818
R1	RW33V150	59[illegible]5-00-843-2809
R2	RW33V200	590[illegible]-00-642-2026
S1	ME-[illegible]	5930-00-892-9550
#18 AWG	———	6145-00-805-1720

EL6760-239-34-TM-8

Figure 3-1. Test drive generator fabrication.

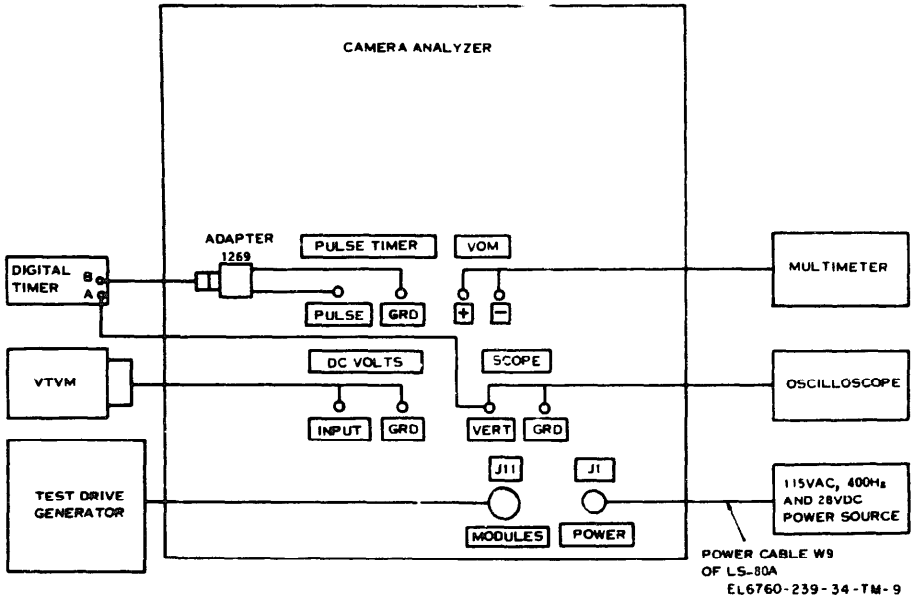


Figure 3-2. Camera analyzer, bench test setup.

Table 3-2. Camera Analyzer Bench Test

Step	Procedure	Position of camera analyzer switches	Result/indication
1		POWER switch (PANEL POWER section): ON	AC PWR and DC PWR lamps (PANEL POWER section) light.
2		LAMP TEST switch (MASTER section): ON	All remaining front panel indicators light.
3		LAMP TEST switch: OFF MASTER switch: INTERNAL TEST 1	*a.* INTVL, VOM DC, and DC VOLTS indicators (MASTER section) light. *b.* Multimeter should indicate −25 ± 5 volts dc. *c.* Vtvm should indicate −3.34 vdc ± 50 millivolts.
4		CYCLE PULSE switch (CAMERA BODY section): Depress momentarily to MANUAL.	*a.* CYCLE PULSE indicator (CAMERA BODY section lights while switch is in MANUAL. *b.* RECYCLE INITIATE indicator flashes. *c.* Digital timer should indicate between 10 and 15 milliseconds.
5		MASTER switch (MASTER section): INTERNAL TEST 2	DC VOLTS indicator (MASTER section) lights.
6		E V/H control (CONTROL-POWER SUPPLY section): 50	Vtvm should indicate 50 ± 0.05 volts dc.
7	Note Vtvm tracks E V/H control.	E V/H control: 10	
8	Connect test drive generator to 115 vac, 400 Hz power source and set switch to on position.	MASTER switch (MASTER section): CONTROL PWR SUPPLY MODULE TEST switch (CONTROL-POWER SUPPLY section): FDA OPR	*a.* Oscilloscope should present sawtooth waveform; 800 Hz per second rate, 2.5 centimeters wavelength. *b.* Motor-tachometer simulator circuit load lamps DS1 through DS4 light.
9		PLUS OUTPUT switch (CONTROL-POWER SUPPLY section): Depress momentarily	Vtvm should indicate greater than 3.0 volts.
10		OPERATE OFF switch: Depress momentarily.	Vtvm should indicate 0 volts.
11	*a.* Set switch on test drive generator to off position. *b.* Disconnect multimeter from VOM terminals and connect between J8, pin J and ground.	MASTER switch (MASTER section): LENS CONES DC EXPOSURE switch (LENS CONE section): INCREASE	Multimeter should indicate +28 vdc.
12	Connect multimeter between J8, pin N and ground.	DC EXPOSURE switch: DECREASE	Multimeter should indicate +28 vdc.
13		TEST switch (LENS CONE section): PHOTO SENSOR; RANGE switch: 0-10,000 FOOT-LAMBERTS control: Rotate from minimum (ccw) to maximum (cw).	Vtvm should indicate from 0 to −3.34 vdc as control is rotated cw.
14		RANGE switch: 0-100 FOOT-LAMBERTS control: Rotate from minimum (ccw) to maximum (cw).	Vtvm should indicate from 0 to −3.34 vdc as control is rotated cw.
15		MASTER switch (MASTER section): INTERNAL TEST 1; MODE switch (CAMERA BODY section): AUTO CYCLE PULSE switch: Depress momentarily to MANUAL.	Digital timer should indicate from 10 to 15 milliseconds.
16	Connect multimeter between J3, pin L and ground; set for RX1 range.	BODY OPR switch: ON	Multimeter should indicate zero resistance.

Table 3-2. Analyzer Bench Test - Continued

Step	Procedure	Position of camera analyzer switches	Result/indication
17	Connect multimeter between J6, pin K and ground.	SIM OPR switch: ON	Multimeter should indicate zero resistance.
18	Connect multimeter between J6, pin H(+) and ground(−); set for RX1 range.	DC EXPOSURE switch (LENS CONE section): INCREASE	Multimeter should indicate approximately 16 ohms resistance.
19	Connect multimeter between J6, pin X (+) and ground(−); set for RX1 range.	DC EXPOSURE switch: DECREASE	Multimeter should indicate approximately 16 ohms resistance.
20	Connect multimeter between J6, pin M and ground; set for RX1 range.	EXPOSURE switch: OVER	Multimeter should indicate zero resistance.
21	Connect multimeter between J6, pin L and ground.	EXPOSURE switch: UNDER	Multimeter should indicate zero resistance.
22	Connect multimeter between J8, pin C and R/C BRDG- terminal.	TEST switch: S/CA	Multimeter should indicate zero resistance.
23	Connect multimeter between R/C BRDG + terminal and ground.	TEST switch: S/CA	Multimeter should indicate zero resistance.
24		POWER switch (PANEL POWER section): OFF	All indicators extinguish.

c. Camera Analyzer Troubleshooting Procedures. Steps referenced in the Trouble symptom column table 3-3, refer to numbered steps in the bench test (*b* above). Electronics parts and associated circuits referenced in the troubleshooting table are shown in the schematic diagram (fig. FO-12) and the wiring diagram (fig. FO-13).

Table 3-3. Camera Analyzer DS Troubleshooting

Item	Trouble symptom	Probable trouble	Correction
1	AC PWR indicator does not light (step 1).	*a.* Defective lamps DS1 and/or DS2.	*a.* Replace defective lamp.
		b. Dirty lamp terminals.	*b.* Clean terminals with fine abrasive.
		c. Defective indicator lamp assembly A6.	*c.* Replace (para 3-13*a*).
		d. Defective resistor R1.	*d.* Refer to a higher category of maintenance.
		e. Defective POWER switch S7.	*e.* Replace (para 3-13*b*).
		f. Defective fuse F1 or fuseholder XF1.	*f.* Replace (para 3-13*h*).
		g. Defective POWER connector J1.	*g.* Refer to a higher category of maintenance.
2	AC PWR indicator lights with one lamp out (step 1).	*a.* Defective lamps DS1 and/or DS2.	*a.* Replace defective lamp.
		b. Dirty lamp terminals.	*b.* Clean terminals with fine abrasive.
		c. Defective indicator lamp assembly A6.	*c.* Replace (para 3-13*a*).
3	DC PRW indicator does not light (step 1).	*a.* Defective lamps DS3 and/or DS4.	*a.* Replace defective lamp.
		b. Dirty lamp terminals.	*b.* Clean terminals with fine abrasive.
		c. Defective indicator lamp assembly A6.	*c.* Replace (para 3-13*a*).
		d. Defective POWER switch S7.	*d.* Replace (para 3-13*b*).
		e. Defective fuse F2 or fuseholder XF2.	*e.* Replace (para 3-13*h*).
		f. Defective POWER connector J1.	*f.* Refer to a higher category of maintenance.
4	One or more indicators on front panel do not light (step 2).	*a.* Defective lamp(s).	*a.* Replace lamp(s).
		b. Dirty lamp terminals.	*b.* Clean terminals with fine abrasive.
		c. Defective indicator lamp assembly.	*c.* Replace (para 3-13*a*).
		d. Defective LAMP TEST switch S6.	*d.* Replace (para 3-13*b*).

Table 3-3. Camera Analyzer DS Troubleshooting - Continued

Item	Trouble symptom	Probable trouble	Correction
		e. Defective lamp circuit diodes on assembly A16.	e. Replace assembly A16 (para 3-13*i*).
5	a. INTVL indicator does not light (step 3).	a. Defective MASTER switch S1.	a. Refer to a higher category of maintenance.
	b. VOM DC indicator does not light (step 3).	b. Defective MASTER switch S1.	b. Refer to a higher category of maintenance.
	c. DC VOLTS indicator does not light (step 3).	c. Defective MASTER switch S1.	c. Refer to a higher category of maintenance.
6	Multimeter does not indicate −25 ± 5 volts dc (step 3).	a. Defective transformer T1.	a. Refer to a higher category of maintenance.
		b. Defective capacitor on assembly A16.	b. Replace assembly A16 (para 3-13*i*).
		c. Defective resistor R2.	c. Refer to a higher category of maintenance.
		d. Defective MASTER switch S1.	d. Refer to a higher category of maintenance.
		e. Defective VOM binding posts J14 and J15.	e. Replace (para 3-13*g*).
7	Vtvm does not indicate −3.34 volts dc ± 50 millivolts (step 3).	a. Defective photocell simulator circuit.	a. Replace assembly A16 (para 3-13*i*).
		b. Defective transistor Q2.	b. Refer to higher category of maintenance.
		c. Defective FOOT-LAMBERTS control R4.	c. Replace (para 3-13*f*).
		d. Photocell simulator circuit misadjusted.	d. Perform adjustment procedure (para 3-15*b*).
		e. Defective MASTER switch S1.	e. Refer to a higher category of maintenance.
		f. Defective DC VOLTS binding posts J18 and J19.	f. Replace (para 3-13*g*).
8	CYCLE PULSE indicator does not light (step 4).	a. Defective MASTER switch S1.	a. Refer to a higher category of maintenance.
		b. Defective CYCLE PULSE switch S2.	b. Replace (para 3-13*b*).
		c. Defective diode CR7.	c. Refer to higher category of maintenance.
9	RECYCLE INITIATE indicator does not flash (step 4).	a. Defective MODE switch S5.	a. Refer to a higher category of maintenance.
		b. Defective resistor R1 and/or capacitor C1.	b. Refer to higher category of maintenance.
10	Digital timer does not indicate between 10 and 15 milliseconds (step 4).	a. Recycle initiate circuit out of adjustment.	a. Perform adjustment procedure (para 3-15*d*).
		b. Defective PULSE TIMER binding posts J12 and J13.	b. Replace (para 3-13*g*).
		c. Defective BODY connector J3.	c. Refer to a higher category of maintenance.
11	DC VOLTS indicator does not light (step 5).	Defective MASTER switch S1	Refer to a higher category of maintenance.
12	Vtvm does not indicate 50 ± .05 vdc (step 6).	a. Defective operational amplifier power supply.	a. Refer to a higher category of maintenance.
		b. Defective operational amplifier.	b. Refer to a higher category of maintenance.
		c. Defective transformer T1.	c. Refer to a higher category of maintenance.
		d. Defective +50-volt power supply and/or regulator circuit.	d. Refer to a higher category of maintenance.
		e. Defective E V/H control.	e. Replace (para 3-13*f*).
		f. Incorrect adjustment of +50 volt power supply.	f. Perform adjustment procedure (para 3-15*a*).
13	Vtvm does not track E V/H control (step 7).	a. Defective E V/H control.	a. Replace (para 3-13*f*).
		b. Loose knob on shaft of E V/H control.	b. Tighten setscrews in knob.
14	Oscilloscope does not indicate proper waveform (step 8).	a. Defective MASTER switch S1.	a. Refer to a higher category of maintenance.

Table 3-3. Camera Analyzer DS Troubleshooting - Continued

		b. Defective relay K3.	A Refer to a higher category of maintenance.
		c. Defective SCOPE binding posts J20 and J21.	c Replace (para 3-13g).
		d. Defective MODULE TEST switch S1.	d Replace assembly A16 (para 3-13i).
		e. Defective motor tachometer simulator circuit.	c. Refer to a higher category of maintenance.
		f. Defective MODULE connector J11.	f. Refer to a higher category of maintenance.
15	Motor - tachometer simulator circuit load lamps do not light (step 8).	a. Defective lamp(s) DS 1 through DS4.	a Replace defective lamp.
		b. Dirty lamp terminals.	b. Clean terminals with fine abrasive,
		c. Defective lamp socket(s).	c. Refer to a higher category of maintenance
16	Vtvm indicates low or no voltage (step 9).	a. Defective motor tachometer simulator circuit.	a. Refer to a higher category of maintenance.
		b. Defective MODULE TEST switch S1.	b. Replace assembly A16 (para 3-13i).
		c. Defective OPERATE OFF switch S15.	c Replace (para 3-13d).
		d. Defective PLUS OUTPUT switch S14.	d Replace (para 3-13c).
		e. Defective MASTER switch S1.	e. Refer to a higher category of maintenance.
		f. Defective DC VOLTS binding posts J18 and J19.	f. Replace (para 3-l3g).
17	Vtvm reads greater than 3.0 volts (step 9).	Defective OPERATE OFF switch S15.	Replace (para 3-13d).
18	Vtvm does not indicate 0 volts (step 10).	Defective OPERATE OFF switch S15.	Replace (para 3-13d).
19	No voltage indicated on multimeter (step 11).	a. Defective LAMP TEST switch S6.	a. Replace (para 3-13b).
		b. Defective DC EXPOSURE switch S13.	b. Replace (para 3-13b).
		c. Defective MODULE connector J8.	c. Refer to a higher category of maintenance.
20	No voltage indicated on multimeter (step 12).	a. Defective DC EXPOSURE switch S13.	a. Replace (para 3-13b).
		b. Defective MODULE connector J8.	b. Refer to a higher category of maintenance.
21	Vtvm does not indicate any variation in voltage (step 13).	a. Defective FOOT-LAMBERTS control R4.	a. Replace (para 3-13f).
		b. Defective Assembly A15.	A Refer to a higher category of mainenance,
		c. Defective TEST switch S10.	c Refer to a higher category of maintenance.
		d. Defective RANGE switch S11.	d Replace (para 3-13b).
22	Vtvm does not indicate any variation in voltage (step 14).	a. Defective assembly A15.	a Refer to a higher category of maintenance.
		b. Defective RANGE switch S11.	b. Replace (para 3-13b).
23	Digital timer does not indicate (step 15).	a. Defective MASTER switch S1.	a Refer to a higher category of maintenance.
		b. Defective CYCLE PULSE switch S2.	b. Replace (para 3-13b).
		c. Defective MODE switch S5.	c. Refer to a higher category of maintenance.
		d. Defective recycle initiate circuit.	d Refer to a higher category of maintenance.
24	Digital timer indication is not within 10 to 15 millisecond time interval (step 15).	Recycle initiate circuit out of adjustment.	Perform adjustment procedure (para 3-l5d).
25	Multimeter does not indicate zero resistance (step 16).	a. Defective BODY OPR switch S4.	a Replace (para 3-13b).
		b. Defective BODY connector J3.	b. Refer to a higher catgory of

Table 3-3. Camera Analyzer DS Troubleshooting - Continued

Item	Trouble system	Probable trouble	Correction
			maintenance.
26	Multimeter does not indicate zero resistance (step 17).	a. Defective SIM OPR switch S3.	a. Replace (para 3-13*b*).
		b. Defective SYS SIMULATOR connector J2.	b. Refer to a higher category of maintenance.
27	Multimeter does not indicate 16 ohms resistance (step 18).	a. Defective LAMP TEST switch S6.	a. Replace (para 3-13*b*).
		b. Defective DC EXPOSURE switch S13.	b. Replace (para 3-13*b*).
		c. Defective LENS CONE connector J6.	c. Refer to a higher category of maintenance.
		d. Defective diode CR5.	d. Refer to a higher category of maintenance.
28	Multimeter does not indicate 16 ohms resistance (step 19).	a. Defective DC EXPOSURE switch S13.	a. Replace (para 3-13*b*).
		b. Defective LENS CONE connector J6.	b. Refer to a higher category of maintenance.
		c. Defective Diode CR6.	c. Refer to a higher category of maintenance.
29	Multimeter does not indicate zero resistance (step 20).	a. Defective EXPOSURE switch S12.	a. Replace (para 3-13*b*).
		b. Defective LENS CONE connector J6.	b. Refer to a higher category of maintenance.
30	Multimeter does not indicate zero resistance (step 21).	a. Defective EXPOSURE switch S12.	a. Replace (para 3-13b).
		b. Defective LENS CONE connector J6.	b. Refer to a higher category of maintenance.
31	Multimeter does not indicate zero resistance (step 22).	a. Defective TEST switch S10.	a. Refer to a higher category of maintenance.
		b. Defective MASTER switch S1.	b. Refer to a higher category of maintenance.
		c. Defective R/C BRDG-binding post J17.	c. Replace (para 3-13*g*).
		d. Defective MODULE connector J8.	d. Refer to a higher category of maintenance.
32	Multimeter does not indicate zero resistance (step 23).	a. Defective R/C BRDG + binding post J16.	a. Replace (para 3-13*g*).
		b. Defective MASTER switch S1.	b. Refer to a higher category of maintenance.
		c. Defective TEST switch S10.	c. Refer to a higher category of maintenance.

3-8. Camera Analyzer DS Voltage and Resistance Measurements

Specific point-to-point voltage and resistance measurements are not taken at DS maintenance. The voltage and resistance measurements at DS maintenance are limited to those made in the bench test (para 3-7*b* above).

3-9. Camera Test Adapter DS Troubleshooting

a. Camera Test Adapter Bench Test.

(1) Set all controls and switches on the camera test adapter to their off, neutral, or counterclockwise positions.

(2) Connect power cable W9 to a 28-volt dc power source and to connector J1 on the camera test adapter.

(3) Perform the procedures in the sequence given in table 3-4.

Table 3-4. Camera Test Adapter Bench Test

Step	Procedure	Position of camera test adapter switches	Result/indication
1		POWER switch: ON	Power indicator should light.
2		LAMP TEST switch: depressed	All indicators should light.
3		LAMP TEST switch: released	All indicators should extinguish except power indicator.
4	Jumper + 28-vdc from P2-L or K to P1-V.		DATA indicator should light until jumper is disconnected.
5	Jumper + 28-vdc from P2-L or K to P1-U.		FLASH indicator should light until jumper is disconnected.

Table 3-4. Camera Test Adapter Bench Test-Continued

Step	Procedure	Position of camera test adapter switches	Result/indication
6	Jumper + 28-vdc from P2-L or K to P2-P.		CYCLE indicator should light until jumper is disconnected.
7	Jumper + 28-vdc from P2-L or K to P2-Z.		SYNC indicator should light until jumper is disconnected.
8	Jumper + 28-vdc from P2-L or K to P2-*c*.		FILM FAIL indicator should light until jumper is disconnected.
9	Jumper + 28-vdc from P2-L or K to P2-*b*.		INTLK indicator should light until jumper is disconnected.
10	Jumper + 28-vdc from P2-L or K to P1-T.		OPR ON indicator should light until jumper is disconnected.
11	Jumper + 28-vdc from P2-L or K to P1-L.		NIGHT indicator should light until jumper is disconnected.
12	Jumper + 28-vdc from P2-L or K to P2-J; jumper ground from P2-A or R to P1-A; and with vtvm set for ac range, connect test leads to terminals 1 (brown lead) and 2 (red lead) of transformer T1.	EXPOSURE switch: 44MM CAL	Vtvm should indicate 115 vac.
13	Same as step 12 except adjust vtvm to read dc volts. Connect the negative test lead to A3-pin 20 and the positive lead to A3-17.	Same as step 12	Vtvm should indicate 134 ± 6 mv.
14	Same as step 13 except jumper ground from P2-A or R to P2-F.	EXPOSURE switch: 3 IN. CAL.	Vtvm should indicate 134 ± 6 mv.
15	Same as step 14.	EXPOSURE switch: 6 IN. CAL.	Vtvm should indicate 134 ± 6 mv.
16	Same as step 13 except jumper ground from P2-A or R to P1-*a*.	EXPOSURE switch: 12 IN. CAL.	
17	Same as step 16.	EXPOSURE switch: CPR ALL	Vtvm should indicate 2.5 vdc.
18	Same as step 16.	EXPOSURE switch: SEN	Vtvm should indicate 0 vdc.
19	Same as step 16 except jumper + 28 vdc from P2-L or K to J2-B.	Same as step 18	Vtvm should indicate + 28 vdc.
20	Disconnect jumper wires and vtvm test leads.	POWER switch: OFF	Power indicator should extinguish.
21		Disconnect power cable W9 from POWER connector J1 of the camera test adapter.	
22	Adjust the multimeter to the resistance range for making continuity checks. Use the RX1 range.		
23	Connect the multimeter test leads to P2-A and P1-B.	MODE switch: AUTO	Multimeter should indicate infinity.
24	Same as step 23.	MODE switch: PULSE	Multimeter should indicate 0 ohms.
25	Connect the multimeter test leads to the COMMON test point and P1-C.	MODE switch: IMC PULSE	Multimeter should indicate 0 ohms.
26	Connect the multimeter test leads to the COMMON test point and P1-K.	MODE switch: NIGHT	Multimeter should indicate 0 ohms.
27	Connect the multimeter test leads to the COMMON test point and P1-F.	EXPOSURE INCR-NORMAL switch: NORMAL	Multimeter should indicate infinity.
28	Same as step 27.	EXPOSURE INCR - NORMAL switch: INCR	Multimeter should indicate 0 ohms.
29	Connect the multimeter leads to the COMMON test point and P1-P.	EXPOSURE OVER - NORMAL - UNDER switch: NORMAL	Multimeter should indicate infinity.
30	Same as step 29.	EXPOSURE OVER - NORMAL - UNDER switch: OVER	Multimeter should indicate 0 ohms.
31	Connect the multimeter test leads to the COMMON test point and P1-J.	EXPOSURE OVER - NORMAL - UNDER switch: NORMAL	Multimeter should indicate infinity.
32	Same as step 31.	EXPOSURE OVER - NORMAL - UNDER switch: UNDER	Multimeter should indicate 0 ohms.
33	Connect the multimeter test leads to P2-N and P1-R.		Multimeter should indicate infinity.
34	Same as step 33.	CYCLE switch: depressed	Multimeter should indicate 0 ohms.
35	To ensure continuity of the remaining interconnecting wires, perform the resistance measurements in table 4-25.		

b. Camera Test Adapter Troubleshooting Procedures. Steps referenced in the Trouble symptom column in Table 3-5 refer to numbered steps in the bench test (a above). Electronic parts and associated circuits referenced in the troubleshooting table are shown in the schematic diagram (fig. FO-15) and the wiring diagram (fig. PO-16).

Table 3-5. Camera Test Adapter Troubleshooting

Item	Trouble symptom	Probable trouble	Correction
1	Power indicator does not light (step 1).	a. Lamp DS1 defective.	a. Replace lamp DS1.
		b. Lamp socket defective.	b. Replace defective indicator assembly (para 3-19*f*).
		c. POWER switch S6 defective.	c. Replace switch S6 (para 3-19*a*).
		d. 15 AMP DC fuse F2 defective.	d. Replace fuse F2.
		e. Wiring defective.	e. Replace defective wiring (fig. FO-16).
2	OPR ON indicator does not light (step 2)	a. Lamp DS1 defective.	a. Replace lamp DS1.
		b. Lamp socket defective.	b. Replace defective indicator assembly A1 (para 3-19*f*).
		c. Wiring defective.	c. Replace defective wiring (fig. FO-16).
		d. Mode and exposure board assembly A3 defective.	d. Replace defective board assembly A3 (para 3-19*i*).
3	FILM FAIL indicator does not light (step 2).	a. Lamp DS2 defective.	a. Replace lamp DS2.
		b. Lamp socket defective.	b. Replace defective indicator assembly A1 (para 3-19*f*).
		c. Wiring defective.	c. Replace defective wiring (fig. FO-16).
		d. Mode and exposure board assembly A3 defective.	d. Replace defective board assembly A3 (para 3-19*i*).
4	INTLK indicator does not light (step 2).	a. Lamp DS3 defective.	a. Replace lamp DS3.
		b. Lamp socket defective.	b. Replace defective indicator assembly A1 (para 3-19*f*).
		c. Wiring defective.	c. Replace defective wiring (fig. FO-16).
		d. Mode and exposure board assembly A3 defective.	d. Replace defective board assembly A3 (para 3-19*i*).
5	NIGHT indicator does not light (step 2).	a. Lamp DS4 defective.	a. Replace lamp DS4.
		b. Lamp socket defective.	b. Replace defective indicator assembly A1 (para 3-19*i*).
		c. Wiring defective.	c. Replace defective wiring (fig. FO-16).
		d. Mode and exposure board assembly A3 defective.	d. Replace defective board assembly A3 (para 3-19*i*).
6	SYNC indicator does not light (step 2).	a. Lamp DS1 defective.	a. Replace lamp DS1.
		b. Lamp socket defective.	b. Replace defective indicator assembly A2 (para 3-19*f*).
		c. Mode and exposure board assembly A3 defective.	c. Replace defective wiring (fig. FO-16).
		d. Mode and exposure board assembly A3 defective.	d. Replace defective board assembly A3 (para 3-19*i*).
7	FLASH indicator does not light (step 2).	a. Lamp DS2 defective.	a. Replace lamp DS2.
		b. Lamp socket defective.	b. Replace defective indicator assembly A2 (para 3-19*f*).
		c. LAMP TEST switch S5 defective.	c. Replace switch S5.
		d. Wiring defective.	d. Replace defective wiring (fig. FO-16).
8	DATA indicator does not light (step 2).	a. Lamp DS3 defective.	a. Replace lamp DS3.
		b. Lamp socket defective.	b. Replace defective indicator assembly A2 (para 3-19*f*).
		c. LAMP TEST switch S5 defective.	c. Replace switch S5 (para 3-19*a*).
		d. Wiring defective.	d. Replace defective wiring (fig. FO-16).
9	CYCLE indicator does not light (step 2).	a. Lamp DS4 defective.	a. Replace lamp DS4.
		b. Lamp socket defective.	b. Replace defective indicator assembly A2 (para 3-19*f*).
		[illegible]	[illegible]

b. Camera Test Adapter Troubleshooting Procedures. **Steps referenced in the *Trouble symptom* column in table 3-5 refer to numbered steps in the bench test (*a* above). Electronic parts and associated circuits** referenced in the troubleshooting table are shown in the schematic diagram (fig. FO-15) and the wiring diagram (fig. FO-16).

Table 3-5. Camera Test Adapter DS Troubleshooting

Item	*Trouble symptom*	*Probable trouble*	*Correction*
1	Power indicator does not light (step 1).	*a.* Lamp DS1 defective.	*a.* Replace lamp DS1.
		b. Lamp socket defective.	*b.* Replace defective indicator assembly (para 3-19*f*).
		c. POWER switch S6 defective.	*c.* Replace switch S6 (para 3-19*a*).
		d. 15 AMP DC fuse F2 defective.	*d.* Replace fuse F2.
		e. Wiring defective.	*e.* Replace defective wiring (fig. FO-16).
2	OPR ON indicator does not light (step 2)	*a.* Lamp DS1 defective.	*a.* Replace lamp DS1.
		b. Lamp socket defective.	*b.* Replace defective indicator assembly A1 (para 3-19*f*).
		c. Wiring defective.	*c.* Replace defective wiring (fig. FO-16).
		d. Mode and exposure board assembly A3 defective.	*d.* Replace defective board assembly A3 (para 3-19*i*).
3	FILM FAIL indicator does not light (step 2).	*a.* Lamp DS2 defective.	*a.* Replace lamp DS2.
		b. Lamp socket defective.	*b.* Replace defective indicator assembly A1 (para 3-19*f*).
		c. Wiring defective.	*c.* Replace defective wiring (fig. FO-16).
		d. Mode and exposure board assembly A3 defective.	*d.* Replace defective board assembly A3 (para 3-19*i*).
4	INTLK indicator does not light (step 2).	*a.* Lamp DS3 defective.	*a.* Replace lamp DS3.
		b. Lamp socket defective.	*b.* Replace defective indicator assembly A1 (para 3-19*f*).
		c. Wiring defective.	*c.* Replace defective wiring (fig. FO-16).
		d. Mode and exposure board assembly A3 defective.	*d.* Replace defective board assembly A3 (para 3-19*i*).
5	NIGHT indicator does not light (step 2).	*a.* Lamp DS4 defective.	*a.* Replace lamp DS4.
		b. Lamp socket defective.	*b.* Replace defective indicator assembly A1 (para 3-19*i*).
		c. Wiring defective.	*c.* Replace defective wiring (fig. FO-16).
		d. Mode and exposure board assembly A3 defective.	*d.* Replace defective board assembly A3 (para 3-19*i*).
6	SYNC indicator does not light (step 2).	*a.* Lamp DS1 defective.	*a.* Replace lamp DS1.
		b. Lamp socket defective.	*b.* Replace defective indicator assembly A2 (para 3-19*f*).
		c. Mode and exposure board assembly A3 defective.	*c.* Replace defective wiring (fig. FO-16).
		d. Mode and exposure board assembly A3 defective.	*d.* Replace defective board assembly A3 (para 3-19*i*).
7	FLASH indicator does not light (step 2).	*a.* Lamp DS2 defective.	*a.* Replace lamp DS2.
		b. Lamp socket defective.	*b.* Replace defective indicator assembly A2 (para 3-19*f*).
		c. LAMP TEST switch S5 defective.	*c.* Replace switch S5.
		d. Wiring defective.	*d.* Replace defective wiring (fig. FO-16).
8	DATA indicator does not light (step 2).	*a.* Lamp DS3 defective.	*a.* Replace lamp DS3.
		b. Lamp socket defective.	*b.* Replace defective indicator assembly A2 (para 3-19*f*).
		c. LAMP TEST switch S5 defective.	*c.* Replace switch S5 (para 3-19*a*).
		d. Wiring defective.	*d.* Replace defective wiring (fig. FO-16).
9	CYCLE indicator does not light (step 2).	*a.* Lamp DS4 defective.	*a.* Replace lamp DS4.
		b. Lamp socket defective.	*b.* Replace defective indicator assembly A2 (para 3-19*f*).
		c. Wiring defective.	*c.* Replace defective wiring (fig.

Table 3-5. Camera Test Adapter DS Troubleshooting-Continued

Item	Trouble symptom	Probable trouble	Correction
			FO-16).
		d. Mode and exposure board assembly A3 defective.	d. Replace defective board assembly A3 (para 3-19*i*).
10	OPR ON, FILM FAIL, INTLK, and NIGHT indicators do not light (step 2).	a. Multiple-section indicator.	a. Replace indicator assembly A1 (para 3-19*f*).
		b. Wiring defective.	b. Replace defective wiring (fig. FO-16).
11	SYNC, FLASH, DATA, and CYCLE indicators do not light (step 2).	a. Multiple-section indicator assembly.	a. Replace indicator assembly A2 (para 3-19*f*).
		b. Wiring defective.	b. Replace defective wiring (fig. FO-16).
12	No indicators light except the power indicator (step 2).	Wiring defective.	Replace defective wiring (fig. FO-16).
13	DATA indicator does not light (step 4).	a. LAMP TEST switch S5 defective.	a. Replace switch S5 (para 3-19*b*).
		b. Wiring defective.	b. Replace defective wiring (fig. FO-16).
		c. Mode and exposure board assembly A3 defective.	c. Replace board assembly A3 (para 3-19*i*).
14	FLASH indicator does not light (step 5).	a. LAMP TEST switch S5 defective.	a. Replace switch S5 (para 3-19*b*).
		b. Wiring defective.	b. Replace defective wiring (fig. FO-16).
		c. Mode and exposure board assembly A3 defective.	c. Replace defective board assembly A3 (para 3-19*i*).
15	CYCLE indicator does not light (step 6).	Wiring defective.	Replace defective wiring (fig. FO-16).
16	SYNC indicator does not light (step 7).	Wiring defective.	Replace defective wiring (fig. FO-16).
17	FILM FAIL indicator does not light (step 8).	Wiring defective	Replace defective wiring (fig. FO-16).
18	INTLK indicator does not light (step 9).	Wiring defective.	Replace defective wiring (fig. FO-16).
19	OPR ON indicator does not light (step 10).	Wiring defective.	Replace defective wiring (fig. FO-16).
20	NIGHT indicator does not light (step 11).	Wiring defective.	Replace defective wiring (fig. FO-16).
21	Vtvm does not indicate 115 vac when ac input to power transformer is checked (step 12).	a. POWER switch S6 defective.	a. Replace switch S6 (para 3-19*a*).
		b. 1.5 AMP DC fuse F1 defective.	b. Replace fuse F1.
		c. EXPOSURE switch S2A defective.	c. Same as item 21b above.
		d. Wiring defective.	d. Replace defective wiring (fig. FO-16).
		e. Mode and exposure board assembly A3 defective.	e. Replace defective board assembly A3 (para 3-19*i*).
22	Incorrect vtvm indication for EXPOSURE switch setting (steps 13, 14, 15, 16).	a. Variable control R11 or R12 misaligned.	a. Refer to higher category of maintenance.
		b. Mode and exposure board assembly A3 defective.	b. Replace defective board assembly A3 (para 3-19*i*).
23	No vtvm indication when EXPOSURE switch is set at 44 mm CAL (step 13).	a. Mode and exposure board assembly A3 defective.	a. Replace defective board assembly A3 (para 3-19*i*).
		b. Mode and exposure board assembly A3 defective.	b. Same as item *a* above.
		c. Wiring defective.	c. Replace defective wiring (fig. FO-16).
24	No vtvm indication when EXPOSURE switch is set at 3 IN. CAL (step 14).	a. Wiring defective.	a. Replace defective wiring (fig. FO-16).
		b. Mode and exposure board assembly A3 defective.	b. Replace defective board assembly A3 (para 3-19*i*).
25	No vtvm indication when EXPOSURE switch is set at 6 IN. CAL (step 15).	a. Mode and exposure board assembly A3 defective.	a. Replace defective board assembly A3 (para 3-19*i*).
		b. Mode and exposure board assembly A3 defective.	b. Same as item *a* above.
		c. Wiring defective.	c. Replace defective wiring (fig. FO-16).

Table 3-5. Camera Test Adapter DS Troubleshooting-Continued

Item	Trouble symptom	Probable trouble	Correction
26	No vtvm indication when EXPOSURE switch is set at 12 IN. CAL (step 16).	a. EXPOSURE switch S2 defective. b. Mode and exposure board assembly A3 defective. c. Wiring defective.	a. Refer to a higher category of maintenance. b. Replace defective board assembly A3 (para 3-19i). c. Replace defective wiring (fig. FO-16).
27	No vtvm indication when EXPOSURE switch is set at OPR ALL (step 17).	a. EXPOSURE switch S2 defective. b. Mode and exposure board assembly A3 defective. c. Wiring defective.	a. Refer to a higher category of maintenance. b. Replace defective board assembly A3 (para 3-19i). c. Replace defective wiring (fig. FO-16).
28	No vtvm indication when EXPOSURE switch is set at SEN (step 19).	a. EXPOSURE switch S2 defective. b. Wiring defective.	a. Refer to a higher category of maintenance. b. Replace defective wiring (fig. FO-16).
29	Vtvm does not indicate continuity when MODE switch is set at PULSE (step 24).	a. MODE switch S1 defective. b. Wiring defective.	a. Refer to a higher category of maintenance. b. Replace defective wiring (fig. FO-16).
30	Vtvm does not indicate continuity when MODE switch is set at IMC PULSE (step 25).	a. MODE switch S1 defective. b. Wiring defective.	a. Refer to a higher category of maintenance. b. Replace defective wiring (fig. FO-16).
31	Vtvm does not indicate continuity when MODE switch is set at NIGHT (step 26).	a. MODE switch S1 defective. b. Wiring defective.	a. Refer to a higher category of maintenance. b. Replace defective wiring (fig. FO-16).
32	Vtvm does not indicate continuity when EXPOSURE INCR-NORM switch is set at NORM (step 27).	a. EXPOSURE INCR-NORM switch S3 defective. b. Wiring defective.	a. Replace switch S3 (para 3-19a). b. Replace defective wiring (fig. FO-16).
33	Vtvm does not indicate continuity when EXPOSURE INCR-NORM switch is set at INCR (step 28).	a. EXPOSURE INCR-NORM switch S3 defective. b. Wiring defective.	a. Replace switch S3 (para 3-19a). b. Replace defective wiring (fig. FO-16).
34	Vtvm does not indicate continuity when EXPOSURE OVER-NORMAL-UNDER switch is set at OVER (step 30).	a. EXPOSURE OVER-NORMAL-UNDER switch S4 defective. b. Wiring defective.	a. Replace switch S4 (para 3-19a). b. Replace defective wiring (fig. FO-16).
35	Vtvm does not indicate continuity when EXPOSURE OVER-NORMAL-UNDER switch is at UNDER (step 32).	a. EXPOSURE OVER-NORMAL-UNDER switch S4 defective. b. Wiring defective.	a. Replace switch S4 (para 3-19a). b. Replace defective wiring (fig. FO-16).
36	Vtvm does not indicate continuity when CYCLE switch is depressed (step 34).	a. CYCLE switch S7 defective. b. Wiring defective.	a. Replace switch S7 (para 3-19b). b. Replace defective wiring (fig. FO-16).

3-10. Camera Adapter DS Voltage and Resistance Measurements

Specific point to point voltage and resistance measurements are not taken at DS maintenance. The voltage and resistance measurements at DS maintenance are limited to those made in the bench test (para 3-9a).

Section IV. DS MAINTENANCE OF CAMERA ANALYZER

WARNING

Disconnect the power source from the equipment when making repairs.

3-11. Camera analyzer Parts Replacement Techniques

All parts and assemblies in the camera analyzer can easily be reached without any special procedures. The following precautions apply:

a. Before any part is removed, not the position of the part and its leads. Wire replacement parts in the same position to avoid undesired coupling and shorting together of wires. If necessary, mark or tag each wire before disconnecting the wire.

b. The printed circuit board and component assembly contain four adjustments, R2, R18, R20, and R23. Each of these adjustments is critical to the overall performance of the camera analyzer. Whenever the printed board and component assembly is replaced, all adjustments should be ry - . . before placing the camera analyzer in serving.

3-12. Consideration Measure Disassembling Camera Analyzer.

Localizing trouble in the camera analyzer (para 3-7) can simplify repairs by limiting the work to the defective area. Disassemble the camera analyzer only to the level necessary to correct the fault

3-13. Camera Analyzer DS Replacement Procedure

(fig. FO-17)

a. Replacement of Indicator Lamp Assemblies (fig. 3-3). To replace any front panel indicator lamp assembly, proceed as follows:

(1) Set POWER switch to OFF.

(2) Disconnect power cable W9 from POWER connector J1.

(3) Remove 14 screws (1) and remove test panel (48) from combination case (47).

(4) Unsolder and carefully mark or tag all electrical connections to indicator lamp assembly.

(5) Insert fingernails in cutouts in lens assembly (fig. 3-3) and pull lens away from indicator body.

(6) Rotate lens 90 degrees counterclockwise, push in slightly to remove tension on index key, and pull complete bulb assembly to stops on indicator body.

(7) Using screwdriver, loosen two screws on inside of indicator body by rotating counterclockwise until screw tabs are loose, and free mounting support

(8) Slide mounting support from test panel in direction of arrow.

(9) Remove indicator body from front panel.

(10) Replace the indicator assembly by reversing steps (4) through (8).

(11) Replace the test panel (48, fig. FO-17) in the combination case (47) by replacing 14 screws.

b. Replacement of Toggle Type Switches. (CYCLE PULSE S2 (28), SIM OPR S3 (27), BODY OPR S4 (24), LAMP TEST S6 (39), POWER S7 (27), RANGE S11 (24), EXPOSURE S12 (26), or DC EXPOSURE S13 (25).) To replace a toggle type switch, proceed as follows:

(1) Perform steps in a(l), (2), and (3) above.

(2) Unsolder and carefully mark or tag all electrical connections on rear of toggle switch (24).

(3) Remove nut (24 ref), lockwasher (24 ref), key washer (24 ref) and if necessary, locknut (24 ref) securing switch (24) to test panel (48) and carefully remove switch from rear of test panel.

(4) Replace the toggle switch (24) by reversing steps in (2) and (3) above.

(5) Replace the teat panel (48) in the combination case by replacing 14 screws.

c. Replacement of PLUS OUTPUT Switch S14. To replace PLUS OUTPUT switch S14 (3), proceed as follows:

(1) Perform steps in a(l), (2), and (3) above.

(2) Unsolder and carefully mark or tag all electrical connections on rear of switch (3).

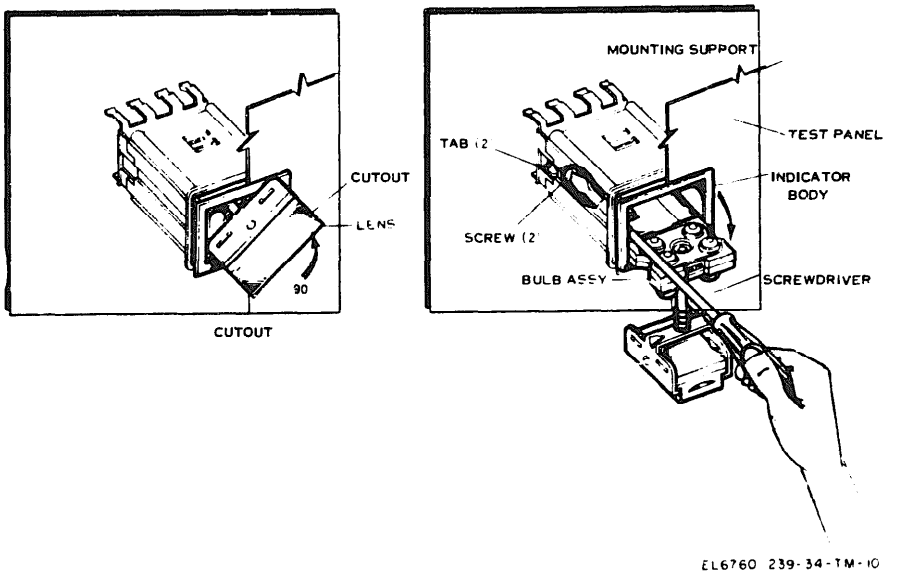


Figure 3-3. Replacement of indicator lamp assembly.

(3) Remove nut (3 ref) and lockwasher (3 ref) from rear of test, panel (48) and carefully remove switch (3) from front of test panel

(4) Replace the PLUS OUTPUT switch by reversing (2) and (3) above.

(5) Replace the test panel in the combination case by replacing 14 screws.

d. Replacement of OPERATE OFF Switch S15. To replace OPERATE OFF switch S15 (4), proceed as follows:

(1) Perform steps in u(l), (2), and (3) above.

(2) Unsolder and carefully mark or tag all electrical connections on rear of switch (4).

(3) Remove facenut (5) and washer (6) from front of test panel (48) and carefully remove lockwasher (7), keywasher (4 ref), and switch (4) from rear of test panel.

(4) Replace the OPERATE OFF switch by reversing steps in (2) and (3) above.

(5) Replace the test panel in the combination case by replacing 14 screws.

e. Replacement of Motor Tachometer Simulator Circuit Load Lamps, proceed as follows:

(1) Perform steps in a(l), (2), and (3) above.

(2) Rotate bulb of lamp (46) counterclockwise until it is loose in socket and remove lamp.

(3) To install replacement lamp, insert in socket and rotate clockwise.

(4) Replace the test panel in the combination case by replacing 14 screws.

f. Replacement of E V/H Control R3 (21) or FOOT LAMBERTS Control R4 (23) To replace potentiometer R3 and R4, proceed as follows:

(1) Perform steps in a(l), (2), and (3) above.

(2) Unsolder and carefully mark or tag the electrical connections on rear of potentiometer (21).

(3) Loosen hex head setscrew (22 ref) on dial (22), and remove dial from shaft of potentiometer (21).

(4) Remove nut (21 ref), and washer (21 ref) and key washer (21 ref) if required, from potentiometer.

(5) Carefully remove potentiometer (21) from rear of test panel (48).

(6) Replace the potentiometer (21) by reversing steps in (2) through (5) above.

(7) Replace the test panel in the combination case by replacing 14 screws

NOTE

Whenever the E V/H control is replaced, perform the adjustment procedure of paragraph 3-15a.

g. Replacement of Binding Posts. To replace a binding post (J12 through J21) (34 and 36), proceed as follows

(1) Perform steps in a (1), (2), and (3) above.

(2) Remove nut (34 ref) from rear of binding post (34).

(3) Remove lug and soldered lead (35) from rear of binding post (34).

(4) Remove second nut (34 ref), washer (34 ref) and insulator spacer (34 ref) from rear of terminal (34).

(5) Remove binding terminal (34) from front of test panel (48).

(6) Replace the binding post (34) by reversing steps in (2) through (5) above.

(7) Replace the test panel in the combination case by replacing 14 screws.

h. Replacement of Indicating Type Fuseholders (AC and DC). To replace an indicating type fuseholder (AC, XF1) (31) or (DC, XF2) (33), proceed as follows:

(1) Perform steps in a(l), (2), and (3) above.

(2) Unsolder and tag the two electrical connections from rear of fuseholder (31).

(3) Remove nut (31 ref) and washer (31 ref) from rear of fuseholder (31).

(4) Carefully remove fuseholder (31) from front panel (48).

(5) Replace the indicating type fuseholder (31) by reversing steps in (2) through (4) above.

(6) Replace the test panel in the combination case by replacing 14 screws.

i. Replacement of Printed Circuit Board and Components Assembly A16. To replace the printed circuit board and components assembly A16, proceed as follows

(1) Perform steps in a(l), (2), and (3) above.

(2) Loosen two set screws (38 ref) on MODULE TEST, TEST and CONFIGURATION switches (40 ref) (CONTROL POWER SUPPLY section) and remove knobs (38).

(3) Remove nuts (40 ref) and washers (40 ref) from each of the three switches. These switches are mounted on the printed circuit board and component assembly (40).

(4) Remove four screws (44) mounting the connector mounting bracket and nut assembly (45) to the printed circuit board mounting bracket and nut assembly (41).

(5) Disconnect the connector mounting bracket and nut assembly (45) from the printed circuit board and components assembly (40).

(6) Remove the six screws (42) and washers (43) mounting the printed circuit board and components assembly (40) to the printed circuit mounting bracket and nut assembly (41).

(7) Carefully remove the printed circuit board and components assembly (40).

CAUTION

The three rotary switches have stops which may become free when removing the printed circuit board and components assembly from the chassis Be careful to maintain these stops in their positions.

(8) Replace the printed circuit board and components assembly (40) by reversing steps in (2) through (7) above.

(9) Replace the teat panel in the combination case by replacing 14 screws.

3-14. Repair of Camera Analyzer Cable Assemblies and Accessories

a Disassembly and Reassembly of Cable Assemblies. Disassembly and reassembly of the camera analyzer cable assemblies are obvious from the parts location drawings (fig. FO-18) and upon inspection of the cable. Perform the disassembly and reassembly procedures on the cable assemblies in accordance with the appropriate drawing. Refer to the cable assemblies wiring diagrams in TM 11-6760-239-12 when performing continuity checks.

b. Exposure Test Adapter. Disassembly and reassembly of the exposure test adapter is obvious from the parts location drawing (fig. 3-4) and upon inspection of the adapter. Perform the disassembly and reassembly procedures on the exposure test adapter in accordance with figure 3-4.

c. Module Test Adapter. Disassembly and reassembly of the module test adapter is obvious from the parts location diagram (fig. 3-5) and upon inspection of the adapter. Perform the disassembly and reassembly procedures on the module test adapter in ac-

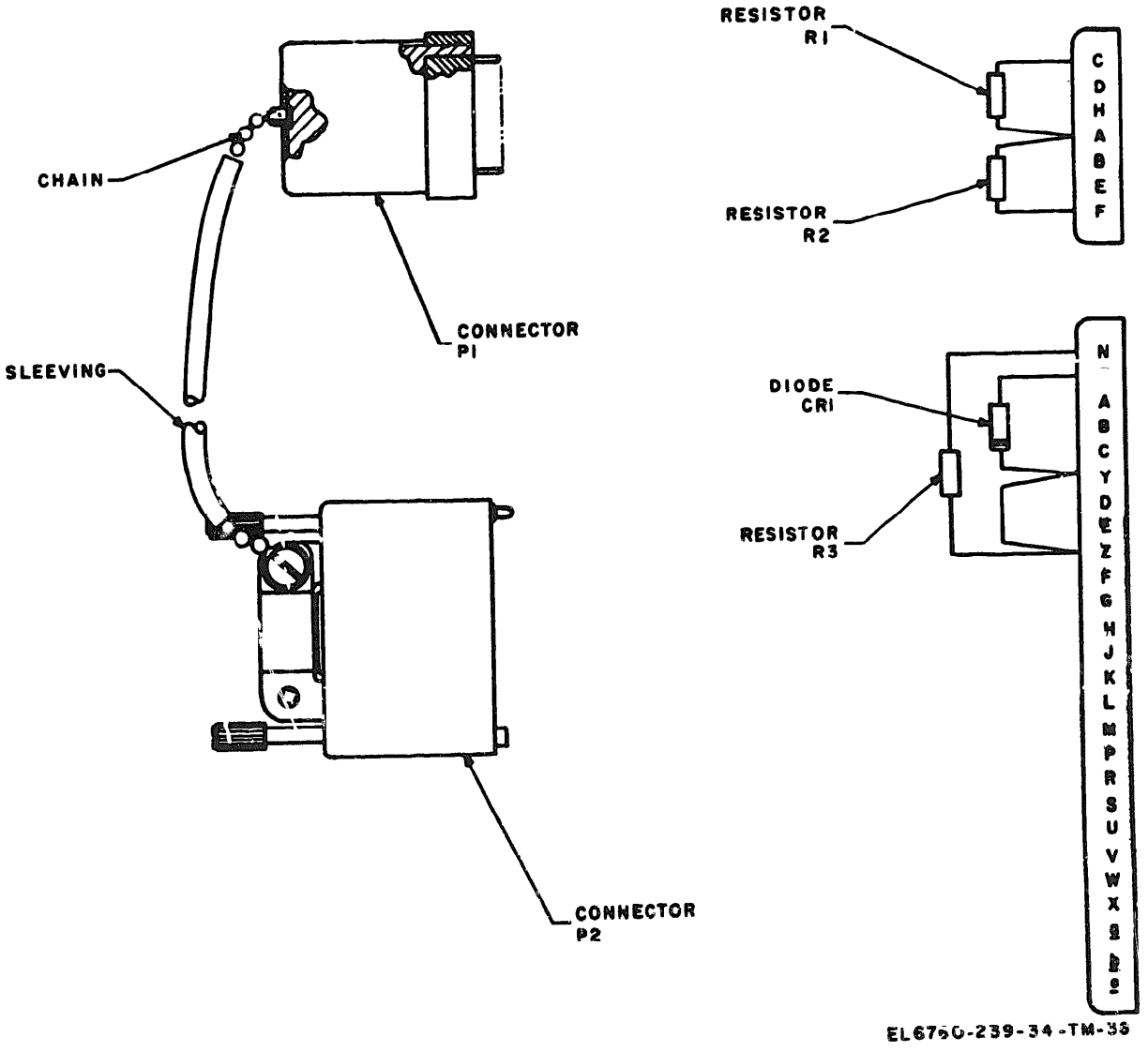


Figure 3-4. Exposure test adapter parts location.

cordance with the parts location diagram.

3-15. Camera Analyzer Adjustment

(fig. 3 -6)

The camera analyzer has four internal adjustments as shown in figure 3-6. These adjustments are performed without the use of special test equipment. These adjustments are: simulated E V/H output (a below), photocell output simulator (b below), simulated exposure feedback (c below), and recycle initiate circuit timing (d below). All adjustments are located on printed circuit and components assembly A16 and are performed with the test panel removed from the combination case.

a. Simulated E V/H Output Adjustment. To adjust the simulated E V/H output circuit, proceed as follows

(1) Se: POWER switch (PANEL POWER section) to OFF.

(2) Connect the vtvm to the DC VOLTS INPUT and GRD terminals (MASTER section).

(3) Set MASTER switch to INTERNAL TEST 2.

(4) Set E V/H control (CONTROL-POWER SUPPLY section) to maximum clockwise position

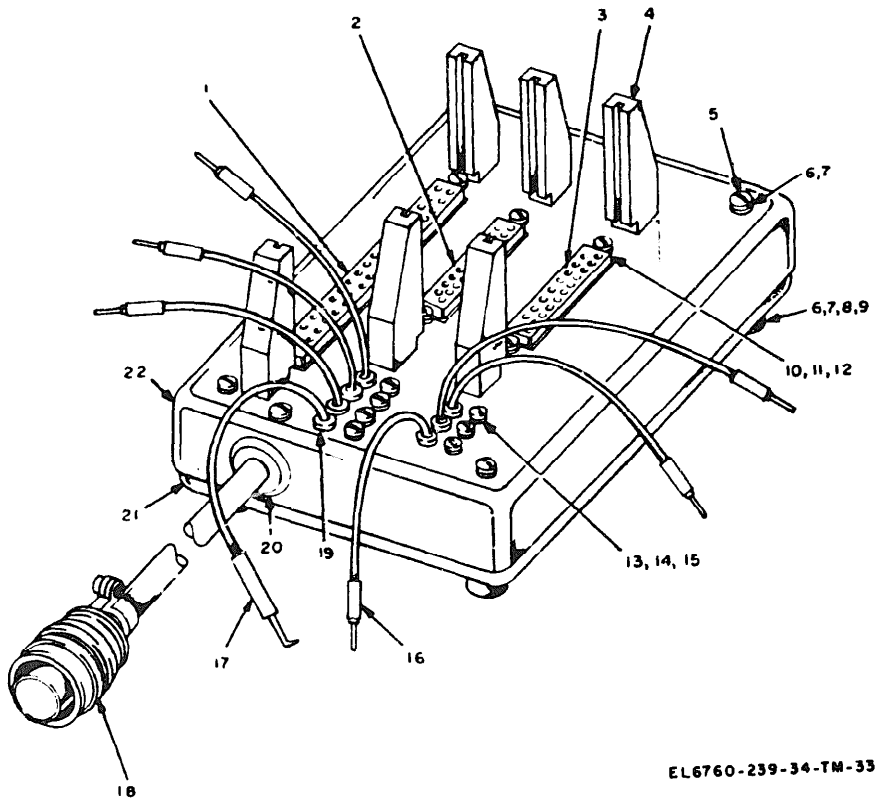
(5) Set POWER switch (PANEL POWER section) to ON.

(6) Adjust resistor R18 to obtain vtvm indication of 50 ± 0.5 volts dc.

(7) Set E V/H control (CONTROL-POWER SUPPLY section) to obtain vtvm indication of 1 volt.

(8) Observe E V/H dial indication. If dial indication is not 1 volt ± 1 millivolt, note number of dial divisions deficient. by or in excess of the 1 volt indication. Rotate dial to its clockwise or counterclockwise stop, depending upon direction of dial error. Loosen hex head setscrew and adjust dial to correct error between dial and vtvm indication. Tighten setscrew.

(9) Repeat steps in (7) and (8) below until no further mechanical adjusting of dial is necessary.



Key to fig. 3-5:
1 Connector J1
2 Connector J2
3 Connector J3
4 Circuit board guide (6)
5 Screw, machine (4)
6 Washer, flat (10)
7 Lockwasher (10)
8 Screw, machine (4)
9 Bumper, rubber (4)
10 Washer, flat (8)
11 Screw, machine (4)
12 Nut, self-locking hexagon (4)
13 Screw machine (7)
14 Lockwasher (19)
15 Terminal, stud (7)
16 Plug, tip, black (6)
17 Clip, red
18 Connector P1
19 Grommet, rubber (7)
20 Grommet, rubber
21 Cover, test adapter
22 Box, test adapter

Figure 3-5. Module test adapter, parts location.

(10) Set E V/H control to 50.

(11) Observe vtvm indication. If indication is not 50 volts, readjust variable resistor R18 to obtain vtvm indication of 50 volts ± 0.1 volt dc.

b. Photocell Output Simulator Adjustment. To adjust the photocell output simulator circuit, proceed as follows:

(1) Set POWER switch (PANEL POWER section) to OFF.

(2) Connect vtvm to DC VOLTS INPUT and GRD terminals (MASTER section).

(3) Set MASTER switch to INTERNAL TEST 1.

(4) Set POWER switch (PANEL POWER section) to ON.

(5) Adjust variable resistor R23 to obtain voltmeter indication of - 3.34 volts ± 50 millivolts dc.

c. Simulated Exposure Feedback Adjustment. To adjust the simulated exposure feedback circuit, pro ceed as follows:

(1) Set POWER switch (PANEL POWER section) to OFF.

(2) Set TEST switch (LENS CONE section) to CAL.

(3) Connect vtvm, adjusted to indicate in millivolt range, between J6, pin W, and ground

(4) Set POWER switch (PANEL POWER section) to ON.

(5) Adjust variable resistor R20 to obtain a vtvm indication of 25 millivolts ± 1 millivolt dc.

d. Recycle Initiate Circuit Timing Adjustment. To adjust the recycle initiate circuit timing, proceed as follows:

(1) Set POWER switch (PANEL POWER section) to OFF.

(2) Connect the digital timer to the test panel in the following manner, connect the BNC adapter 1269 (part of camera analyzer) to the PULSE TIMER terminals (MASTER section). Connect the B input of the pulse timer to the SCOPE VERT terminal.

(3) Set MASTER switch to INTERNAL TEST 1.

(4) Set MODE switch (CAMERA BODY section) to AUTO.

(5) Set POWER switch (PANEL POWER section) to ON.

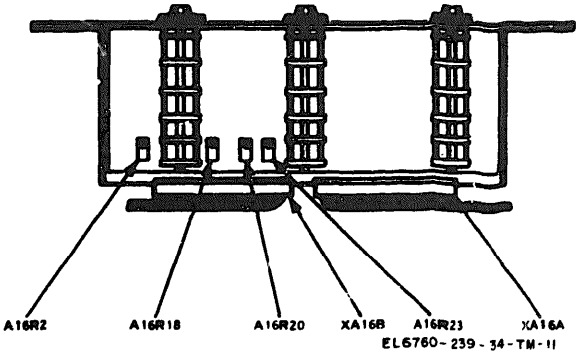


Figure 3-6. Camera analyzer, adjustments.

(6) Set CYCLE PULSE switch (CAMERA BODY section) to MANUAL momentarily.

(7) Observe digital timer indication; if indication is not between 10 and 15 milliseconds, adjust resistor R2, and repeat step (6).

(8) Repeat (7) above until digital timer indication between 10 and 15 milliseconds is obtained.

3-16. Cleaning Camera Analyzer Mechanical Parts and Electrical Contacts

WARNING

The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT use near an open flame. Trichloroethane is not flammable, but exposure of the fumes to an open flame converts the fumes to highly toxic dangerous gases.

To remove grease or dirt from mechanical parts or electrical contacts, wipe the area to be cleaned with a cloth moistened (not wet) with trichloroethane. If it is available, dry the parts with compressed air or wipe them dry with a clean lintfree cloth. Do not allow lint or foreign matter to remain between surfaces of any parts.

Section V. DS MAINTENANCE OF CAMERA TEST ADAPTER

WARNING

Disconnect the power source from the equip ment when making repairs.

3-17. Camera Test Adapter Parts Replacement Techniques

All parts in the camera test adapter can be reached easily and replaced without special procedures. The following precautions apply:

a Before any part is removed, note the position of the part and its leads. Wire replacement parts in the same position so as to avoid undesired coupling and shorting together of wires. If necessary, mark or tag each wire before disconnecting the wire.

b. Do not disturb the settings of exposure control variable resistors R11 and R12 while repairing the equipment. These settings should be changed only if realignment becomes necessary.

3-18. Considerations Before Disassembling Camera Test Adapter

3-9) can simplify repairs by limiting the work to the defective area. Disassemble the camera test adapter only to the level necessary to correct the fault

3-19. Camera Test Adapter DS Replacement Procedures (fig. 3-7)

a. Replacement of Toggle Switches. Remove any of the toggle switches (7, 9, and 10) from the camera test adapter as follows:

(1) Remove the camera test adapter case rear cover (1) for access to internal parts; it is attached to the camera test adapter front cover (2) by four slotted-head screws (3) and flat washers (4).

(2) Unsolder and carefully mark or tag all electrical connections to the part which is to be removed.

(3) Remove the knurled nut, lockwasher and key washer (ref. 7) which secure the switch in place. This hardware is located on the front cover of the case.

(4) Replace the switch or its substitute. and reassemble the camera test adapter by reversing (1), (2), and (3) above.

NOTE

If a switch is found to be defective and must be substituted, ensure that any lugs used with the defective switch are installed on its replacement before mounting the new switch

b. Replacement of Pushbutton Switches.

(1) Perform steps in a(1) and (2) above.

(2) Remove the hex nut and lockwasher (ref. 11) from the switch (11) which are accessible on the rear side of the front cover, then remove the switch through the from cover.

(3) Remount the switch by reversing the procedure in step (2) above.

(4) Reassemble the camera test adapter by reversing steps in a(1) and (2) above.

c. Replacement of Rotary Switch Assemblies. The rotary switches (13 and 14) of the camera test adaptor on the mode and exposure board assembly cannot be replaced at direct support maintenance. Instead, the mode and exposure board assembly must be replaced to effect a switch substitution. For replacement of rotary switch assemblies, refer to higher category of maintenance.

d. Replacement of Binding Post Terminal Assemblies.

(1) Perform steps in a(1) and (2) above.

(2) Remove the hex nut, flat washer, and insulating washer (ref. 15) which secure the binding post terminal assembly (15) in place, then slide the terminal assembly through the front cover. This hardware is located on the rear side of the camera test adapter front cover.

(3) Replace the assembly or its substitute by reversing the procedure given in (2) above.

(4) Reassemble the camera test adapter by reversing steps in a(l) and (2) above.

e. Replacement of Active and Spare Fuseholder Assemblies.

(1) Perform steps in a(1) and (2) above.

(2) Remove the hex nut and lockwasher (ref 18) which secures the fuse holder assembly (18) in place. It is located on the rear side of the camera test adapter front cover.

NOTE

The hex nut has a special cut-out on its inner dimension to clear the lug on the back end of the fuseholder assembly.

(3) Replace the fuseholder assembly or its substitute be reversing the procedure given in (2) above.

(4) Reassemble the camera test adapter by reversing steps (1) and (2) of paragraph a above.

f. Replacement of Multiple-Section Indicator Assemblies.

(1) Perform steps in a(1) and (2) above.

(2) Insert fingernails in cut-out lens (fig. 3-3), and pull lens away from indicator assembly.

(3) Rotate lens 90 degrees counterclockwise, push in slightly to remove tension on index key, then pull complete bulb assembly from indicator body as far as the mechanical stop will allow.

(4) Using screwdriver, loosen two screws on inside of indicator body by rotating counterclockwise until tabs are loose and free from the mounting supports.

(5) Slide mounting support from camera test adapter in direction of arrow.

(6) Remove the indicator body from the front cover.

(7) Instill the replacement indicator lamp assembly by reversing steps in (2) through (6) above.

(8) Reassemble the camera test adapter by reversing steps in a(1) and (2) above.

g. Replacement of Pendant Connector Cables.

(1) Perform steps in a(1) and (2) above.

(2) Open the tie wrap (35, fig. 3-7) on the clamp (34) then remove the cable harness from the clamp.

(3) Remove the cable by pulling through grommet (28) on top of the front cover.

(4) Replace the cable by reversing steps (2) and (3) above.

NOTE

Item 36 is similar to item 29 except that it only supports one cable harness.

(5) Reassemble the camera test adapter by reversing steps in a(l) and (2) above.

h. Removal of Connectors.

(1) Perform steps in a(1) and (2) above.

(2) Release connector (42 or 45) by removing four screws (43) and hex nuts (44).

(3) Install the replacement connector by reversing the procedure given in (2) above.

NOTE

Remember to reconnect terminal lug (46) when replacing the connector.

(4) Reassemble the camera test adapter by reversing steps in a(1) and (2) above.

i. Removal of Printed Circuit Board

(1) Perform steps in a(l) and (2) above.

(2) Remove the knobs (12), hex nuts, and washers (ref. 13) from the two rotary switches (13 and 14) on the front cover.

(3) Remove the two screws (49) and flat washers (31) to release the right side and left side bracket and nut assemblies which secure the printed circuit assembly to the front cover.

(4) Remove the printed circuit assembly through the opening at the back of the front cover.

(5) Install the replacement printed circuit assembly by reversing the procedures given in steps (3) and (4) above.

(6) Reassemble the camera test adapter by reversing step (2) of this subparagraph as well as a(1) and (2) above.

3-20. Cleaning Camera Test Adapter Mechanical Parts and Electrical Contacts

WARNING

The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used, DO NOT use near an open flame. Trichloroethane is not flammable, but exposure of the fumes to an open flame converts the fumes to highly toxic dangerous gases.

To remove grease or dirt from mechanical parts or electrical contacts, wipe the area to be cleaned with a cloth moistened (not wet) with trichloroethane. If it is available, dry the parts with compressed air or wipe them dry with a clean lintfree cloth. Do not allow lint or foreign matter to remain between surfaces of any parts.

Section VI. DS TESTING PROCEDURES

3-21. Direct Support Test Information

a. Direct support test procedures are prepared for use by direct support maintenance personnel and service organizations responsible for direct support maintenance of electronic equipment to determine the acceptability of repaired electronic equipment These procedure-s set forth specific requirements that repaired electronic equipment must meet before it is returned to the using organization.

b. Direct support testing procedures consist of a physical test and inspection and an electric test. These tests are described in paragraphs 3-24 through 3-27.

3-22. Test Equipment and Tools Required for Direct Support Tests

a. Test Equipment.

(1) Multimeter TS-352B/U.

(2) Voltmeter, Electronic ME-202A/U.

(3) Timer, Digital Electronic LA-387A.

(4) Oscilloscope AN/USM-281A.

b. Tools

(1) Tool Kit, Photographic Repair TK-109/GF.

(2) Tool Kit, Photographic Repair TL-77/GF.

3-23. Special Requirements

Fabrication of a test drive generator is required for the performance of the direct support testing procedures for the camera analyzer. Refer to paragraph 3-7 for fabrication details.

3-24. Camera Analyzer DS Physical Tests and Inspection

a Tools, Test Equipment, and Materials. The test equipment and materials required for the camera analyzer physical tests and inspection are listed in table 3-6.

Table 3-6. Tools, Test Equipment, and Materials Required for Camera Analyzer DS Physical Tests and Inspection

Item	National stock number
Tool Kit, Photographic Repair TK-77/GF	5180-00-752-9068
Vacuum cleaner	7910-00-215-5786
Lint-free cloth	8305-00-170-5062
Trichloroethane	6810-00-664 -0273
Camel's hair brush	8020-00-245-4509
Fungus removal solution	6850-00-133-0695

b. Test Connections and Conditions. Remove the camera anayzer test panel from its combination case (para 3-13a). Refer to the parts location illustration (figs. FO-17 and FO-18) when performing the physical tests and inspection

c. Procedure.

Step No.	*Test equipment*	*Equipment under test*	*Control settings* / *Test procedures*	*Performance standard*
1	N/A	N/A	On the camera analyzer front panel, make the following checks and inspections:	
			a. Inspect all controls and switches for loose or	a. Screws, nuts, and bolts must be tight and

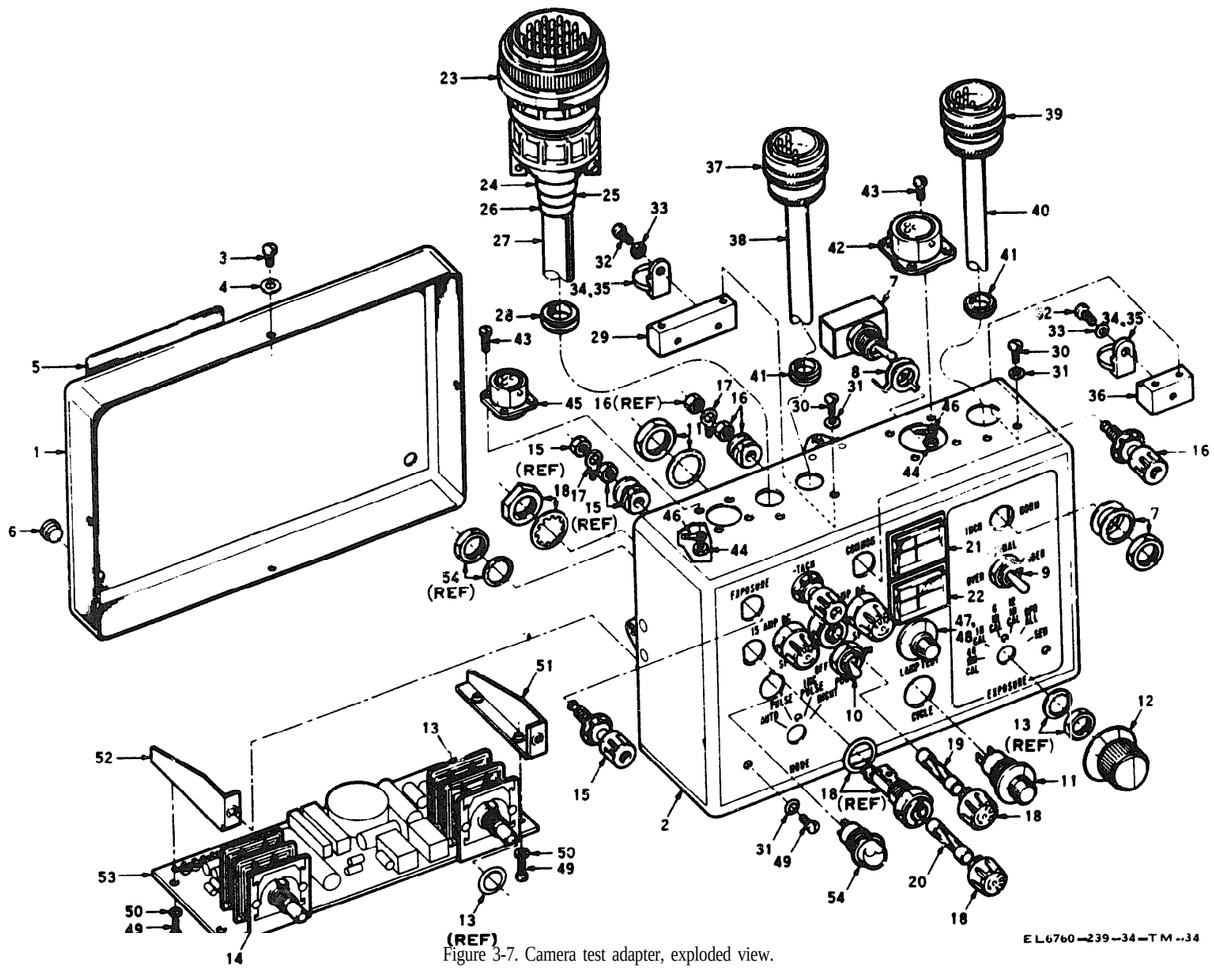


Figure 3-7. Camera test adapter, exploded view.

Key to fig. 3-7.

1 Rear cover
2 Front cover
3 Screw (4)
4 Washer (4)
5 Identification plate
6 Foot (4)
7 Switch, toggle, EXPOSURE INCR-NORM S3 (mounting hardware included with switch.)
8 Terminal (2)
9 Switch, toggle, EXPOSURE OVER-NORMAL-UNDER S4 (Mounting hardware included with switch.)
10 Switch, toggle, POWER S6 (Mounting hardware included with switch.)
11 Switch, pushbuttom CYCLE S7 (Mounting hardware included with switch.)
12 Knob (2)
13 Switch, rotary, EXPOSURE S2 (Mounting hardware included with switch.)
14 Switch, rotary, MODE S1
15 Terminal (3)
16 Post, binding (2); EXPOSURE J3 and TACH J4
17 Post, binding COMMON J5
18 Fuse holder (4); 1.5 AMP DC SPARE, 15 AMP DC, and SPARE
19 Fuse (2) (1.5 AMP)
20 Fuse (2) (15 AMP)
21 Indicator assembly; OPR ON, FILM FAIL, INTLK, and NIGHT lights (Mounting hardware included with indicator assembly.)
22 Indicator assembly; SYNC, FLASH, DATA, and CYCLE lights (Mounting hardware included with indicator assembly.)
23 Pendant connector P3
24 Sleeving (5/8 in. I.D. x 2 in. lg)
25 Sleeving (1/2 in. I.D. x 2 in. lg)
26 Sleeving (3/8 in. I.D. x 2 in. lg)
27 Sleeving (1/4 in. I.D. x 2 in. lg)
28 Grommet
29 Support
30 Screw (4)
31 Washer (6)
32 Screw (3)
33 Washer (3)
34 Clamp (3)
35 Tie wrap (3)
36 Support
37 Pendant connector P1
38 Sleeving (1/4 in. I.D. x 30 in. lg)
39 Pendant connector P2
40 Sleeving (5/16 in. I.D. x 30 in. lg)
41 Grommet (2)
42 Connector J1
43 Screw (8)
44 Nut (8)
45 Connector J2
46 Terminal (2)
47 Switch, toggle, LAMP TEST
48 Shield, knurled
49 Screw (6)
50 Washer (4)
51 Bracket and nut assembly, left side
52 Bracket and nut assembly, right side
53 Mode and exposure board and switch assembly
54 Light assembly, indicator, power

c. *Procedure*—Continued

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
			missing screws, bolts. and nuts.	none missing.
			b. Inspect indicator assemblies for damage.	b. No evidence of damage.
			c. Check operating fuses for proper rating. See that SPARE fuseholders contain fuses with proper rating.	c. Operating fuses must be damaged and must be of proper rating. Each SPARE fuseholder must contain a fuse of proper rating.
			d. Inspect wiring for cuts, breaks, and damaged insulation.	d. Wiring must be free of cuts. breaks, and damaged insulation.
			WARNING The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT use near an open flame. Trichloroethane is not flammable but exposure of fumes to open flame converts fumes to highly toxic, dangerous gases.	
			f. Inspect interior of chassis for signs of dirt or fungus. Remove dirt with lint-free cloth dampened with trichloroethane or fungus removal solution.	f. Interior of chassis must be clean with no signs of dirt or fungus.
			g. Inspect condition of finish and panel lettering.	g. External surfaces must be in good condition and panel lettering must be legible.
			NOTE Touch up painting is recommended in lieu of refinishing whenever practicable Screwheads, biding posts, receptacles. and plated fastener parts will not be painted or polished with abrasives.	
2	N/A	N/A	inspect cable assemblies for cuts. breaks. damaged insulation, or broken connectors.	Cable assemblies must be free of cuts, breaks. damaged insulation, or broken connectors.
3	N/A	N/A	Inspect camera analyzer accessories for missing hardware. damage and completeness (TM 11-6760-239-12).	Accessories must be free of damage and no parts missing and complete.
4	N/A	N/A	Inspect combination case for damage. See that there are no missing screws and hardware from mounts.	Combination case must be free from damage and no parts missing

3-25. Camera Analyzer DS Electrical Test

a. Tools, Test Equipment and Materials.

(1) Multimeter TS-352B/U.
(2) Voltmeter, Electronic ME-202A/U.
(3) Timer, Digital, Electronic LA-387A.
(4) Oscilloscope AN/USM-281A.
(5) Tool Kit, Photographic Repair TK-77/GF.
(6) Tool Kit, Photographic Repair TK-109/GF.

b. Test Conditions and Connections.

(1) Fabricate the test drive generator in accordance with figure 3-1.

(2) Connect the camera analyzer and test equipment as shown in figure 3-2.

c. Procedure. Perform the bench test as described in paragraph 3-7 b.

3-26. Camera Test Adapter DS Physical Tests and Inspection

a Test Equipment and Materials. The test equip ment and materials required for camera test adapter physical tests and inspection are listed in table 3-7.

Table 3-7. Tools, Test Equipment, and Materials Required for Camera Test Adapter Physical Tests and Inspection

Item	National stock number
Tool Kit Photographic Repair TK-77/GF	5180-00-752-9068
Vacuum cleaner	7910-00-215-5786
Lint-free cloth	8305-00-170-5062
Trichloroethane	6810-00-664-0273
Camel's hair brush	8020-00-245-4509
Fungus removal solution	6850-00-133-0695

b. Test Connections and Conditions. Remove the camera test adapter cover (para 3-19a). Refer to the parts location illustration (fig. 3-7) when performing the physical tests and inspection.

c. Procedure.

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
1	N/A	N/A	**On the camera test adapter front panel make the following checks and inspections:**	
			a. Inspect all controls and switches for loose or missing screws, bolts, and nuts.	a. Screws, nuts, and bolts must be tight and none missing.
			b. Inspect indicator assemblies for damage.	b. No evidence of damage.
			c. Check operating fuses for proper rating. See that SPARE fuseholders contain fuses with proper rating.	c. Operating fuses must not be damaged and he of proper rating. Each SPARE fuse holder must contain a fuse of proper rating.
			d. Inspect wiring for cuts, breaks, and damaged insulation.	d. Wiring must be free of cuts. breaks, and damaged insulation
			WARNING **The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT use near an open flame. Trichloroethane is not flammable, but exposure of fumes to open flame converts fumes to highly toxic, dangerous gases.**	
			f. Inspect interior of chassis for signs of dirt or fungus. Remove dirt with lint-free cloth dampened with trichloroethane or fungus removal solution.	f. Interior of chassis must be clean with no signs of dirt or fungus.
			g. Inspect condition of finish and panel lettering. NOTE Touchup painting is recommended in lieu of refinishing whenever practicable. Screwheads. binding posts, receptacles, and plated fastener parts will not be painted or polished with abrasives.	g. External surfaces must be in good condition and panel lettering must be legible.
2	N/A	N/A	Inspect the pendant cable assemblies for cuts, breaks, damaged insulation, or broken connectors.	Pendant cable assemblies must be free of cuts, breaks, damaged insulation, or broken connectors.

3-27. Camera Test Adapter DS Electrical Test

a Tools, Test Equipment, and Materials.

(1) Multimeter TS-352B/U.
(2) Voltmeter, Electronic ME-202A/U.
(3) Tool Kit, Photographic Repair TK-77/GF.

(4) Tool Kit, Photographic Repair TK-109/GF.

b. Test Conditions and Connections. Connect power cable W9 to a 28-volt de power source and to connector J1 or the camera test adapter.

c. Procedure. Perform the bench test as described in paragraph 3-9a.

CHAPTER 4

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

4-1. Scope of General Support Maintenance

This chapter contains the following general support maintenance functions for the camera analyzer and camera test adapter: bench testing, troubleshooting, voltage and resistance measurements, disassembly, reassembly, and general support testing procedures. The general support maintenance procedures supplement the direct support maintenance instructions and the maintenance procedures contained in TM 11-6760-239-12.

4-2. Organization of General Support (GS) Maintenance

The maintenance duties of the general support repairman for the camera analyzer and camera test adapter are contained in a and b below together with references to the paragraphs covering the specific maintenance function.

a Camera Analyzer GS Troubleshooting Procedures. The GS troubleshooting procedures for the camera analyzer are listed below:

(1) Lamp teat circuit.
(a) Bench test (para 4-8a).
(b) Troubleshooting procedures (para 4-8b).

(2) Internal test 1 circuit.
(a) Bench test (para 4-9a).
(b) Troubleshooting procedures (para 4-9b).
(c) Voltage and resistance measurements (para 4-9c).

(3) Internal test 2 circuit.
(a) Bench test (para 4-10a).
(b) Troubleshooting procedures (para 4-10b).
(c) Voltage and resistance measurements (para 4-10c).

(4) Control-power supply section.
(a) Bench test (para 4-11b).
(b) Troubleshooting procedures (para 4-11c).
(c) Voltage and resistance measurements (para 4-11d).

(5) Lens cone section.
(a) Bench test (para 4-12b).
(b) Troubleshooting procedures (para 4-12c).
(c) Voltage and resistance measurements (4-12d).

(6) Camera body section.
(a) Bench test (para 4-13b).
(b) Troubleshooting procedures (para 4-13c).
(c) Voltage and resistance measurements (para 4-13d.

b. Camera Analyzer GS Replacement Procedures. The camera analyzer replacement procedures are contained in paragraph 4-18.

c. Camera Test Adapter GS Troubleshooting Procedures. The camera test adapter GS troubleshooting procedures are contained in paragraph 4-14.

d. Camera Test Adapter GS Replacement Procedures. The camera test adapter replacement procedures are contained in paragraph 4-24.

Section II. TOOLS AND EQUIPMENT (GS)

4-3. Tools and Test Equipment Required for General Support Maintenance

Refer to the maintenance allocation chart (TM 11-6760-239-12) for a listing of tools and test equipment required to perform the maintenance functions outlined in paragraph 4-2.

4-4. Materials Required for General Support Maintenance

The materials required for general support maintenance are listed in table 4-1.

Table 4-1 Materials Required for General Support Maintenance

Item	Quantity	National stock number
Trichloroethane	As required	6810-00-664-0273
Solder	As required	3439-00-194 -9727
Lint-free cloth	As required	8305-00-170-5062
Xylol (Feder Spec. TT-X-916)	As required	6610-00-584-4070
Butyl alcohol	As required	6810-00-281-2685
Araldite 571CX	As required	
Diacetone alcohol (Federal spec. 0-0-306)	As required	
Fungus removal solution (mixture of Isopropyl	As required	6650-00-133-0695

Table 4-1. Materials Required For General Support Maintenance - Continued

Item	Quantity	National stock numbers
alcohol 65% and Freon 35%		
Sandpaper	As required	5350-00-235-0124
Liquid staking compound GE1201F	As required	
Glyptal thinner 1500	As required	
Wiring- No. 16 AWG	As required	6145-00-846-9818
No. 18 AWG	As required	6145-00-805-1720
No. 22 AWG	As required	6145-00-954-5121
Sealing compound, Loctite Grade A (red)	As required	8030-00-680-0889
Lacquer, acrylic, resin type, (purple)	As required	8010-00-835-1424
Epoxy adhesive, MIL-A-1402	As required	
Acetone (Federal Spec. O-A-51) Variable voltage test fixture fabrication: (Used for control-power supply bench test (para 4-1))	As required	
Fuse FHN 26W	1	5920-00-952-9029
Connector, Type 3017, Federal supply code 83330	3	
Resistor RV6NAYSD102A	1	5905-00-577-1761
Resistor RNR63C6R80F	1	
Switch MS-24655-221	1	5930-00-892-9550
Repair Kit, Printed Wiring Board MK-772/U	1	5999-00-757-7042

Section III. GS TROUBLESHOOTING

WARNING

Be careful when troubleshooting the equipment. Dangerous voltages exist in the equip ment.

4-5. GS Troubleshooting Information

GS troubleshooting procedures include all troubleshooting actions performed at lower levels of maintenance in addition to the information contained in this chapter. Refer to TM 11-6760-239-12 for troubleshooting information on the more commonly encountered troubles Unless the trouble has been specifically localized or isolated, perform the applicable troubleshooting procedures given in TM 11-6760-239-12. The symptoms and troubles listed in the GS troubleshooting tables are presumed to exist after all lower level troubleshooting procedures and corrective measures have been performed. The major unit troubleshooting and module troubleshooting data provide general support maintenance personnel with the information required to recheck, crosscheck, and correlate all information from the lower levels of maintenance with the test equipment and tools available at the general support maintenance level. Perform the procedures in the troubleshooting tables in the order given. Do not proceed to the next action when the corrective measures already taken eliminate the trouble Use the applicable schematic and wiring diagrams as an aid when troubleshooting. Figure FO-20 provides the color code markings for military standard resistors, inductors, and capacitors.

4-6. signal Substitution

Signal substitution procedures quickly enable the general support repairman to localize a fault. A variable voltage test fixture (fig. 4-1) is used for the control-power supply, lens cone section, and camera body section bench tests. Instructions for fabrication of the variable voltage test fixture are given in paragraph 4-11a. An oscilloscope, RC bridge, or voltmeter may also be used in performing signal sub stitution procedures. Signal substitution and signal tracing techniques are given below.

a. Test jumper cables can be used to apply either +28 volts dc power or ground to particular points throughout the equipment.

b. Voltmeter, Electronic ME-202A/U (vtvm) is used to measure voltages. Multimeter TS-352B/U (multimeter) is used to measure resistance.

NOTE

When connecting the test jumper cables, it may be necessary to partially remove the fungicide coating to ensure proper electrical contact. Use acetone (Federal Specification O-A-51) to remove the fungicide from electrical contact points.

c. After trouble is traced to a particular circuit, disconnect the test equipment and perform voltage and resistance measurements to localize the defective parts.

4-7. Isolating Trouble Within a Stage

a. When trouble has been localized to a stage, either through performance of the bench tests, or other means, isolate the defective part by measuring voltages at the transistor terminals and other points related to the stage suspected being faulty.

CAUTION

Do not take resistance measurements on the transistors. The multimeter battery can damage the transistors by causing excessive current through them.

b. Transistor terminal voltage measurements are made with the vtvm. Measurements that differ widely from those in the voltage tables can, when used with the appropriate schematic diagram, often localize the trouble to a specific part.

NOTE

Voltages measured at the emitter and base terminala of replaced transistors may vary as much as 15 to 20 percent from the voltage listed in the voltage tables. Collector voltages, however, should not vary by more than 10 percent. Bias voltage should remain approximately the same as those listed in the voltage tables.

NOTE

All troubleshooting procedures on the camera analyzer are performed with the test panel removed from the combination case (para 3-13a), and power cable W9 connected to POWER connector Jl.

4-8. Lamp Test Circuit Troubleshooting

a. Bench Test.

(1) Set all controls and switches to their off, neutral, or counterclockwise positions.

(2) Connect power cable W9 to primary power source and to POWER connector J.

(3) Perform the lamp test circuit bench test given in table 4-2.

Table 4-2. Lamp Test Circuit Bench Test

Step	*Procedure*	*Result/indication*
1	Set POWER switch (PANEL POWER section) to ON	*a.* AC PWR and DC PWR indicators light. *b.* AC and DC fuse indicators do not light.
2	Hold LAMP TEST switch (MASTER section) at ON until all front panel indicators are carefully observed; then release to OFF.	All remaining front panel indicators light while switch is in ON position.

b. Lump Test Circuit Troubleshooting Procedures. Steps referenced in the Trouble symptom column table 4-3, refer to the numbered steps in the bench test (a above). Electronic parts referenced in the trouble shooting table are shown in the schematic diagram (fig. FO-12) and wiring diagram (fig. FO-13).

NOTE

In the following troubleshooting table, the maintenance repairman should check first for defective indicator lamp before replacing part as indicated in the table.

Table 4-3. Lamp Test Circuit Troubleshooting

Item	*Trouble symptom*	*Probable trouble*	*Correction*
1	AC PWR indicator does not light; AC indicator fuse lights (step 1).	*a.* Defective fuse F1.	*a.* Replace fuse F1.
		b. Defective indicator assembly A6.	*b.* Replace (para 3-13*a*).
		c. Defective POWER connector J1.	*c.* Check continuity through pin A of connector J1. Replace connector if defective (para 4-18*a*).
2	DC PWR indicator does not light; DC indicator fuse lights (step 1).	*a.* Defective fuse F2.	*a.* Replace fuse F2.
		b. Defective indicator assembly A6.	*b.* Replace (para 3-13*a*).
		c. Defective POWER connector J1.	*c.* Check continuity through pin J of connector J1. Replace connector if defective (para 4-18*a*).
3	INCR LIM indicator DSI does not light (step 2).	Defective diode CR56	Replace diode CR56 (para 4-19).
4	DECR indicator DS4 does not light (step 2).	Defective diode CR61	Replace Diode CR61 (para 4-19).
5	INCR indicator DS3 does not light (step 2).	Defective diode(s) CR57, CR58, CR59, or CR60.	Replace defective diode (para 4-19).
6	DECR LIM indicator DS2 does not light (step 2).	Defective indicator assembly A10 or LAMP TEST switch S6.	Replace indicator assembly (para 3-13*a*) or switch (para 3-13*b*).
7	UNDER indicators DS3 and DS4 do not light (step 2).	Defective diode CR53.	Replace diode CR53 (para 4-19).
8	OVER indicators DS1 and DS2 do not light (step 2).	Defective diode CR52.	Replace diode CR52 (para 4-19).
9	44MM indicator DS1 does not light (step 2).	Defective diode CR3.	Replace diode CR3 (para 4-21).
10	3 IN. indicator DS2 does not light (step 2).	Defective diode CR44.	Replace diode CR44 (para 4-19).
11	6 IN. indicator DS3 does not light (step 2).	Defective diode CR47.	Replace diode CR47 (para 4-19).
12	12 IN. indicator DS4 does not light (step 2).	Defective diode CR46.	Replace diode CR46 (para 4-19).
13	RIGHT A indicator DS2 does not light (step 2).	Defective diode CR42.	Replace diode CR42 (para 4-19).
14	LEFT A indicator DS1 does not light (step 2).	Defective diode CR39.	Replace diode CR39 (para 4-19).
15	RIGHT B indicator DS4 does not light (step 2).	Defective diode CR41.	Replace diode CR41 (para 4-19).
16	LEFT B indicator DS3 does not light (step 2).	Defective diode CR40.	Replace diode CR40 (para 4-19).

Table 4-3. Lamp Tent Circuit Troubleshooting - Continued

Item	Trouble symptom	Probable trouble	Correction
17	INTERVAL PULSE indicators DS1 and DS2 does not light (step 2).	Defective diode CR105.	Replace diode CR105 (para 4-19).
18	MODULE INTVL indicator DS3 does not light (step 2).	Defective diode CR114.	Replace diode CR114 (para 4-19).
19	MODULE FILM DRIVE indicator DS4 does not light (step 2).	Defective diode CR113.	Replace diode CR113 (para 4-19).
20	MOUNT AC indicator DS1 does not light (step 2).	Defective diode CR118.	Replace diode CR118 (para 4-19).
21	AC ØA indicator DS2 does not light (step 2).	Defective diode CR119.	Replace diode CR119 (para 4-19).
22	CAMR 28V indicator DS3 does not light (step 2).	Defective diode CR121.	Replace diode CR121 (para 4-19).
23	AC ØB indicator DS4 does not light (step 2).	Defective diode CR120.	Replace diode CR120 (para 4-19).
24	INTVL PULSE indicator DS1 does not light (step 2).	Defective diode CR108.	Replace diode CR108 (para 4319).
25	VERT POS indicator DS3 does not light (step 2).	Defective diode CR100.	Replace diode CR100 (para 4-19).
26	RELAY OPR indicator DS4 does not light (step 4).	Defective diode CR101.	Replace diode CR101 (para 4-19).
27	MAN PIC indicator DS2 does not light (step 2).	Defective diode CR99.	Replace diode CR99 (para 4-19).
28	SYS RDY indicator DS1 does not light (step 2).	Defective diode CR95 or CR94.	Replace diode CR95 or CR94 (para 4-19).
29	NIGHT EXP indicator DS3 does not light (step 2).	Defective diode CR97.	Replace diode CR97 (para 4-19).
30	FLASH AC indicator DS2 does not light (step 2).	Defective diode CR96.	Replace diode CR96 (para 4-19).
31	FLASH DC indicator DS4 does not light (step 2).	Defective diode CR98.	Replace diode CR98 (para 4-19).
32	NIGHT indicator DS4 does not light (step 2).	Defective diode CR22 or resistor R5.	Replace diode CR22 or resistor R5 (para 4-19).
33	AUTO TRIP indicator DS2 does not light (step 2).	Defective diode CR20.	Replace diode CR20 (para 4-19).
34	FILM FAIL indicator DS1 does not light (step 2).	Defective diode CR18.	Replace diode CR18 (para 4-19).
35	NIGHT INTLK indicator DS3 does not light (step 2).	Defective diode CR21.	Replace diode CR21 (para 4-19).
36	EXP RESET indicator DS1 does not light (step 2).	Defective diode CR13.	Replace diode CR13 (para 4-19).
37	BODY RDY indicator DS3 does not light (step 2).	Defective diode CR16.	Replace diode CR16 (para 4-19).
38	BODY OPR indicator DS4 does not light (step 2).	Defective diode CR17.	Replace diode CR17 (para 4-19).
39	SIM OPR indicator DS2 does not light (step 2).	Defective diode CR15.	Replace diode CR15 (para 4-19).
40	CYCLE PULSE indicator DS1 and DS2 do not light (step 2).	Defective diode CR8.	Replace diode CR8 (para 4-19).
41	RECYCLE INHIBIT indicators DS3 and DS4 do not light (step 2).	Defective diode CR10.	Replace diode CR10 (para 4-19).
42	SCOPE indicator DS1 does not light (step 2).	Defective diode CR3.	Replace diode CR3 (para 4-19).
43	VOM DC indicator DS2 does not light (step 2).	Defective diode CR4.	Replace diode CR4 (para 4-19).
44	WIDTH INDICATOR DS3 does not light (step 2).	Defective diode CR6.	Replace diode CR6 (para 4-19).
45	INTVL indicator DS4 does not light (step 2).	Defective diode CR5.	Replace diode CR5 (para 4-19).
46	R/C BRIDGE indicators DS1 and DS2 do not light (step 2).	Defective diode CR2.	Replace diode CR2 (para 4-19).
47	DC VOLTS indicators DS3 and DS4 do not light (step 2).	Defective diode CR1.	Replace diode CR1 (para 4-19).

4-9. Internal Test Circuit Troubleshooting

Internal test 1 circuit troubleshooting consists of a bench test (a below), troubleshooting table (b below), and voltage and resistance measurements (c below). The bench test is performed using the test setup of paragraph 3-7a (steps 1 through 8). When an abnormal result is obtained during performance of the bench test, refer to the troubleshooting table.

a. Bench Test. Perform the internal test 1 bench test given in table 4-4 below.

Table 4-4. Internal Test, Circuit Bench Test

Step	Procedure	Result
1	Set POWER switch (PANEL POWER section) to ON.	COUNTER INTVL indicator lights.
2	Set MASTER switch (MASTER section) to INTERNAL TEST 1.	a. VOM DC indicator lights. b. DC VOLTS indicator lights. c. Multimeter indicates - 25 ± 5 volts dc d. Vtvm indicates - 3.34 volts ± 50 millivolts dc.
3	Set CYCLE PULSE switch (CAMERA BODY section) momentarily to MANUAL, then release.	a CYCLE PULSE indicator flashes. b. RECYCLE INITIATE indicator flashes c. Digital timer indicates between 10 and 15 milliseconds.

b. Internal Test 1 Circuit Troubleshooting Procedures. Step referenced in the Trouble symptom column in table 4-5, refer to the numbered steps in the bench test (a above). Electronic parts referenced in the troubleshooting table are shown in the schematic diagram (fig. FO-12) and wiring diagram (fig. FO-13).

Table 4-5. Internal Test I Circuit Troubleshooting

Item	Trouble symptom	Probable trouble	Correction
1	COUNTER INTVL indicator does not light step 1).	Defective MASTER switch	Check continuity through MASTER switch replace if defective (para 4-18b).
2	VOM DC indicator does not light (step 2).	Defective MASTER switch	Same as step 1 above.
3	DC VOLTS indicator does not light (step 2).	Defective MASTER switch	Same as step 1 above.
4	No voltage or low voltage indication on multimeter (step 2).	a. Defective component in -28 volts dc power supply.	a Check voltage and resistsance to isolate and replace detective component (para 4-9c).
		b. Defective MASTER switch	b. Check continuity through MASTER switch; replace if defective (para 4-18b).
5	No voltage or out of tolerance indication on vtvm (step 2).	a Defective component in photo cell output simulator circuit.	a Check voltage and resistance to isolate and replace defective component (para 4-9c).
		b. Photocell output simulator circuit out of adjustment.	b. Check adjustment and correct as required (para 3-15b).
		c. Defective MASTER switch	c. Check continuity through MASTER switch replace if defective (para 4-18b).
		d. Defective resistor Rl3.	d. Replace resistor R13 (para 4-21).
6	CYCLE PULSE indicator does not flash (step 3).	a Defective MASTER switch	a. Check continuity through MASTER switch. replace if defective (para 4-18b).
		b. Defective diode CR7.	b. Replace diode CR7.
7	RECYCLE INITIATE indicator does not flash (step 3).	a Defective unijunction transistor Q1 or associated circuit component.	a Check and replace defective component (para 4-21).
		b. Defective relay K1 or K2.	b. Check relays and replace if de fective (para 4-19).
		c Defective diode CR9 or CR12.	c. Replace diode CR9 or CR12 (para -19).
8	Digital timer indication outside of tolerance specified (step 3).	a Defective timing circuit component (transistor Ql, resistors R2 through R4, capacitor C2).	a Check and replace defective component (para 4-19).
		b. Incorrect adjustment.	b. Check adjustment and correct if required (para 3-15d).
		c. Defective resistor R12.	c. Replace resistor R12 (para 4-21).
		d. Defective diode CR9.	d. Replace diode CR9 (para 4-21).

c. Internal Test 1 Circuit Voltage and Resistance Measurements. **Use the schematic diagram (fig. FO-12), wiring diagram (fig. FO-13), and parts location diagrams (fig. 4-2 through 4-4, FO-17, and FO-19) as an aid when making voltage and resistance measurements.**

(1) *Voltage measurements.* **Measure voltages between the designated points** and chassis ground in table 4-6. Be sure to observe polarity. Adjust the vtvm for proper range as required when making the voltage measurements.

Table 4-6. Internal Test 1 Circuit Voltage Measurement

Pin/Point	*Voltage to ground*	*Conditions*
XA16B, pin 12	Zero	
A2, pin G	+28 vdc	
XA16B, pin 13	Zero	
XA16B, pin V	Zero	
Junction of CR34 CR35	−28 vdc	
Emitter of Q2	−3.34 vdc	
Junction of R22 and R23	−5.1 vdc	
J3, pin N	+28 vdc	Set MASTER switch to CAMERA BODY; MODE switch to AUTO, PULSE or PULSE IMC; and CYCLE PULSE switch to MANUAL.
J3, Pin J	+28 vdc	Set MASTER switch to CAMERA BODY; MODE switch to AUTO, PULSE or PULSE IMC; and CYCLE PULSE switch to MANUAL.
J3, pin W	+28 vdc	Set MASTER switch to CAMERA BODY.

(2) Resistance measurements. Measure resistance between points given in table 4-7. Make measurements with power cable W9 disconnected from POWER connector J1.

Table 4-7. Internal Test 1 Circuit Resistance Measurements

Pin/point	Resistance *(ohms)*
XA16B. pin 12 to ground	zero
XA16B, pin 13 to ground	Zero
XA16B, pin V to ground	zero
XA16B, pin 3 to J14	390
J19 to ground	zero
J3, pin N to J3, pin J	Zero

4-10. Internal Test 2 Circuit Troubleshooting

a. Bench Test. **Perform the internal test 2 circuit bench test given in table 4-8.**

NOTE

The bench test is performed with the vtvm connected to DC volts input and GRD terminals.

Table 4-8. Internal Test 2 Circuit Bench Test

Step	*Procedure*	*Result/indication*
1	Set POWER switch (PANEL POWER section) to ON.	DC VOLTS indicator lights.
2	Set MASTER switch (MASTER section) to INTERNAL TEST 2.	Vtvm indication tracks setting of E V/H control.

b. Internal Test 2 Circuit Troubleshooting Procedures. Steps referenced in the Trouble symptom column in table 4-9, refer to the numbered steps in the bench test (a above). Electronic parts referenced in the troubleshooting table are shown in the schematic diagram (fig. FO-12), and wiring diagram (fig. FO-13).

Table 4-9. Internal Test 2 Circuit Troubleshooting

Item	Trouble symptom	Probable trouble	Correction
1	DC VOLTS indicator does not light (step 1).	Defective MASTER switch	Check continuity through MASTER switch; replace if defective (para 4-18*b*).
2	Vtvm does not track E V/H control setting (step 2).	*a.* Defective MASTER switch *b.* Defective operational amplifier A2. *c.* Defective component in operational amplifier power supply (part of A16). *d.* Defective component in +50 vdc regulator circuit. *e.* +50 volts regulator circuit out of adjustment. *f.* Defective resistor R13.	*a.* Same as step 1 above. *b.* Check and replace if defective (para 4-19). *c.* Check and replace defective component (para 4-19). *d.* Check and replace defective component (para 4-19). *e.* Perform adjustment procedure (para 3-15*a*). *f.* Replace resistor R13 (para 4-19).

c. Internal Test 2 Circuit Voltage and Resistance Measurements. **Use the schematic diagram (fig. FO-12), wiring diagram (fig. FO-13), and parts location diagrams (fig. 4-2 through 4-4, FO-17, and FO-19) as an aid when making voltage and resistance measurements.**

(1) Voltage measurements. Measure voltages between the designated points/and chassis ground in table 4-10 unless otherwise specified. Adjust the vtvm for proper range as required when making the voltage measurements

Table 4-10. Internal Test 2 Circuit Voltage Measurements

Pin/point	Voltage	Conditions
XA16B. pin V	zero	
J9, pin DD	- 25 vdc	E V/H control set to 25
A2, pin 2	-25 vdc	EV/H control set to 25
Between TP2(-) and TP1(+)	+ 13 vdc	
Between TP3(-) and TP2(+)	- 13 vdc	
TP5	+50 vdc	
TP4	+8.2 vdc	

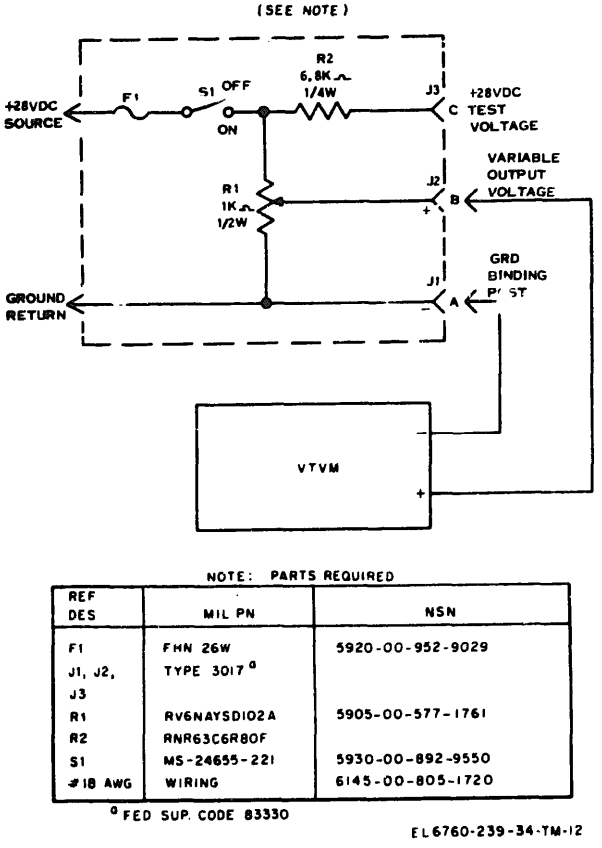


Figure 4-1. Variable voltage test fixture, fabrication details.

(2) Resistance measurements. Measurements resistance between points given in table 4-11. **Make** measurements with power cable W9 disconnected from POWER connector J1.

Table 4-11. Internal Test 2 Circuit Resistance Measurements

Pin/point	Resistance (ohms)
XA26B, pin V to ground	Zero
J18 to J9, pin DD	1K

4-11. Control-Power Supply Section Troubleshooting

a. Preliminary Procedures.

(1) Fabricate the variable voltage test fixture in accordance with figure 4-1.

(2) Connect one end of a 2-foot long wire (black) to the chassis of the test panel. Install a small alligator clip to the other end of the wire. This connection will serve as the test ground.

(3) Set MASTER switch to CONTROL PWR SUPPLY.

(4) Set POWER switch to ON.

b. Bench Test. Perform the control-power supply section bench test given table 4-12.

WARNING

Be careful when applying voltages or grounds to pins of connectors. Make connections with power off. Always disconnect the test voltage after observations are completed and before proceeding to the next step.

NOTE

All switches remain in positions given unless instructed. otherwise. When making continuity or resistance measurements, always disconnect power cable W9 from POWER connector J1. An asterisk (*) next to the step number serves as a reminder to disconnect power cable W9 from primary power source.

Table 4-12. Control-Power Supply Section Bench Test

Step	Procedure	Result/indication
1	Set MODULE TEST switch (CONTROL-POWER SUPPLY section) to INTVL R9 BAL.	MAN PIC indicator lights.
2	Apply +28 vdc output of variable voltage test fixture to J11, pin k momentarily.	INTVL and DC VOLTS indicators light.
3*	Measure continuity between DC VOLTS GRD connector and ground, using multimeter.	Multimeter indicates zero resistance.
4	Connect test drive generator (fig. 3-1) to MODULES connector J11, and set power switch on test drive generator to on.	Lamps DS1 thru DS4 on chassis and components assembly light.
5	Measure voltage on J11, pin y, using vtvm.	Vtvm indicates approximately – 50 volts dc.
6	Momentarily depress OPERATE OFF switch.	Vtvm on J11, pin y indicates zero vdc.
7*	Disconnect test drive generator from J11, and measure resistance between J11, pin w and DC VOLTS INPUT connector, using multimeter.	Multimeter indicates 1K ohm resistance.

Table 4-12. Control Power Supply Section Bench Test - Continued

Step	Procedure	Result/indication
8*	Measure continuity between J11, pin q and ground using multimeter.	Multimeter indicates zero resistance.
9	Insert one end of 10K ohm, 1/4 watt resistor onto center tap of E V/H control; set control dial to 39; then connect other end of resistor and multimeter to J11, pin u momentarily and observe, vtvm indication	Vtvm indication decreases from 39 volts dc to 33 volts dc.
10*	Measure continuity between J11, pin v and J11, pin t, using multimeter.	Multimeter measure zero resistance.
11*	Disconnect test setup of step 9. and measure continuity between J11, pair and ground, using multimeter.	Multimeter indicates zero resistance.
12	Set MODULE TEST switch to INTVL R7 BAL, and apply + 28 vdc output of variable voltage teat fixture to J11. pin k momentarily.	INTVL and DC VOLTS indicators light.
13*	Measure continuity between DC VOLTS GRD terminal and ground using multimeter.	Multimeter indicates zero resistance.
14*	Measure resistance between DC VOLTS INPUT terminal and J11, pin w. using multimeter.	Multimeter indicates 1K ohm resistance.
15*	Measure continuity between J11, pin v and J11, pin t, using multimeter.	Multimeter indicates zero resistance.
16	Insert one end of 10K ohm, 1/4 watt resistor onto center tap of E V/H control; set control dial to 39; then connect other end of resistor and vtvm to J11, pin u momentarily and observe vtvm indication	Vtvm indication decreases from 39 volts dc to 33 volts dc.
17	Set MODULE TEST switch to INTVL OPR and disconnect test setup of step 9, then apply + 28 vdc output of variable voltage test fixture to J11, pink momentarily.	COUNTER INTVL, MODULE INTVL, COUNTER WIDTH and SCOPE indicators light
18*	Measure continuity between SCOPE GRD terminal and ground using multimeter.	Multimeter indicates zero resistance.
19*	Measure resistance between SCORE VERT terminal and J11, pin m, using multimeter.	Multimeter indicates 1K ohm resistance.
20	Apply +28 vdc output of variable voltage test fixture to J11, pm n momentarily.	INTVL PULSE indicate lights.
21	Apply + 28 vdc output of variable voltage text fixture to J11, pm m momentarily.	INTERVAL PULSE indicator lights.
22	Measure voltage on J11, pin r, using vtvm	Vtvm indicates setting of E V/H control
23	Set MODULE TEST switch to INTVL + 40VDC, and apply +28 vdc output of variable voltage test fixture to J11, pin k.	INTVL, DC VOLTS and SCOPE indicators light.
24*	Measure continuity between DC VOLTS GRD terminal and ground using multimeter.	Multimeter indicates zero resistance.
25*	Measure continuity between SCOPE GRD terminal and ground using multmeter.	Multimeter indicates zero resistance.
26*	Measure resistance between DC VOLTS INPUT terminal and J11, pm u, using multimeter.	Multimeter indicates 1 K ohm resistance.
27*	Measure resistance between SCOPE VERT terminal and J11, pin u, using multimeter.	Multimeter indicates 1 K ohm resistance.
28	Measure voltage on J11, pin r, using vtvm.	V tvm indicates setting of E V/H control
29	Set MODULE TEST switch to INTVL -40 VDC, and apply +28 vdc output of variable voltage text fixture to J11, pin k.	INTVL, DC VOLTS and SCOPE indicators light
30*	Measure continuity between DC VOLTS GRD terminal and ground using multimeter.	Multimeter indicatea zero resistance.
31*	Measure continuity between SCOPE GRD terminal and ground using multimeter.	Multimeter indicates zero resistance.
32*	Measure resistance between J11, pin t and DC VOLTS INPUT terminal using multimeter.	Multimeter indicates 1 K ohm resistance
33*	Measure resistance between J11, pin t and SCOPE VERT terminal using multimeter.	Multimeter indicatea 1 K ohm resistance.
34	Measure voltage on J11, pin r, using vtvm.	V tvm indicatea setting of E V/H control
35	Set MODULE TEST switch to INTVL TP3, and apply + 28 vdc output of variable voltage text fixture to J11, pink.	INTVL, DC VOLTS and SCOPE indicators light
36*	Measure continuity between DC VOLTS GRD terminal and ground, using multimeter.	Multimeter indicates zero resistance.
37*	Measure continuity between SCOPE GRD terminal and ground using multimeter.	Multimeter indicates zero resistance.

Table 4-12. Control-Power Supply Section Bench Test - Continued

Step	Procedure	Result/Indication
38*	Measure resistance between J11, pin v and DC VOLTS INPUT terminal using multimeter.	Multimeter indicates 1 K ohm resistance.
39*	Measure resistance between J11, pin v and SCOPE VERT terminal using multimeter.	Multimeter indicates 1 K ohm resistance.
40	Measure voltage on J11, pin r. using vtvm.	V tvm indicates setting of EV/H control.
41	Set MODULE TEST switch to FDA R13ADJ, and apply +28 vdc output of variable voltage test fr: to pin J11, pin z.	FILM DRIVE and DC VOLTS indicators light.
42*	Measure continuity between J11, pin AA and ground using multimeter.	Multimeter indicates zero resistance.
43*	Measure resistance between J11, pin BB and DC VOLTS GRD terminal using multimeter.	Multimeter indicates 82K ohms resistance.
44*	Measure resistance between J11, pin CC and DC VOLTS INPUT terminal, using multimeter.	Multimeter indicates 82K ohms resistance.
45	Set MODULE TEST switch to FDA R9ADJ. and apply +28 vdc output of variable voltage text fixture to J11, pin z.	FILM DRIVE and DC VOLTS indicators light
46*	Measure continuity between J11, pin y and ground, using multimeter.	Multimeter indicates zero resistance.
47*	Measure resistance between J11, pin BB and DC VOLTS GRD terminal using multimeter.	Multimeter indicates 82K ohms resistance.
48*	Measure resistance between J11, pin CC and DC VOLTS INPUT terminal, using multimeter.	Multimeter indicates 82K ohms resistance
49	Set MODULE TEST switch to FDA OPR, and apply +28 vdc output of variable voltage test fixture to J11, pin z.	FILM DRIVE, DC VOLTS and SCOPE indicators light
50	Measure voltage on J11, pin AA, using vtvm.	Vtvm indicates setting of E V/H control
51*	Measure continuity between DC VOLTS GRD terminal and ground using multimeter.	Multimeter indicates zero resistance.
52*	Measure continuity between J11, pm BB and SCOPE GRD terminal using multimeter.	Multimeter indicates zero resistance.
53*	Measure resistance between J11, pin CC and SCOPE VERT terminal using multimeter.	Multimeter indicates 1 K ohm resistance.
54	Set MODULE TEST switch to FDA + 6 VDC, and apply + 28 vdc output of variable voltage test fixture to J11, pin z.	FILM DRIVE, DC VOLTS and SCOPE indicators light.
55	Measure voltage on J11, pin AA, using vtvm.	V tvm indicates setting of E V/H Control
56*	Measure continuity between SCOPE GRD terminal and ground using multimeter.	Multimeter indicates zero resistance.
57*	Measure continuity between DC VOLTS GRD terminal and ground, using multimeter.	Multimeter indicates zero resistance.
58*	Measure resistance between J11, pm CC and SCOPE VERT terminal, using multimeter.	Multimeter indicates 1 K ohm resistance.
59*	Measure resistance between J11, pin GG and DC VOLTS INPUT terminal, using multimeter.	Multimeter indicates 1 K ohm resistance.
60	Set MODULE TEST switch to FDA −6VDC, and apply +28 vdc output of variable voltage text fixture to J11, pin z.	FILM DRIVE, DC VOLTS, and SCOPE indicators light.
61	Measure voltage on J11, pin AA, using vtvm.	V tvm indicates setting of E V/H control
62*	Measure continuity between DC VOLTS GRD terminal and ground, using multimeter.	Multimeter indicates zero resistance.
63*	Measure continuity between SCOPE GRD terminal and ground, using multimeter.	Multimeter indicates zero resistance.
64*	Measure resistance between J11, pin HH and DC VOLTS INPUT terminal, using multimeter.	Multimeter indicates 1 K ohm resistance.
65*	Measure resistance between J11, pin HH and SCOPE VERT terminal, using multimeter.	Multimeter indicates 1 K ohm resistance.
66	Set MODULE TEST switch to FDA TP2, and apply +28 vdc output of variable voltage test fixture to J11, pin z.	FILM DRIVE and SCOPE indicators light
67	Measure voltage on J11, pin AA, using vtvm.	V tvm indicates setting of E V/H control.
68*	Measure continuity between SCOPE GRD terminal and ground, using multimeter.	Multimeter indicates zero resistance.
69*	Measure resistance between J11, pin FF and SCOPE VERT terminal, using multimeter.	Multimeter indicates 1 K ohm resistance.
70	Connect test ground to J11, pin J.	MOUNT AC indicator lights.
71*	Set TEST switch to SYSTEM RDY GRD ON, then measure continuity between J9, pm F and ground, using multimeter.	Multimeter indicates zero resistance.
72*	Set TEST switch to SYSTEM OPERATE, then measure continuity between J9, pin v and ground, using multimeter.	Multimeter indicates zero resistance.

Table 4-12. Control-PowerSupply Section Bench Test - Continued

Step	Procedure	Result/indication
73*	Measure resistance between J9, pin H (+) and ground (-) using multimeter set on RX1 scale.	Multimeter indicates approximately 160 ohms resistance.
74*	Measure resistance between J9, pin F (+) and J9. pin J (-), using multimeter set on RX1 scale.	Multimeter indicates approximately 160 ohms resistance
75	Measure voltage on J9, pin L, using vtvm	Vtvm indicates +28 vdc.
76	Connect J9. pin L to J10, pin Y and connect test ground to J9, pin M.	SYS RDY indicators lights.
77*	Set TEST switch to SYSTEM MAN PIC, then measure continuity between J9. pin J and ground, using multimeter.	Multimeter indicates zero resistance.
78*	Measure resistance between J9, pin H (+) and J9. pin J (-), using multimeter set on RX 1 scale.	Multimeter indicates approximately 160 ohms.
79	Measure voltage on J9, pin L using vtvm.	V tvm indicates + 28 vdc.
80*	Set TEST switch to SYSTEM NIGHT FLASH, then measure resistance between J9, pin e (+) and ground (-) using multimeter set on RX1 range.	Multimeter indicates approximately 15 ohms resistance.
81	Measure voltage on J9. pin L, using vtvm.	Vtvm indicates +28 vdc.
82*	Measure resistance between J9, pin H(+) and ground (-), using multimeter set on RX1 scale.	Multimeter indicates approximately 160 ohms resistance.
83*	Set TEST switch to SYSTEM FLASH RDY, then measure resistance between J9, pin e (+) and ground (-), using multimeter set on RX1 range.	Multimeter indicates approximately 15 ohms resistance.
84	Measure voltage on J9, pin X, using v tvm.	V tvm indicates + 28 vdc.
85	Measure voltage on J9. pin L. using vtvm	V tvm indicate +28 vdc,
86	Set TEST switch to AUX BD INTVL	R/C BRDG indicator lights.
87*	Measure continuity between J11, pin b and R/C BRDG + terminal using multimeter.	Multimeter indicates zero resistance.
88	Set TEST switch to AUX BD FDA.	R/C BRDG indicator lights.
89*	Measure continuity between J11, pin A VC BRDG + terminal using multimeter.	Multimeter measures zero resistance.
90*	Set TEST switch to SYSTEM OPERATE; set CONFIGURATION switch to 44MM VERT, then measure resistance between J9, pin A (a) and ground (-), using multmeter on RX1 scale.	Multimeter indicates approximately 15 ohms resistance.
91*	Set CONFIGURATION switch to 3 IN. 15° R. then measure resistance between J9, pin z (+) and ground (-) using multimeter on RX1 scale.	Multimeter indicates approximately 15 ohms resistance.
92*	Measure resistance between J9, pin h (+) and J9 pin z (-) using multimeter set on RX1 scale.	Multimeter indicates approximately 15 ohms resistance.
93	Measure voltage on J10, pin X, using vtvm.	Vtvm indicates + 28 vdc.
94	Measure voltage on J9. pin HH, using vtvm.	V tvm indicates + 28 vdc.
95	Measure voltage on; J10, pin S, using vtvm.	V tvm indicates + 28 vdc.
96	Connect test ground on J10. pin X, J9, pin HH and J10, pin S, simultaneously.	RELAY OPR indicator lights.
97	Simultaneously connect test ground on J11, pin d and pin P, and apply the +28 vdc output of variable voltage test fixture to J11, pin D.	VERT POS indicator lights.
98*	Set CONFIGURATION switch to 3 IN. 30° R, then measure resistance between J9, pin K (+) and ground (-) using multimeter on RX1 scale.	Multimeter indicates approximately 15 ohms resistance.
99*	Measure resistance between J9, pin h (+) and J9, pin k (-) using multimeter set on RX1 scale.	Multimeter indicates approximately 15 ohms resistance.
l00	Connect test ground on J11, pin C, J11, pin X and J11, pin c, simultaneously.	RELAY OPR indicator lights.
101*	Set CONFIGURATION switch to 3 IN. VERT, then measure resistance between J9, pin h (+) and ground (-) using multimeter on RX1 scale.	Multimeter indicates approximately 15 ohms resistance.
102*	Set CONFIGURATION switch to 6 IN. 15 °L, then measure resistance between J9, pin y (+) and ground (-) using multimeter on RX1 scale.	Multimeter indicates approximately 15 ohms resistance.
103	Connect test ground on J11, pin S, J11, pin Z and J10, pin S, simultaneously.	RELAY OPR indicator lights.
104*	Set CONFIGURATION switch to 6 IN. 30ºL, then measure resistance between J9. pin j (+) and ground (-) using multimeter on RX1 scale.	Multimeter indicates approximately 15 ohms resistance.
105	Connect test ground on J11, pin S, J11, pin N and J11, pin C, simultaneously.	RELAY OPR indicator lights.

Table 4-12. Control-Power Supply Section Bench Test - Continued

Step	Procedure	Result/indicator
106*	Set CONFIGURATION switch to 6 IN. VERT. then measure resistance between R/C BRDG - connector J17 and ground using multimeter on RX1 range.	Multimeter indicates zero resistance.
107*	Measure resistance between R/C BRDG + connector J16 and J11- b using multimeter.	Multimeter indicates zero resistance
108*	Set CONFIGURATION switch to 12 IN. 15° L, then measure resistance between J9, pin y (+) and ground (-) using multimeter on RX1 scale.	Multimeter indicates approximately 160 ohms resistance.
109*	Measure resistance between J9, pin a (+) and ground (-) using multimeter set on RX1 scale.	Multimeter indicates approximately 160 ohms.
110	Connect test ground on J11, pin S, J11, pin z and J11, pin D, simultaneously.	RELAY OPR indicator lights.
111	Set CONFIGURATION switch to 12 IN. 30° L, then measure resistance between J9, pin a (+) and ground (-) using multimeter on RX1 scale.	Multimeter indicates approximately 160 ohms.
112	Connect test ground on J11, pins, J11, pin N and J11, pin R, simultaneously.	RELAY OPR indicator lights.
113	Set CONFIGURATION switch to 12 IN. VERT, then measure resistance between J9, pin a (+) and ground (-) using multimeter on RX1 scale.	Multimeter indicates approximately 15 ohms.

c. *Control-Power Supply Section Troubleshooting Procedures.* Steps referenced in the *Trouble symptom* column table 4-13, refer to the numbered steps in the bench test (*b* above). Electronic parts referenced in the troubleshooting table are shown in the schematic diagram (fig. FO-12), and wiring diagrams (fig. FO-13 and FO-14).

Table 4-13. Control-Power Supply Section Troubleshooting

Item	Trouble symptom	Probable trouble	Correction
1	MAN PIC indicator does not light (step 1).	Defective resistor R50 or transistor Q15.	Replace defective component (para 4-19).
2	a INTVL and DC VOLTS indicators dc not light (step 2).	a. Defective transistor Q17, diodes CR116 and CR117. or resistor R52.	a Replace defective component (para 4-19).
	b. DC VOLTS indicator does not light (step 2).	b. Defective diode CR112, MODULE TEST switch S1, MASTER switch S1, or diode CR68.	b Replace defective component (para -19).
3	Multimeter indicatea open circuit (step 3).	Defective MODULE TEST switch S1, relay K3, or MASTER switch S1.	Replace defective component (para 4-19).
4	Lamps DS1 through DS4 do not light (step 4).	Open lamp circuit (DS1, DS2, DS3 or DS4), or defective lamp socket (XDS1, XDS2, XDS3, or XDS4).	Repair wiring (fig. FO-13) or replace defective lamp socket (para 4-18c).
5	No voltage or low voltage indication (step 5).	Defective motor tachometer circuit component (transformer T2, diode CR2, resistors R5 and R6, capacitor C2, OPERATE OFF' switch S15).	Replace defective component (para 4-21).
6	Vtvm does not indicate zero volts (step 6).	Defective OPERATE OFF switch S15.	Replace switch S15 (para 3-13d).
7	Multimeter indicates open circuit (step 7).	Defective MODULE TEST switch S1, relay K3, or MASTER switch S1.	Replace defective component (para 4-19 or 1-18b).
8	Multimeter indicatea open circuit (step 8).	Defective OPERATE OFF' switch S15.	Replace switch Sl5 (para 3-13d).
9	No decrease in voltage observed (step 9).	Defective MODULE TEST switch S1 or Zener diode CR115.	Replace defective component (para 4-19).
10	Multimeter indicates open circuit (step 10).	Defective MODULE TEST switch S1.	Replace MODULE TEST switch S1 (para 4-19).
11	Multimeter indicatea open circuit (step 11).	Defective MODULE TEST switch S1.	Same as step 10 above.
12	INTVL and DC VOLTS indicatora do not light (step 12).	Defective MODULE TEST switch S1.	Same as step 10 above.

Table 4-13.Control-Power Supply Section Troubleshooting-Continued

Item	Trouble symptom	Probable trouble	Correction
13	Multimeter indicates open circuit (step 13).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
14	Multimer indicates open circuit (step 14).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
15	Multimeter indicates open circuit (step 15).	Defective MODULE TEST switch S1.	Replace switch S1 (para 4-19).
16	No decrease in voltage observed (step 16).	Defective MODULE TEST switch S1 or Zener diode CR115.	Replace defective component (para 4-19).
17	COUNTER INTVL, COUNTER WIDTH, MODULE INTVL or SCOPE indicators do not light (step 17).	Defective MODULE TEST switch S1.	Replace switch S1 (para 4-19).
18	Multimeter indicates open circuit (step 18).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
19	Multimeter indicates open circuit (step 19).	Defective MODULE TEST switch S1, relay K3, MASTER switch S1, or resistor R14.	Replace defective component (para 4-19).
20	INTVL PULSE indicator does not fight (step 20).	Defective INTVL PULSE indicator DS1 circuit component.	Replace defective component (para 3-13a).
21	INTERVAL PULSE indicator does not light (step 21).	Defective INTERVAL PULSE indicator DS1 circuit. component	Replace defective component (pars 3-13a).
22	Vtvm does not indicate setting of E V/H control (step 22).	Defective MODULE TEST switch S1 or resistor R53.	Replace defective component (para 4-19).
23	INTVL, DC VOLTS and SCOPE indicators do not light (step 23).	Defective MODULE TEST switch S1.	Replace switch S1 (para 4-19).
24	Multimeter indicates open circuit (step 24).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19)
25	Multimeter indicates open circuit (step 25).	Defective MODULE TEST switch S1.	Replace switch S1 (para 4-19).
26	Multimeter indicates open circuit (step 26).	Defective MODULE TEST switch S1.	Replace switch S1 (para 4-19).
27	Multimeter indicates open circuit (step 27).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
28	Vtvm does not indicate setting of E V/H control (step 28).	Defective MODULE TEST switch S1 or resistor R53.	Replace defective component (para 4-19).
29	INTVL DC VOLTS and SCOPE indicators do not light (step 29).	Defective MODULE TEST switch S1.	Replace switch S1 (para 4-19).
30	Multimeter indicates open circuit (step 30).	Defective MODULE TEST switch S1.	Replace switch S1 (para 4-19).
31	Multimeter indicates open circuit (Step 31).	Defective MODULE TEST switch S1.	Replace switch S1 (para 4-19).
32	Multimeter indicates open circuit (step 32).	Defective MODULE TEST switch Sl.	Replace switch S1 (para 4-19).
33	Multimeter indicates open circuit (step 33).	Defective MODULE TEST switch Sl.	Replace switch S1 (para 4-19).
34	Vtvm does not indicate setting of E V/H control (step 34).	Defective MODULE TEST switch Sl.	Replace switch S1 (para 4-19).
35	INTVL DC VOLTS and SCOPE indicators do not light (step 35).	Defective MODULE TEST switch Sl.	Replace switch Sl (para 4-19).
36	Multimeter indicates open circuit (step 36).	Defective MODULE TEST switch Sl.	Replace switch Sl (para 4-19).
37	Multistep indicates open circuit (step 37).	Defective MODULE TEST switch Sl.	Replace switch S1 (para 4-19).
38	Multimeter indicates open circuit (step38)	Defective MODULE TEST switch Sl.	Replace switch S1 (para 4-19).
39	Multimeter indicates open circuit (step 39).	Defective MODULE TEST switch Sl.	Replace switch S1 (para 4-19).
40	Vtvm does not indicate setting of E V/H control (step 40).	Defective MODULE TEST switch Sl.	Replace switch S1 (para 4-19).
41	a. FILM DRIVE and DC VOLTS indicators do not light (step 41).	a Defective transistor Q16. diodes CR109 and CR110, or resistor R51.	a Replace defective component (para 4-19).
	b. DC VOLTS indicator does not light.	b. Defective diode CR111, MODULE TEST tch Sl, or MASTER switch S1.	b. Replace defective component (para 4 -19 or 4 -186).

Table 4-13. Control-Power Supply Section Troubleshooting-Continued

Item	Trouble symptom	Probable trouble	Correction
42	Multimeter indicates open circuit (step 42).	Defective MODULE TEST switch S1.	Replace switch S1 (para 4-19).
13	Multimeter indicates short or open Circuit (step 43).	Defective MASTER switch S1, resister R42, MODULE TEST switch S1, or relay K3.	Replace defective component (para 4-18b or 4-19).
14	Multimeter indicates short or open circuit (Step 44).	Defective resistor R43, or R13, MODULE TEST switch S1, relay K3, MASTER switch S1.	Replace defective component (para 4-18b or 4-19).
45	FILM DRIVE and DC VOLTS indicators do not Light (step 45).	Defective MODULE TEST switch S1.	Replace switch S1 (para 4-19).
46	Multimeter indicates open circuit (step 46).	Defective MODULE TEST switch S1.	Replace switch S1 (para 4-19).
47	Multimeter indicates open or short circuit (step 47).	Defective MODULE TEST switch S1, relay K3 or resistor R42.	Replace defective component (para 4-19).
48	Multimeter indicates open or short circuit (step 48).	Defective MODULE TEST switch S1, relay K3, or resistor R43.	Replace defective component (para 4-19).
49	FILM DRIVE, DC VOLTS and SCOPE indicators do not light (step 49).	Defective MODULE TEST switch S1 or diode CR72.	Replace defective component (para 4-19).
50	Vtvm does not indicate setting of E V/H (step 50).	Defective MODULE TEST switch S1. resistor R41 or capacitor C15.	Replace defective component (para 4-19).
51	Multimeter indicates open circuit (step 51).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
52	Multimeter indicates open circuit (step 52).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
53	Multimeter indicates open circuit (step 53).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
54	FILM DRIVE, DC VOLTS, and SCOPE indicators do not light (step 54).	Defective MODULE TEST switch S1 or diodes CR72 and CR73.	Replace defective component (para 4-19).
55	Vtvm does not indicate setting of E V/H COB trol (Step 55).	Defective MODULE TEST switch S1, resistor R41 or capacitor C15.	Replace defective component (para 4-19).
56	Multimeter indicates open circuit (step 56).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
57	Multimeter indicates open circuit (step 57).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
58	Multimeter indicates open circuit (step 58).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
59	Multimeter indicates open circuit (step 59).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
60	FILM DRIVE, DC VOLTS, and SCOPE indicator: do not light (step 60).	Defective MODULE TEST switch S1 or diodes CR72 and CR73.	Replace defective component (para 4-19).
61	Vtvm doea not indicate setting of E V/H control (step 61).	Defective MODULE TEST switch S1, resistor R41 or capacitor C15.	Replace defective component (para 4-19).
62	Multimeter indicates open Circuit (Step 62).	Defective MODULE TEST switch S1, or relay K3.	Replace defective component (para 4-19).
63	Multimeter indicates open circuit (step 63).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
64	Multimeter indicates open circuit (step 64).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
65	Multimeter indicates open circuit (step 65).	Defective MODULE TEST switch S1 or K3.	Replace defective component (para 4-19).
66	FILM DRIVE and SCOPE indicators do not light (step 66).	Defective MODULE TEST switch S1.	Replace switch S1 (para 4-19).
67	Vtvm does not indicate setting of E V/H control (step 67).	Defective MODULE TEST switch S1, resistor R41, or capacitor C15.	Replace defective component (para 4-19).
68	Multimeter indicates open circuit (step 68).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
69	Multimeter indicates open circuit (step 69).	Defective MODULE TEST switch S1 or relay K3.	Replace defective component (para 4-19).
70	MOUNTAC indicator does not light (step 70).	Defective MOUNTAC indicator circuit wiring or assembly A13.	Repair defective wiring (fig. FO-13) or replace assembly A13

Table 4-13. Control-Power Supply Section Troubleshooting-Continued

Item	Table symptom	Probable trouble	Correction
			(para 3-13a).
71	Multimeter indicates open circuit (step 71).	Defective TRST switch S2.	Replace switch S2 (para 4-19).
72	Multimeter indicates open circuit (step 72).	Defective TEST switch S2.	Replace switch S2 (para 4-19).
73	Multimeter indicates open or short circuit (step 73).	Defective diode CR79	Replace diode CR79 (para 4-19).
74	Multimeter indicates open or short circuit (Step 74).	Defective diode CR78 or CR81.	Replace defective component (para 4-19).
75	Vtvm indicates no voltage (step 75).	Defective TEST switch S2.	Replace switch S2 (para 4-19).
76	SYS RDY indicator does not light (step 76).	Defective SYS RDY indicator circuit wiring or assembly A11.	Repair defective wiring (fig. FO-13) or replace assembly All (Para 3-13a).
77	Multimeter indicatea open circuit (step 77).	Defective TEST switch S2.	Replace switch S2 (para 4-19).
78	Multimeter indicates open or short circuit (step 78).	Defective diode CR81 or diode CR7.	Replace diode CR7 (para 4-19).
79	Vtvm indicates no voltage (step 79).	Defective TEST switch S2.	Replace switch S2 (para 4-19).
80	Multimeter indicates open circuit (step 80).	Defective TEST switch S2 or diode CR8.	Replace defective component (para 4-19).
81	Vtvm indicates no voltage (step 81).	Defective TEST switch S2.	Replace switch S2 (para 4-19).
82	Multimeter indicates short or open circuit (step 82).	Defective diode CR80.	Replace diode CR80 (para 4-19).
83	Multimeter indicates open circuit (step 83).	Defective TEST switch S2.	Replace switch S2 (para 4-19).
84	Vtvm indicates no voltage(step84).	Defective TEST switch S2.	Replace switch S2 (para 4-19).
85	Vtvm indicates no voltage (step 85).	Defective diode CR91.	Replace diode (para 4-19).
86	R/C BRDG indicator does not light (step 86).	Defective TEST switch S2 or MASTER switch S1.	Replace defective switch (para 4-19 or 4-18b).
87	Multimeter indicates open circuit (step 87).	Defective TEST switch S2 or MASTER switch S1.	Replace defective switch (para 4-19 or 4-18b).
88	R/C BRDG indicator does not light (step 88).	Defective TEST switch S2 or MASTER switch S1.	Replace defective switch (para 4-19 or 4-18b).
89	Multimeter indicates open circuit (step 89).	Defective TEST switch S2.	Replace switch S2 (para 4-19).
90	Multimeter indicatea open or short circuit (step 90).	Defective CONFIGURATION switch S3 or diode CR82.	Replace defective component (para 4-19).
91	Multimeter indicates open or short circuit (Step 91).	Defective CONFIGURATION switch S3 or diode CR82.	Replace defective component (para 4-19).
92	Multimeter indicates open or short circuit (Step 92).	Defective diode CR84.	Replace diode CR84 (para 4-19).
93	Vtvm indicates zero voltage (step 93).	Defective CONFIGURATION switch S3 or resistor R46.	Replace defective component (para 4-19).
94	Vtvm indicates zero voltage (step 94).	Defective CONFIGURATION switch S3. resistor R47. or capacitor C16.	Replace defective component (para 4-19).
95	Vtvm indicates zero voltage (step 95).	Defective CONFIGURATION switch S3 or resistor R48.	Replace defective component (para 4-19).
96	RELAY OPR indicator does not light (step 96).	Defective assembly Al or transistor Ql4.	Replace defective component (para 4-19).
97	VERT POS indicator does not light (step 97).	Defective assembly Al or transistor Q13.	Replace defective component (para 4-19).
98	Multimeter indicates open or short circuit (step 98).	Defective CONFIGURATION switch S3 or diode CR82.	Replace defective component (par 4-19).
99	Multimeter indicates open or short circuit (Step 99)	Defective diode CR86.	Replace diode CR86 (para 4-19).
100	RELAY OPR indicator does not light (step 169).	Defective diode CR103. CONFIGURATION switch S3, assembly Al, or transistor Q14.	Replace defective component (para 4-19).
101	Multimeter indicates open or short circuit (step 101).	Defective CONFIGURATION switch S3 or diode CR82.	Replace defective component (para 4-19).
102	Multimeter indicates open or short circuit (Step 102).	Defective CONFIGURATION switch S3.	Replace defective component (para 4-19).
103	RELAY OPR indicator does not light (step 1031.	Defective CONFIGURATION switch S3, assembly Al or transistor Ql4.	Replace defective component (para 4-19).
104	Multimeter indicates open or short circuit (Step 104).	Defective CONFIGURATION switch S3.	Replace defective component (para 4-19).
105	RELAY OPR indicator does not light (step 105).	Defective CONFIGURATION switch S3. assembly A1, or transistor Ql4.	Replace defective component (para 4-19).

Table 4-13. Control Power Supply Section Troubleshooting - Continued

Step	Trouble symptom	Probable trouble	Correction
106	Multimeter indicates open circuit (step 166).	Defective R/C BRDG - connector J17, MASTER switch S1, or CONFIGURATION switch S3.	Replace defective conponent (para 3-13g. 4-18b, or 4-19)
107	Multimeter indicates open circuit (step 107).	Defective R/C BRDG + connector J16, MASTER switch S1, or configuration switch S3.	Replace defective component (para 3-13g, 4-18b, or 4-19).
108	Multimeter indicates open or short circuit (step 108).	Defective CONFIGURATION switch S3 or diode CR87.	Replace defective component (para 4-19).
109	Multimeter indicates open or short circuit (step 169).	Defective diode CR89.	Replace diode CR89 (para -19).
110	RELAY OPR indicator does not light (step 110).	Defective CONFIGURATION switch S3, assembly Al, or transistor Ql4.	Replace defective component (para 4-19).
111	Multimeter indicates open or short circuit (step 111).	Defective CONFIGURATION switch S3 or diode CR88.	Replace defective component (para 4-19).
112	RELAY OPR indicator does not light (step 112).	Defective CONFIGURATION switch S3, diode CR103, assembly Al, or transistor Ql4.	Replace defective component (para 4-19).
113	Multimeter indicates open or short circuit (step 113).	Defective CONFIGURATION switch S3.	Replace switch S3 (para 4-19).

d. Control-Power Supply Section Voltage and Resistance Measurements. Use the schematic diagram (fig. FO-12), wiring diagram (fig. FO-13), and parts location diagrams (fig. 4-2, 4-3, 4-4, FO-17, and FO-19) as an aid when making voltage and resistance measurements.

(1) Voftage measurements. The dc voltage in table 4-14 is present at all times when power is applied to the test panel. The ac voltage is present only when MASTER switch is set to CONTROL PWR SUPPLY. All measurements are made from pins to ground

Table 1-14. Control-Power Supply Section Voltage Measurements.

Connector		
J9 *Pin*	*J11* *Pin*	*Voltage*
E, D	s	115 vac
f	B, n	+28 vdc

(2) Resistance measurements. Table 4-15 lists continuity measurements between the pins of connectors associated with the control-power supply section of the test panel Make measurements with power cable W9 disconnected from POWER connector J1.

Table 4-15. Control-Power Supply Section Resistance Measurements.

Continuity				
From connector pins			*To connector pins*	
J9	*J10*	*J11*	*J9*	*J10*
		s	E, D	
		E	a	
		G	A	
		e	z	
		W	k	
		F	h	
		Y	y	
		f	HH	
		X	AA	
		Z	GG	

Table 4-15. Control-Power Supply Section Resistance Measurements-Continued

Continuity				
From connector pins			*To connector pins*	
J9	*J10*	*J11*	*J9*	*J10*
		R	j	
		N	EE	
		S		T
		q		M
		J		C
		d	W	Z
		y	W	
		P	FF	
		c		X
		g*		
		K*		
		L*		
		p*		
		x*		
		BB		k
		CC		j
	a*			
	b*			
q*				
CC*				
BB*				
C*				
B*				
R*				
N*				
V*				
HH			K	
S*				

*Grounded pin

4-12. Lens Cones Section Troubleshooting

a. Preliminary Procedures.

(1) Fabricate the variable voltage test fixture in accordance with figure 4-1.

(2) Connect one end of 2-foot long wire (black) to the chassis of the test panel. Install a small alligator clip to the other end of the wire. This connection will serve as the test ground.

(3) Set MASTER switch to LENS CONES.

(4) Set POWER switch to ON.

b. Bench Test. Perform the lens cones section bench test given in table 4-16.

WARNING

Be careful when applying voltages or grounds to pins of connectors. Make connections with power off. Always disconnect the test voltage after observations are completed and before proceeding to the next step.

NOTE

All switches remain in positions given unless instructed otherwise. When making continuity of resistance measurements, always disconnect power cable W9 from POWER connector J1. An asterisk (*) next to the step number serves as a reminder to disconnect power cable W9 from primary power source

Table 4-16. Lens Cones Section Bench Test

Step	Procedure	Result/indication
1	Set TEST switch to S/C A.	R/C BRDG indicator lights.
2*	Measure continuity between J8, pin C and R/C BRDG + terminal using multimeter.	Multimeter indicates zero resistance
3	Set TEST switch to S/C B.	R/C BRDG indicator lights.
4*	Measure continuity between J8, pin F and R/C BRDG − terminal, using multimeter.	Multimeter indicates zero resistance.
5	Set TEST switch to CAL.	DC VOLTS indicator lights.
6*	Measure continuity between J6, pin J and DC VOLTS INPUT terminal, using multimeter.	Multimeter indicates zero resistance.
7	Measure voltage on J6, pin W using vtvm	Vtvm indicates 35 ± 1 millivolts dc.
8	Set TEST switch to OPERATE.	DC VOLTS indicator lights.
9*	Measure continuity between J8, pin T and R/C BRDG + terminal, using multimeter.	Multimeter indicates zero resistance.
10*	Measure continuity between J6, pin W and DC VOLTS INPUT terminal, using multimeter.	Multimeter indicates zero resistance.
11	Connect variable output voltage of +28 vdc momentarily to J8, pin U.	R/C BRDG indicator lights.
12	Set TEST switch to PHOTO SENSOR.	DC VOLTS indicator lights.
13*	Measure continuity between J6, pin Z and DC VOLTS INPUT terminal, using multimeter.	Multimeter indicates zero resistance.
14*	Set FOOT-LAMBERTS control to 0; set RANGE switch to 0-10,000; and measure resistance between J6, pin Z, and J7, pin C, using multimeter.	Multimeter indicates 4.99K ohms resistance.
15*	Set RANGE switch to 0-100 and measure resistance between J6, pin Z, and J7, pin C, using multimeter.	Multimeter indicates 499K ohms resistance.
16*	Connect multimeter between J6, pin M and ground, and set EXPOSURE switch to OVER.	Multimeter indicates zero resistance.
17*	Connect multimeter between J6, pin L and ground, and set EXPOSURE switch to UNDER.	Multimeter indicates zero resistance.
18*	Connect multimeter (set at RX1 range) between J6, pin H (+) and ground (−), and set DC EXPOSURE switch to INCREASE.	Multimeter indicates approximately 15 ohms resistance.
19*	Connect multimeter (set at RX1 range) between J6, pin X (+) and ground (−), and set DC EXPOSURE switch to DECREASE.	Multimeter indicates approximately 15 ohms resistance.
20	Connect vtvm, adjusted to measure +28 vdc, between J8, pin J and ground, then set DC EXPOSURE switch to INCREASE.	Vtvm indicates +28 vdc.
21	Connect vtvm, adjusted to measure +28vdc, between J8, pin N and ground, then set DC EXPOSURE switch to DECREASE.	Vtvm indicates +28vdc.
22	Apply the +28 volts dc of variable voltage test fixture to J6, pin T momentarily.	INCR indicator lights.
23	Connect a test ground to J6, pin and apply the +28 volt dc output of variable voltage test fixture to J6, pin S momentarily.	INCR LIM indicator lights.
24	Connect a test ground to J6, pin U, and connect the +28 volts dc output of variable voltage test fixture to J6, pin T, momentarily.	DECR indicator lights
25	Observe 6 IN. indicator.	6 IN. indicator is lighted.
26	Connect a test ground to J6, pin c, momentarily.	6 IN. indicator extinguishes and 12 IN. indicator lights.

Table 4-16. Lens Cones Section Bench Test - Continued

Step	Procedure	Result/indication
27	Connect a test ground to J6, pin D, momentarily.	6 IN. indicator extinguishes and 3 IN. indicator lights.
28	Connect a test ground to J6, pin b, momentarily.	6 IN. indicator extinguishes, 44mm indicator lights, an DECR LIM indicator extinguishes.
29	Connect a test ground to J6, pin b, and apply the +28 volts dc output of variable voltage test fixture to J6, pin R momentarily.	DECR LIM indicator lights.
30	Apply a +15-volt dc output from the variable voltage test fixture to J6, pin, F momentarily.	UNDER indicator lights.
31	Apply a +10-volt dc output from the variable voltage test fixture to J6, pin F momentarily.	OVER and UNDER indicators remain extinguished.
32	Apply a +20-volt dc output from the variable voltage test fixture to J6, pin F, momentarily.	OVER indicator lights.

c. Lens Cones Section Troubleshooting Procedures. Steps referenced in the trouble symptom column table 4-17 below, refer to the numbered steps in the bench test (b above). Electronic parts referenced in the troubleshooting table are shown in the schematic diagram (fig. FO-12) and wiring diagrams (fig. FO-13 and FO-14).

Table 4-17. Lens Cones Section Troubleshooting

Item	Trouble symptom	Probable trouble	Corrections
1	R/C BRDG indicator does not light (step 1).	Defective TEST switch S10 or MASTER switch S1.	Replace defective switch (para 4-18*b*).
2	Multimeter indicates open circuit (step 2).	Defective TEST switch S10 or MASTER switch S1.	Replace defective switch (para 4-18*b*).
3	R/C BRDG indicator does not light (step 3).	Defective TEST switch S10 or MASTER switch S1.	Replace defective switch (para 4-18*b*).
4	Multimeter indicates open circuit (step 4).	Defective TEST switch S10.	Replace defective switch (para 4-18*b*).
5	DC VOLTS indicator does not light (step 5).	Defective TEST switch S10 or MASTER switch S1.	Replace defective switch (para 4-18*b*).
6	Multimeter indicates open circuit (step 6).	Defective TEST switch S10, MASTER switch S1 or resistor R13.	Replace defective switch (para 4-18*b*) or resistor R13 (fig. FO-12).
7	*a.* Vtvm indication out of tolerance specified (step 7).	*a.* Simulated exposure feedback circuit out of adjustment.	*a.* Adjust simulated exposure feedback circuit (para 3-15*c*).
	b. Vtvm indicates no voltage (step 7).	*b.* Defective TEST switch S10.	*b.* Replace (para 4-18*b*).
8	DC VOLTS indicator does not light (step 8).	Defective TEST switch S10 or diode CR1.	Replace switch S10 (para 4-18*b*) or diode CR1 (para 4-19).
9	Multimeter indicates open circuit (step 9).	Defective TEST switch S10 or MASTER switch S1.	Replace defective switch (para 4-18*b*).
10	Multimeter indicates open circuit (step 10).	Defective TEST switch S10 or resistor R13.	Replace switch S10 (para 4-18*b*) or defective resistor R13 (para 4-19).
11	R/C BRDG indicator does not light (step 11).	Defective transistor Q1, resistor R1 or R2, or diode CR4.	Replace defective component.
12	DC VOLTS indicator does not light (step 12).	Defective TEST switch S10.	Replace switch S10 (para 4-18*b*).
13	Multimeter indicates open circuit (step 13).	Defective TEST switch S10.	Replace switch S10 (para 4-18*b*).
14	*a.* Multimeter indicates open circuit (step 14).	*a.* Defective RANGE switch S11 or resistor R3.	*a.* Replace defective component (para 3-13*b* or fig. 4-4).
	b. Multimeter indicates short circuit (step 14).	*b.* Defective resistor R3.	*b.* Replace resistor R3 (22, fig. FO-19 and fig. 4-4).
15	*a.* Multimeter indicates open circuit (step 15).	*a.* Defective resistor R4 or RANGE switch S11.	*a.* Replace defective component (fig. 4-4 or para 3-13*b*).
	b. Multimeter indicates short circuit (step 15).	*b.* Defective resistor R4.	*b.* Replace resistor R4 (fig. 4-4).
16	Multimeter indicates open circuit (step 16).	Defective EXPOSURE switch S12, or LAMP TEST switch S6.	Replace defective switch (para 3-13*b*).
17	Multimeter indicates open circuit (step 17).	Defective EXPOSURE switch S12.	Replace (para 3-13*b*).
18	Multimeter indicates open circuit (step 18).	Defective DC EXPOSURE switch S13, or LAMP TEST switch S6.	Replace defective switch (para 3-13*b*)
19	Multimeter indicates open circuit (step 19).	Defective DC EXPOSURE switch S13 or diode CR6.	Replace switch S13 (para 3-13*b*) or diode CR6.
20	Vtvm indicates no voltage (step 20).	Defective DC EXPOSURE switch S13.	Replace switch S13 (para 3-13*b*).

Table 4-17. Lens Cones Section Troubleshooting-Continued

Item	Trouble symptom	Probable troublc	Correction
21	Vtvm indicates no voltage (step 21).	Defective DC EXPOSURE switch S13.	Replace switch S13 (para 3-13b).
22	INCR Indicator does not light (step 22).	Defective diode CR58, CR59, or CR60.	Replace defective diode (para 4-19).
23	INCR LIM indicator does not light (step 23).	Defective INCR LIM indicator circuit wiring.	Repair wiring (fig. FO-13).
24	DECR indicator does not light (step 24).	Defective transistor Q9, diode CR62 or CR63, or resistor R40.	Replace defective component (pare 4-19).
25	6 IN. indicator does not light (step 25).	Defective transistor Q5 or resistor R26.	Replace defective component (para 4-19).
26	a 12 IN. indicator does not light (step 26).	a Defective 12 IN. indicator circuit wiring.	a. Repair wiring (fig. FO-13).
	b. 6 IN. indicator does not extinguish (Step 26).	b. Defective diode CR49 or transistor Q5.	b. Replace defective components) (para 4-19).
27	a 3 IN. indicator does not light (step 27).	a Defective 3 IN. indicator circuit wiring.	Repair wiring (fig. FO-13).
	b. 6 IN. indicator does not extinguish (step 27).	b. Defective diode CR45.	b. Replace diode CR45 (para 4-19).
28	a. 6 IN. indicator does not extinguish (step 28).	a Defective diode CR48.	a Replace diode CR48 (para 4-19).
	b. 44mm indicator does not light (step 28).	b. Defective 44MM indicator circuit wiring.	b. Repair wiring (fig. FO-13).
	c. DECR LIM indicator does not extinguish (step 28).	c. Defective transistor Q3 or resistor R11.	c. Replace defective components.
29	DECR LIM indicator does not tight (step 29).	Defective Zener diode CR66, resistor R37, transistor Q11, resistor R38, resistor R33, resistor R34, or diodes CR64 and CR65.	Replace defective component (para 4-19).
30	UNDER indicator does not light (step 30).	Defective Zener diode CR51. transistors Q7 and Q8, or resistors R30 through R32.	Replace defective component (para 4-19).
31	UNDER indicator lights (step 31).	Defective Zener diode CR51 or transistor Q7.	Replace defective component (para 4-19).
32	OVER indicator does not light (step 32).	Defective resistor R27, Zener diode CR50, resistor R29, or transistor Q6.	Replace defective component (para 4-19).

d. Lens Cones Section Voltage and Resistance Measurements. Use the schematic diagram (fig. FO-12), wiring diagram (fig. FO-13), and parts location diagrams (fig. 4-2, 4-3, 4-4, FO 17, and FO-19) as an aid when making voltage and resistance measure ments.

(1) *Voltage measurement.* Measure the voltage in the lens cones section as follows. Connect the vtvm from pin B of connector J6 to pin S of connector J8. The vtvm should indicate + 28 volts dc.

(2) *Resistance measurements.* Table 4-18 lists continuity measurements between the pins of connectors associated with the lens cones section. Make all measurements with power cable W9 disconnected from POWER connector J1.

Table 4-18. Lens Cones Section Resistance Measurements

Continuity

From connector pins		To connector pins		
J6	J8	J6	J7	J8
Y*		N*		
A				R
U				L

Table 4-18. Lens Cones Section Resistance Measurements-Continued

Continuity

From connector pins		To connector pins		
J6	J8	J6	J7	J8
T				K
S				P
H(+)				N(−)
X(+)				J(−)
				A*
	M	R		
Z			C	
			E*	

4-13. Camera Body Section Troubleshooting

a. Preliminary Procedures.

(1) Fabricate the variable voltage test fixture in accordance with figure 4-1.

(2) Connect one end of a 2-foot long wire (black) to the chassis of the test panel. Install a small alligator clip to the other end of the wire. This connection will serve as the test ground

(3) Set MASTER switch to CAMERA BODY.
(4) Set POWER switch to ON.

b. Bench Test. Perform the control-power supply section bench test given in table 4-19.

WARNING

Be careful when applying voltage or grounds to pins of connectors. Make connectiona with power off. Always disconnect the teat voltage after observations are completed and before proceeding to the next step.

NOTE

All switches remain in positions unless instructed otherwise. When making continuity or resistance measurements, always disconnect power cable W9 from POWER connector J1. An asterisk (*) next to the step number serves as a reminder to disconnect power cable W9 from primary power source.

Table 4-19. Camera Body Section Bench Test

Step	Procedure	Result/indication
1	Set MODE switch to AUTO.	WIDTH, INTVL and SCOPE indicators light.
2	Set CYCLE PULSE switch to MANUAL momentarily.	CYCLE PULSE indicator lights.
3*	Pleasure resistance between J3, pin N and SCOPE VERT terminal. using multimeter.	Multimeter indicates 2.7K ohms resistance.
4*	Measure resistance between J3, pin N and PULSE TIMER PULSE terminal using multimeter.	Multimeter indicates 3.7K ohms resistance.
5	Apply a + 28 volt dc output from the variable voltage text fixture to J3, pin V momentarily.	AUTO TRIP indicator lights.
6*	Set MODE switch at PULSE and measure continuity between J3, pin Z and ground, using multimeter.	Multimeter indicates zero resistance.
7*	Measure resistance between J3, pin N and SCOPE VERT terminal	Multimeter indicates 2.7K ohms resistance.
8	Set MODE switch to PULSE IMC.	DC VOLTS indicator lights.
9*	Measure continuity between J3, pin Z and ground, using multimeter.	Multimeter indicates zero resistance.
10*	Measure continuity between J3. pin X and ground, using multimeter.	Multimeter indicates zero resistance.
11*	Measure resistance between J3, pin N and SCOPE VERT terminal	Multimeter indicates 2.7K ohms. resistance.
12*	Set MODE switch to NIGHT and measure continuity between J3, pin Z and ground, using multimeter.	Multimeter Indicates zero resistance.
13*	Measure resistance between J3, pin a and SCOPE VERT terminal	Multimeter indicates 2.7K ohms resistance.
14*	Measure continuity between J3. pin X and ground, using multimeter.	Multimeter indicates zero resistance.
15*	Measure continuity between J3, pin c and ground using multimeter.	Multimeter indicates zero resistance.
16	Apply a + 12-volt dc output from the variable voltage test fixture to J3, pin Y momentarily.	NIGHT indicator lights.
17	Apply a + 28-volt dc output from the variable voltage text fixture to J3, pin T.	EXP RESET indicator lights.
18	Apply a + 28-volt dc output from the variable voltage teat fixture to J3, pin B.	BODY OPR indicator lights.
19	Apply a + 28-volt dc output from the variable voltage test fixture to J3, pin F.	BODY RDY indicator lights.
20	Apply a + 28-volt dc output from the variable voltage test fixture to-J3 pin M.	FILM FAIL indicator lights.
21	Apply a + 28-volt dc output from the variable voltage text fixture to J3, pin U.	NIGHT INTLK indicator lights.
22	Connect test ground to J2, pin K.	SIM OPR indicator lights.
23	Set TEST RIGHT ASSEMBLY switch at positions 6 through 8, and measure continuity between J5, pin a and ground.	Multimeter indicates zero resistance.
24	TEST RIGHT ASSEMBLY switch: Position 1 — Measure voltage between J5, pin N and ground. Position 2 thru 8 — Measure voltage between J5, pin W and ground Position 2 thru 8 — Measure voltage between J5, pin B and ground.	Vtvm indicates + 28 vdc.
25	TEST RIGHT ASSEMBLY switch: Position 1 — Ground pin J5, pin K Position 2 — Ground pin J5, pin c Position 3 — Ground pin J5, pin L	RIGHT B indicator lights.

Table 4-19. Camera Body Section Bench Test - Continued

Step	Procedure		Result/indication
	Position	Ground pin	
25 (cont)	4 and 5	J5, pin Z	
	6	J5, pin d	
	7	J5, pin e	
	8	J5, pin H	
26	TEST RIGHT ASSEMBLY switch:		RIGHT A indicator lights.
	Position	Apply +28 udc output of card able voltage test fixture tu	
	1	J5, pin T	
	2	J5, pin M	
	3	J5, pin J	
	4	J5, pm V	
	5	J5, pin B	
	6	J5, pin U	
	7	J5, pin f	
	8	J5, pin g	
27'	TEST LEFT ASSEMBLY switch:		Multimeter indicates zero resistance.
	Position	Measure continuity between	
	1	J4, pin n and J4, pin g	
		J4, pin A and J4. pin a	
	2	J4, pin n and J4, pin K	
	3	J4. pin n and J4, pin t	
		J4, pin Z and J4 pin P	
	5	J4, pin e and ground	
		J4, pin Z and J4, pin S	
	6	J4, pin n and J4, pin F	
		J4, pin Z and J4, pin f	
	7	J4, pin e and ground	
		J4, pin n and J4, pin C	
		J4, pin Z and J4, pin T	
	8	J4, pin and J4, pin C	
		J4, pin Z and J4, pin T	
	9	J4, pin G and ground	
		J4, pin n and J4, pin C	
		J4, pin Z and J4, pin T	
	10	J4, pin i and ground	
		J4, pin n and J4, pin C	
		J4, pin Z and J4. pin b	
	11	J4, pin i and ground	
		J4, pin n and J4, pin C	
		J4, pin Z and J4, pin b	
	12	J4, pin 1 and ground	
		J4, pm n and J4, pin E	
		J4, pin Z and J4, pin b	
	13	J4, pin n and J4, pin F	
		J4, pin Z and J4. pin h	
	14	J4, pin Z and J4, pin F	
	15	J4, pin T and ground	
		J4, pin n and J4, pin C	
		J4, pin Z and J4, pin j	
	16	J4, pin T and ground	
		J4, pin Z and J4, pin t	
	17	J4, pin Z and J4, pin T	
28	TEST LEFT ASSEMBLY switch:		LEFT A indicator lights.
	Position	Connect + 28 vdc output of varc able voltage test future to	
	1	J4. pin m	
	2	J4. pin Y	
	3	J4, pin B	
	4	J4. pin J	
		J4, pin U	
	6	J4, pin M	
	7	J4, pinB	

Table 4-19. Camera Body Section Bench Test - Continued

Step	Procedure		Result/indication
28 (cont)	Position	Connect +28 vdc output of variable voltage test fixture to	
	8	J4, pin J	
	9	J4, pin U	
	10	J4, pin k	
	11	J4, pin J	
	12	J4, pin a	
	13	J4, pin K	
	15	J4, pin P	
	16	J4, pin p	
	17	J4, pin b	
			LEFT B indicator lights.
29	TEST LEFT ASSEMBLY switch:		
	Position	Ground pin	
	1	J4, pin L	
	2	J4, pin D	
	3	J4, pin p	
	4	J4, pin h	
	5	J4, pin V	
	6	J4, pin c	
	7	J4, pin q	
	8	J4, pin h	
	9	J4, pin c	
	10	J4, pin V	
	11	J4, pin h	
	12	J4, pin p	
	13	J4, pin L	
	14	J4, pin L	
	15	J4, pin R	
	16	J4, pin R	
	17	J4, pin r	

c. Camera Body Section Troubleshooting Procedures. Steps referenced in the Trouble symptom column in table 4-20, refer to the numbered steps in the bench test (b above). Electronic parts referenced in the troubleshooting table are shown in the schematic diagram (fig. FO-12) and wiring diagrams (fig. FO-13 and FO-14).

Table 4-20. Camera Body Section Troubleshooting

Item	Trouble symptom	Probable trouble	Correction
1	a. WIDTH, SCOPE and INTVL indicators does not light (step 1).	a. Defective MODE switch S5.	a. Replace switch S5 (para 4-18*b*).
	b. Any one of three indicators does not light (step 1).	b. Defective MASTER switch S1.	b. Replace switch S1 (para 4-18*b*).
2	CYCLE PULSE indicator does not light (step 2).	Defective CYCLE PULSE switch S2 or diode CR7.	Replace switch S2 (para 3-13*b*) or diode CR7 (para 4-19).
3	a. Multimeter indicates open circuit (step 3).	a. Defective MODE switch S5 or MASTER switch S1.	a. Replace defective switch (para 4-18*b*).
	b. Multimeter indicates short circuit or less than 2.7K ohms (step 3).	b. Defective resistor R1.	b. Replace resistor R1 (para 4-19).
4	Multimeter indicates open circuit (step 4).	Defective MASTER switch S1.	Replace switch S1 (para 4-18*b*).
5	AUTO TRIP indicator does not light (step 5).	Defective MODE switch S5 or diode CR19.	Replace switch S5 (para 4-18*b*) or diode CR19 (para 4-19).
6	Multimeter indicates open circuit (step 6).	Defective MODE switch S5.	Replace switch S5 (para 4-18*b*).
7	Multimeter indicates open circuit (step 7).	Defective MODE switch S5.	Replace switch S5 (para 4-18*b*).
8	DC VOLTS indicator does not light (step 8).	Defective MODE switch S5 or MASTER switch S1.	Replace defective switch (para 4-18*b*).
9	Multimeter indicates open circuit (step 9).	Defective MODE switch S5.	Replace switch S5 (para 4-18*b*).
10	Multimeter indicates open circuit (step 10).	Defective MODE switch S5.	Replace switch S5 (para 4-18*b*).
11	Multimeter indicates open (step 11).	Defective MODE switch S5.	Replace switch S5 (para 4-18*b*).
12	Multimeter indicates open circuit (step 12)	Defective MODE switch S5.	Replace switch S5 (para 4-18*b*).
13	Multimeter indicates open circuit (step 13).	Defective MODE switch S5	Replace switch S5 (para 4-18*b*).
14	Multimeter indicates open circuit (step 14).	Defective MODE switch S5	Replace switch S5 (para 4-18*b*).
15	Multimeter indicates open circuit (step 15).	Defective MODE switch S5	Replace switch S5 (para 4-18*b*).
16	NIGHT indicator does not light (step 16).	Defective diode CR23 or resistor R6.	Replace defective component. (para 4-19).

Table 4-20. Camera Body Section Troubleshooting-Continued

Item	Trouble symptom	Probable trouble	Correction
17	EXP RESET indicator does not light (step 17).	Defective EXP RESET indicator wiring.	Repair wiring (fig. FO-13).
18	BODY OPR indicator does not light (step 18).	Defective BODY OPR indicator wiring.	Repair wiring (fig. FO-13).
19	BODY RDY indicator does not light (step 19).	Defective BODY RDY indicator wiring.	Repair wiring (fig. FO-13).
20	FILM FAIL indicator does not light (step 20).	Defective FILM FAIL indicator wiring.	Repair wiring (fig. FO-13).
21	NIGHT INTLK indicator does not light (step 21).	Defective NIGHT INTLK indicator wiring.	Repair wiring (fig. FO-13).
22	SIM OPR indicator does not light (step 22).	Defective SIM OPR indicator wiring.	Repair wiring (fig. FO-13).
23	Multimeter indicators open circuit in any or all switch positions (step 23).	Defective TEST RIGHT ASSEMBLY switch S9.	Replace switch S9 (para 4-18b).
24	Vtvm indicates zero voltage in any or all switch positions (step 24).	Defective TEST RIGHT ASSEMBLY switch S9.	Replace switch S9 (para 4-18b).
25	RIGHT B indicator does not light in any or all switch positions (step 25).	Defective TEST RIGHT ASSEMBLY switch S9.	Replace switch S9 (para 4-18b).
26	RIGHT A indicator does not light in any or all switch positions (step 26).	Defective TEST RIGHT ASSEMBLY switch S9.	Replace switch S9 (para 4-18b).
27	Multimeter indicates open circuit in any or all switch positions (step 27).	Defective TEST LEFT ASSEMBLY switch S8.	Replace switch S8 (para 4-18b).
28	LEFT A indicator does not light in any or all switch positions (step 28).	Defective TEST LEFT ASSEMBLY switch S8.	Replace switch S8 (para 4-18b).
29	LEFT B indicator does not light in any or all switch positions (step 29).	Defective TEST LEFT ASSEMBLY switch S8.	Replace switch S8 (para 4-18b).

d. Camera Body Section Voltage and Resistance Measurements. Use the schematic diagram (fig FO-12), wiring diagram (fig. FO-13), and parts location diagrams (fig. 4-2, 4-3, 4-4, FO-17, and FO-19) as an aid when making voltage and resistance measurements.

(1) Voltage measurements. Table 4-21 lists the voltages present on the connector associated with the camera body section. These voltages are present only when MASTER switch is set to CAMERA BODY and with power applied to the test panel.

Table 4-21. Camera Body Section Voltage Measurements

Connector	Voltage
J3, pins E and W	28 volts dc
J4, pins W. H, N	28 volts dc
J5, pin F and Y	28 volts dc

(2) Resistance measurements. Table 4-22 lists continuity measurements between the pins of connectors associated with the camera body section. Make all measurements with power cable W9 disconnected from POWER connector J1.

Table 4-22. Camera Body Section Resistance Measurements

Continuity						
From connector pins				To connector pins		
J2	J3	J4	J5	J3	J4	J5
A*						
M				D		
J				G		
L				H		
	A*					
	d*					
	b*					
	d			A		
	E			W		

Table 4-22. Camera Body Section Resistance Measurements-Continued

Continuity						
From connector pins				To connector pins		
J2	J3	J4	J5	J3	J4	J5
		A*				
		s*				
		d*				
			W			b
			D*			
			A*			
			C*			
			E*			
			R*			
			X*			

*Ground pin

4-14. Camera Test Adapter GS Trouble-t shooting

a. Bench Test. Perform the camera test adapter bench test given in paragraph 3-9a

b. Camera Test Adapter GS Troubleshooting Procedures. Steps referenced. in l he trouble symptom column table 4-23 below, refer to the numbered steps in the bench test (para 3-9a). Electronic parts referenced in the table are shown in schematic diagram (fig. FO-15) and wiring diagram (fig. FO-16).

NOTE

The GS troubleshooting procedures supplement the DS troubleshooting procedures (para 3-9b). Perform the steps in the DS troubleshooting procedures prior to performing the procedures in table 4-23.

Table 4-23. Camera Test Adapter GS Troubleshooting

Item	Trouble	Probable trouble	Correction
1	OPR ON indicator does not light (step 2).	Diode CR20 defective.	Replace diode CR20 (para 4-24c).
2	FILM FAIL indicator does not light (step 2).	Diode CR17 defective.	Replace diode CR17 (para 4-24c).
3	INTLK indicator does not light (step 2).	Diode CR19 defective.	Replace diode CR19 (para 4-24c).
4	NIGHT indicator does not light (step 2).	Diode CR18 defective.	Replace diode CR18 (para 4-24c).
5	SYNC indicator does not light (step 2).	Diode CR14 defective.	Replace diode CR14 (para 4-24c).
6	CYCLE indicator does not light (step 2).	Diode CR16 defective.	Replace diode CR16 (para 4-24c).
7	DATA indicator does not light (step 4).	Transistor Q2 or associated circuit defective.	Replace transistor or associated defective component (para 4-24c).
8	FLASH indicator does not light (step 5).	Transistor Q1 or associated circuit defective.	Replace transistor or associated defective component (para 4-24c).
9	Vtvm does not indicate 115 vac when ac input to power transformer is checked (step 12).	a. Power relay K2 defective.	a. Replace relay K2 (para 4-24c).
		b. Power transformer T1 defective.	b. Replace transformer (para 4-24a).
		c. Exposure relay K1 solenoid defective.	c. Replace relay K1 (para 4-24c).
		d. Diode CR5 defective.	d. Replace diode CR5 (para 4-24c).
10	Incorrect vtvm indication for EXPOSURE switch setting (steps 13, 14, 15, 16).	Power supply rectifier or filter circuit defective.	Replace defective component (para 4-24c).
11	No vtvm indication when EXPOSURE switch is set at 44 MM CAL (step 13).	a. Resistor R9 defective.	a. Replace resistor R9 (para 4-24c).
		b. Power supply rectifier, filter, resistor load circuit defective.	b. Replace defective component (para 4-24c).
		c. Power transformer T1 defective.	c. Replace transformer T1 (para 4-24a).
12	No vtvm indication when EXPOSURE switch is set at 3 IN. CAL (step 14).	a. Diode CR6 defective.	a. Replace diode CR6 (para 4-24c).
		b. EXPOSURE switch S2 defective.	b. Replace switch S2 (para 4-24b).
		c. Resistor R8 defective.	c. Replace resistor R8 (para 4-24c).
13	No vtvm indication when EXPOSURE switch is set at 6 IN. CAL (step 15).	a. Relay K1 contacts defective.	a. Replace relay K1 (para 4-24c).
		b. Resistor R7 defective.	b. Replace resistor R7 (para 4-24c).
14	No vtvm indication when EXPOSURE switch is set at 12 IN. CAL (step 16).	a. Diode CR7 defective.	a. Replace diode CR7 (para 4-24c).
		b. Resistor R6 defective.	b. Replace resistor R6 (para 4-24c).

c. Camera Test Adapter Voltage and Resistance Measurements. Use the schematic diagram (fig. FO-15), wiring diagram (fig. FO-16), and parts location diagram (fig. 3-7 and 4-5) as an aid when making voltage and resistance measurements.

(1) *Voltage measurements.* The transistor terminal voltages listed in table 4-24 below are made with the multimeter. The voltage measurements are taken with the camera test adapter front panel POWER switch set to ON.

Table 4-24. Camera Test Adapter Voltage Measurements

Transistor	Voltage to ground		
	Emitter	Collector	Base
A3Q1	0 vdc	+28 vdc	0 vdc
A3Q2	0 vdc	−28 vdc	0 vdc

(2) *Resistance measurements.* Make all resistance measurements with power cable W9 disconnected from connector J1.

(a) The dc resistance of power transformer T1 windings are listed below:

Terminals	Resistance (ohms)
1 - 2	130
3 - 4	11

(b) The resistance measurements of the camera test adapter connectors are listed in table 4-25 below.

Table 4-25. Camera Test Adapter Resistance Measurements

Connector — pin test points	Resistance
P1-D to P2-A	0 ohm
P1-E to P2-N	0 ohm
P1-M to P3-a	0 ohm
P1-H to P1-Z	0 ohm

Table 4-25. Camera Test Adapter Resistance Measurements - Continued

Connector—pin test points	Resistance	Connector—pin test points	Resistance
P1-R to P1-N,Y	0 ohm	P2-S to P3-K (with POWER switch to OFF)	Infinity
J2-C to P2-E	0 ohm	P2-S to P3-K (with POWER switch to ON)	0 ohm
J2-C to Jct CR11 and CR12	0 ohm	P2-W to J4 (– TACH test point), P3-J	0 ohm
P2-A to P2-V, R, B, C	0 ohm	P2-Y to P3-M	0 ohm
P2-G to P3-H	0 ohm	P3-A to P3-W, J1-H, L	0 ohm
P2-H to J3 (EXPOSURE test point)	0 ohm	P3-d to P2-P	0 ohm
P2-L to P2-K	0 ohm	P3-G to P2-b	0 ohm
P2-M to P3-L	0 ohm	J1-G to P2-S	0 ohm

Section IV. GS MAINTENANCE OF CAMERA ANALYZER

WARNING

Disconnect the power source from the equipment when making repairs.

NOTE

GS maintenance includes all repair operations covered in TM 11-6760-239-12 and DS maintenance as well as those covered in this chapter.

4-15. Camera Analyzer GS Repair Procedures

Most of the assemblies, subassemblies, and parts in the camera analyzer can be reached easily and replaced without the use of special tools. When replacing parts, the general techniques and precautions in *a* through *c* below apply.

WARNING

Acetone is toxic and flammable. Use only in small quantities in a well-ventilated area. Do not breathe vapors or allow liquid to contact the skin. Do not use in the presence of open flame or sparks.

a. To remove or loosen liquid staked parts, carefully scrape away any visible staking compound first, then attempt to loosen part. If necessary, apply heat to the screw using a soldering iron; heat only the staked part. If heat fails, apply small quantities of acetone, Federal Specification O-A-51, directly to the area with a small brush. Remove acetone as soon as possible. To apply liquid staking refer to paragraph 4-16*b*.

b. Use a pencil-type soldering iron with a 25-watt maximum capacity. This equipment is transistorized. If the iron must be used with ac, use an isolating transformer between the iron and the line. Do *not* use a soldering gun near the transistorized assemblies; damaging voltages may be induced in the circuit components.

c. When soldering transistor leads, solder quickly. Whenever wiring or parts permit, use a heat sink (such as long-nosed pliers) between the solder point and the transistor.

d. After disassembling the basic test panel (para 3-13*a*), refer only to the paragraphs that contain instructions concerning the defective area.

4-16. Liquid Staking

Liquid staking (Glyptal 1201F) is a paste that is applied to machine screws, adjustments, nuts and other fasteners to lock them in place.

a. Grade. Liquid staking grade 4 (Glyptal 1201F, manufactured by General Electric Co., Schenectady, New York) is the only grade used in the camera analyzer.

b. Application. Before it hardens, liquid staking can be applied as follows:

(1) Using a brush, apply liquid staking to the screw threads. Remove excess liquid staking.

(2) If the screw is placed in a blind hole, reverse the rotation occasionally to allow trapped air to escape.

(3) If necessary to thin liquid staking, use Glyptal 1500 Thinner (manufactured by General Electric Co., Schenectady, New York).

(4) Approximately 12 hours curing time is required. Heat, not exceeding 212° F. from 3 to 5 hours, may be used to accelerate curing.

4-17. Epoxy Coating

After any maintenance has been performed that requires removal of the surface coating on printed circuit board and components assemblies, the exposed areas must be recoated for fungus and moisture protection using the following procedure.

WARNING

Xylol is toxic and flammable, use it only in small quantities in a well ventilated area. Do not breathe vapors or allow liquid to contact the skin. Do not use in the presense of open flame or sparks.

a. Part A (Resin). Measure 100 parts by weight of Araldite 571CX (manufactured by Ciba Co., Fair Lawn, N.J.) with 29 parts by weight of Beetle 216-8 (manufactured by American Cyanamid Co.) and stir well. Mix 27 parts by weight of Xylol (Federal Specifi-

cation TT-X-916) and stir well Mix 13 parts by weight of Diacetone Alcohol (Federal Specification O-D-306) and stir well Store in separate container.

b. Part B (Hardener). Measure 100 parts by weight of Araldite 820 (manufactured by Ciba Co., Fair Lawn, N.J.) with 37.5 parts by weight of Xylol (Federal Specification TT-X-916) and stir well Mix 20 parts by weight of Butyl Alcohol (Federal Specification TT-B-846) and stir well. Store in separate container.

c. To Prepare Epoxy For immediate Use. To prepare the epoxy for immediate use, mix two parts "A" (Resin) with one part "B" (Hardener) in a quantity that can be used in eight hours. Mix thoroughly. Brush the mixture onto the areas to be coated making sure to avoid areas that require mechanical movement, such as control adjustments and wafer switch contacts. The epoxy mixture will dry to the touch in approximately 1 hour when applied in a film of 0.005 to 0.010 inch thickness Total curing time requires 24 hours at room temperature. Curing time can be shortened by heating in a circulating oven at 150°F. for 3 hours.

4-18. Camera Analyzer GS Replacement Procedures (fig. FO-19)

a Replacement of POWER Connector J1, SYS SIMULATOR Connector J2, BODY Connector J3, LEFT ASSEMBLY Connector J4, RIGHT ASSEMBLY Connector J5, LENS CONE Connector J6, SENSOR Connector J7, MODULE Connector J8, CONTROL (J1) Connector J9, CONTROL (J2) Connector J10, or MODULES Connector J11. To replace these connector& proceed as follows:

(1) Perform the procedures in paragraph 3-l3a(1), (2) and (3).

(2) Unsolder and carefully mark or tag all electrical connections on rear of connector (5, fig. FO-19).

(3) Remove four screws (1), washers (2) and locknuts (3) which secure connector (5) to rear of front Panel.

NOTE

Connectors J1, J3, J5, J7, J8 and J10 have terminals installed on the mounting hardware. When installing a replacement connector, make sure the terminals are located in the same position

NOTE

Connector J9 has a board assembly A26 assembly (PN7912-149) installed on the mounting hardware. When installing a replacement connector, make sure the assembly is located in the same position.

(4) Remove connector (5) from behind front panel

(5) Replace connector (5) by reversing steps in a(2), (3), *and* (4).

(6) Replace the test panel in the combination case by replacing 14 screws.

b. Replacement of MASTER Switch S1, MODE Switch S5, TEST LEFT ASSEMBLY Switch S8, TEST RIGHT ASSEMBLY Switch S9, or TEST Switch S10. **To replace these switches, proceed as follows:**

(1) Perform the procedures in paragraph 3-13a(l), (2), and (3).

(2) Unsolder and carefully mark or tag all electrical connections on wafers of switch (20, fig. FO-19).

(3) Loosen two setscrews (21 ref) which secure knob (21) onto shaft of switch (20).

(4) Remove knob (21).

(5) Remove nut (20 ref) and washer (20 ref) from shaft of switch (20).

NOTE

The rear of TEST switch S10 is used to mount assembly A15. When removing switch S10, remove two additional nuts (20 ref) and washers (20 ref) mounting the assembly in position. When installing a replacement switch, make sure the assembly is located in the same position.

(6) Remove switch (20) from behind front panel

(7) Replace switch (20) by reversing steps in (2) through (6) above.

(8) Replace the test panel in the combination case by replacing 14 screws

c. Replacement of Lamp Sockets XDS1 Through XDS4. To replace the lamp sockets, proceed as follows:

(1) Perform the procedure in paragraph 3-13a(1), (2), and (3).

(2) Disconnect wiring to socket (53, fig. FO-19) by removing two screws (53 ref), two washers (54) and two terminals (55).

(3) Remove lamp (56) from socket (53).

(4) Remove two screws (51) and nuts (52) which secure socket (53) to chassis

(5) Remove socket (53).

(6) Replace socket (53) by reversing steps in (2) through (5) above.

(7) Replace the test panel in the combination case by replacing 14 screws.

d. Replacement of Transistors Ql and Q2. To replace these transistors, proceed as follows

(1) Perform the procedure in paragraph 3-13a(1). (2) and (3).

(2) Unsolder and carefully mark or tag all electrical connections on the transistor (44, fig. FO- 19).

(3) Remove two screws (38), two nuts (39) ground terminal (40) with lead wire attached, washer (41), two sleeves (42), transistor (44), and thermafilm washer (43).

(4) Replace the transistor (44) by reversing steps in (2) and (3).

(5) Replace the test panel in the combination case by replacing 14 screws.

e. Replacement of Transformer T2. To replace the transformer, proceed as follows:

(1) Perform the procedure in paragraph 3-13*a*(1), (2), and (3).

(2) Remove the four screws (27, fig. FO-19) that secure the chassis and components assembly to the top and bottom support (33, 34).

(3) Remove the screw (35) and washer (36) that secure the chassis and components assembly to the post (37).

NOTE

When performing step (4) below, avoid straining the wire connections to the chassis and components assembly (29).

(4) Carefully place the chassis and components assembly (29) to a position suitable for removing the transformer (50).

(5) Unsolder and carefully mark or tag all electrical connections on the transformer (50).

(6) Remove four screws (48) and four nuts (49) that secure the transformer (50) to the chassis and components assembly.

(7) Remove the transformer (50).

(8) Replace the transformer by reversing steps in (2) through (7) above.

(9) Replace the test panel in the combination case by replacing 14 screws.

f. Replacement of Transformer T1. To replace the transformer, proceed as follows:

(1) Perform steps in *e*(1) through (4) above.

(2) Unsolder and carefully mark or tag all electrical connections on the transformer (47).

(3) Remove two screws (45) and two nuts (46) that secure transformer (47) to the chassis and components assembly.

(4) Remove transformer (47).

(5) Replace the transformer (47) by reversing steps in (2), (3), and (4) above.

(6) Replace the test panel in the combination case by replacing 14 screws.

4-19. Disassembly of Printed Circuit Board Components Assembly A16. (fig. 4-2)

a. Perform steps in paragraph 3-13*a*(1) through (3) for access to components on assembly A16.

b. Perform steps in paragraph 3-13*i*(2) through (7) to remove assembly A16 from the camera analyzer.

c. When replacing switches (11, 31, and 84, fig. 4-2), unsolder and carefully mark or tag all electrical connections on wafers of switches.

NOTE

If the setting of any variable resistor (165, 167, 174, or 199) is disturbed during the disassembling process, perform the appropriate adjustment procedure given in paragraph 3-15 after reassembling A16.

d. when replacing other components (resistors, capacitors, diodes, transistors, relays, or integrated circuit assemblies), similarly unsolder and carefully mark or tag all electrical leads.

4-20. Reassembly of Printed Circuit Board and Components Assembly A16. (fig. 4-2)

a. Replace any component that was removed in the reverse order of removal.

NOTE

If it is necessary to spray Epoxy coating, thin with Xylol (Federal Specification TT-X-916).

b. Mask over 5/16-inch on both sides of connector contacts before applying Epoxy coating (para 4-17).

c. Mask over screw adjustment of variable resistors R2, R18, R20, and R23 (199, 174, 167 and 165, fig. 4-2) and the holes of test points TP1 through TP6 (185, 188, 210, 170, 168 and 98) before applying Epoxy coating (para 4-17).

d. Replace A16 in the camera analyzer by reversing steps in paragraph 3-*i*(2) through (7).

e. If any variable resistor is replaced or its control setting is disturbed during the disassembly of A16, perform the appropriate adjustment procedure given in paragraph 3-15.

f. After step *e* above is accomplished (if applicable), replace the test panel in the combination case by replacing 14 screws.

4-21. Disassembly of Chassis and Component Assembly (fig. 4-3)

a. Perform steps in paragraph 3-13*a* (1) through (3) for access to chassis and component assembly.

NOTE

It may not be necessary to remove the chassis and component assembly (29, fig. FO-19) completely from the camera analyzer for disassembly purposes. If this is the case and disassembly is attempted without unsoldering all parts, position the assembly carefully after performing step in *b* above to prevent strain on electrical wiring.

b. Release the chassis and component assembly by removing four screws (27) and four nuts (28).

c. Partially withdraw the chassis and component assembly without producing strain on its wire leads, then unsolder and carefully mark or tag all electrical connections to the assembly.

d. To remove lamp sockets, perform steps in paragraph 4-18*c* (2) through (5).

e. To remove transistors Q1 or Q2, perform steps in

Key to Fig. 4-2

1 Diode (CR25)
2 Diode (CR27)
3 Diode (CR88)
4 Diode (CR90)
5 Diode (CR6)
6 Diode (CR5)
7 Diode (CR86)
8 Diode (CR85)
9 Transistor (Q2)
10 Diode (CR87)
11 Switch, rotary: CONFIGURATION (S3)
12 Diode (CR89)
13 Diode (CR37)
14 Diode (CR36)
15 Resistor (R10)
16 Resistor (R12)
17 Diode (CR34)
18 Diode (CR35)
19 Diode (CR32)
20 Capacitor (C7)
21 Diode (CR33)
22 Resistor (R17)
23 Resistor (R24)
24 Capacitor (C12)
25 Resistor (R22)
26 Resistor (R21)
27 Diode (CR83)
28 Diode (CR38)
29 Diode (CR47)
30 Resistor (R54)
31 Switch, rotary: TEST (S2)
32 Diode (CR46)
33 Diode (CR44)
34 Resistor (R26)
35 Diode (CR48)
36 Diode (CR45)
37 Diode (CR78)
38 Diode (CR81)
39 Diode (CR91)
40 Diode (CR79)
41 Diode (CR80)
42 Diode (CR49)
43 Diode (CR82)
44 Diode (CR119)
45 Diode (CR120)
46 Transistor (Q5)
47 Transistor (Q6)
48 Diode (CR54)
49 Diode (CR11)
50 Diode (CR12)
51 Resistor (R5)
52 Diode (CR9)
53 Diode (CR106)
54 Diode (CR107)
55 Diode (CR10)
56 Diode (CR16)
57 Diode (CR104)
58 Diode (CR105)
59 Diode (CR17)
60 Diode (CR108)
61 Diode (CR56)
62 Diode (CR13)
63 Diode (CR22)
64 Diode (CR92)
65 Diode (CR18)
66 Diode (CR95)
67 Diode (CR21)
68 Diode (CR57)
69 Diode (CR23)
70 Resistor (R6)
71 Diode (CR19)
72 Diode (CR20)
73 Diode (CR98)
74 Diode (CR42)
75 Diode (CR121)
76 Diode (CR39)
77 Resistor (R45)
78 Diode (CR14)
79 Resistor (R44)
80 Diode (CR63)
81 Diode (CR8)
82 Diode (CR93)
83 Diode (CR58)
84 Switch, rotary: MODULE TEST (S1)
85 Diode (CR76)
86 Diode (CR69)
87 Diode (CR77)
88 Diode (CR71)
89 Diode (CR70)
90 Diode (CR68)
91 Diode (CR72)
92 Diode (CR73)
93 Diode (CR67)
94 Relay (K3)
95 Diode (CR75)
96 Diode (CR7)
97 Diode (CR96)
98 Test point (TP6)
99 Diode (CR109)
100 Diode (CR110)
101 resistor (R51)
102 Transistor (Q16)
103 Resistor (R41)
104 Resistor (R42)
105 Capacitor (C19)
106 Resistor (R43)
107 Diode (CR111)
108 Diode (CR113)
109 Diode (CR114)
110 Diode (CR112)
111 Transistor (Q17)
112 Resistor (R52)
113 Diode (CR116)
114 Diode (CR117)
115 Diode (CR115)
116 Resistor (R53)
117 Capacitor (C18)
118 Diode (CR59)
119 Diode (CR60)
120 Resistor (R40)
121 Resistor (R39)
122 Resistor (R38)
123 Transistor (Q9)
124 Transistor (Q10)
125 Diode (CR64)
126 Diode (CR62)
127 Resistor (R49)
128 Resistor (R33)
129 Diode (CR65)
130 Diode (CR61)
131 Triple 3-input NOR gate (A1)
132 Resistor (R34)
133 Resistor (R35)
134 Transistor (Q11)
135 Resistor (R36)
136 Transistor (Q12)
137 Transistor (Q13)
138 Transistor (Q14)
139 Diode (CR102)
140 Resistor (R37)
141 Transistor (Q15)
142 Resistor (R50)
143 Diode (CR103)
144 Diode (CR100)
145 Diode (CR101)
146 Diode (CR99)
147 Diode (CR66)
148 Diode (CR94)
149 Diode (CR97)
150 Diode (CR52)
151 Diode (CR53)
152 Diode (CR55)
153 Diode (CR118)
154 Diode (CR40)
155 Diode (CR41)
156 Resistor (R29)
157 Diode (CR50)
158 Resistor (R28)
159 Resistor (R27)
160 Resistor (R30)
161 Resistor (R32)
162 Diode (CR51)
163 Resistor (R31)
164 Transistor (Q8)
165 Variable resistor (R23)
166 Transistor (Q7)
167 Variable resistor (R20)
168 Test Point (TP5)
169 Resistor (R14)
170 Test point (TP4)
171 Transistor (Q4)
172 Capacitor (C11)
173 Resistor (R16)
174 Variable resistor (R18)
175 Resistor (R15)
176 Capacitor (C9)
177 Resistor (R19)
178 Capacitor (C10)
179 Transistor (Q3)
180 Diode (CR1)
181 Diode (CR15)
182 Resistor (R11)
183 Resistor (R13)
184 Diode (CR2)
185 Test point (TP1)
186 Capacitor (C2)
187 Relay (K1)
188 Test point (TP2)
189 Relay (K2)
190 Diode (CR3)
191 Resistor (R9)
192 Diode (CR4)
193 Capacitor (C14)
194 Capacitor (C8)
195 Capacitor (C1)
196 Resistor (R1)
197 Diode (CR29)
198 Diode (CR28)
199 Variable resistor (R2)
200 Operational amplifier (A2)
201 Resistor (R4)
202 Diode (CR31)
203 Capacitor (C16)
204 Resistor (R25)
205 Resistor (R3)
206 Capacitor (C13)
207 Capacitor (C5)
208 Capacitor (C3)
209. Transistor (Q1)
210 Test point (TP3)
211 Resistor (R7)
212 Resistor (R8)
213 Capacitor (C6)
214 Capacitor (C4)
215 Capacitor (C15)
216 Diode (CR26)
217 Diode (CR24)
218 Resistor (R48)
219 Resistor (R46)
220 Resistor (R47)
221 Transistor (Q18)
222 Diode (CR74)
223 Diode (CR30)

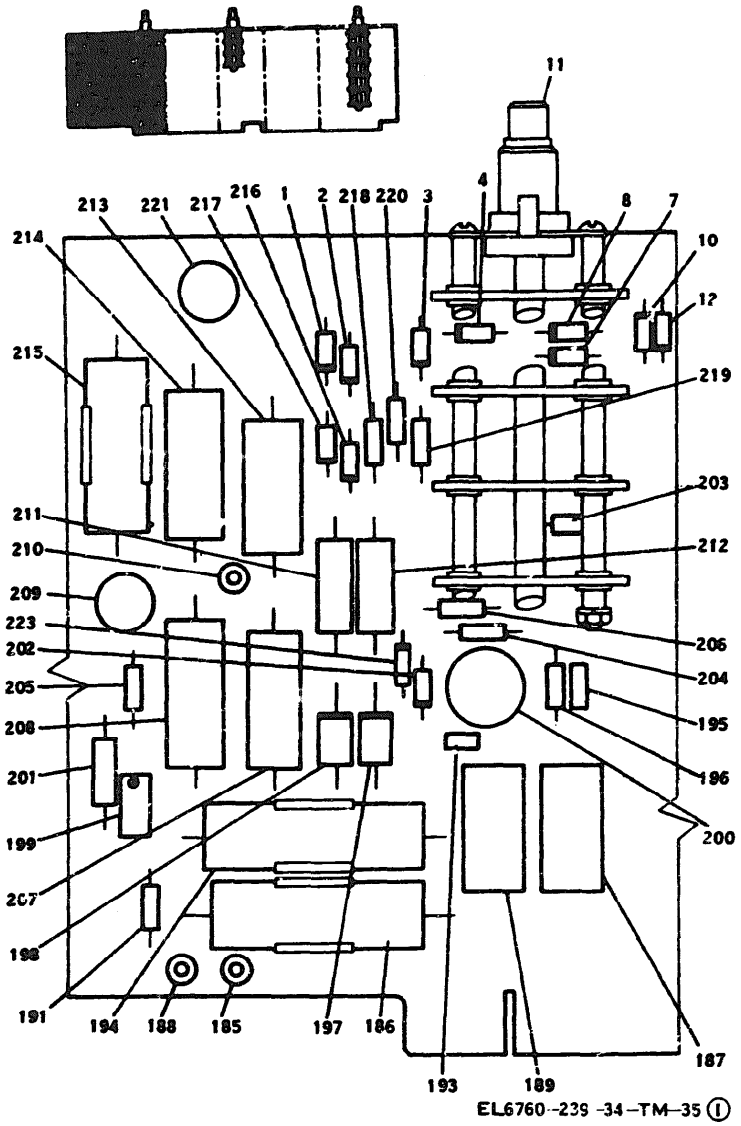


Figure 4-2(1). Printed circuit board and component assembly A16, parts location (sheet 1 of 5).

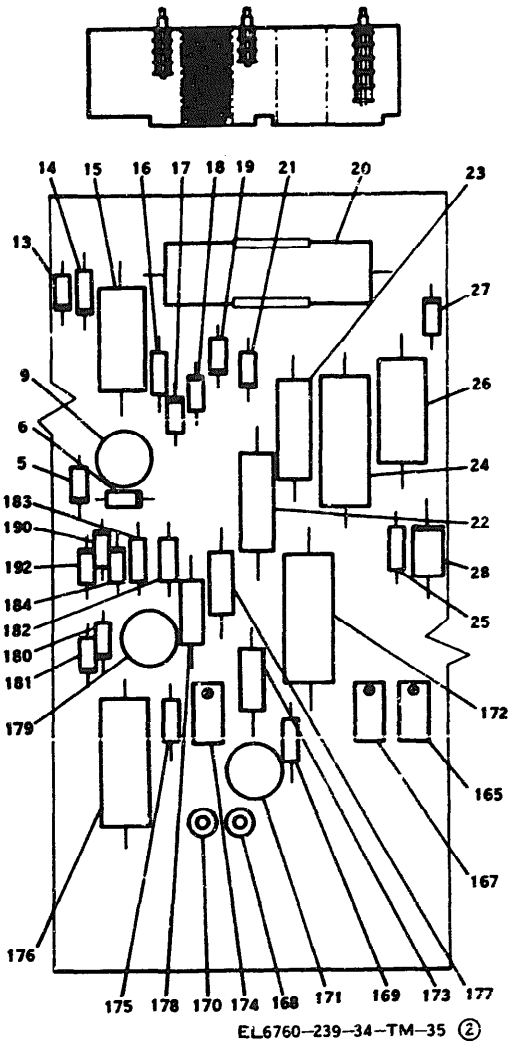


Figure 4-2(2). Printed circuit board and component assembly A16, parts location (sheet 2 of 5).

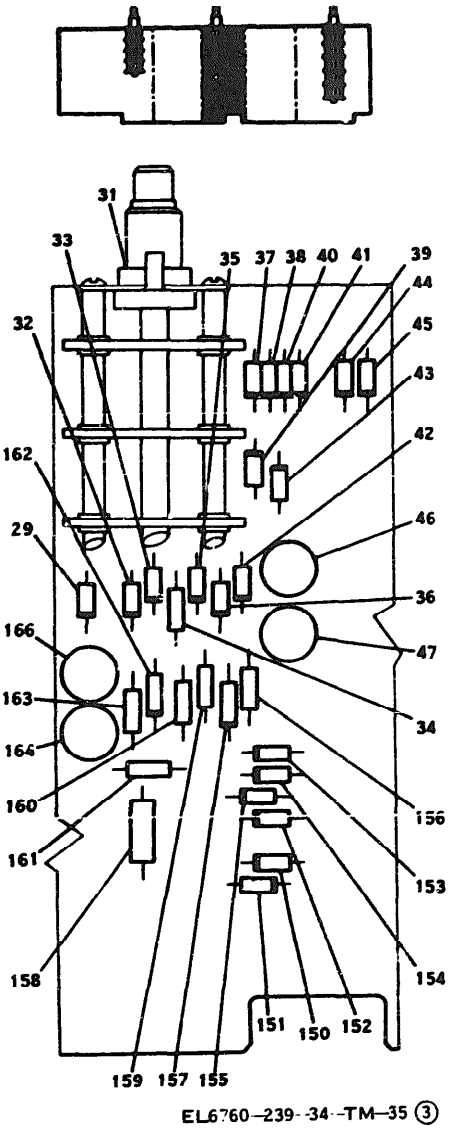


Figure 4-2(3). Printed circuit board and component assembly A16, parts location (sheet 3 of 5).

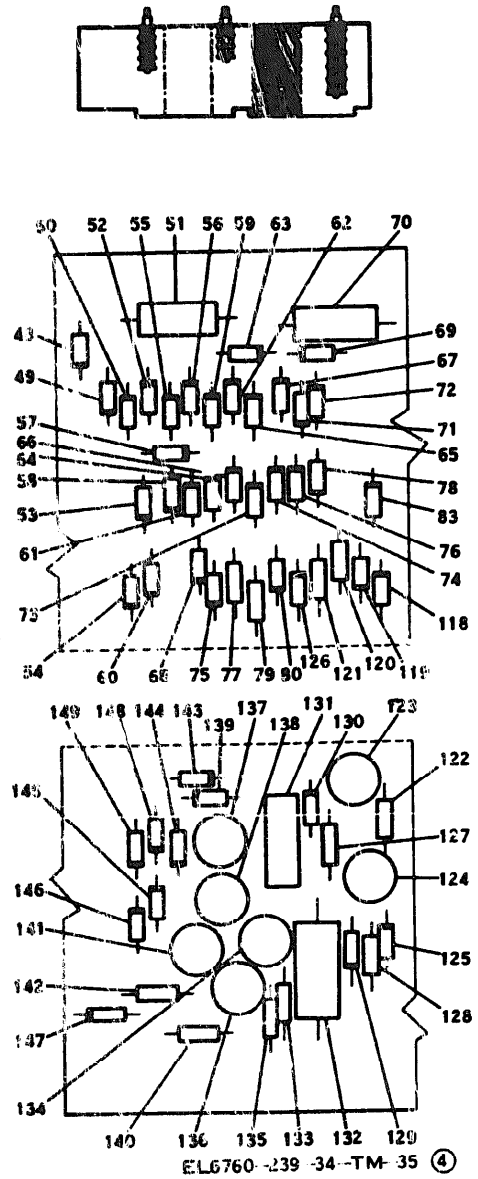


Figure 4-2(4). Printed circuit board and component assembly A16. parts location (sheet 4 of 5).

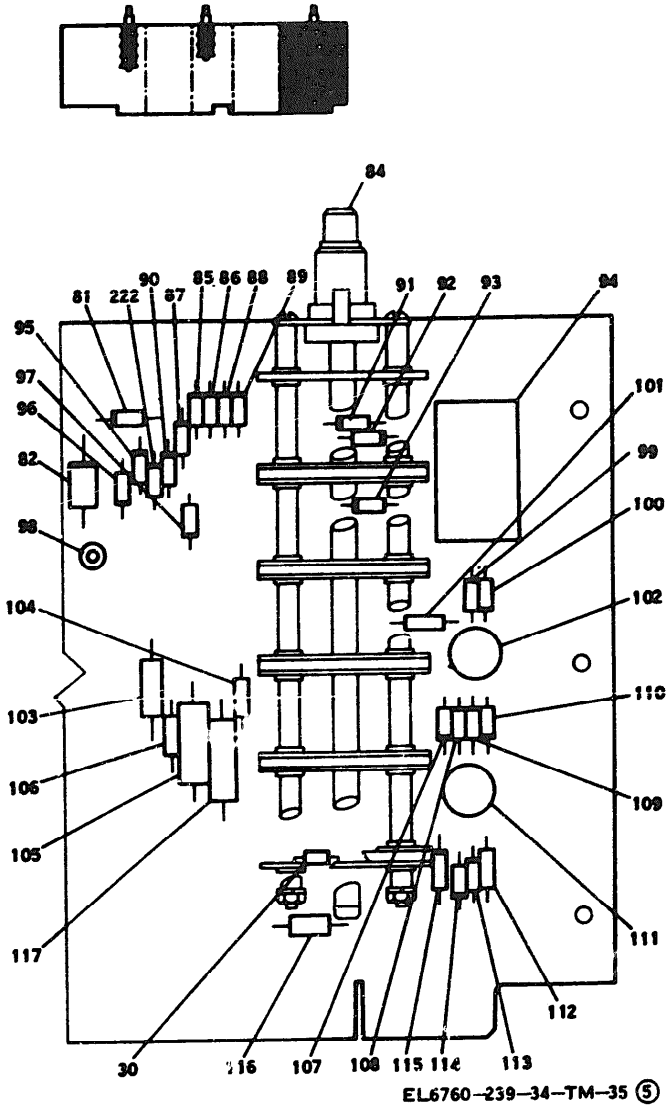
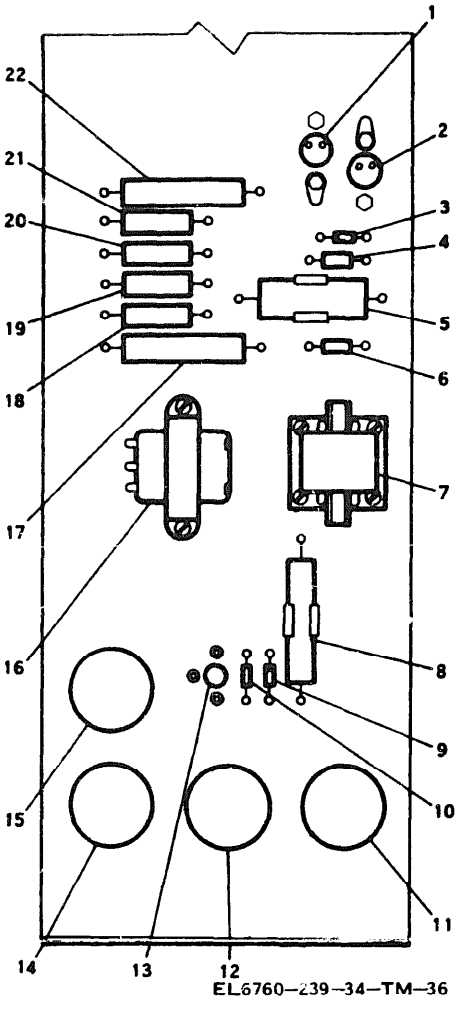


Figure 4-2(5). Printed circuit board and component assembly A16, parts location (sheet 3 of 5).



Key to fig. 4-3.

1 Transistor (Q1)
2 Transistor (Q2)
3 Diode (CR2)
4 Resistor (R5)
5 Capacitor (C2)
6 Resistor (R6)
7 Transformer (T2)
8 Capacitor (C1)
9 Diode (CR3)
10 Resistor (R11)
11 Lamp (DS4)
12 Lamp (DS3)
13 Transistor (Q3)
14 Lamp (DS2)
15 Lamp (DS1)
16 Transformer (T1)
17 Resistor (R1)
18 Resistor (R2)
19 Resistor (R8)
20 Resistor (R9)
21 Resistor (R10)
22 Resistor (R7)

Figure 4-3. Chassis and component assembly, parts location

paragraph 4-18d(2) and (3).

f. To remove transformer T2, perform steps in paragraph 4-l8e (5) through (7).

g. To remove transformer T1, perform steps in paragraph 4-18f(2) through (4).

h. When replacing other components (resistors, capacitors, or diodes), similarly unsolder and carefully mark and tag all electrical connections.

4-22. Assembly of Chassis and Component Assembly (fig. 4-3)

a Replace any component that was removed in essentially the reverse order of removal.

NOTE

If it is necessary to spray Epoxy coating, thin with Xylol (Federal Specification TT-X-916).

b. Mask over 19 terminals on both sides of the chassis and component assembly before applying Epoxy coating (para 4-17).

c Replace the chassis and component assembly in the camera analyzer by reversing the procedures in paragraph 4-21b and c.

d. Replace the test panel in the combination case by replacing 14 screws.

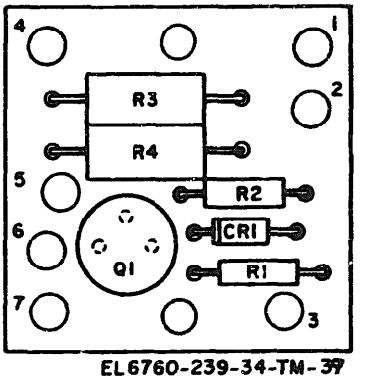


Figure 4-4. Assembly A15, parts location.

Section V. GS MAINTENANCE OF CAMERA TEST ADAPTER

WARNING

Disconnect the power source from the equipment when making repairs.

NOTE

GS maintenance includes all repair operations covered in TM 11-6760-239-12 and DS maintenance as well as those covered in this chapter.

4-23. Camera Test Adapter GS Repair Procedures

The camera test adapter repair procedures are identical to the camera analyzer GS repair procedures. Refer to paragraph 4-15 for camera test adapter GS repair procedures.

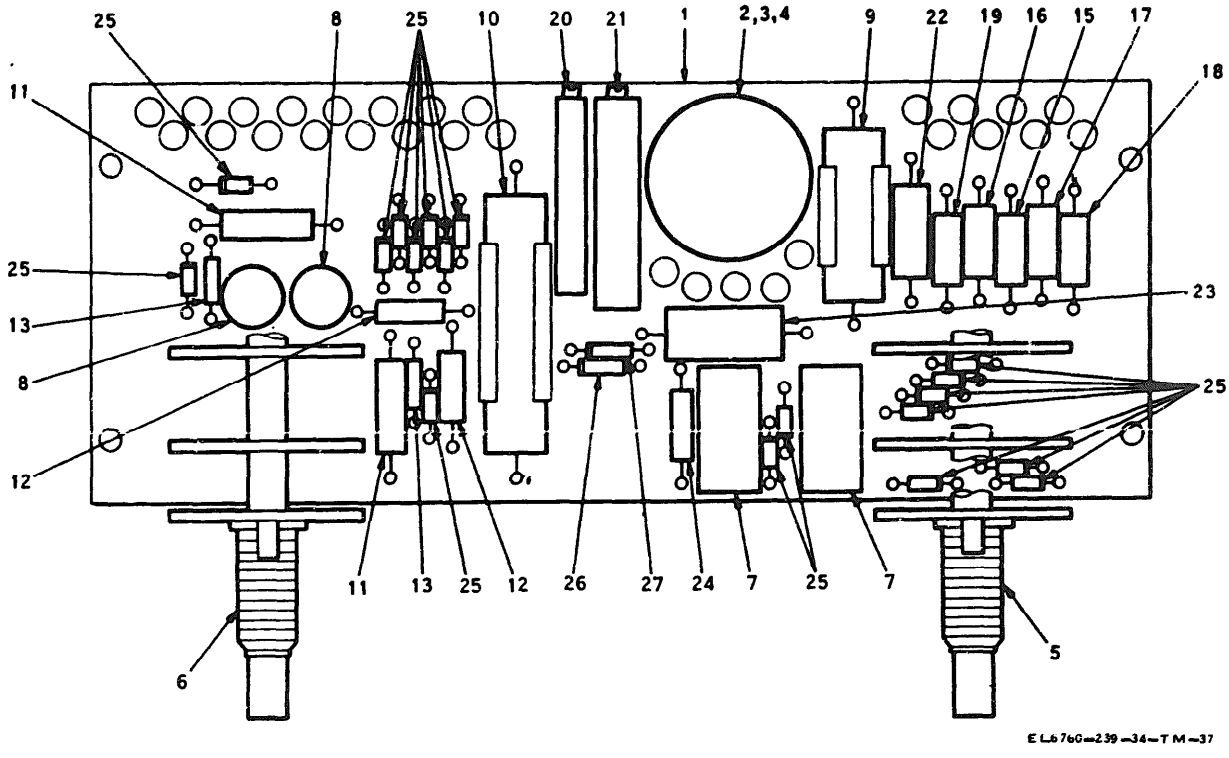
4-24. Camera Test Adapter GS Replacement ment Procedures (fig. 4-5)

a. Replacement of Transformer T1. Replace transformer T1 (2) as follows:

(1) Perform the procedure in paragraph 3-19*b*(1) through (4).

(2) Unsolder and carefully mark or tag all electrical connections to transformer T1 (2).

(3) Remove two nuts (3) and two washers (4) securing transformer T1 (2) to chassis and carefully remove transformer.



1 Mode and exposure board and switch assembly A3
2 Transformer T1
3 Nut (2)
4 Washer (2)
5 Switch, rotary; EXPOSURE S2
6 Switch, rotary; MODE S1
7 Relay K1, K2 (2)
8 Transistor Q1, Q2 (2)
9 Capacitor C1
10 Capacitor C2
11 Capacitor C3, C4 (2)
12 Resistor R1, R4 (2)
13 Resistor R2, R5 (2)
14 Deleted
15 Resistor R6
16 Resistor R7
17 Resistor R8
18 Resistor R9
19 Resistor R10
20 Resistor, variable R11
21 Resistor, variable R12
22 Resistor, R13
23 Resistor R14
24 Resistor R15
25 Diode (CR1 through CR7, CR10 through CR14, and CR16 through CR21
26 Diode CR8
27 Diode CR9

Figure 4-5. Mode and exposure board and switch assembly, parts location.

(4) Install replacement transformer T1 by reversing the procedures in (2) and (3) above.

(5) Reassemble the camera test adapter by reversing the procedure in paragraph 3-19*i*(1) through (4).

b. Replacement of MODE Switch S1 or EXPOSURE Switch S2. Replace MODE switch S1 (6) or EXPOSURE switch S2 (5) as follows:

(1) Perform the procedure in paragraph 3-19*i*(1) through (4).

(2) Unsolder and carefully mark or tag all electrical connections to the switch.

(3) Unsolder the switch from the printed circuit board and carefully remove switch.

(4) Install a replacement switch by reversing the procedures in (2) and (3) above.

(5) Reassemble the camera test adapter by reversing the procedures in paragraph 3-19*i*(1) through (4).

c. Replacement of Remaining Electronic Components. Replace any of the remaining electronic components as follows:

(1) Perform the procedures in paragraph 3-19*i*(1) through (4).

(2) Unsolder and carefully mark or tag all electrical connections to the electronic component.

(3) Unsolder the electronic component in question and remove.

(4) Install the replacement part by reversing steps in (2) and (3) above.

NOTE

When replacing diodes or electrolytic capacitors, be sure to observe the correct polarities.

(5) Reassemble the camera test adapter by reversing the procedures in paragraph 3-19*i*(1) through (4).

4-25. Camera Test Adapter Adjustment Procedures

a. The camera test adapter procedures consist of adjustment of exposure test signal variable resistors R11 and R12 (20, 21, fig. 4-5). These adjustments are required after GS repairs have been performed on the equipment.

b. The test equipment required to perform the camera test adapter adjustment procedures are listed below.

(1) Simulator, Control System, Camera LS-36A.

(2) Voltmeter, Electronic ME-202A/U (vtvm).

4-26. Adjustment of Exposure Test Signal Variable Resistors R11 and R12 (fig. 4-6).

a. Connect the vtvm positive lead to pin 17 of mode and exposure and switch assembly A3; connect the vtvm negative lead to pin 20.

b. Using a jumper cable, connect pins J and K of camera test adapter connector P2.

c. Connect one end of cable assembly LM-110A (part of LS-36A) to LS-36A connector J705 and the other end to the 28 volts dc and 115 volts, 400 Hz power sources.

d. Connect one end of power cable W9 (part of LS-80A) to camera test adapter connector J1 and the other end to a +28 volts dc power source.

e. Connect one end of cable assembly LA-174A (part of LS-36A) to camera test adapter connector P3 and the other end to LS-36A connector J706.

f. Set LS-36A POWER switch to ON.

g. Set camera test adapter EXPOSURE switch to 44MM CAL.

h. Set camera test adapter POWER switch to ON. Allow the equipment to warm up for approximately 15 minutes.

i. On mode and exposure board and switch assembly A3, adjust resistor R11 (20, fig. 4-5) for a +134 ±6 millivolts (mv) indication on the vtvm.

j. Set camera test adapter EXPOSURE switch to OPR ALL.

k. On mode and exposure board and switch assembly A3, adjust resistor R12 (21, fig. 4-5) for a +2.5 ±0.1 volt dc indication on the vtvm.

l. Set POWER switches on the LS-36A and camera test adapter to OFF.

m. Disconnect test setup.

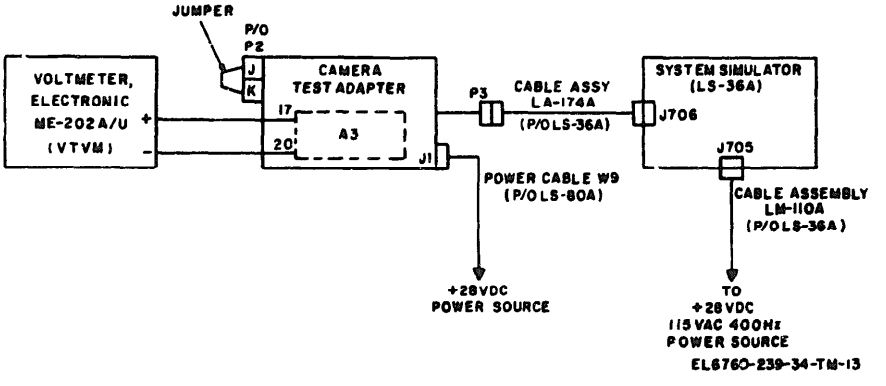


Figure 4-6. Camera test adapter adjustments.

APPENDIX A

REFERENCES

The following publications contain information applicable to the direct support and general support repairman of Test Set, Analyzer Camera LS-80A.

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	U.S. Army Index of Modification Work Orders.
TM 11-1510-204-20-2-1	Organizational Maintenance Manual: Signal Electronic Equipment Configuration, Army Model OV-1D Aircraft.
TM 11-1510-204-35-2/1	Direct Support, General Support, and Depot Maintenance Manual: Signal Electronic Equipment Configuration, Army Model OV-1D Aircraft.
TM 11-6625-203-12	Operator and Organizational Maintenance Manual: Multimeter AN/URM-105, and AN/URM 105C Including Multimeter ME-77/U.
TM 11-6625-366-15	Operator's Organizational, DS, GS, and Depot Maintenance Manual: Multimeter TS-352B/U.
TM 11-6625-537-14-1	Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual: Voltmeter, Electronic ME-202A/U. (NSN 6625-00-709-0288) and ME-202B/U (NSN 6625-00-972-4046).
TM 11-6625-1703-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tool Lists: Oscilloscope AN/USM-281A.
TM 11-6720-236-12	Operator's and Organizational Maintenance Manual: Camera, Still Picture KA-76A and Lens Cones, Camera, Aerial Reconnaissance LA-370A, LA-371A, and LA-372A.
TM 11-6720-236-35	DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tool Lists: Camera, Still Picture KA-76A and Lens Cones, Camera, Aerial Reconnaissance LA-370A, LA-371A, and LA-372A.
TM 11-6720-245-20	Organizational Maintenance Manual Including Repair Parts and Special Tools List: Photographic Surveillance System, Airborne KS-104A (6720-890-7623) and Photographic Surveillance System, Airborne KS-104B (6720-406-4653).
TM 11-6720-245-34	Direct Support and General Support Maintenance Manual Including Repair Parts and Special Tools List: Photographic Surveillance System, Airborne KS-104A (6720-890-7623) and Photographic Surveillance System, Airborne KS-104B (6720-406-4653).
TM 11-6720-250-12	Operator's and Organizational Maintenance Manual Including Repair Parts and Special Tools List: Photographic Surveillance System, Airborne KS-113A.
TM 11-6720-250-35	Direct Support, General Support, and Depot Maintenance Manual Including Repair Parts and Special Tools List: Photographic Surveillance System, Airborne KS-113A.
TM 11-6760-220-12	Operator and Organizational Maintenance Manual: Test System, Photographic Surveillance LS-34A; Analyzer, Still Picture Camera LS-44A; Test System, Photographic Surveillance System LS-45A; Tool Kit, Still Picture Camera Maintenance LS-48A; Test Set, Converter, Altitude-Ground Speed Ratio LS-50A; Test Set, Scanner Alignment LS-51A; and Test Set, Vacuum Regulator Assembly LS-185A; as used for Testing, Camera, Still Picture KA-30A; and Photographic Surveillance Systems, Airborne KS-59( ) and KS-61A.
TM 11-6760-238-12	Operator's and Organizational Maintenance Manual Including Repair Parts and Special Tool Lists for Test Set, Control Panel, Focal Plane Shutter LS-78A.
TM 11-6760-242-15	Operator's, Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tool Lists: Timer, Digital Electronic LA-387A.
TM 11-6760-245-12	Operator's and Organizational Maintenance Manual Including Repair Parts and

	Special Tools Lists for Analyzer Set, Photographic Surveillance System LS-89A (FSN 6760-462-3041).
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 55-1510-204-10/5	Operator's Manual: OV-1D Aircraft.

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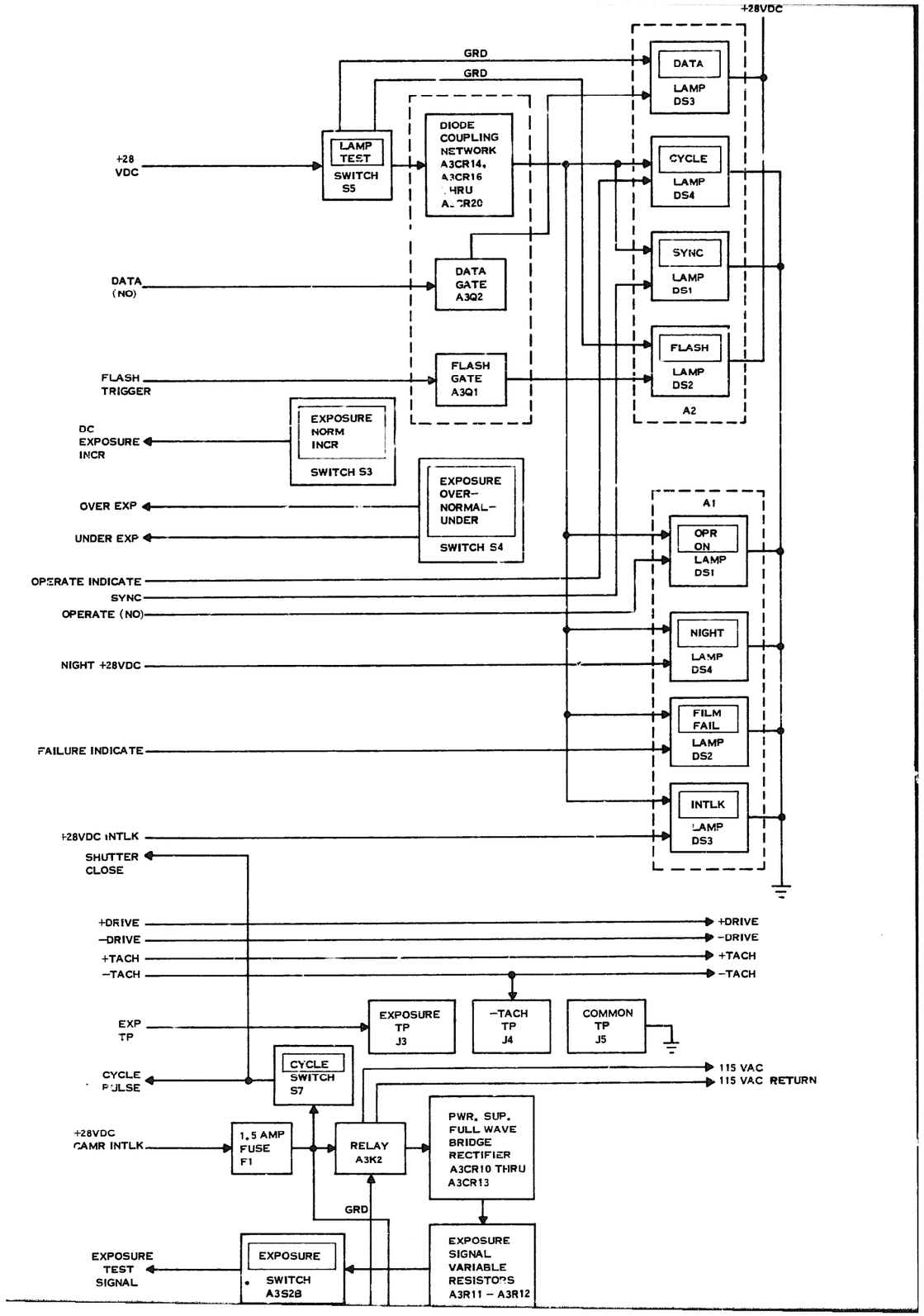


Figure FO-1. Camera test adapter, overall block diagram.

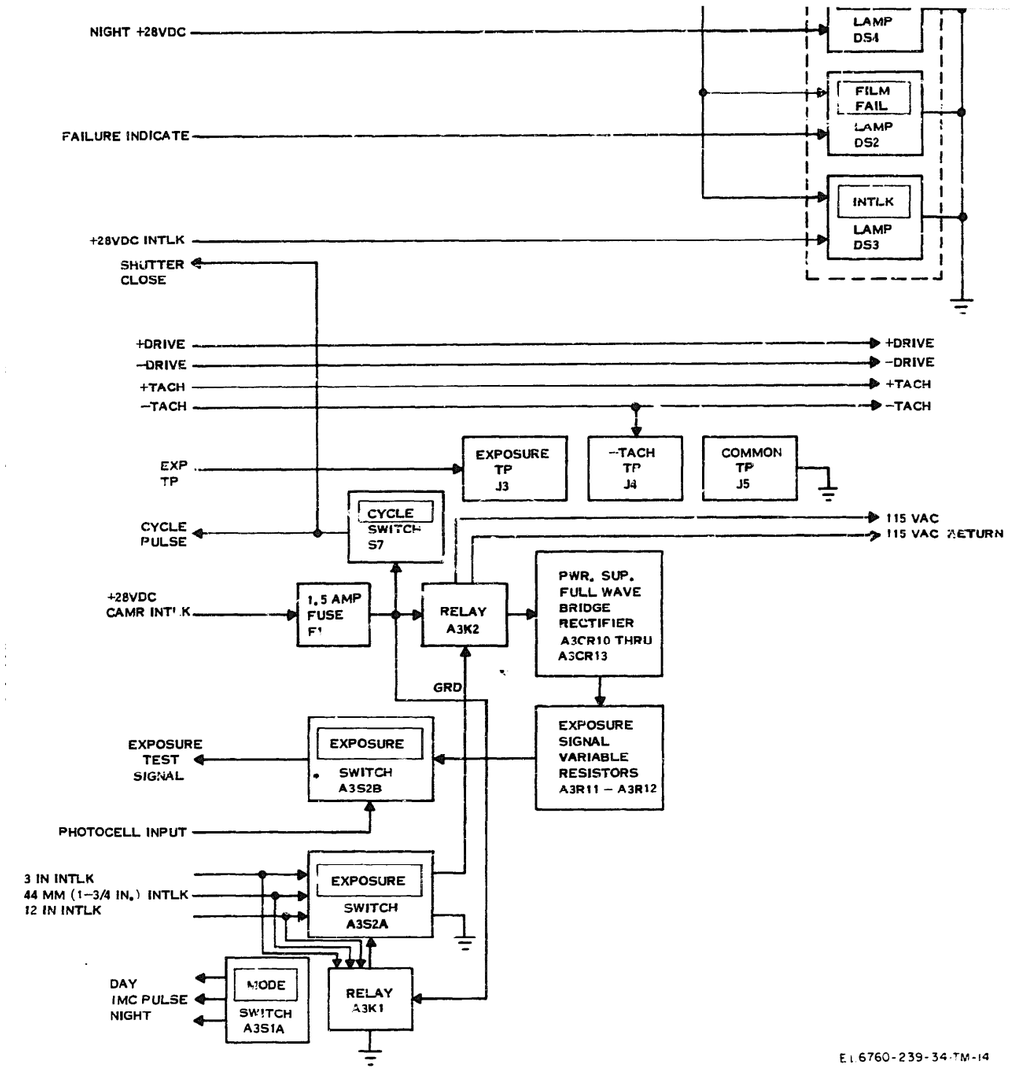


Figure FO-1. Camera test adapter, overall block diagram.

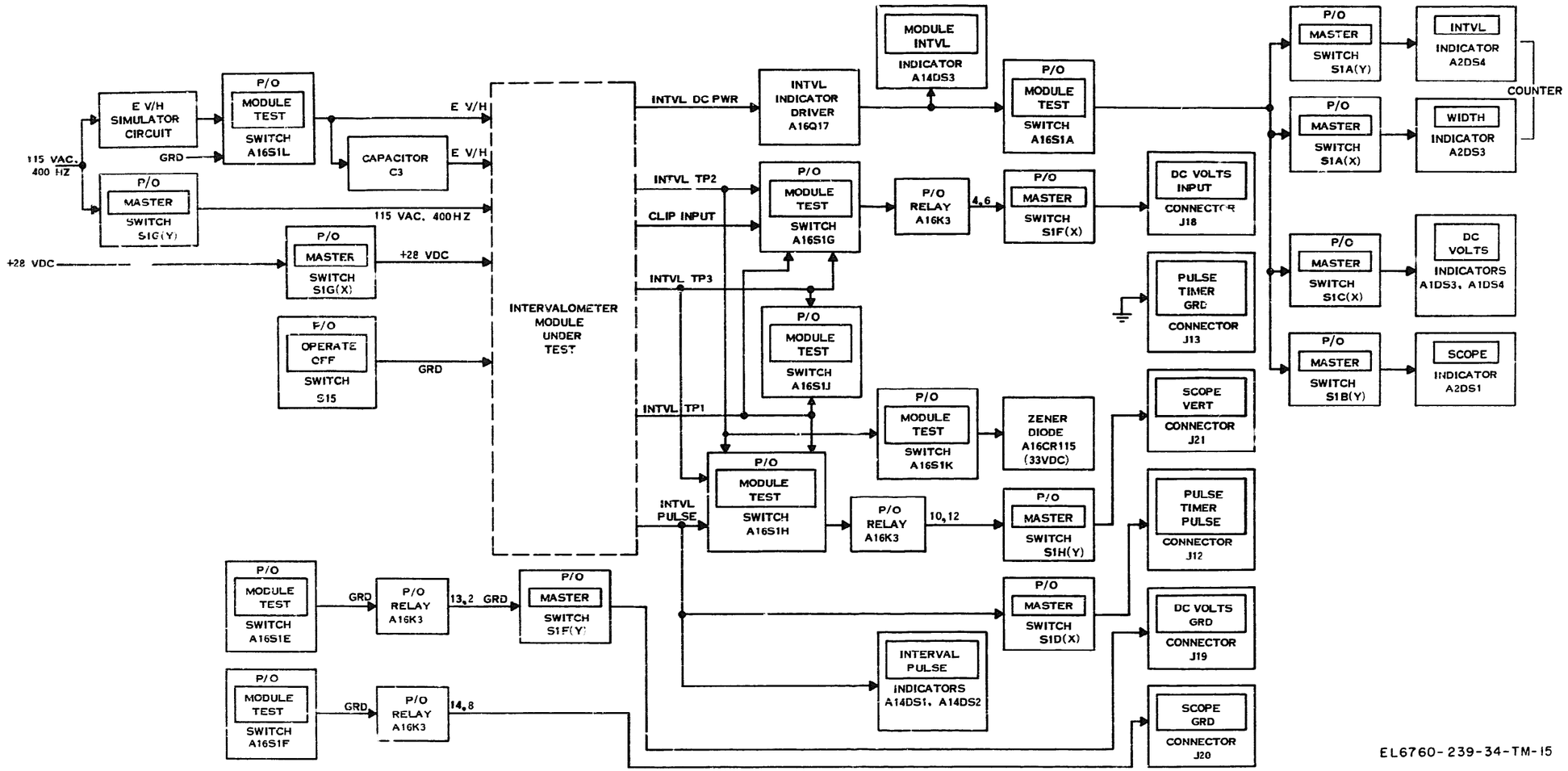


Figure FO-2. Control-power supply intervalometer module test, block diagram.

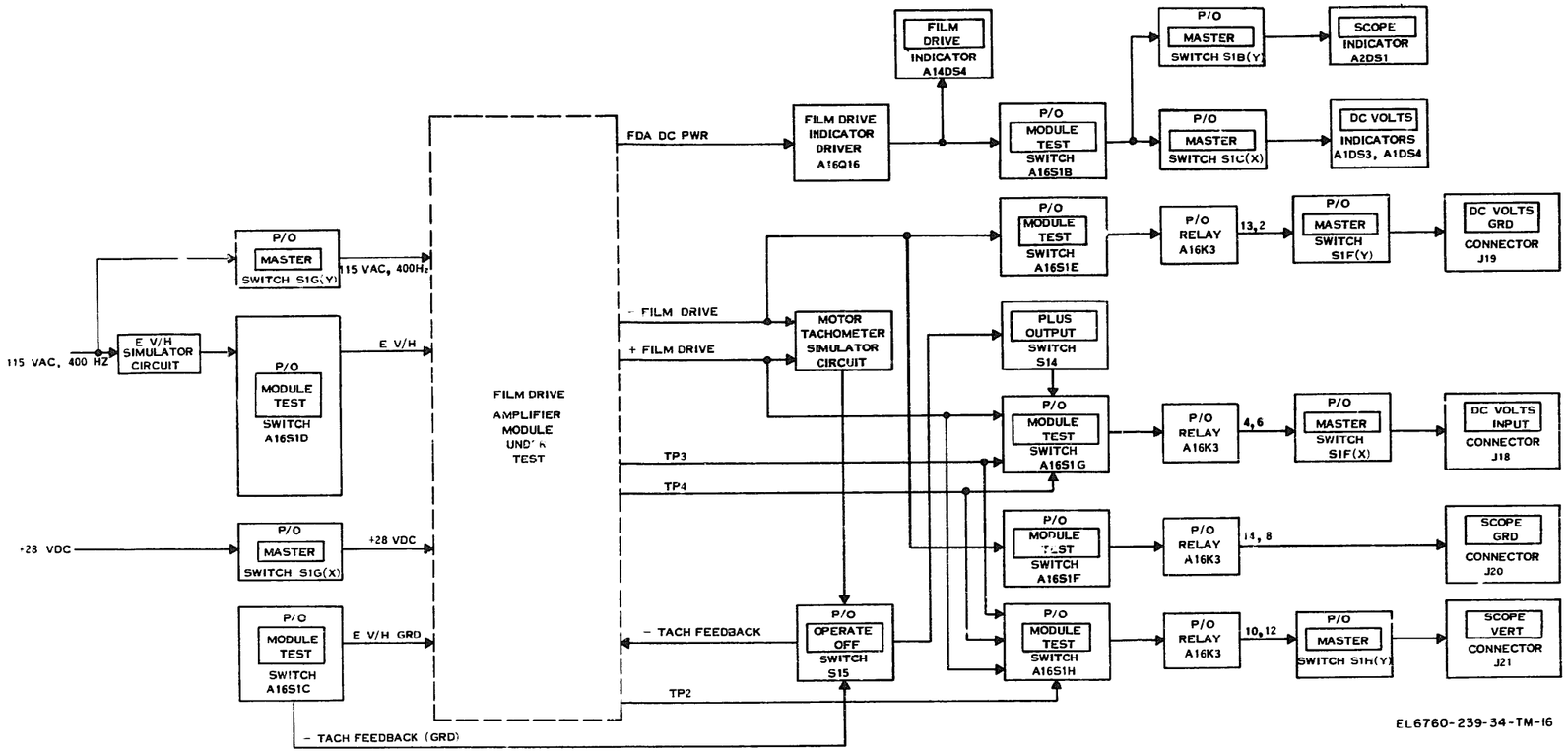
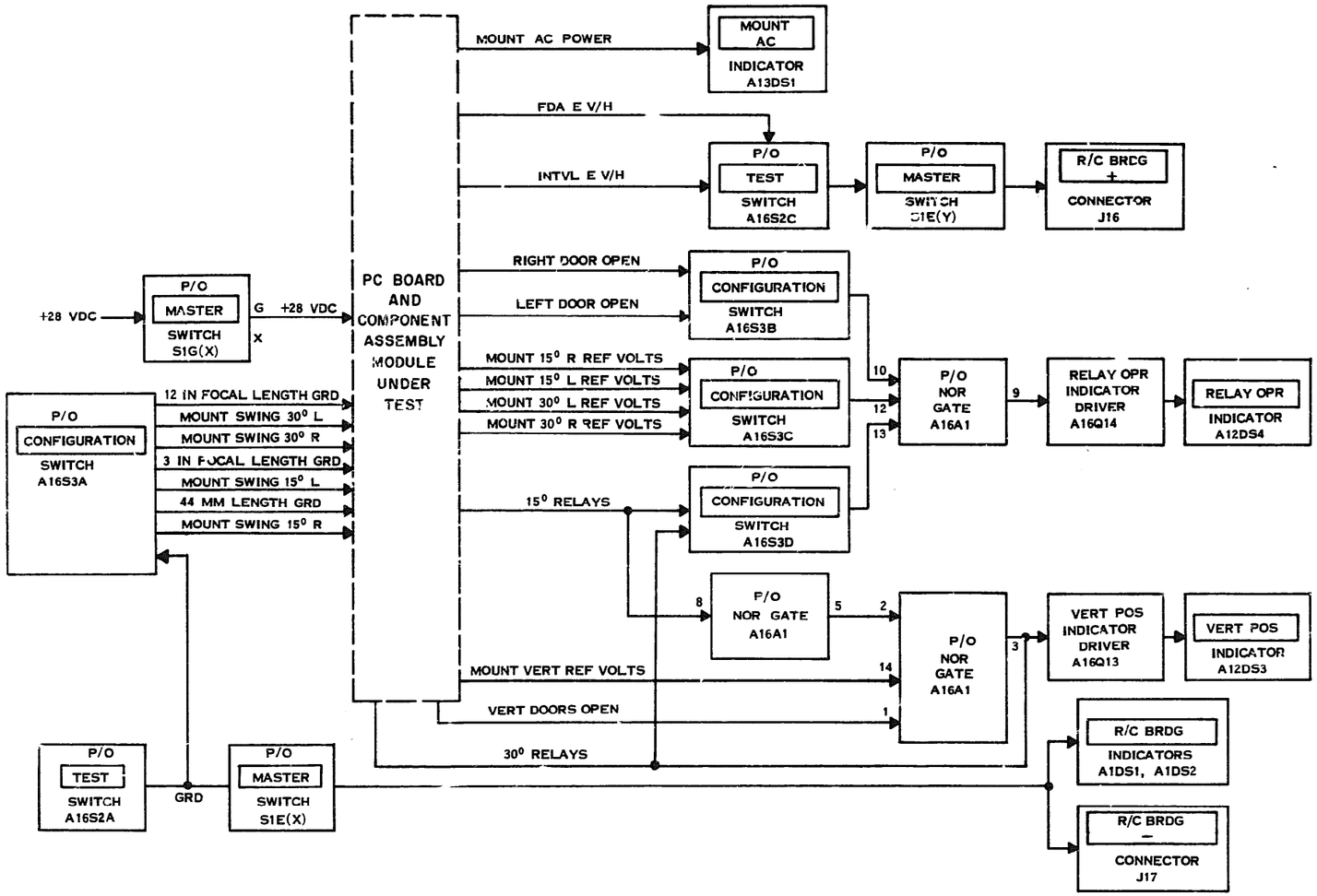


Figure FO-3. Control-power supply, film drive amplifier module test, block diagram.



EL6760-239-34-TM-17

Figure FO-4. Control-power supply PC board and component assembly module test, block diagram.

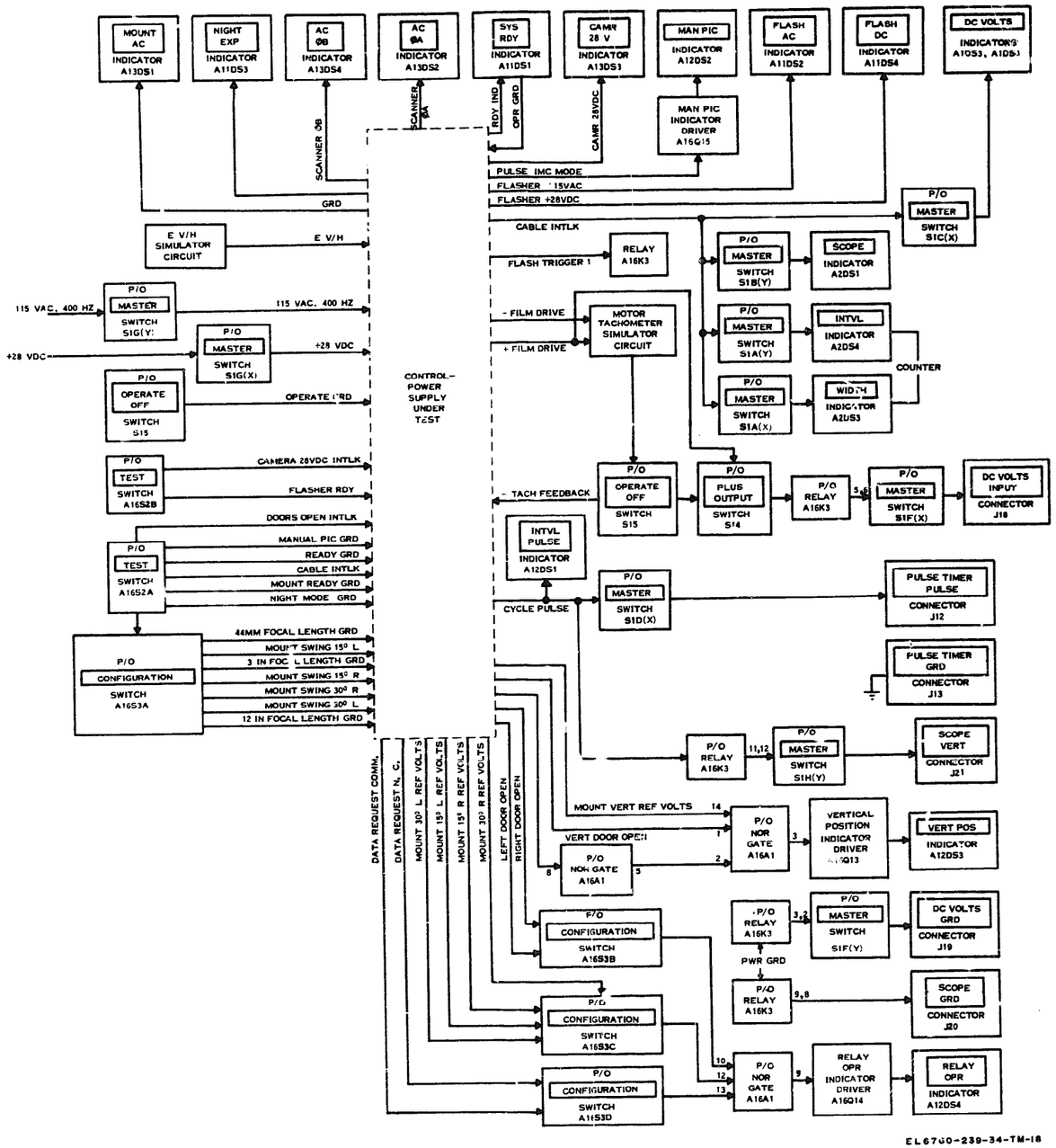


Figure FO-5. Control-power supply tests, block diagram.

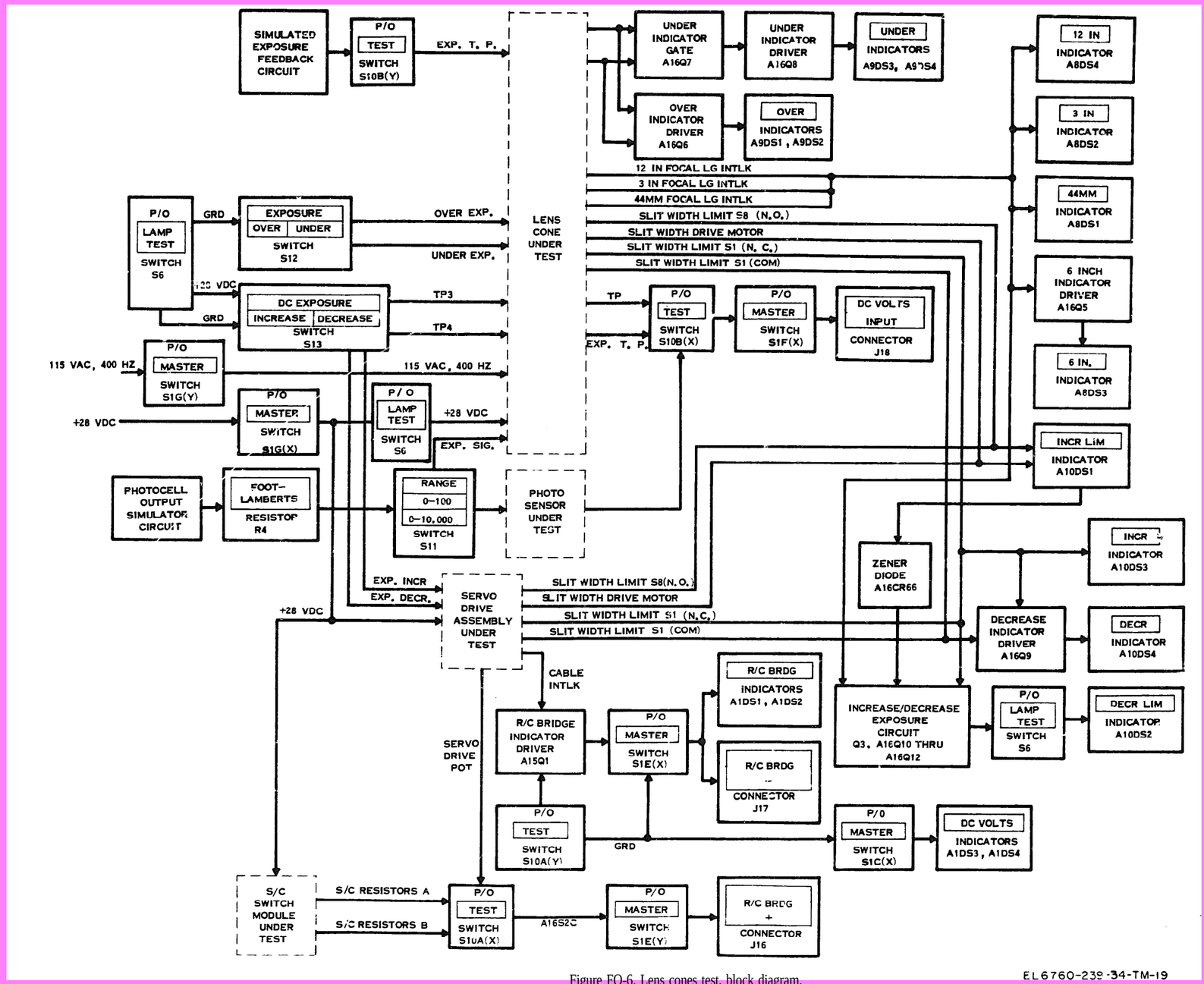


Figure FO-6. Lens cones test, block diagram.

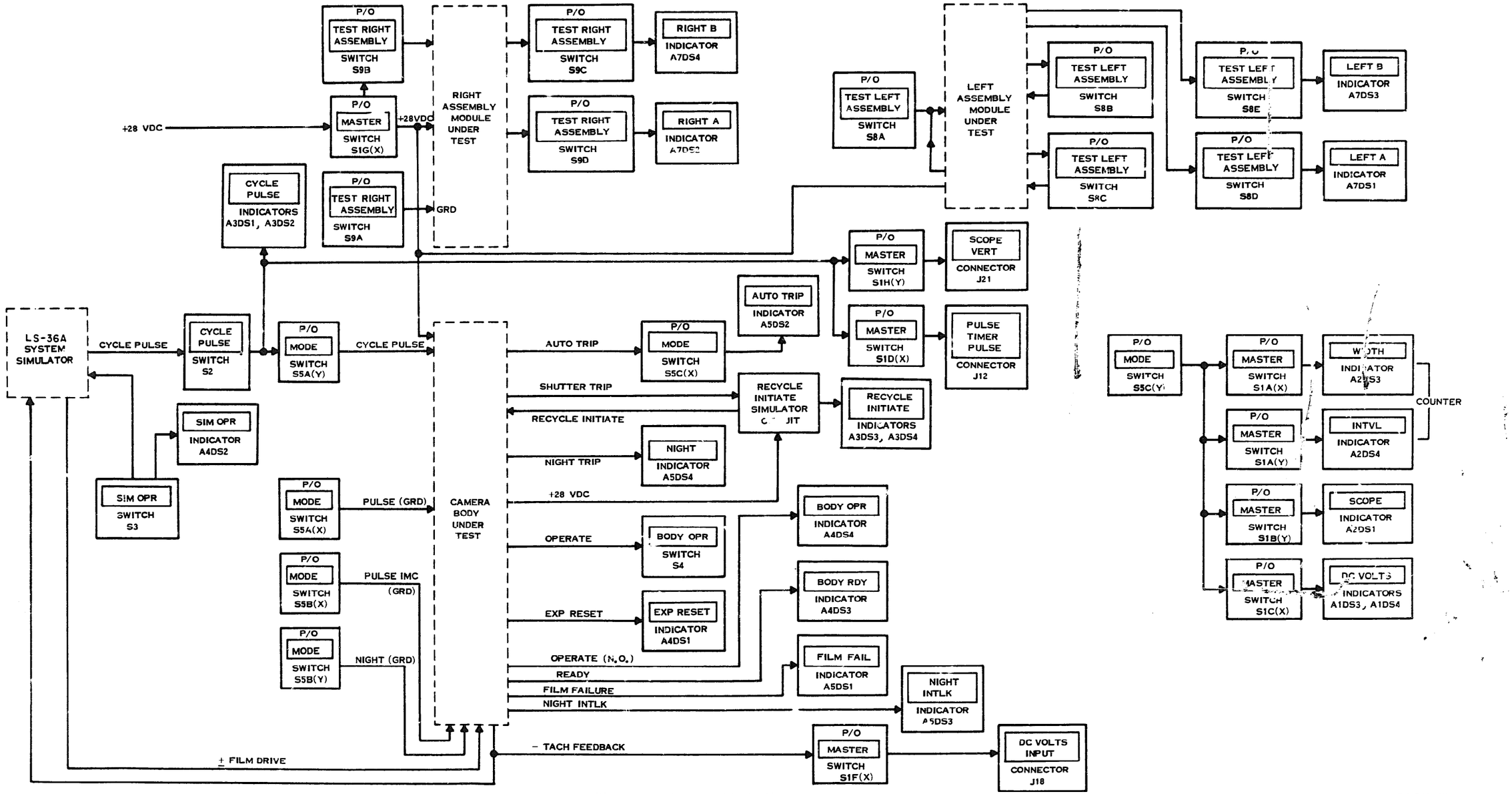


Figure FO-2. Camera body tests. block diagram.

EL6760-239-34-TM-20

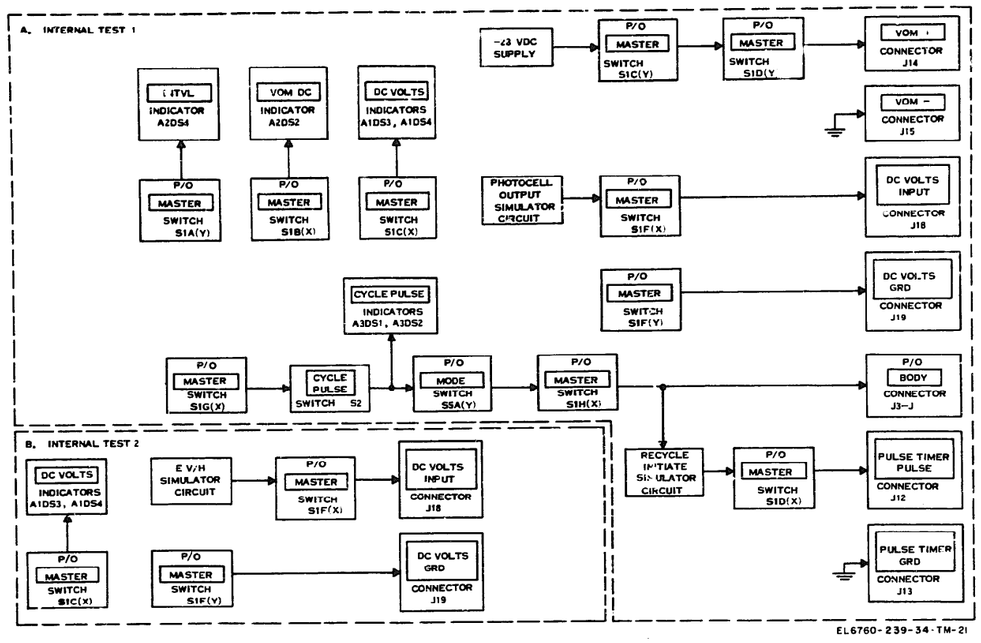


Figure FO-1. Internal tests, block diagram.

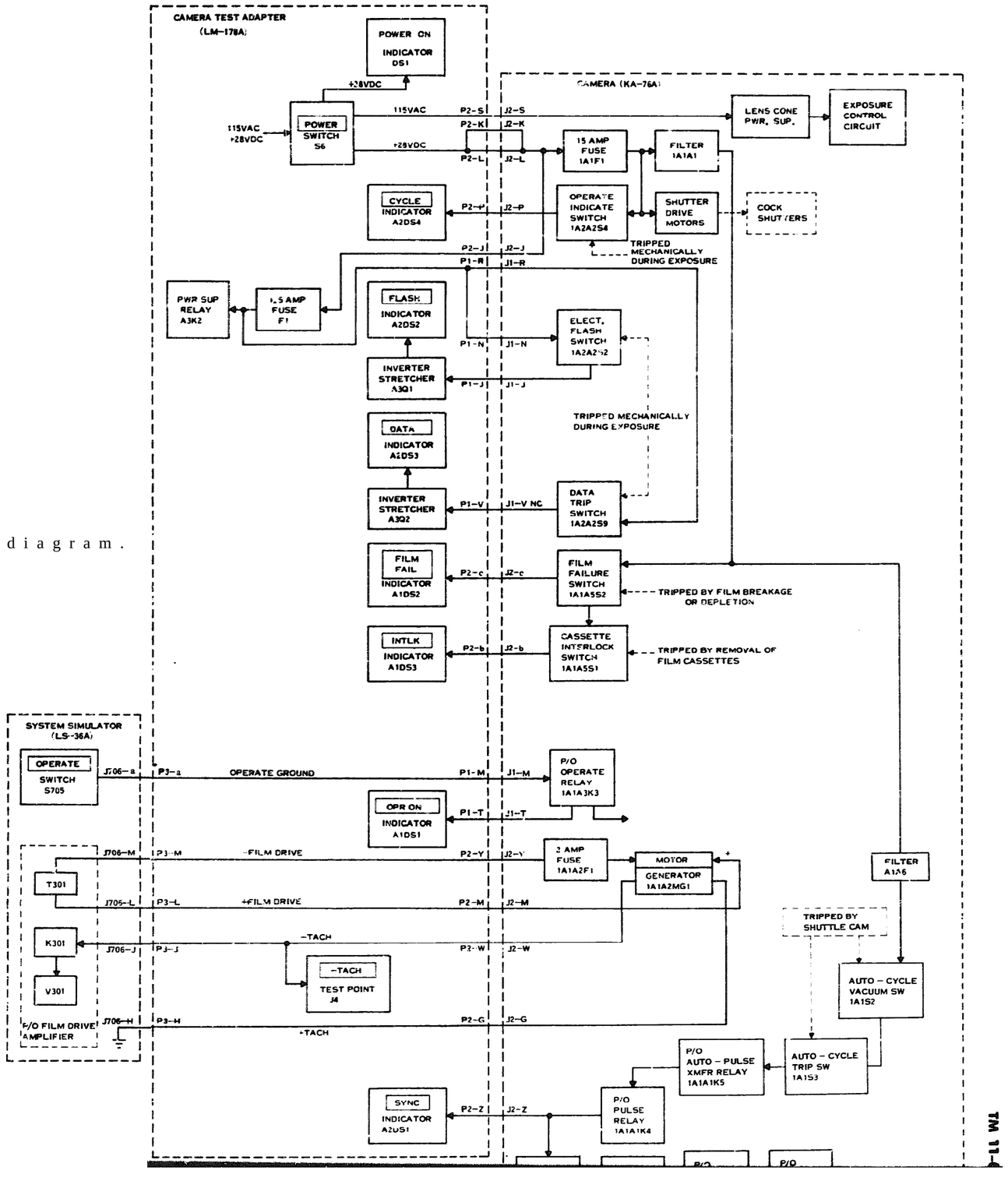


Figure FO-9. Auto mode test, block diagram.

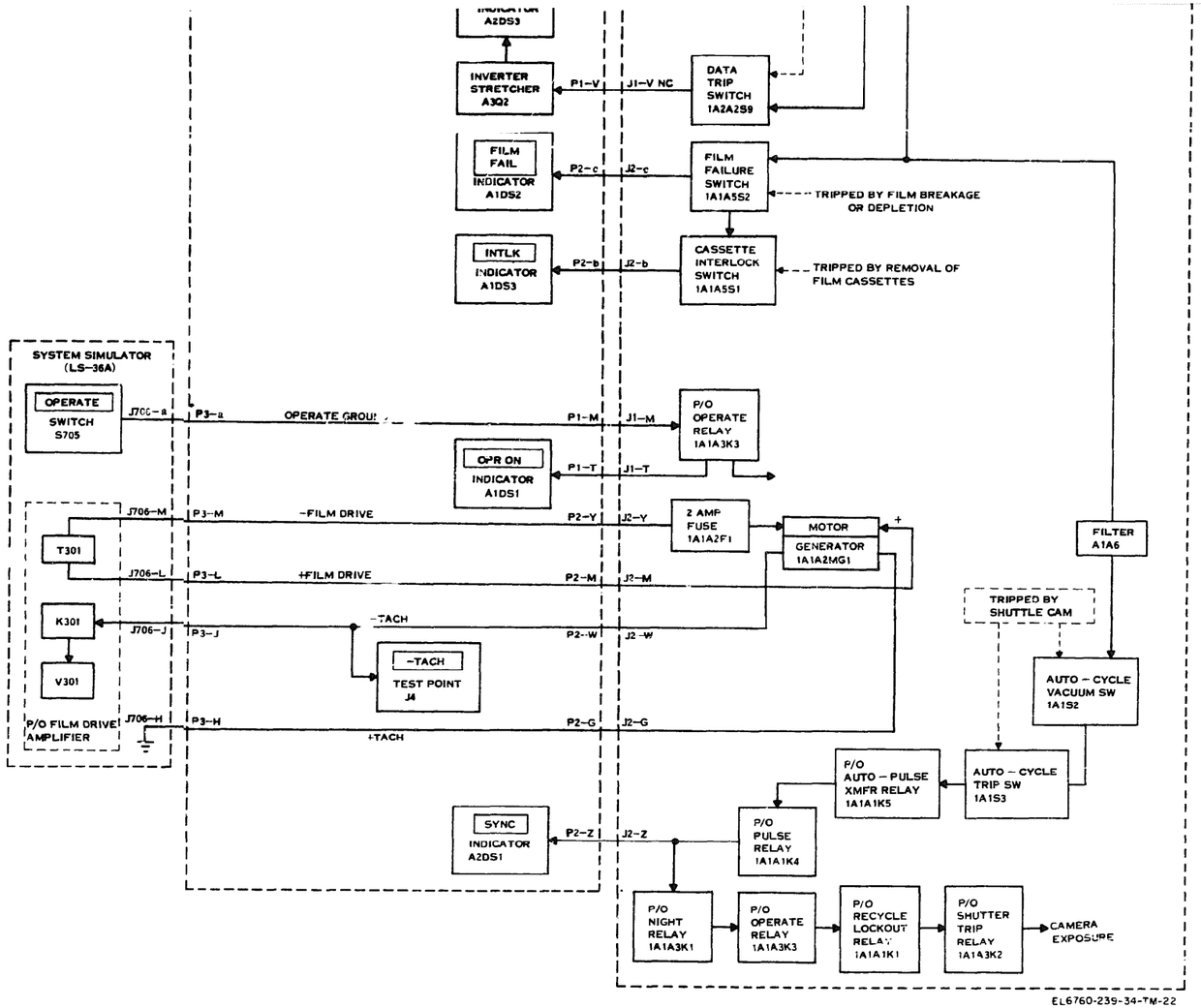


Figure FO-9. Auto mode test, block diagram.

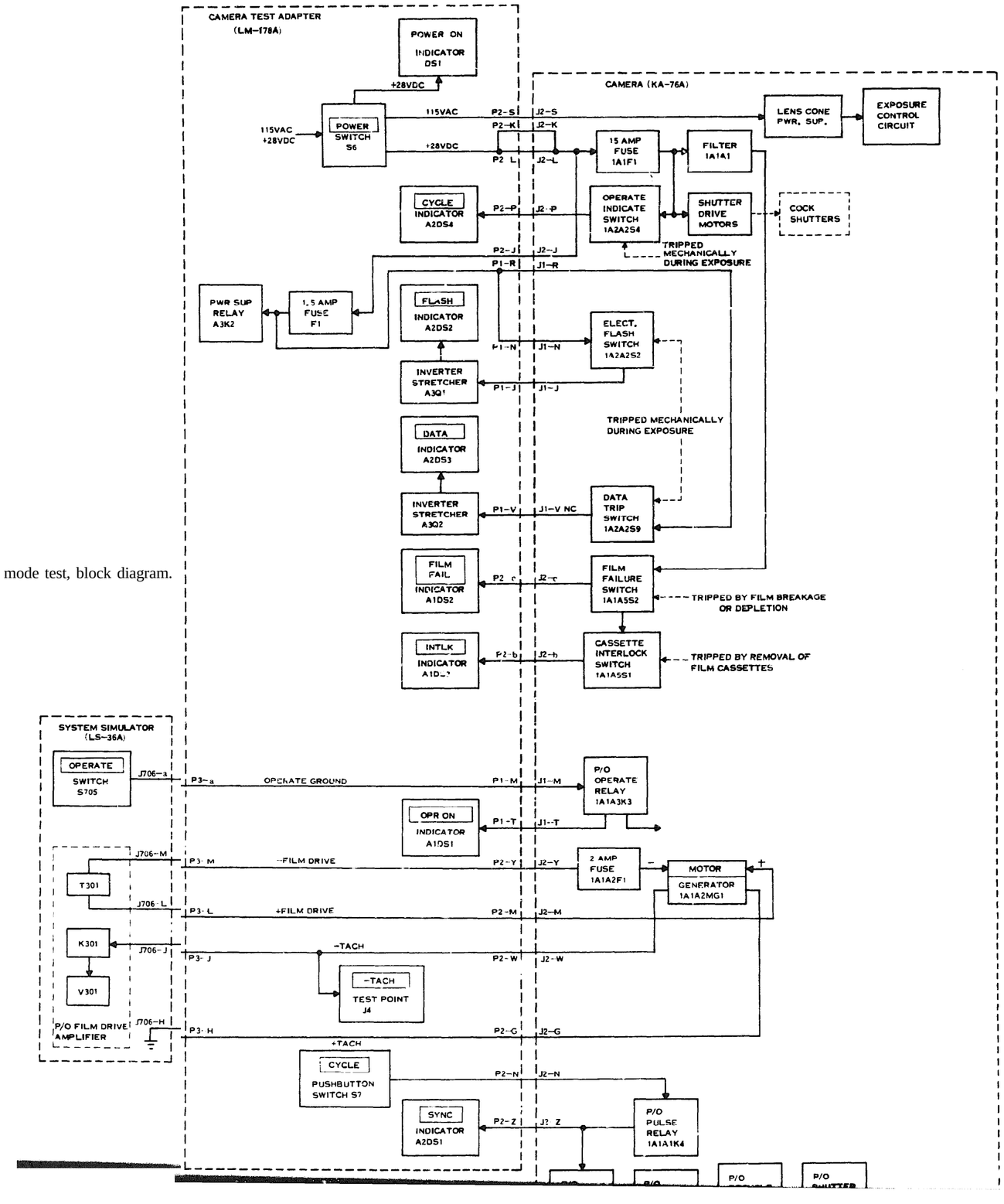
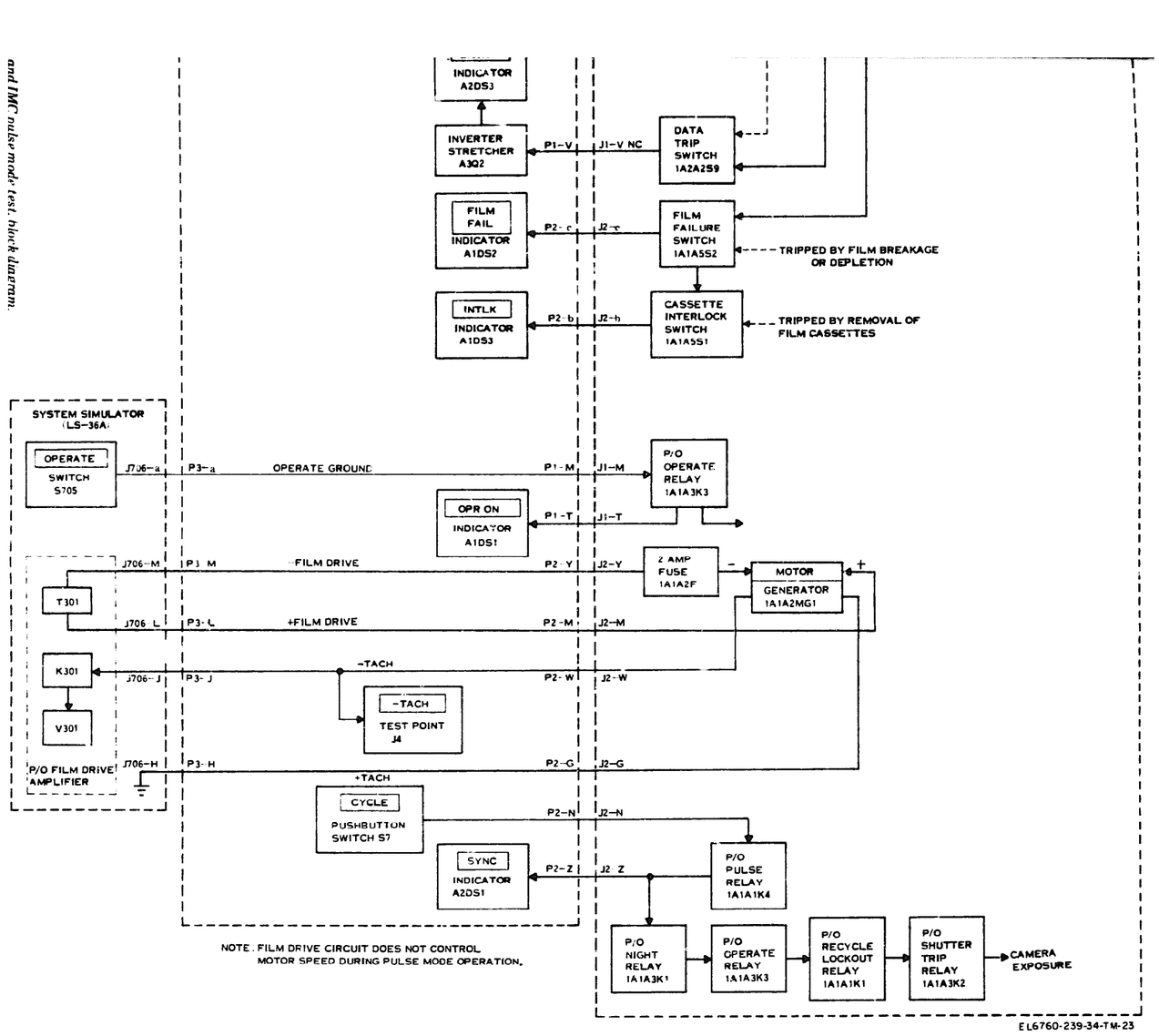
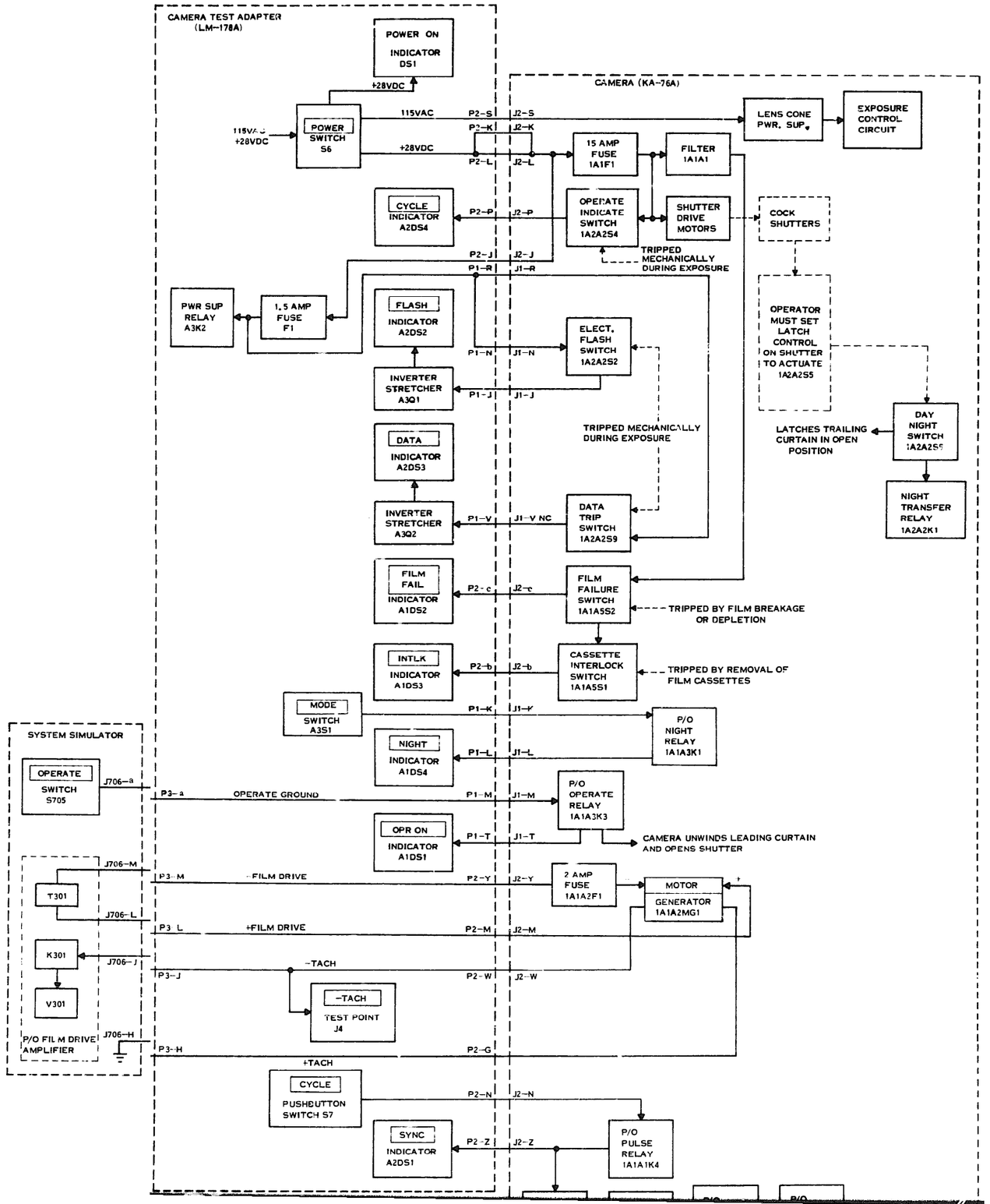


Figure FO-10. Pulse and IMC pulse mode test, block diagram.

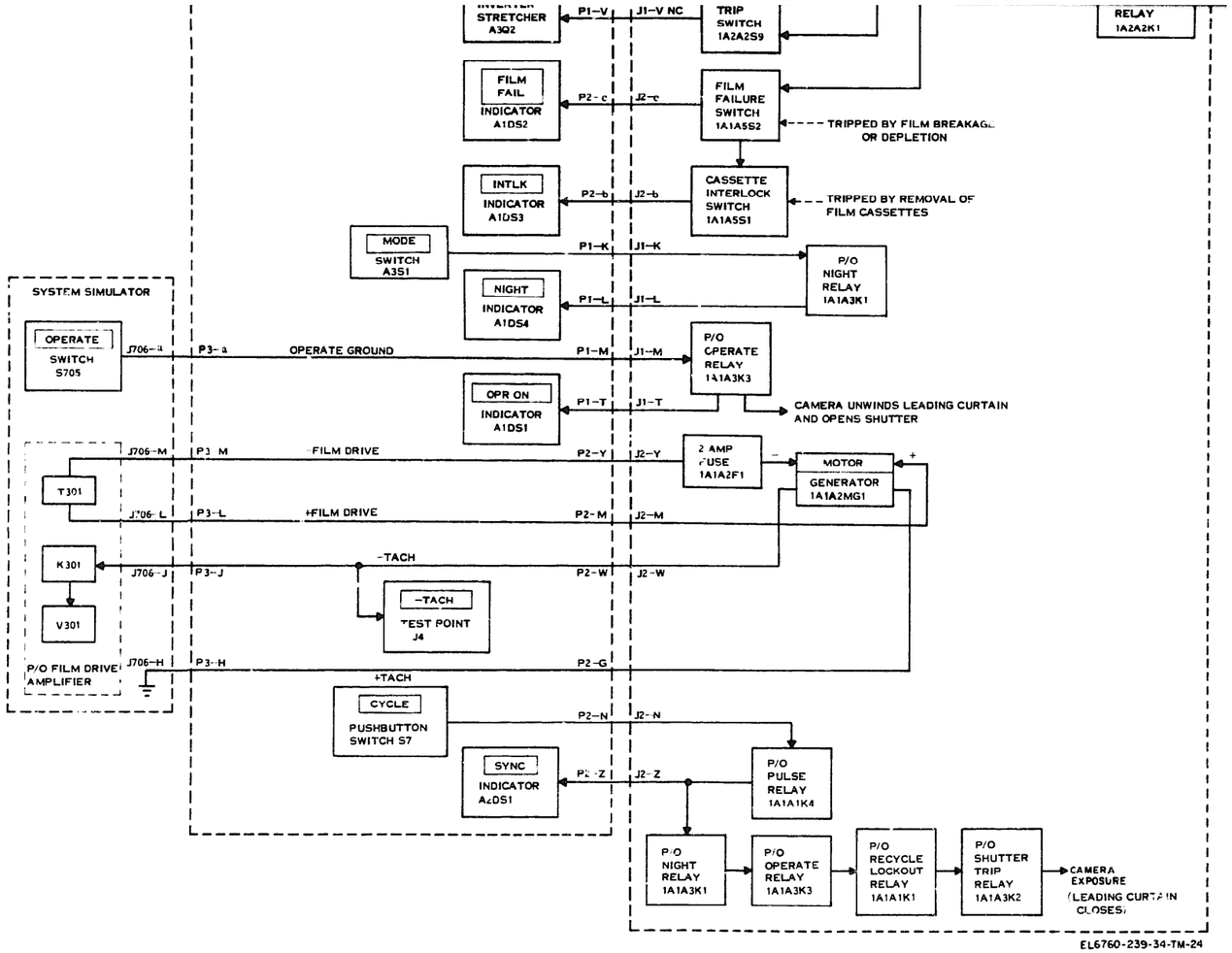


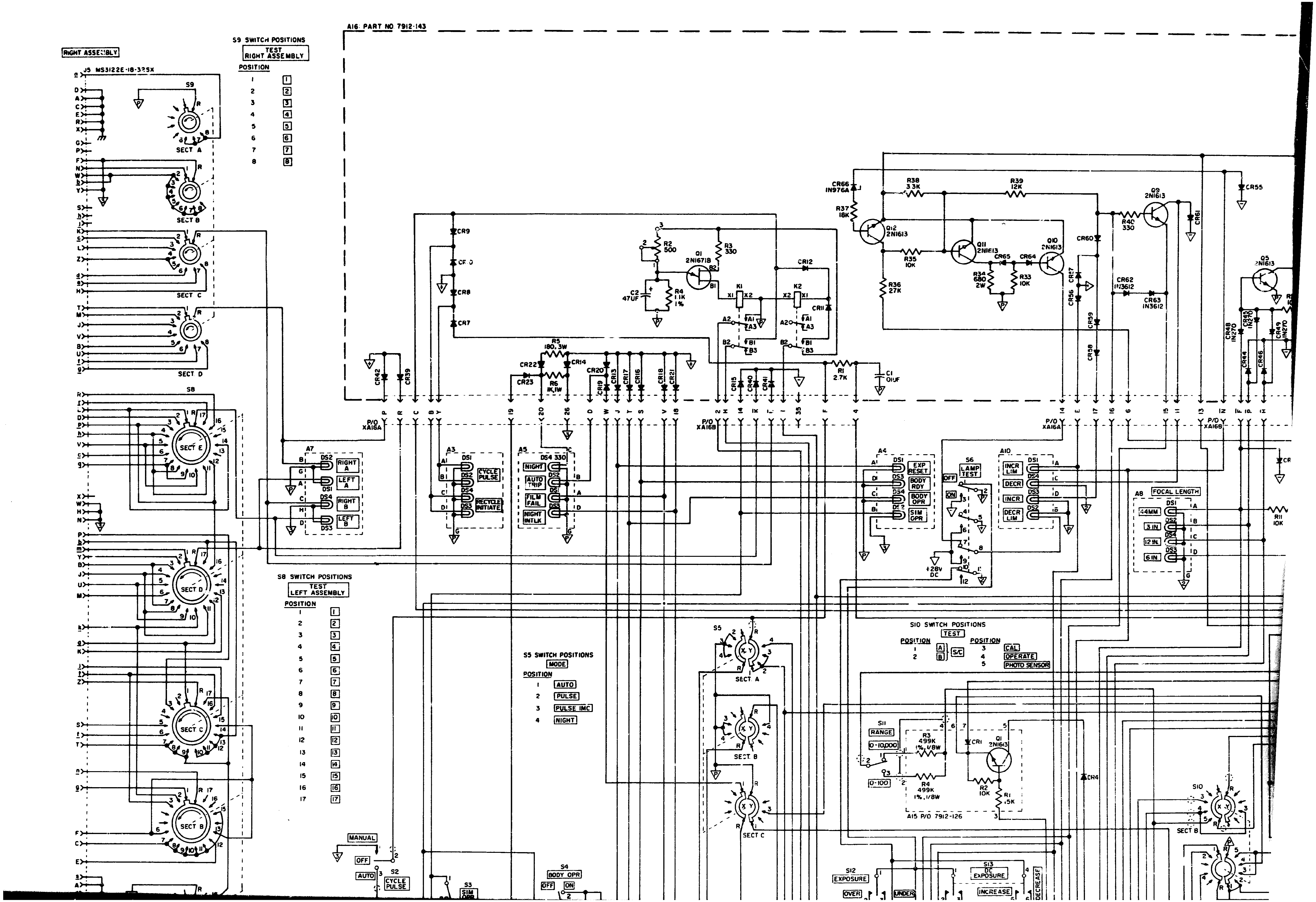
and IMC pulse mode test, block diagram

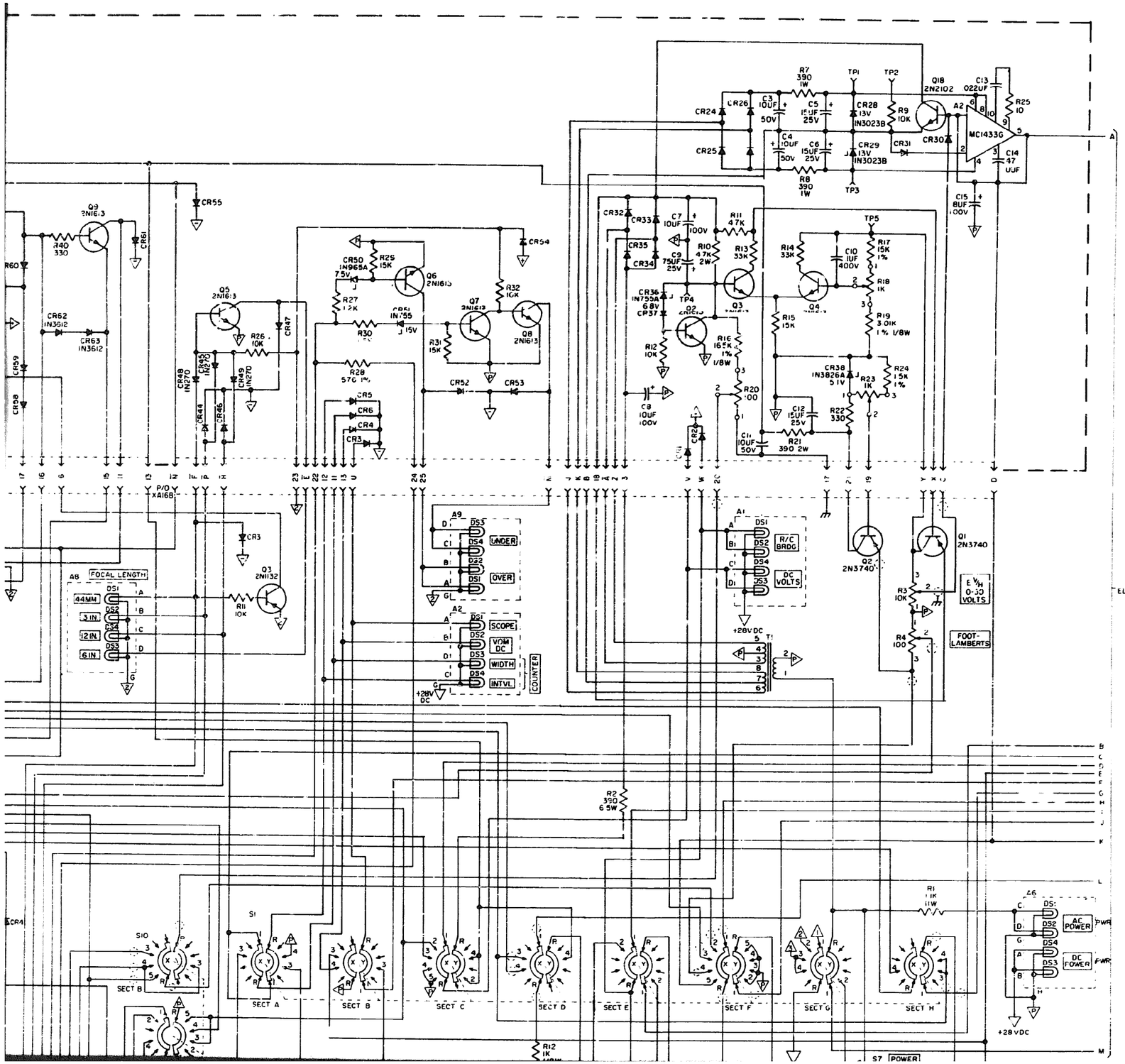
Figure FO-11. Night mode test, block diagram.

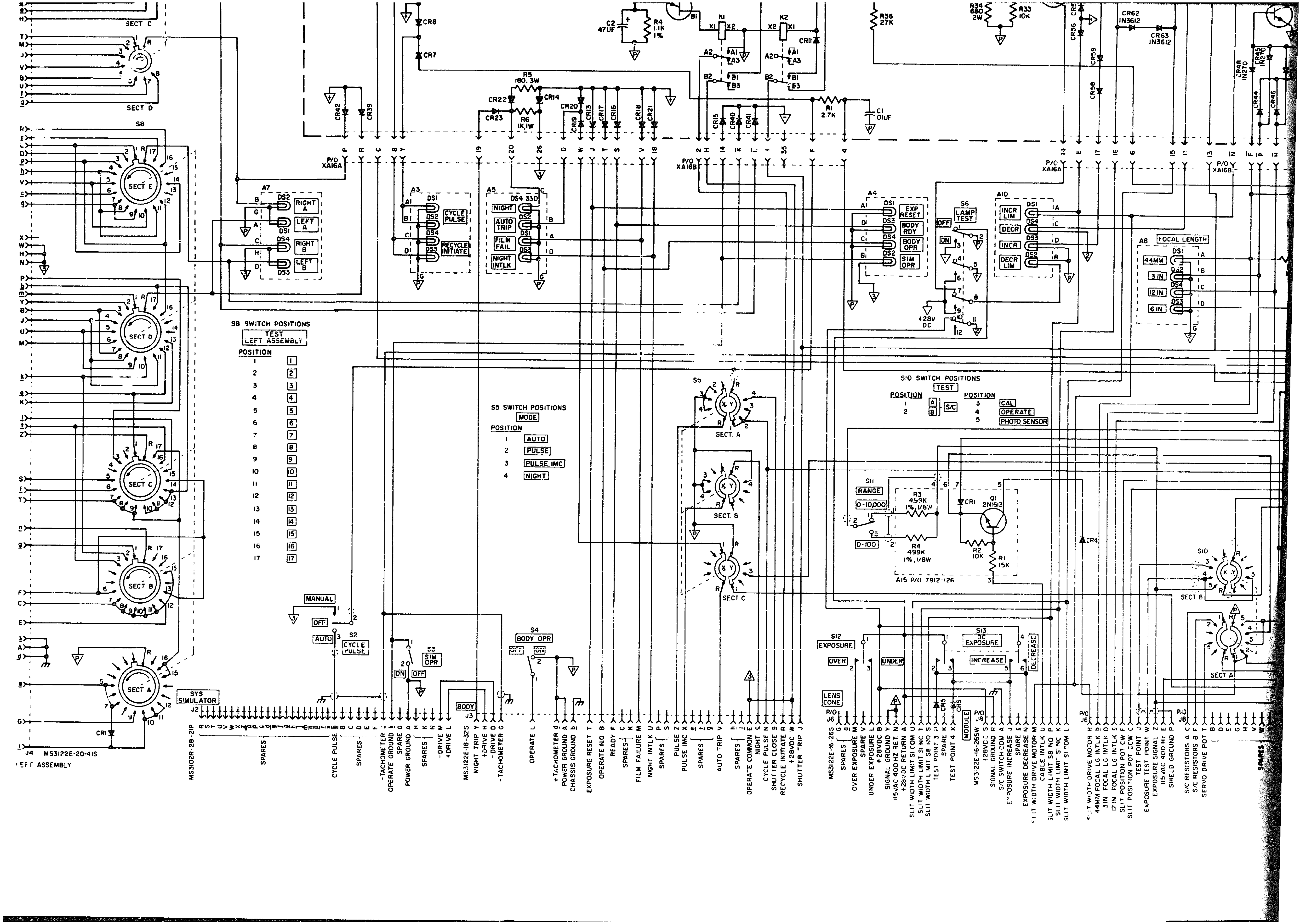


Night mode test, block diagram.




RIGHT ASSEMBLY
J5 MS3122E-18-32SX
S9 SWITCH POSITIONS
TEST
RIGHT ASSEMBLY
POSITION
1 2 3 4 5 6 7 8
SECT A
SECT B
SECT C
SECT D
S8
SECT E
SECT D
SECT C
SECT B
S8 SWITCH POSITIONS
TEST
LEFT ASSEMBLY
POSITION
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
A16 PART NO 7912-143
A7
RIGHT A
LEFT A
RIGHT B
LEFT B
A3
CYCLE PULSE
RECYCLE INITIATE
A5
NIGHT
AUTO TRIP
FILM FAIL
NIGHT INTLK
P/O XA16A
P/O XA16B
Q1 2N1671B
R2 500
R3 330
R4 1.1K 1%
C2 47UF
K1
K2
R1 2.7K
C1 0.1UF
R5 180, 3W
R6 1K,1W
CR66 1N976A
R37 18K
R38 3.3K
R39 12K
Q12 2N1613
Q11 2N1613
Q10 2N1613
Q9 2N1613
R35 10K
R36 27K
R34 680 2W
R33 10K
R40 330
CR62 1N3612
CR63 1N3612
CR55
Q5 2N1613
CR48 1N270
CR45 1N270
CR49 1N270
A4
EXP RESET
BODY RDY
BODY OPR
SIM OPR
S6
LAMP TEST
OFF
ON
+28V DC
A10
INCR LIM
DECR
INCR
DECR LIM
A8
FOCAL LENGTH
44MM
3 IN
12 IN
6 IN
R11 10K
S5
SECT A
SECT B
SECT C
S5 SWITCH POSITIONS
MODE
POSITION
1 AUTO
2 PULSE
3 PULSE IMC
4 NIGHT
S10 SWITCH POSITIONS
TEST
POSITION 1 2 A B S/C
POSITION 3 CAL
4 OPERATE
5 PHOTO SENSOR
S11
RANGE
0-10,000
0-100
R3 499K 1%, 1/8W
R4 499K 1%, 1/8W
Q1 2N1613
R2 10K
R1 1.5K
A15 P/O 7912-126
S10
SECT B
MANUAL
OFF
AUTO
S2
CYCLE PULSE
S3
SIM OPR
S4
BODY OPR
OFF
ON
S12
EXPOSURE
OVER
UNDER
S13
DC EXPOSURE
INCREASE
DECREASE


Q9 2N1613
R40 330
CR61
CR60
CR62 IN3612
CR63 IN3612
CR59
CR58
CR55
Q5 2N1613
R26 10K
CR47
CR48 IN270
CR49 IN270
CR50 IN965A 7.5V
R25 15K
Q6 2N1613
R27 1.2K
R30
CR51 IN755 6.8V
R28 576 1%
CR54
R32 1.6K
Q7 2N1613
R31 15K
Q8 2N1613
CR52
CR53
CR5
CR6
CR4
CR3
CR24
CR25
CR26
C3 10UF 50V
R7 390 1W
TP1
TP2
C5 15UF 25V
CR28 13V IN3023B
R9 10K
Q18 2N2102
C13 .022UF
R25 10
A2
MC1433G
C4 10UF 50V
C6 15UF 25V
CR29 13V IN3023B
CR31
CR30
C14 .47 UUF
R8 390 1W
TP3
C15 8UF 100V
A
CR32
CR33
C7 10UF 100V
R11 47K
CR35
CR34
C9 75UF 25V
R10 47K 2W
R13 33K
TP5
R14 33K
C10 1UF 400V
R17 15K 1%
R18 1K
CR36 IN755A 6.8V
CP37
TP4
Q2 2N1613
Q3
Q4
R15 15K
R19 3.01K 1% 1/8W
R12 10K
R16 165K 1% 1/8W
R20 100
C8 10UF 100V
C12 15UF 25V
C11 10UF 50V
R21 390 2W
CR38 IN3826A 5.1V
R23 1K
R24 1.5K 1%
R22 330
CR27
P/O XA16B
A8 FOCAL LENGTH
44MM
3 IN
12 IN
6 IN
CR3
Q3 2N1132
R11 10K
A9
DS3
DS4
DS2
DS1
UNDER
OVER
A2
SCOPE
VOM DC
WIDTH
INTVL
COUNTER
+28V DC
A1
R/C BRDG
DC VOLTS
+28VDC
Q2 2N3740
Q1 2N3740
R3 10K
E 1/2 0-30 VOLTS
R4 100
FOOT-LAMBERTS
TO EL6760-239-34 TM-25 (2)
R2 350 6.5W
S10
S1
SECT B
SECT A
SECT B
SECT C
SECT D
SECT E
SECT F
SECT G
SECT H
R1 1K 1W
A6
AC POWER
DC POWER
+28VDC
R12 1K
S7 POWER


S8 SWITCH POSITIONS
TEST
LEFT ASSEMBLY
POSITION
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
S5 SWITCH POSITIONS
MODE
POSITION
1 AUTO
2 PULSE
3 PULSE IMC
4 NIGHT
S10 SWITCH POSITIONS
TEST
POSITION 1 A
POSITION 2 B S/C
POSITION 3 CAL
POSITION 4 OPERATE
POSITION 5 PHOTO SENSOR
SECT A
SECT B
SECT C
SECT D
SECT E
S8
S5
S10
S11 RANGE 0-10,000 0-100
A15 P/O 7912-126
Q1 2N1613
S12 EXPOSURE OVER UNDER
S13 DC EXPOSURE INCREASE DECREASE
LENS CONE
MODULE
A4 EXP RESET BODY RDY BODY OPR SIM OPR
A10 INCR LIM DECR INCR DECR LIM
A8 FOCAL LENGTH 44MM 3 IN 12 IN 6 IN
A7 RIGHT A LEFT A RIGHT B LEFT B
A3 CYCLE PULSE RECYCLE INITIATE
A5 NIGHT AUTO TRIP FILM FAIL NIGHT INTLK
S6 LAMP TEST OFF ON
+28V DC
S2 MANUAL OFF AUTO CYCLE PULSE
S3 SIM OPR ON OFF
S4 BODY OPR OFF ON
SYS SIMULATOR
J2 MS3102R-28-21P
J3 MS3122E-18-32S
J4 MS3122E-20-41S
LEFT ASSEMBLY
P/O XA16A
P/O XA16B
P/O J6 MS3122E-16-26S
P/O J8 MS3122E-16-26SW
SPARES
CYCLE PULSE
-TACHOMETER
OPERATE GROUND
SPARE
POWER GROUND
-DRIVE
+DRIVE
BODY
NIGHT TRIP
OPERATE
+TACHOMETER
CHASSIS GROUND
EXPOSURE RESET
OPERATE NO
READY
FILM FAILURE
NIGHT INTLK
PULSE
PULSE IMC
AUTO TRIP
OPERATE COMMON
NIGHT
SHUTTER CLOSE
RECYCLE INITIATE
+28VDC
SHUTTER TRIP
OVER EXPOSURE
UNDER EXPOSURE
SIGNAL GROUND
115VAC 400HZ RET
+28VDC RETURN
SLIT WIDTH LIMIT S1 COM
SLIT WIDTH LIMIT S1 NC
SLIT WIDTH LIMIT S8 NO
TEST POINT 3
TEST POINT 4
S/C SWITCH COM
EXPOSURE INCREASE
EXPOSURE DECREASE
SLIT WIDTH DRIVE MOTOR
CABLE INTLK
SLIT WIDTH DRIVE MOTOR
44MM FOCAL LG INTLK
3 IN FOCAL LG INTLK
12 IN FOCAL LG INTLK
SLIT POSITION POT CW
SLIT POSITION POT CCW
TEST POINT
EXPOSURE TEST POINT
EXPOSURE SIGNAL
115VAC 400 HZ
SHIELD GROUND
S/C RESISTORS
SERVO DRIVE POT
R5 180, 3W
R6 1K, 1W
R4 1.1K 1%
C2 47UF
R1 2.7K
C1 01UF
R36 27K
R34 680 2W
R33 10K
CR62 1N3612
CR63 1N3612
R3 499K 1%, 1/8W
R4 499K 1%, 1/8W
R2 10K
R1 15K

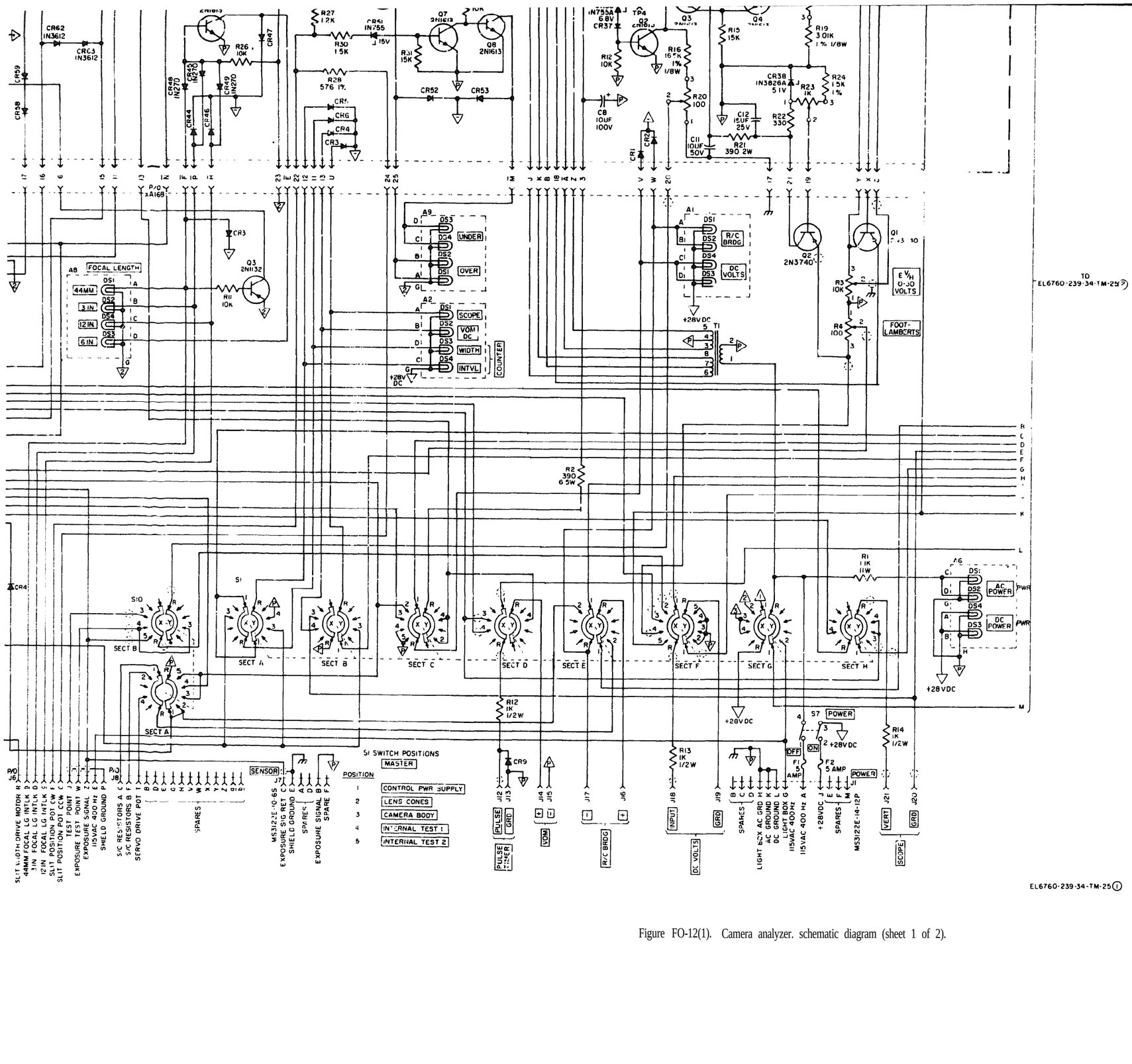


Figure FO-12(1). Camera analyzer. schematic diagram (sheet 1 of 2).

S1 SWITCH POSITIONS

MODULE TEST

POSITION			POSITION		
1	R9 BAL	INTVL	7	R13 ADJ	FDK
2	R7 BAL		8	R9 ADJ	
3	OPR		9	OPR	
4	+40 VDC		10	+6 VDC	
5	-40 VDC		11	-6 VDC	
6	TP3		12	TP2	

S1 SECT A SECT B SECT C SECT D SECT E SECT F SECT G SECT H SECT J SECT K SECT L

CR68 CR69 CR70 CR71 CR72 CR73 CR74 CR75 CR76 CR77 CR96 CR95 CR98 CR94 CR97

R41 142K 1%, 1/8W

C18 1UF 200V

R42 82K

R43 82K

C19 1UF 200V

CR67 K3 CR108 CR105 CR107 CR106

CR115 1N973A 33V

R54 4.7K

R53 39.2K 1% 1/10W

CR111 CR112 CR113 CR114

R51 330 Q16 2N1613

R52 330 Q17 2N1613

CR109 CR110 CR117 CR116

16B

A12 DS1 INTVL PULSE DS3 VERT POS DS4 RELAY OPR DS2 MAN PIC

A11 DS1 SYS RDY DS3 NIGHT EXP DS2 FLASH AC DS4 FLASH DC

S14 PLUS OUTPUT

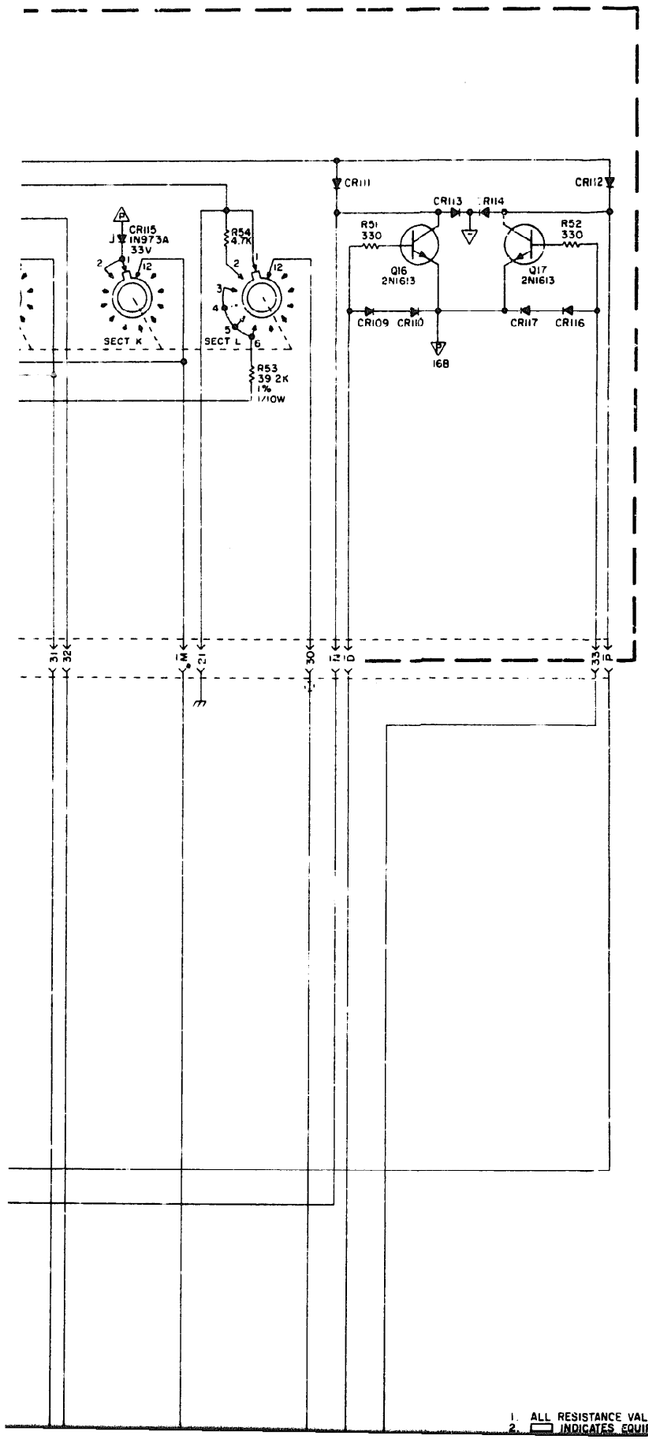
DS1 DS2 DS3 DS4 311 311 311 311

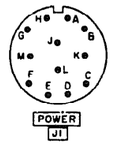
T1 C1 1UF 400V CR2 R6 39K 1/2W R5 2.7K 1/2W C2 30UF 100V

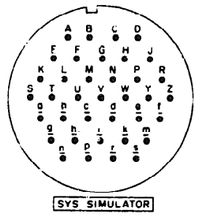
S15 OPERATE OFF

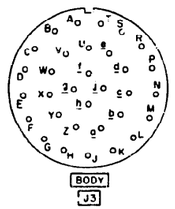
A14 DS1 INTERVAL PULSE DS2 INTVL DS3 FILM DRIVE DS4 MODULE

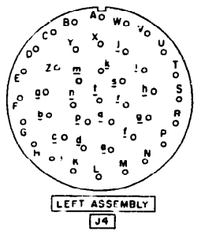
NOTES:
1. ALL RESISTANCE VALUES ARE IN
2. INDICATES EQUIPMENT MARKI

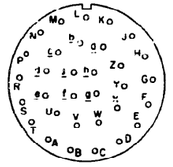


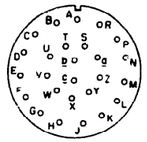


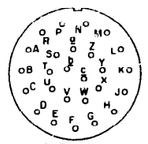


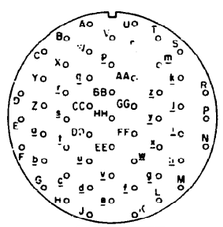


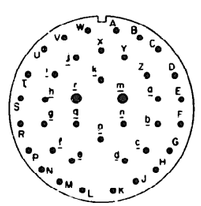


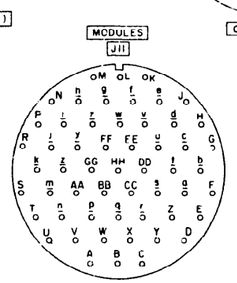




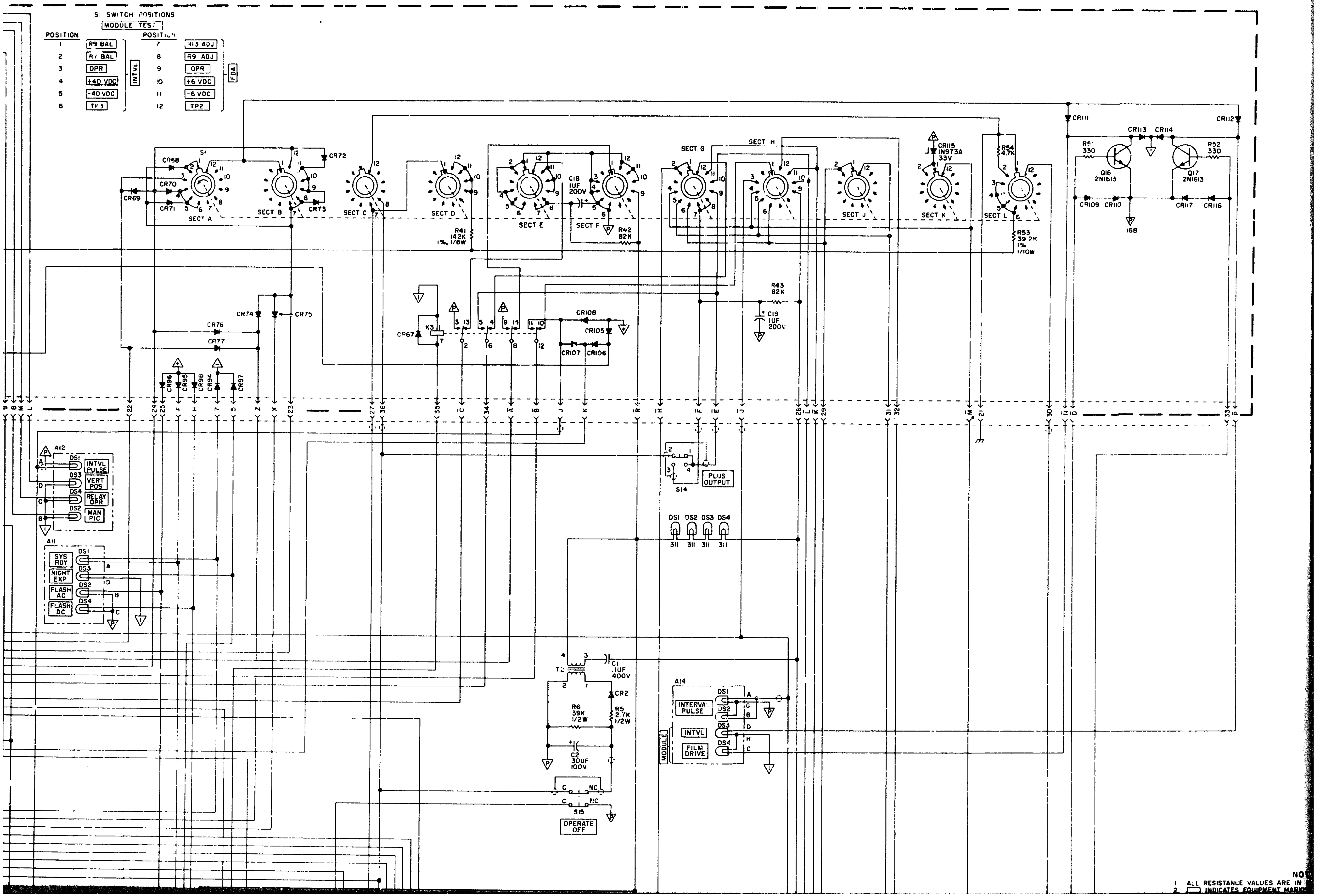




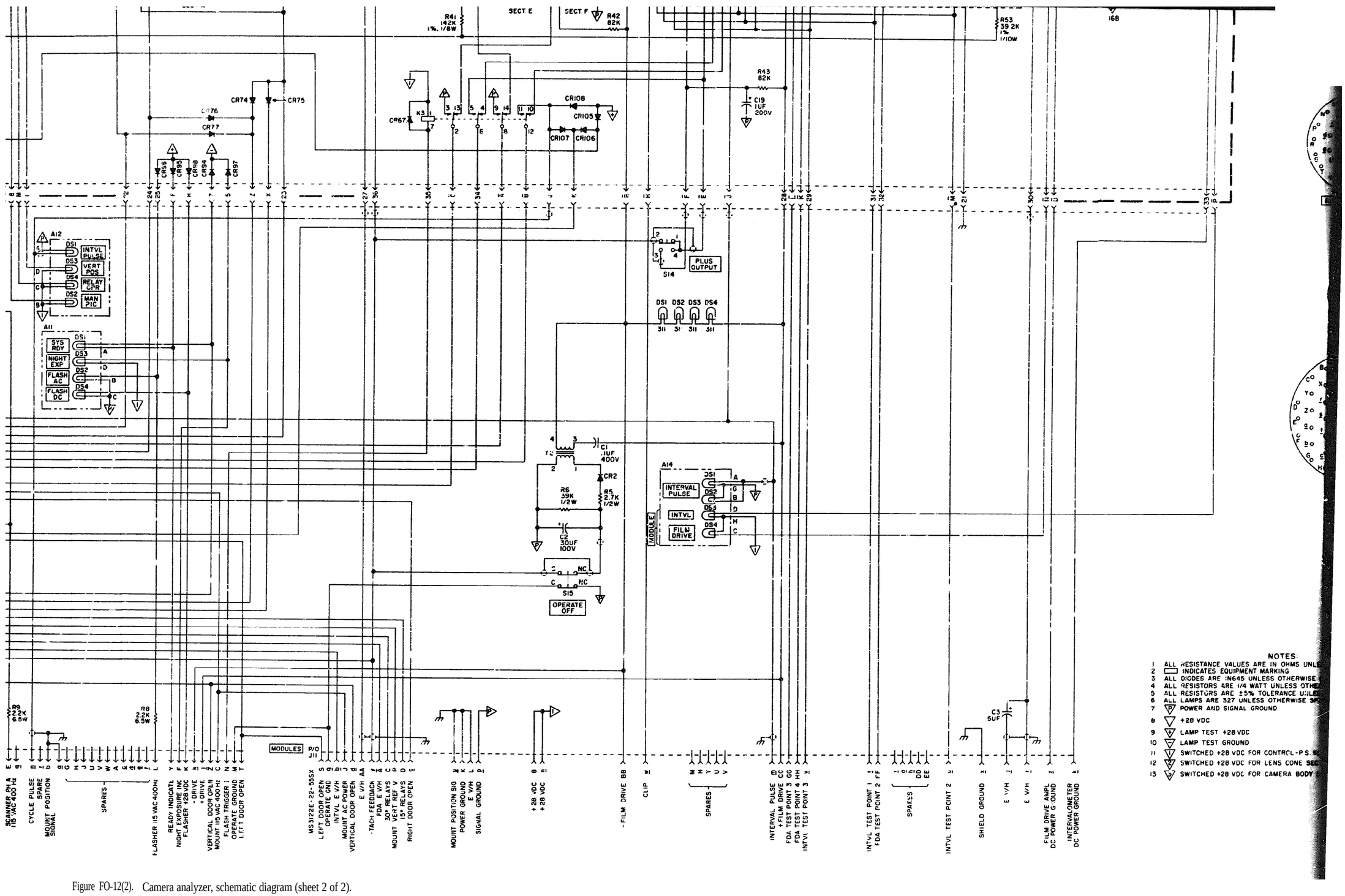




NOTES:
1. ALL RESISTANCE VALUES ARE IN OHMS UNLESS OTHERWISE SPECIFIED
2. ▭ INDICATES EQUIPMENT MARKING.



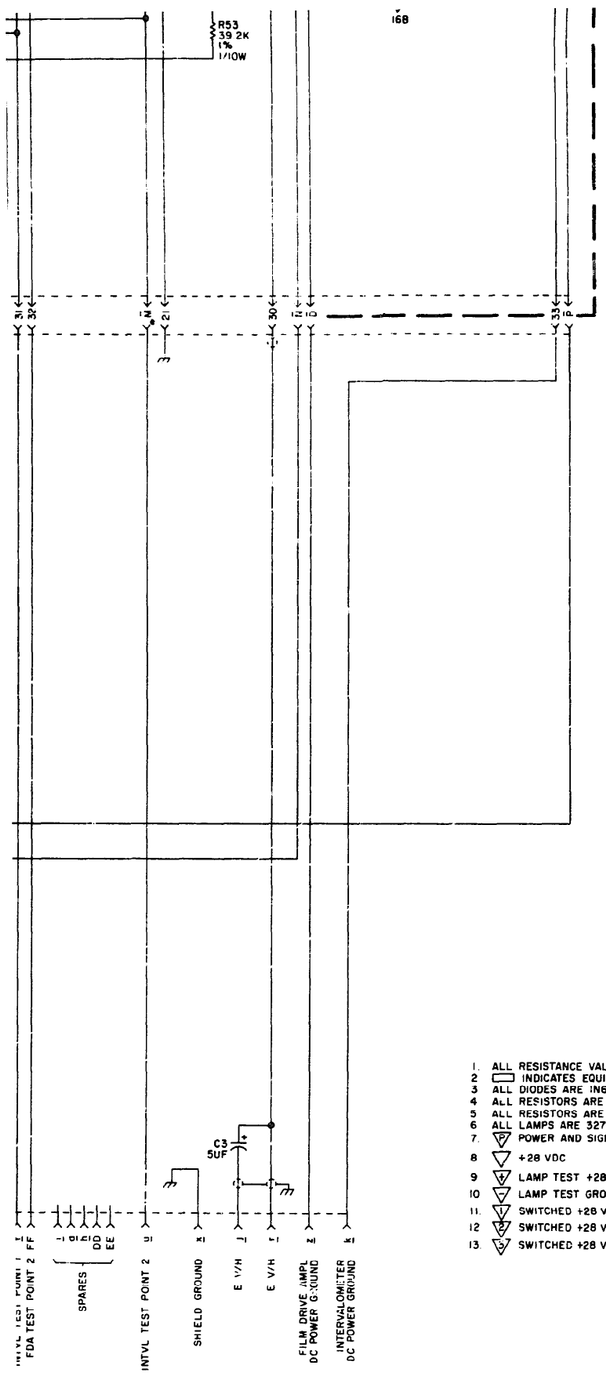
NOTES
1. ALL RESISTANCE VALUES ARE IN
2. ▭ INDICATES EQUIPMENT MARKING

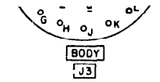


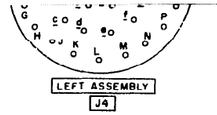
NOTES:

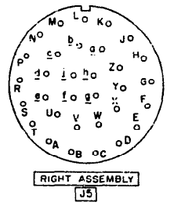
1. ALL RESISTANCE VALUES ARE IN OHMS UNLE
2. INDICATES EQUIPMENT MARKING
3. ALL DIODES ARE 1N645 UNLESS OTHERWISE
4. ALL RESISTORS ARE 1/4 WATT UNLESS OTHE
5. ALL RESISTORS ARE ±5% TOLERANCE UNLE
6. ALL LAMPS ARE 327 UNLESS OTHERWISE SP
7. POWER AND SIGNAL GROUND
8. +28 VDC
9. LAMP TEST +28 VDC
10. LAMP TEST GROUND
11. SWITCHED +28 VDC FOR CONTROL-P S.
12. SWITCHED +28 VDC FOR LENS CONE SE
13. SWITCHED +28 VDC FOR CAMERA BODY

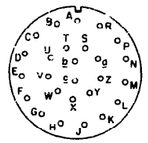
Figure FO-12(2). Camera analyzer, schematic diagram (sheet 2 of 2).

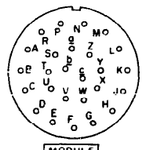


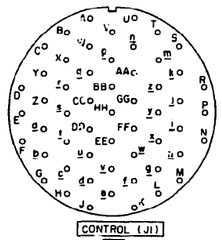


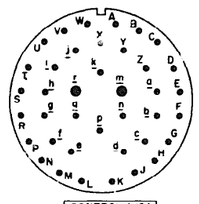


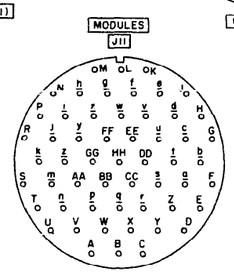












NOTES:

1. ALL RESISTANCE VALUES ARE IN OHMS UNLESS OTHERWISE SPECIFIED
2. ▭ INDICATES EQUIPMENT MARKING
3. ALL DIODES ARE IN645 UNLESS OTHERWISE SPECIFIED
4. ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED.
5. ALL RESISTORS ARE ±5% TOLERANCE UNLESS OTHERWISE SPECIFIED.
6. ALL LAMPS ARE 327 UNLESS OTHERWISE SPECIFIED
7. ▽ POWER AND SIGNAL GROUND.
8. ▽ +28 VDC
9. ▽ LAMP TEST +28 VDC
10. ▽ LAMP TEST GROUND
11. ▽ SWITCHED +28 VDC FOR CONTROL-PS SECTION
12. ▽ SWITCHED +28 VDC FOR LENS CONE SECTION
13. ▽ SWITCHED +28 VDC FOR CAMERA BODY SECTION

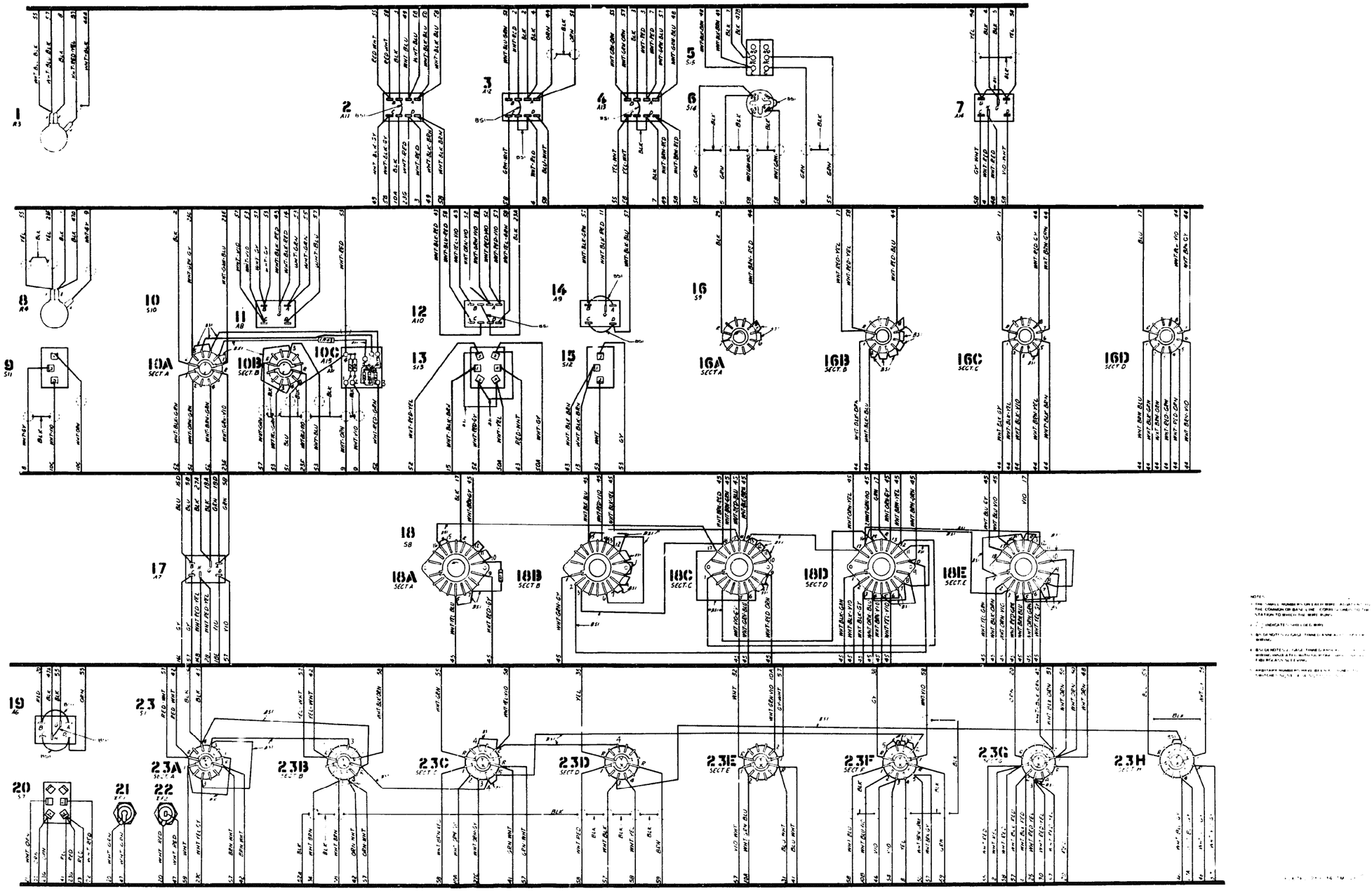


Figure FO-13(1). Camera analyzer, wiring diagram (sheet 1 of 2).

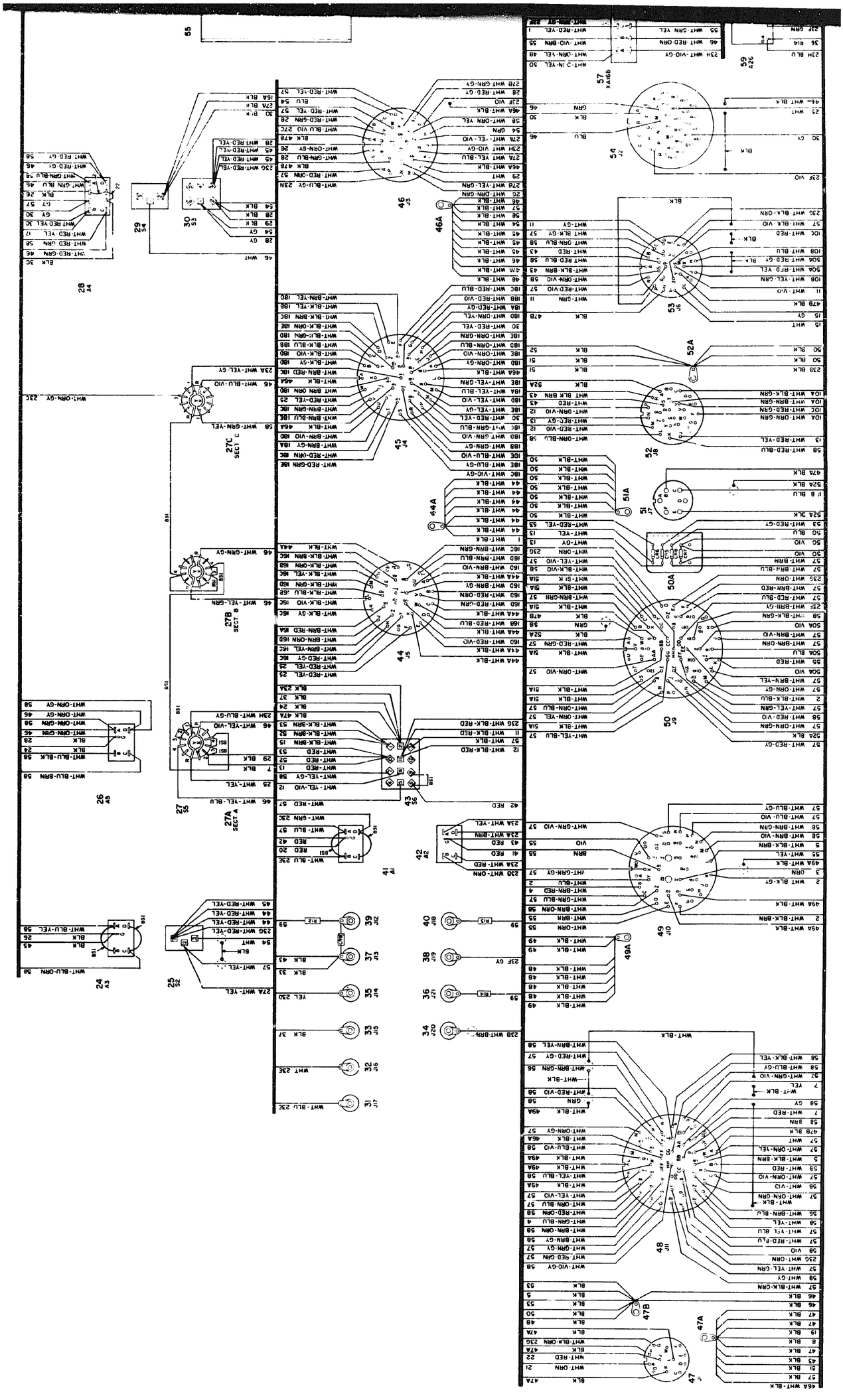
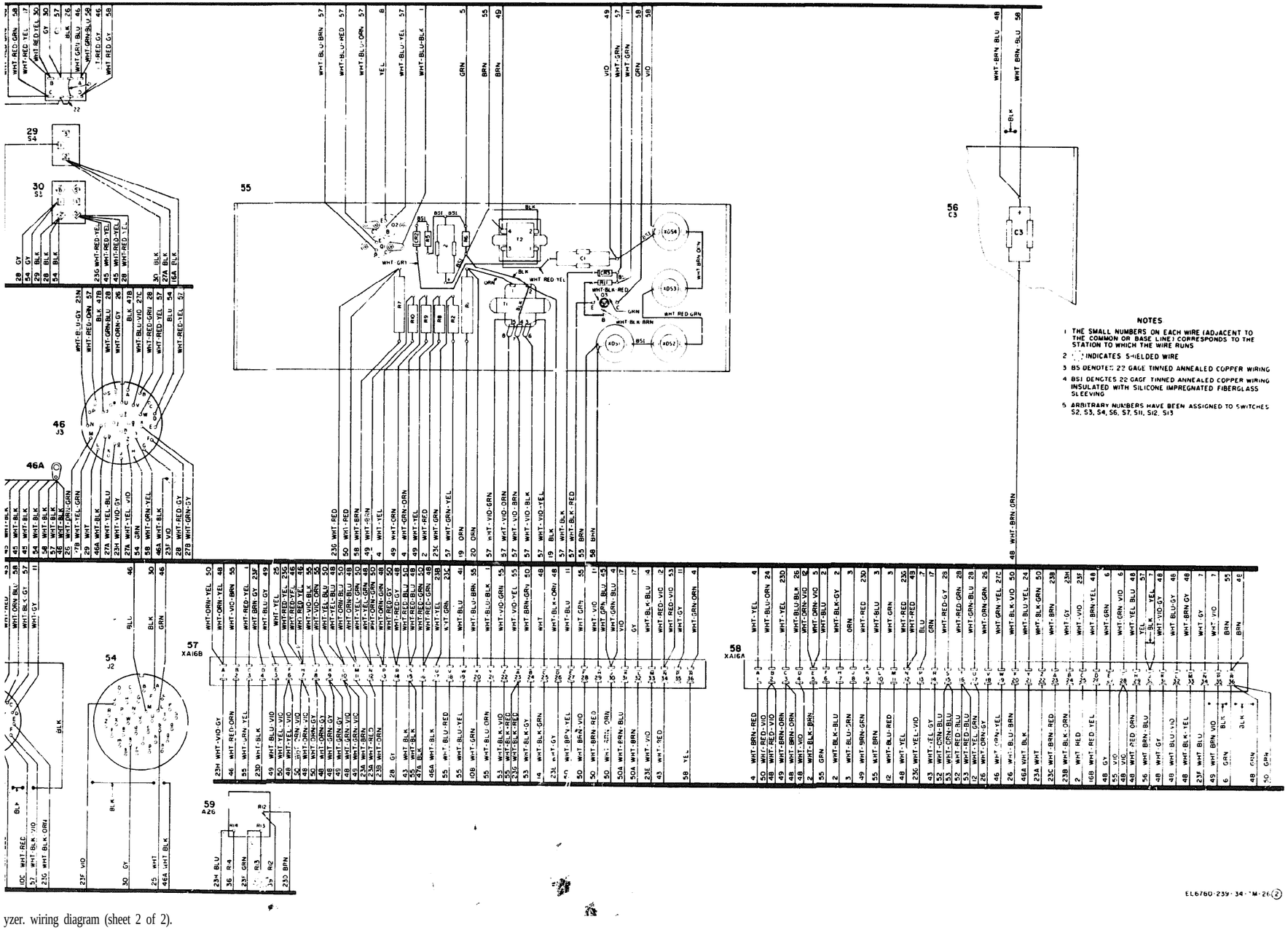


Figure FO-13(2). Camera analyzer, wiring diagram (sheet 2 of 2).



yzer. wiring diagram (sheet 2 of 2).

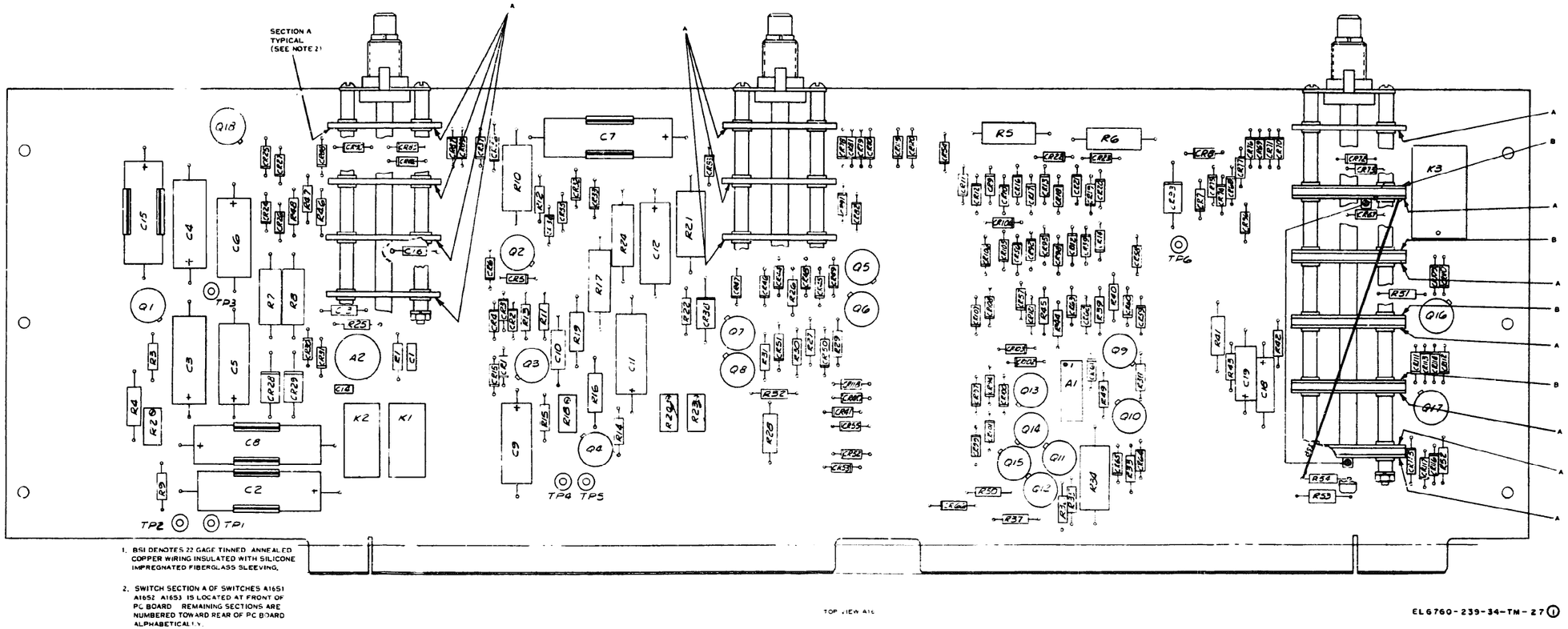


Figure FO-14(1). Printed circuit board and component assembly, wiring diagram (sheet 1 of 4).

MS5126F16-26 W

NOTES:
1. ALL RESISTANCE VALUES ARE IN OHMS AND TO BE 1/2 WATT UNLESS OTHERWISE SPECIFIED
2. [ ] INDICATES EQUIPMENT MARKING.

Figure FO-15. Camera test adapter, schematic diagram.

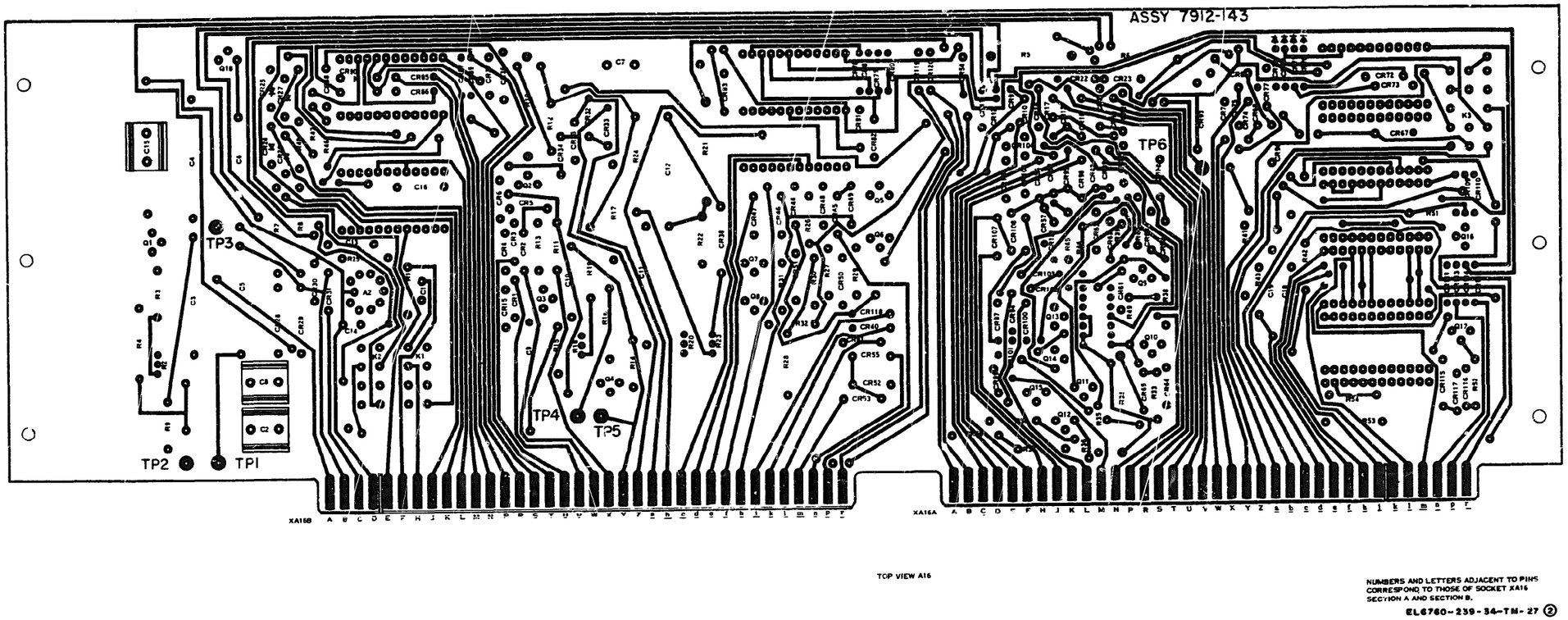


Figure FO-14(2). Printed circuit board and component assembly, wiring diagram (sheet 2 of 4).

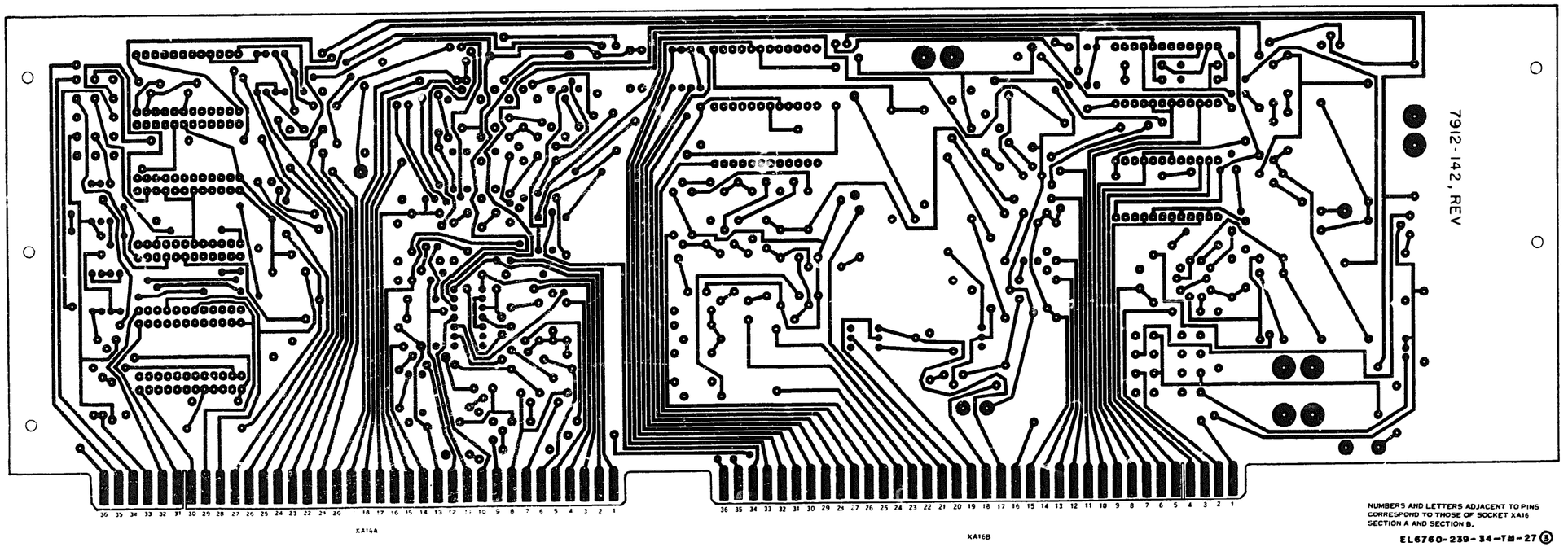
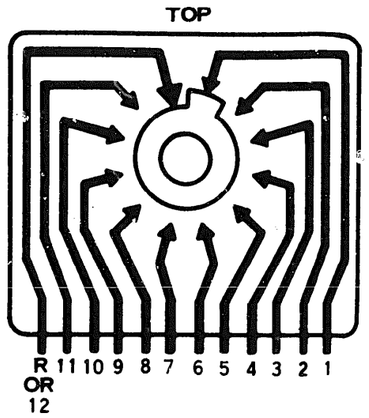
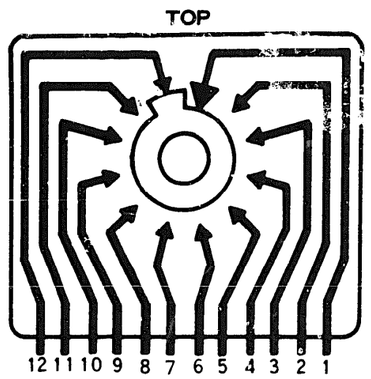


Figure FO-14(3). Printed circuit board and component assembly, wiring diagram (sheet 3 of 4).

A. SWITCH SECTION WIRING DIAGRAM



B. SWITCH SECTION WIRING DIAGRAM



SECTION	DETAIL		
	A16S1	A16S2	A16S3
A	A	A	A
B	B	A	A
C	A	A	A
D	B		A
E	A		
F	B		
G	A		
H	B		
J	A		
K	A		
L	A		

NOTE:
FOR PROPER ORIENTATION, VIEW DETAIL A OR B AS REFERENCED BY THE ARROW IN TOP VIEW OF A16 (SEE PART 1).

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Figure FO-14(4). Printed circuit board and component assembly, wiring diagram (sheet 4 of 4).

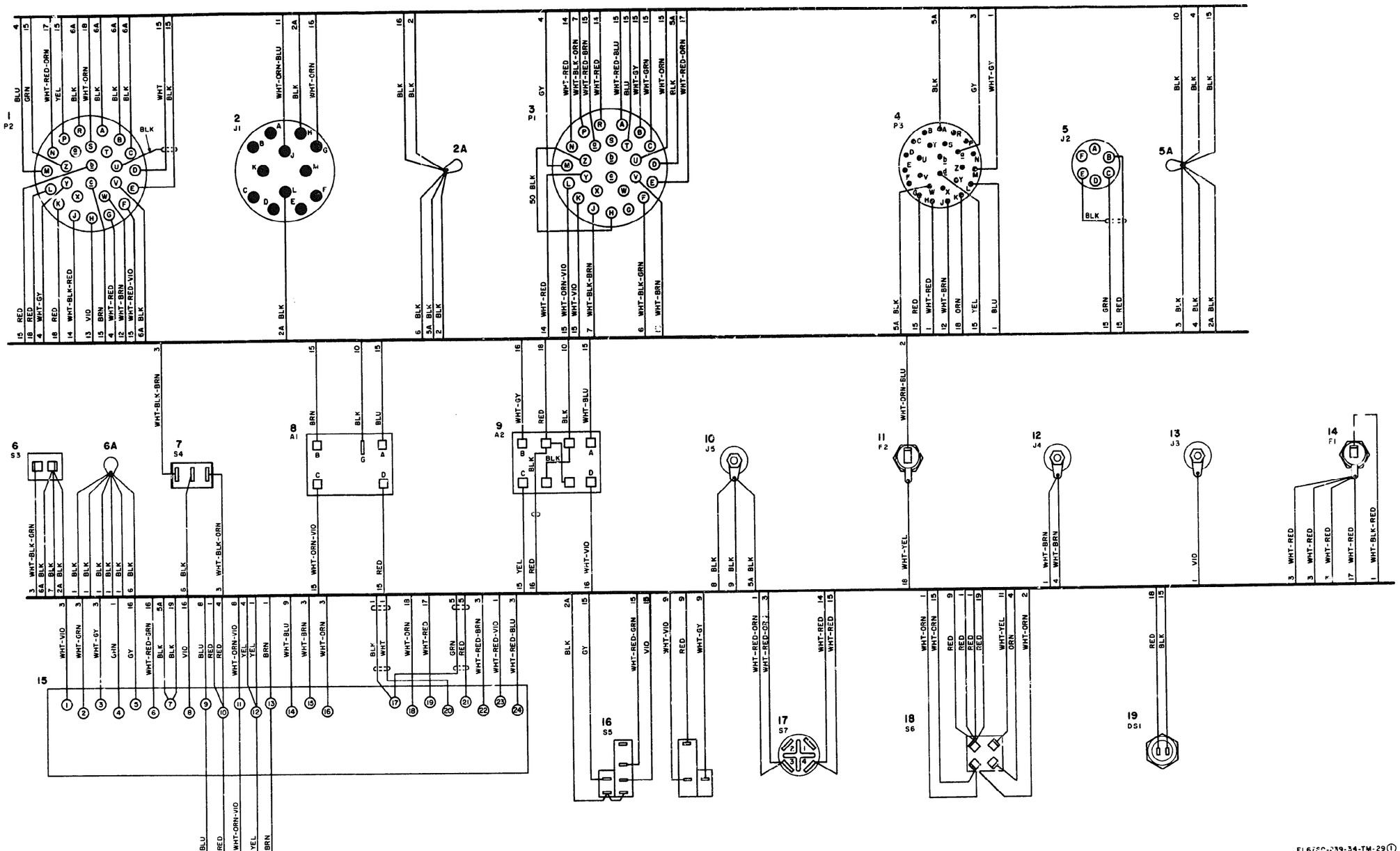


Figure FO-16(1), Camera test adapter, wiring diagram.

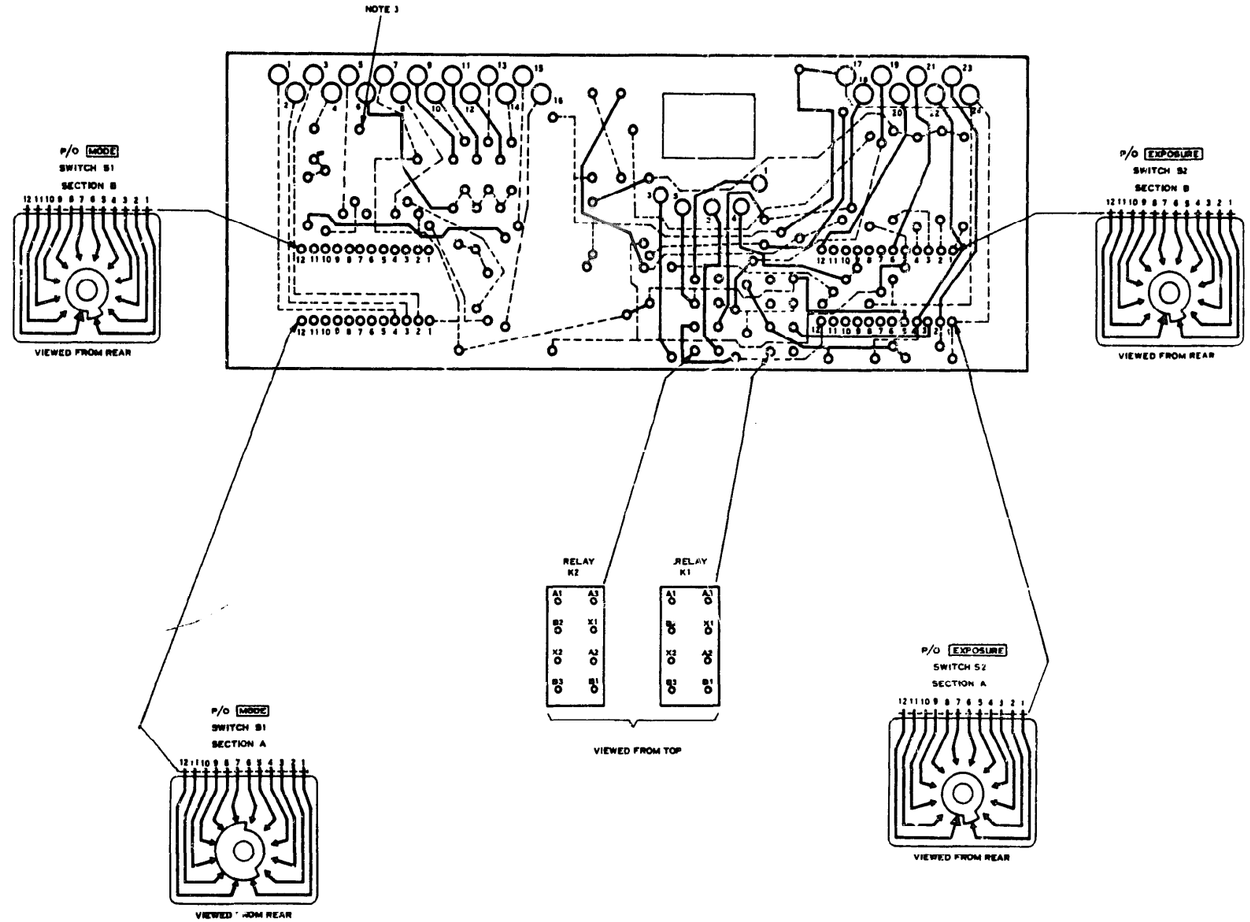
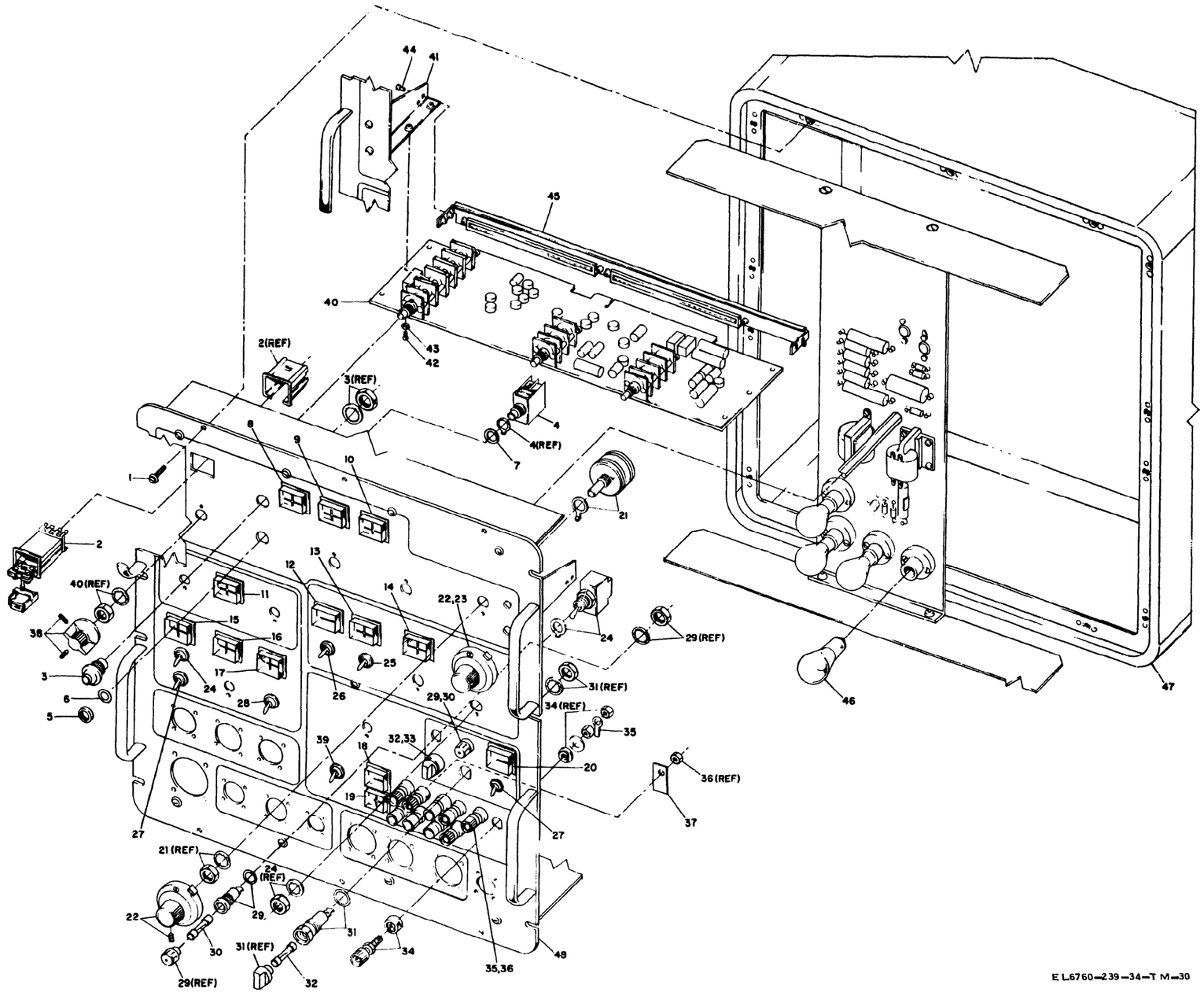
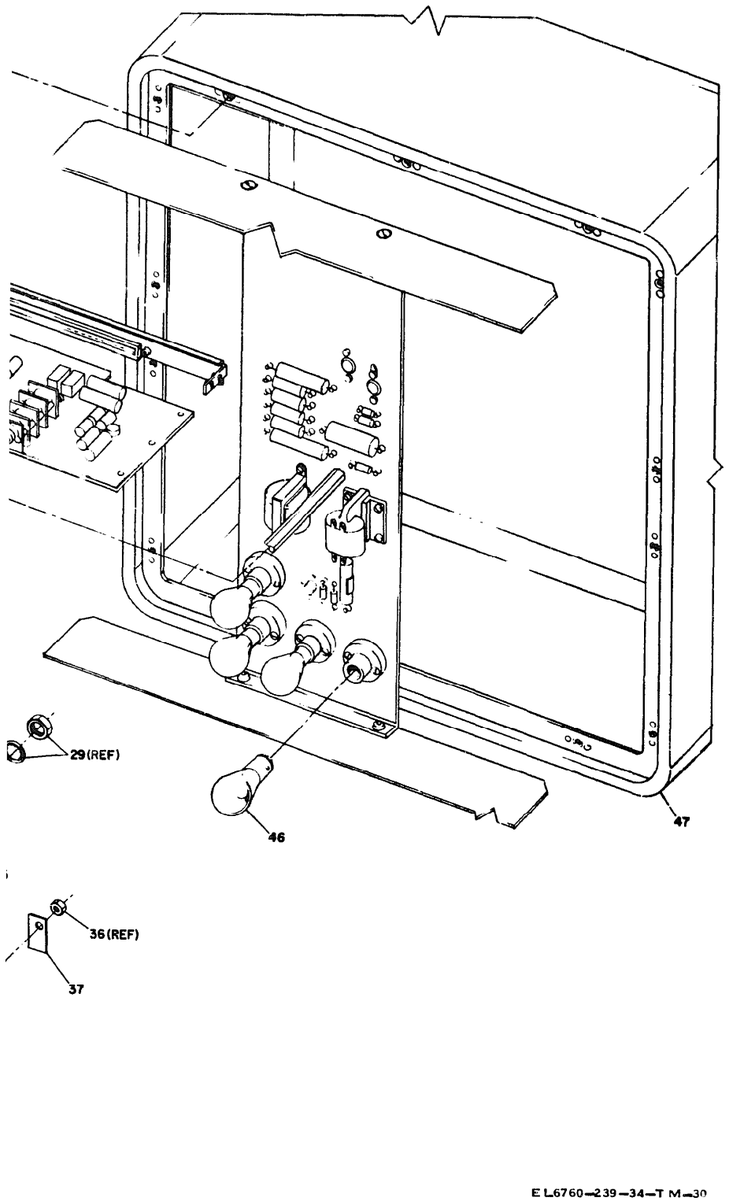


Figure FO-16(2). Camera test adapter, wiring diagram.



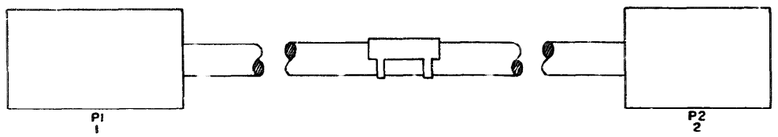
1 Screw (14).
2 Indicator lamp assembly; INTERVAL **PULSE, INTVL,** and **FILM DRIVE lights** (A14). (Mounting hardware included with indicator assembly.)
3 Switch, pushbutton. PLUS **OUTPUT S14**. (Mounting hardware included with switch.)
4 Switch, pushbutton OPERATE OFF S15. (Keyway washer included with switch.)
5 Facenut.
6 Washer (3).
7 Washer (3).
8 Indicator lamp assembly; MOUNT AC, CAM 28V. AC **ØA, and** AC **ØB** lights. (Mounting hardware include with indicator assembly.)
9 Indicator lamp assembly; **INTVL PULSE**, MAN PIC, VERT **POS**, and **RELAY OPR lights** A12. (Mounting hardware included with indicator assembly.)
10 Indicator lamp assembly; **SYS** READY, **FLASH** AC, NIGHT EXP, and FLASH **DC** lights All. (Mounting hardware included with indicator assembly.)
11 Indicator lamp assembly; LEFT A, RIGHT A. LEFT B and RIGHT El lights **(A7)**. (Mounting hardware included with indicator assembly.)
12 Indicator lamp assembly; OVER and UNDER lights **(A9)**. (Mounting hardware included with indicator assembly.)
13 Indicator lamp assembly; INCR **LIM**, DECR LIM, INCR. and **DECR lights (A10)**. (Mounting hardware included with indicator assembly.)
14 Indicator lampassembly; **44MM**, 3 IN. 6 IN., and 12 IN. lights **(A8)**. (Mounting hardware included with indicator assembly.)
15 Indicator lamp assembly; EXP RESET, SIM OPR. **BODY RDY**, and BODY OPR **lights (A4)**. (Mounting hardware included with indicator assembly.)
16 Indicator lamp assembly; FILM FAIL, AUTO **TRIP**, NIGHT **INTLK**, and **NIGHT** lights (A5). (Mounting hardware included with indicator assembly.)
17 Indicator lampassembly: CYCLE PULSE and RECYCLE **INITIATE lights** (A3). (Mounting hardware included **with indicator assembly**.)
18 **Indicator** lamp assembly; R/C BRDG and DC **VOLTS** lights (Al). (Mount hardware included with indicator assembly.)
19 Indicator **lamp** assembly; SCOPE, **VOM** DC, **WIDTH,** and **INTVL** lights **(A2)**. (Mounting hardware included with indicator assembly.)
20 **Indicator** lamp assembly; DC POWER, and AC POWER lights

Figure FO-17. Camera analyz

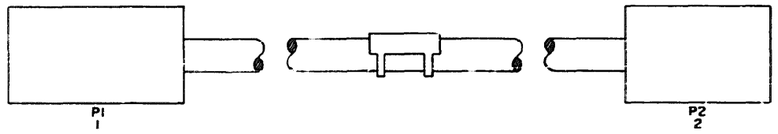


1 Screw (14).
2 Indicator lam assembly; INTERVAL PULSE, INTVL, and FILM DRIVE lights (A14). (Mounting hardware included with indicator assembly).
3 Switch, pushbutton, PLUS OUTPUT S14. (Mounting hardware included with switch.)
4 Switch, pushbutton OPERATE OFF S15. (Keyway washer included with switch)
5 Facenut,
6 Washer (3).
7 Washer (3)
8 Indicator lamp assembly; MOUNT AC, CAM 28V. AC 0A. and Ac OB lights. (Mounting hardware include with indicator assembly.)
9 Indicator lam assembly; INTVL PULSE, MAN PIC. VERT POS. and RELAY OPR lights A12. (Mounting hardware included with indicator assembly.)
10 Indicator lam assembly; SYS READY FLASH AC NIGHT EXP. and FLASH DC lights All. (Mounting hardware included with indicator assembly.)
11 Indicator lamp assembly, LEFT A, RIGHT A, LEFT B, and RIGHT B lights (A7). (Mounting hardware included with indicator
12 Indicator lamp assembly; OVER and UNDER lights (A9). (Mounting hardware included with indicator assembly.)
13 Indicator lamp assembly; INCR LIM, DECR LIM. INCR. and DECR lights (A10). (Mounting hardware included with indicator assembly.)
14 Indicator lampassembly; 44MM, 3 IN. 6 IN., and 12 IN. lights (A8). (Mounting hardware included with indicator assembly.)
15 Indicator lamp assembly; EXP RESET, SIM OPR, BODY RDY, and BODY OPR lights (A4). (Mounting hardware included with indicator assembly.)
16 Indicator lam assembly; FILM FAIL, AUTO TRIP, NIGHT INTLK. and NIGHT lights (A5). (Mounting hardware included with indicator assembly.)
17 Indicator lamp assembly; CYCLE PULSE and RECYCLE INITIATE lights (A3). (Mounting hardware included with indicator as-
18 Inicator lamp assembly; R/C BRDG and DC VOLTS lights (A1). (Mounting hardwareincluded with indicator assembly)
19 Indicator lamp assembly; SCOPE VOM DC WITH, and INTVL lights (A2). (Mounting hardware included with indicator assembly.)
20 Indicator lamp assembly; DC POWER, and AC POWER lights (A6). (Mounting hardware Included with indicator assembly.)
21 Potentiometer, E V/H 0 - 50 VOLTS R3.
22 Multidial precision (21 (AMP 18. AMP 19). Mounting hardware included with multidial)
23 Potentiometer. FOOT-LAMBERTS R4. (Mounting hardware included with potentiometer.)
24 Switch, toggle (2); RANGE and BODY OPR. (Mounting hardwareincluded with switch.)
25 Switch, toggle, DC EXPOSURE S13. (Mounting hardware included with switch.)
26 Switch, toggle. EXPOSURE S12. (Mounting hardware included with switch.)
27 Switch. toggle (2); SIM OPR S3 and POWER S7 (Mounting hardware included with switch.)
28 Switch, toggle, CYCLE PULSE S2. (Mounting hardware included with switch.)
29 Holder, fuse; SPARE 5 AMP (2) XF3. XF4.
30 Fuse. spare. 5 AMP (2) F3. F4. (Mounting hardware included with fuse holders.)
31 Holder. fuse, AC (SF1). (‘Mounting hardware included with fuse
32 Fuse, 5 AMP (2) F1, F2.
33 Holder. fuse, DC (XF2). (Mounting hardware included with fuse
34 Binding post, black (5); PULSE TIMER GRD J13. VOM - J15. R/C BRDG - J17. DC VOLTS GRD J19. and SCOPE: GRD J20. (Mounting hardware included with binding post.)
35 Terminal (10) (E1 through E10).
36 Binding post, red (51; PULSE TIMER PULSE J12. VOM + J14. R/C BRDG + J16. DC VOLTS INPUT J18. and SCOPE VERT J21. (Mounting hardware included with binding post.)
37 Plate and terminal assembly A26.
38 Knob (3).
39 Switch, toggle, LAMP TEST S6.
40 Printed circuit hoard and component assembly A16.
41 Bracket and nut assembly right side A24. Bracket and nut assembly left side A25.
42 Screw (6).
43 Washer (6)
44 Screw (4).
45 Connector mounted bracket and nut assembly A22.
46 Lamp (4). (DS 1 through DS4.)
47 Combination
48 Test panel

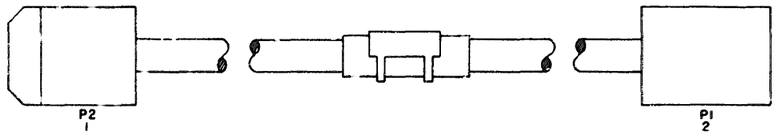
Figure FO - 17. Camera analyzer. DS maintenance, exploded view.



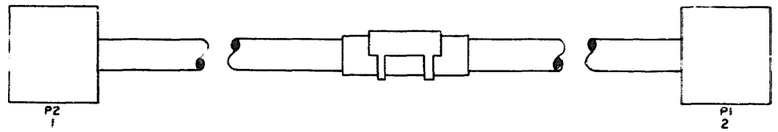
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, W5



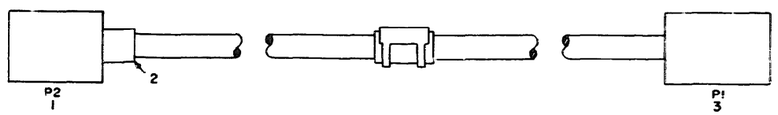
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, W6



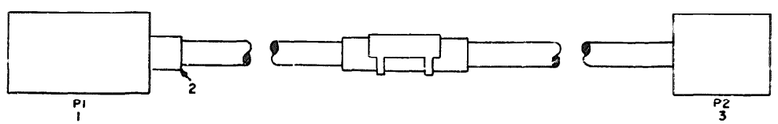
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, SHUTTER CONE JUMPER



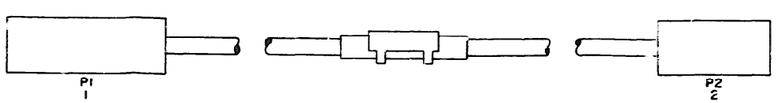
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, CAMERA JUMPER



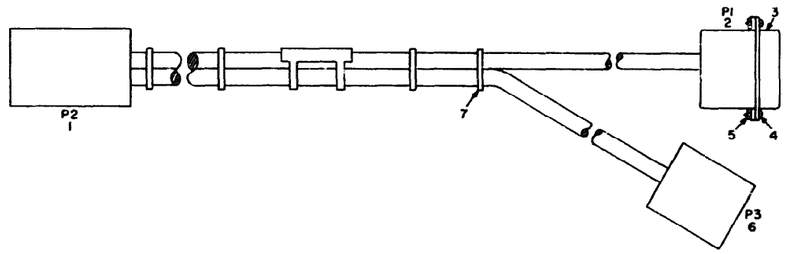
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, W4



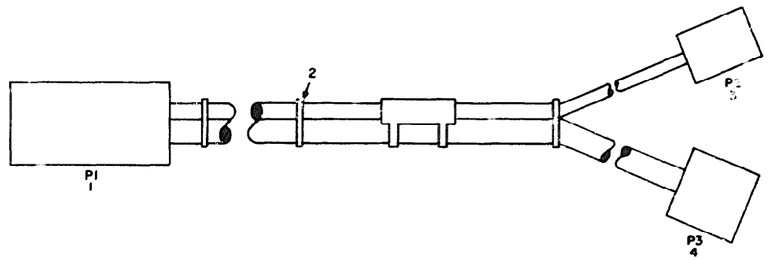
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, W1



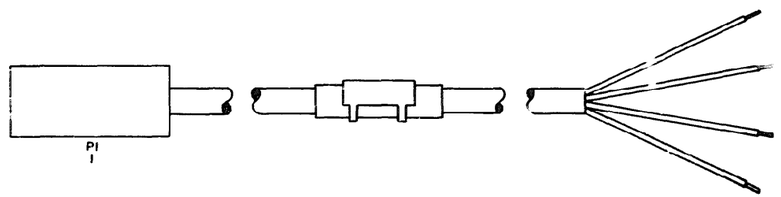
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, W7



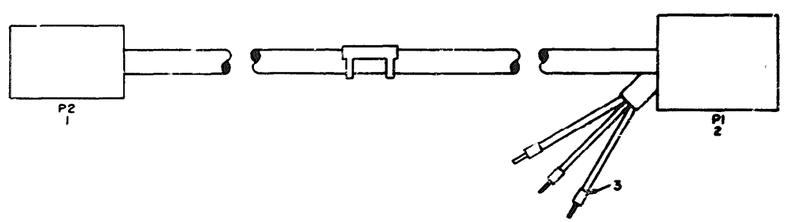
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, W2



CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, W8



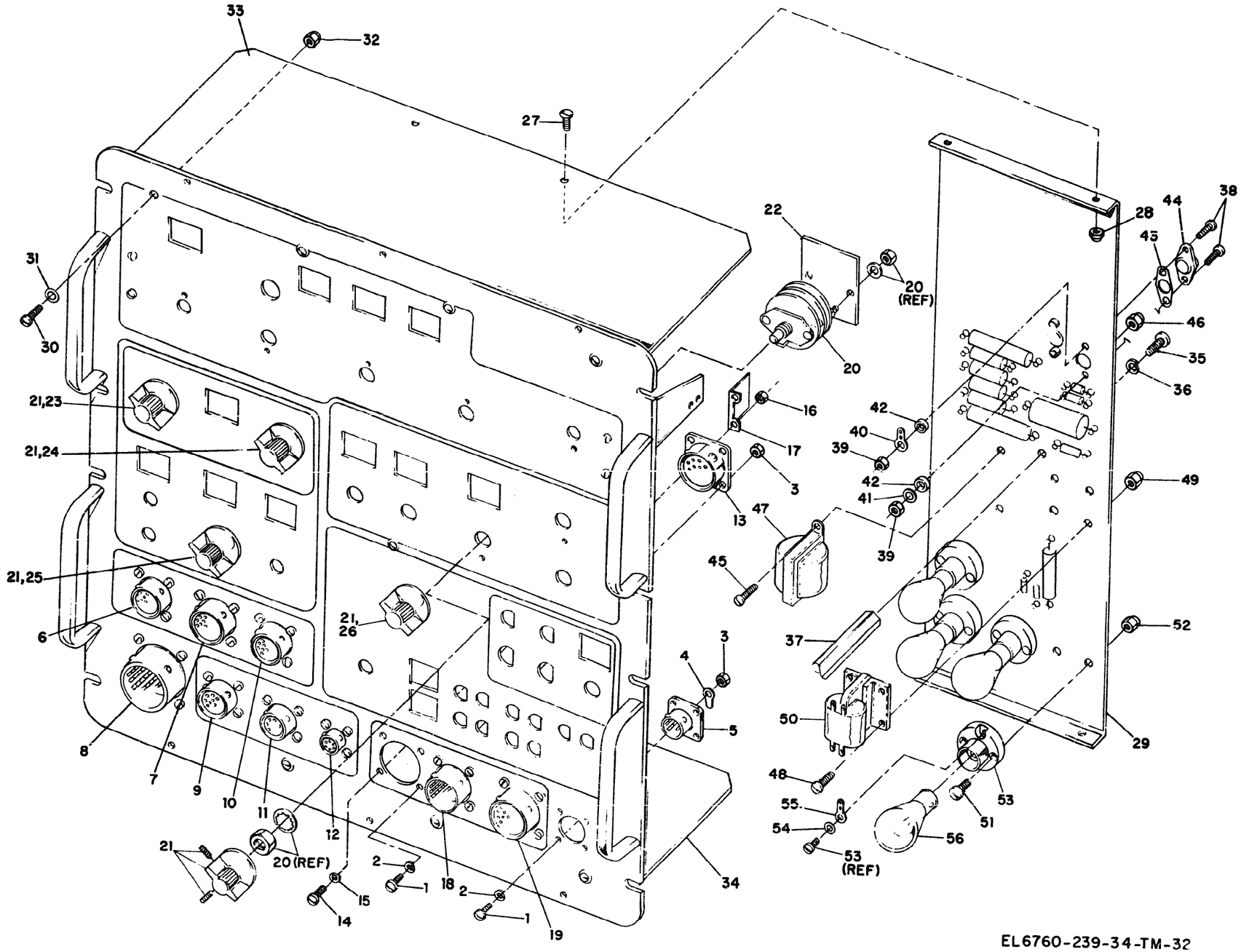
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, W9



CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, W3

EL6760-239 34-TM-31

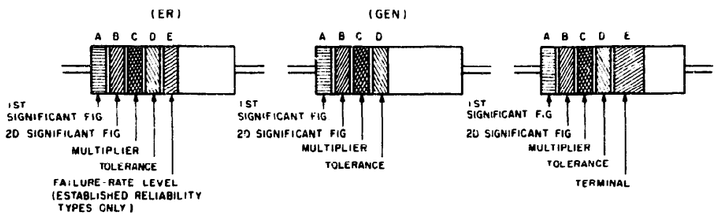
Figure FO-18. Camera analyzer. cable assemblies. parts location.



EL6760-239-34-TM-32

1 Screw (4)
2 Washer (4)
3 Nut (4)
4 Terminal (2)
5 Connector J1
6 Connector J3 (screw (4), washer (4), nut (4), and terminal)
7 Connector J4 (screw (4), washer (4), nut (4)).
8 Connector J2 (screw (4), washer (4), nut (4)).
9 Connector J6 (screw (4), washer (4), nut (4).
10 Connector J5 (screw (4), washer (4), nut (4), and terminal).
11 Connector J8 (screw (4), washer (4), nut (4), and terminal).
12 Connector J7 (screw (4), washer (4), nut (4), and terminal).
13 Connector J9 (screw (2)).
14 Screw (2).
15 Washer (4).
16 Nut (4).
17 Bracket and component assembly A26.
18 Connector J10 (screw (4), washer (4), nut (4), and terminal).
19 Connector J11 (screw (4), washer (4), nut (4)).
20 Switch S10 and component assembly, LENS CONE TEST A27. (Mounting hardware included with switch and component assembly.)
21 Knob (5). (Mounting hardware included with knob.)
22 Printed circuit board and component assembly A15.
23 Switch S8 and jumper assembly, TEST LEFT ASSEMBLY A19.
24 Switch S9 and jumper assembly, TEST RIGHT ASSEMBLY A23.
25 Switch S5 and jumper assembly, MODE A18.
26 Switch S1 and jumper assembly, MASTER A17.
27 Screw (4).
28 Nut (4).
29 Chassis and component assembly A21.
30 Screw (8).
31 Washer (8).
32 Nut (8).
33 Support, top.
34 Support, bottom.
35 Screw (2).
36 Washer (2).
37 Post.
38 Screw (4).
39 Nut (4).
40 Terminal (2).
41 Washer (2).
42 Sleeve (4).
43 Washer, thermafilm.
44 Transistor (2) (Q1, Q2).
45 Screw (2).
46 Nut (2).
47 Transformer T1.
48 Screw (4).
49 Nut (4).
50 Transformer T2.
51 Screw (8).
52 Nut (8).
53 Socket (4) (XDS1 through XDS4).
54 Washer (8).
55 Terminal (8).
56 Lamp (DS1 through DS4).

Figure FO-19. Camera analyzer, GS maintenance, exploded view.



COLOR CODE MARKING FOR COMPOSITION TYPE RESISTORS

COLOR-CODE MARKING FOR FILM-TYPE RESISTORS

TABLE I
COLOR CODE FOR COMPOSITION TYPE AND FILM TYPE RESISTORS

BAND A		BAND B		BAND C		BAND D		BAND E		
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULT-PLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)	COLOR	FAILURE RATE LEVEL	TERM
BLACK	0	BLACK	0	BLACK	1			BROWN	M=1.0	
BROWN	1	BROWN	1	BROWN	10			RED	P=0.1	
RED	2	RED	2	RED	100			ORANGE	R=0.01	
ORANGE	3	ORANGE	3	ORANGE	1,000			YELLOW	S=0.001	
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	±10 (COMP TYPE ONLY)	WHITE		SOLD-ERABLE
GREEN	5	GREEN	5	GREEN	100,000	GOLD	±5			
BLUE	6	BLUE	6	BLUE	1,000,000	RED	±2 (NOT APPLICABLE TO ESTABLISHED RELIABILITY)			
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7							
GRAY	8	GRAY	8	SILVER	0.01					
WHITE	9	WHITE	9	GOLD	0.1					

BAND A — THE FIRST SIGNIFICANT FIGURE OF THE RESISTANCE VALUE (BANDS A THRU C SHALL BE OF EQUAL WIDTH)

BAND B — THE SECOND SIGNIFICANT FIGURE OF THE RESISTANCE VALUE

BAND C — THE MULTIPLIER (THE MULTIPLIER IS THE FACTOR BY WHICH THE TWO SIGNIFICANT FIGURES ARE MULTIPLIED TO YIELD THE NOMINAL RESISTANCE VALUE.)

BAND D — THE RESISTANCE TOLERANCE

BAND E — WHEN USED ON COMPOSITION RESISTORS, BAND E INDICATES ESTABLISHED RELIABILITY FAILURE-RATE LEVEL (PERCENT FAILURE PER 1,000 HOURS) ON FILM RESISTORS, THIS BAND SHALL BE APPROXIMATELY 1-1/2 TIMES THE WIDTH OF OTHER BANDS, AND INDICATES TYPE OF TERMINAL

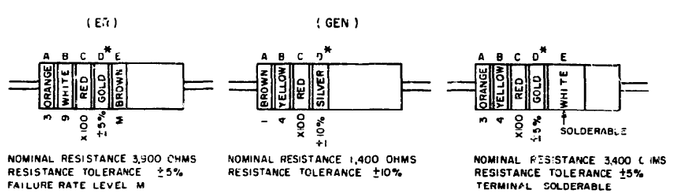
RESISTANCES IDENTIFIED BY NUMBERS AND LETTERS (THESE ARE NOT COLOR CODED)

SOME RESISTORS ARE IDENTIFIED BY THREE OR FOUR DIGIT ALPHA NUMERIC DESIGNATORS. THE LETTER R IS USED IN PLACE OF A DECIMAL POINT WHEN FRACTIONAL VALUES OF AN OHM ARE EXPRESSED. FOR EXAMPLE:

2R7 = 2.7 OHMS 10R0 = 10.0 OHMS

FOR WIRE-WOUND-TYPE RESISTORS COLOR CODING IS NOT USED. IDENTIFICATION MARKING IS SPECIFIED IN EACH OF THE APPLICABLE SPECIFICATIONS

EXAMPLES OF COLOR CODING

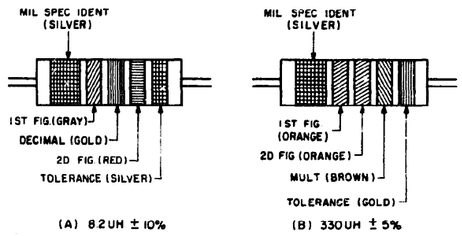


COMPOSITION-TYPE RESISTORS

FILM-TYPE RESISTORS

* IF BAND D IS OMITTED, THE RESISTOR TOLERANCE IS ±20% AND THE RESISTOR IS NOT MIL-STD

A. COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS



(A) 8.2UH ± 10% (B) 330UH ± 5%

COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES. AT A, AN EXAMPLE OF OF THE CODING FOR AN 8.2UH CHOKE IS GIVEN AT B, THE COLOR BANDS FOR A 330 UH INDUCTOR ARE ILLUSTRATED

TABLE 2
COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	INDUCTANCE TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	1
RED	2	100	2
ORANGE	3	1,000	3
YELLOW	4		
GREEN	5		
BLUE	6		
VIOLET	7		
GRAY	8		
WHITE	9		
NONE			20
SILVER			10
GOLD	DECIMAL POINT		5

MULTIPLIER IS THE FACTOR BY WHICH THE TWO COLOR FIGURES ARE MULTIPLIED TO OBTAIN THE INDUCTANCE VALUE OF THE CHOKE COIL.

B. COLOR CODE MARKING FOR MILITARY STANDARD INDUCTORS.

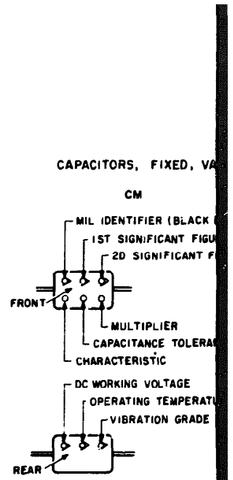
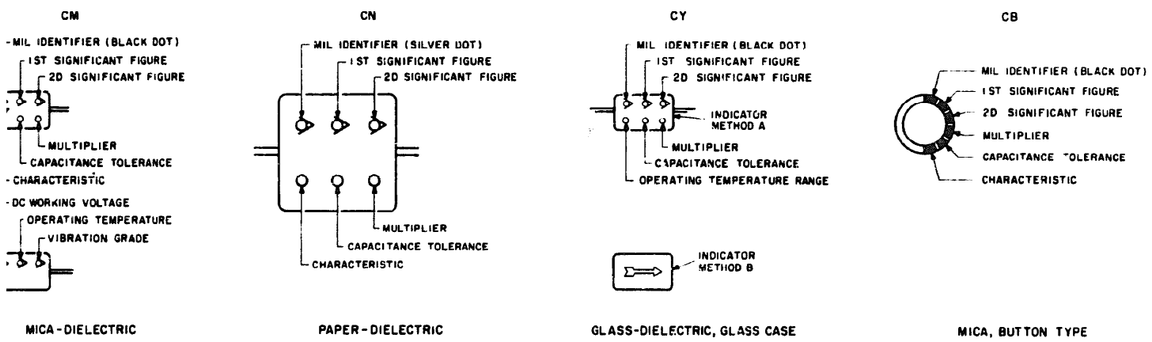
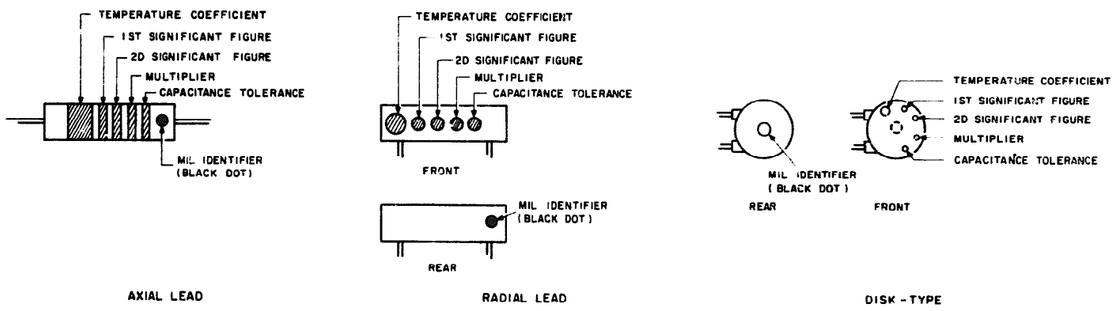


Figure FO-20. Color code ma





C. COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

TABLE 3 — FOR USE WITH STYLES CM, CN, CY AND CB.

COLOR	MIL ID	1ST SIG FIG	2D SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]			DC WORKING VOLTAGE	OPERATING TEMP RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CB	CM	CY, CM	CM
BLACK	CM, CY CB	0	0	1			±20%	±20%		A			-55°$_{TO}$+70°C	10-55 Hz
BROWN		1	1	10					B	E	B			
RED		2	2	100	±2%		±2%	±2%	C				-55°$_{TO}$+85°C	
ORANGE		3	3	1,000		±30%			D		D	300		
YELLOW		4	4	10,000					E				-55°$_{TO}$+125°C	10-2,000Hz
GREEN		5	5		±5%				F			500		
BLUE		6	6										-55°$_{TO}$+150°C	
PURPLE (VIOLET)		7	7											
GRAY		8	8											
WHITE		9	9											
GOLD				0.1			±5%	±5%						
SILVER	CN			0.01	±10%	±10%	±10%	±10%						

TABLE 4 — TEMPERATURE COMPENSATING, STYLE CC.

COLOR	TEMPERATURE COEFFICIENT[4]	1ST SIG FIG.	2D SIG FIG.	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					CAPACITANCES OVER 10 UUF	CAPACITANCES 10 UUF OR LESS	
BLACK	0	0	0	1		±2.0 UUF	CC
BROWN	-30	1	1	10	±1%		
RED	-80	2	2	100	±2%	±0.25 UUF	
ORANGE	-150	3	3	1,000			
YELLOW	-220	4	4				
GREEN	-330	5	5		±5%	±0.5 UUF	
BLUE	-470	6	6				
PURPLE (VIOLET)	-750	7	7				
GRAY		8	8	0.01*			
WHITE		9	9	0.1*	±10%		
GOLD	+100			0.1		±1.0 UUF	
SILVER				0.01			

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-25D, MIL-C-11272B, AND MIL-C-10950C RESPECTIVELY

3 LETTERS INDICATE THE TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS DESIGNATED IN MIL-C-11015D

4 TEMPERATURE COEFFICIENT IN PARTS PER MILLION PER DEGREE CENTIGRADE

* OPTIONAL CODING WHERE METALLIC PIGMENTS ARE UNDESIRABLE.

Figure FO-20. Color code marking for MIL-STD resistors, inductors and capacitors.

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

Official:
PAUL T. SMITH
Major General, United States Army
The Adjutant General

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

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Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703

DATE: 10 July 1975

PUBLICATION NUMBER	DATE	TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PPC-76

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PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.
2-25	2-28		
3-10	3-3		3-1
5-6	5-8		
		F03	

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°.

REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.

Item 5, Function column. Change "2 db" to "3db."

REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON: This is the output line of the 5 VDC power supply. + 24 VDC is the input voltage.

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE: SSG I. M. DeSpiritof

DA FORM 1 AUG 74 2028-2 (TEST)

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HISA 1686-75

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TEAR ALONG DOTTED LINE

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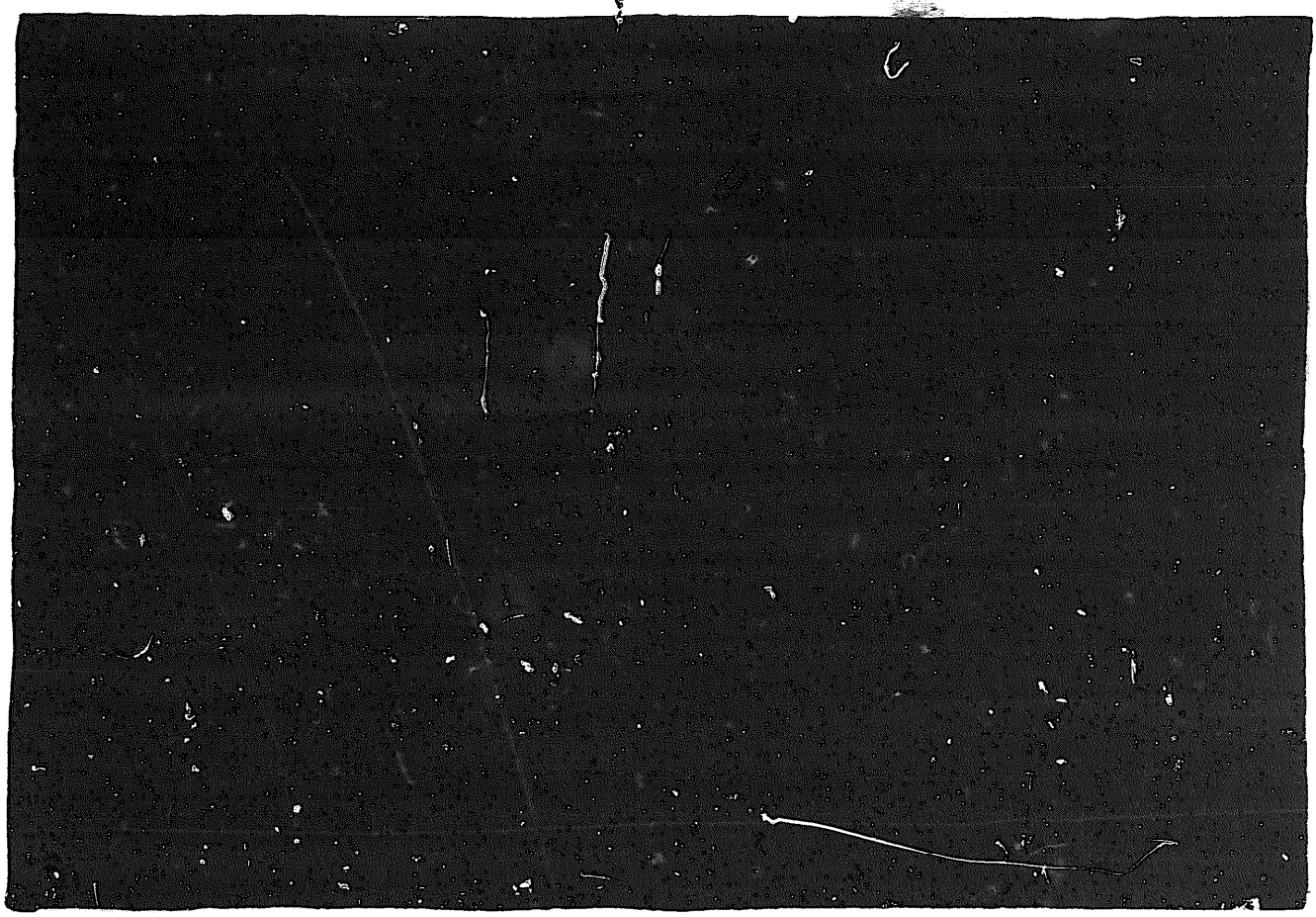

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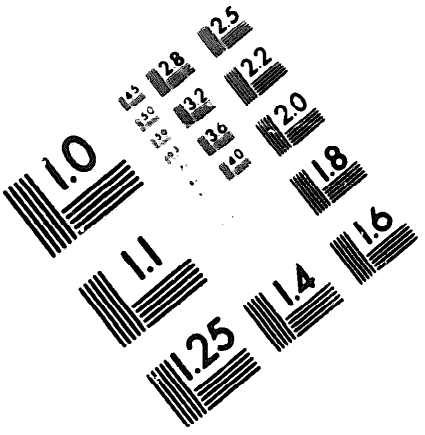

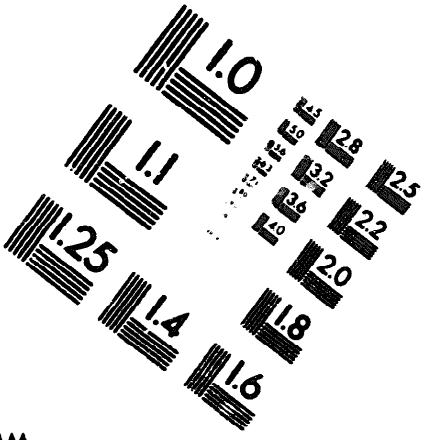

150 MM

1.0 mm (e= .81 mm)

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1.5 mm (e= 1.09 mm)

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abcdefghijklmnopqrstuvwxyz
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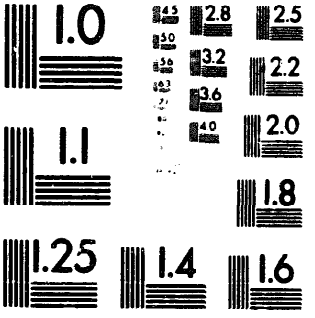

1.0 mm (e= .81 mm)

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1.5 mm (e= 1.09 mm)

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2.5 mm (e= 1.77 mm)

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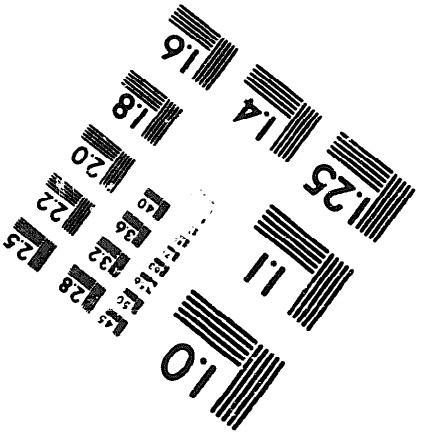
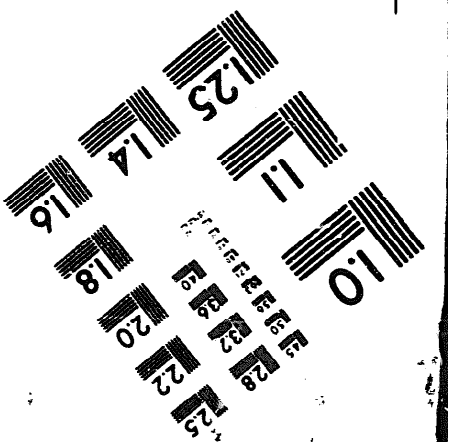
200 MM





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