PART 5 - SECTION 6

OIL SYSTEM

OIL TANK

GENERAL

1 The oil system is comprised of an oil tank vented to the atmosphere through a barometric valve, pressure and temperature instruments and a circulating system. Oil flows by gravity directly from the tank to the oil pump inlet on the engine and thence through the engine oil system and the temperature regulator back to the tank. For a full description of the engine oil system, together with the servicing and inhibiting procedures, refer to EOs 10B-10B-2, 10B-10BA-2 and 10B-10-9. A drain cock for the engine oil system is provided at the pump oil inlet. The aircraft oil system drain cock is located near the oil tank. Both drains are reached through the right wheel well. For details of the pressure and temperature instruments, refer to Part 6, Section 1, following.

OIL TANK

2 The oil tank (see Figure 1-19) is attached to the right side of the fuselage structure by a support and tank straps. The capacity of the oil tank is approximately 2.9 Imperial (3.5 U.S.) gallons with an expansion space of approximately 0.8 Imperial (1.0 U.S.) gallon. The tank sump drain line, with a branch from the filler overflow, drains overboard in the right wheel well. The tank is vented to the atmosphere, and an air-deflecting block is located immediately aft of the oil tank vent outlet, which deflects the airflow and reduces the possibility of collapse of the oil tank under certain flight conditions.

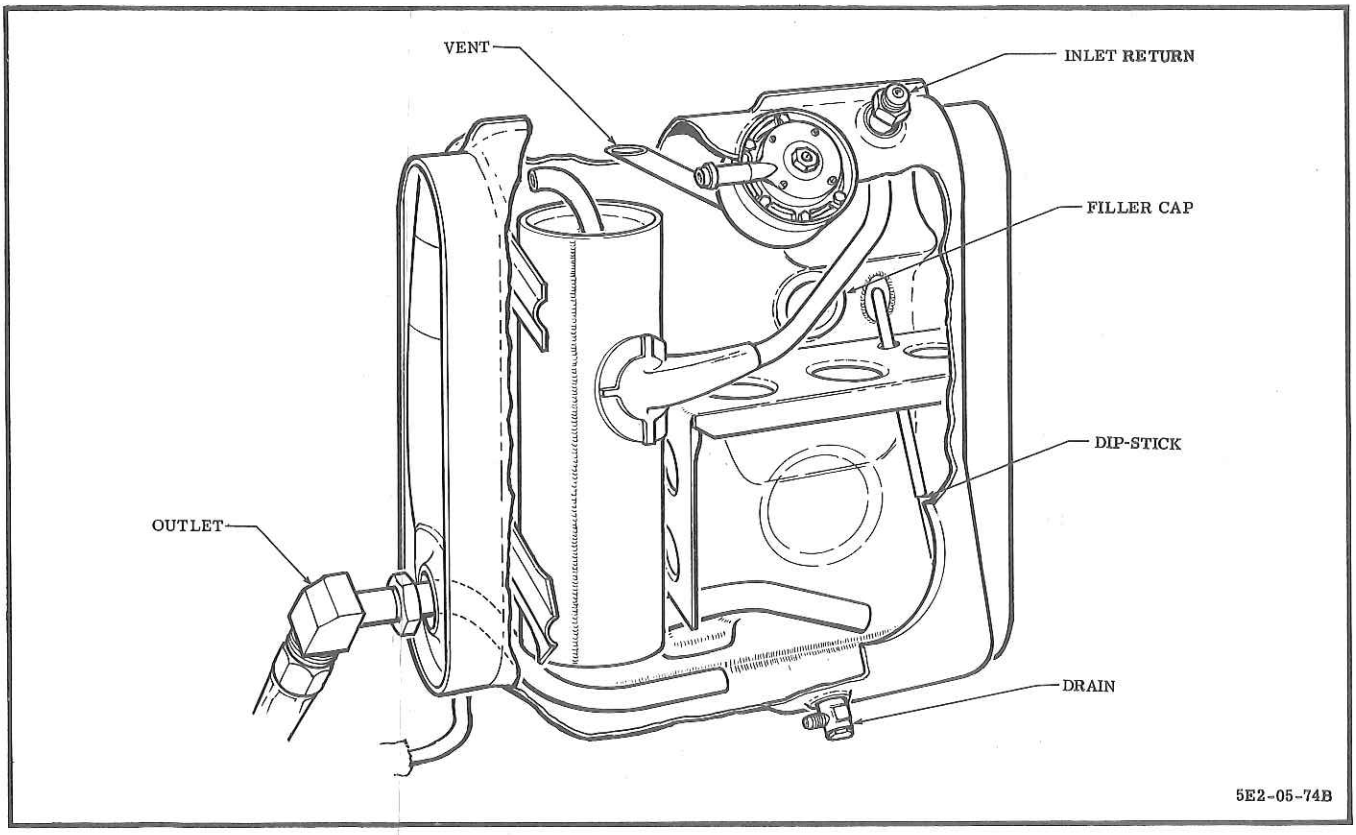

Figure 5-29 Oil Tank

(a)R Oil is returned tangentially into a cylindrical baffle or hopper located vertically inside the tank (see Figure 5-29). A large pipe, facing the rear at the bottom of the hopper, allows oil flow into the tank. A smaller pipe, leading from the top of the hopper facing forward, will also allow oil flow into the tank during different flight attitudes. An oil pick-up pipe terminates beneath and aft of the hopper.

(b) An immersion-type oil heater may be installed through the filler neck to warm the oil. Cover plates on the side of the tank are provided for internal inspection and cleaning when the tank is removed from the aircraft.

NOTE

Above 10,000 feet altitude, the barometric valve allows pressure to build up to 3-1/2 psi.

REMOVAL OF OIL TANK

3 To remove the oil tank, proceed as follows:

(a) Remove engine. (Refer to Part 5, Section 1, preceding.)

(b) Drain oil tank and lines to engine.

(c) Disconnect all oil drain and vent lines at oil tank.

(d) Disconnect bonding braid at oil tank. Remove three upper nuts, bolts and washers and two lower nuts, bolts and washers. Remove forward tank support.

(e) Disconnect turnbuckle securing oil tank to fuselage and lift oil tank out.

INSTALLATION OF OIL TANK

4 To install the oil tank proceed as follows:

(a) Check that securing strap chafing pads are in good condition.

(b) Position tank in cradle, being careful not to damage tank.

(c) Connect securing strap and check for proper alignment.

(d) Tighten turnbuckle until tank is secure. Safety turnbuckle.

(e) Install forward tank support with three upper bolts, washers and nuts and two lower bolts, washers and nuts.

(f) Connect bonding braid at oil tank.

(g) Connect all oil, drain and vent lines at oil tank.

(h) Install engine (refer to Part 5, Section 1, preceding) and fill oil system.

OIL COOLER/TEMPERATURE REGULATOR

5 The oil cooler/temperature regulator is mounted externally on the under surface of the engine compressor casing. The unit is in the oil system between the scavenge pump and the oil tank and consists of a heat exchanger which transfers heat from the scavenge oil to fuel flowing through the unit. Oil flow is controlled by a thermostatic valve which allows cool oil to by-pass the cooling elements. A pressure relief valve is incorporated in the thermostatic valve assembly. For further information refer to EO 10B-10B-2 and EO 10B-10BA-2.

OIL FILTERS

6 For the servicing procedures for filters and strainer screens, refer to EO 10B-10B-2 and EO 10B-10BA-2.

STORAGE

7 When aircraft are to be placed in storage, the oil tanks must be inhibited as follows:

(a) Remove access cover from inside right wheel well.

(b) Open drain valve in main supply line.

(c) Open oil sump and drain residual oil.

(d) Refill oil system with an inhibiting mixture consisting of three parts oil, Specification MIL-O-6081, Grade 1010 (latest issue), and one part corrosion preventative compound, Specification MIL-C-6529, Type 1 (latest issue).

(e) Make certain that all drains and filler caps are properly closed.

(f) Install access cover.

(g) For engine inhibiting procedure, refer to EO 10B-10-9.

PART 5 - SECTION 7

STARTING AND IGNITION SYSTEMS

STARTING AND IGNITION SYSTEMS

GENERAL

1 The starting and ignition systems are composed of the following units; a starter-generator, a starter controller, a starter ignition control relay, a throttle control relay, a combination starter-battery switch, an engine master switch, a stop-starter switch and an ignition switch, a high-energy ignition unit and, on aircraft 23001 to 23370 inclusive, a torch-igniter reducing valve.

TROUBLE SHOOTING

2 Trouble shoot the starting and ignition systems as follows:

TROUBLE	PROBABLE CAUSE	REMEDY
Starter-generator does not operate.	Open circuit to the battery-starter switch.	Repair wiring.
	Open circuit in relay energizing coil.	Install replacement relay.
	Battery-starter switch defective.	Install replacement.
	Dirty or burned relay points.	Clean contacts.
	Defective relay ground.	Repair.
Intermittent operation of the starter-generator.	Short-circuited relay coil.	Install replacement relay.
	Loose electrical connection.	Clean and tighten electrical connections.
	Defective ground.	Clean grounding point and install new ground.
Excessive arcing of motor brushes.	Binding, worn or improperly seated brushes or brushes with excessive play.	Install replacement brushes. Clean binding brushes and brush boxes with unleaded gasoline. (Refer to Paragraph 7.)
	Commutator dirty, burned, pitted or grooved.	If commutator is grooved, burned or pitted, install replacement starter-generator. (Refer to EO 10B-10B-2 or EO 10B-10BA-2.)

(Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive arcing of motor brushes.	Brush spring tension too high.	Install replacement brush springs.
	Grounded or open field circuit.	Install replacement starter-generator. (Refer to EO 10B-10B-2 or EO 10B-10BA-2.)
Starter turns engine but engine fails to start.	Throttle inboard.	Move throttle to outboard.
	Defective booster pump and ignition relays.	If there is power to the relay, the relay is defective and a replacement must be installed.
	Defective ignition vibrator units.	Install replacement units.
	Fuel shut-off valve fails to open.	Master switch OFF. Check wiring circuit to shut-off valve. Install replacement shut-off valve if defective.
	Defective igniter plugs.	Install replacement igniter plugs. (Refer to EO 10B-10B-2 or EO 10B-10BA-2.)
	Master switch OFF.	Place master switch ON.
No ignition.	Defective high-energy ignition unit.	Install replacement.
	Throttle lever inboard.	Move throttle lever outboard.
	Defective engine-starting ignition control relay coil.	Install replacement.
	Battery-starter switch defective.	Install replacement battery-starter switch.
	Master switch OFF or defective.	Turn master switch ON. If defective install replacement switch.
	Defective throttle relay.	Install replacement.
	Defective throttle micro-switch.	Install replacement.

TROUBLE	PROBABLE CAUSE	REMEDY
Starter fails to operate. Low starter motor rpm and cranking speed.	Circuit-breaker open.	Close circuit-breaker.
	Defective starter contactor relay.	Install replacement.
	Defective ignition control relay.	Install replacement.
	Defective starter.	Install replacement.
	Low external power source.	Check external source of 28 volts.
	Defective or improper wiring or loose connections.	Correct wiring and clean and tighten all loose connections.
	Binding, worn or improperly seated brushes. Brushes with excessive side play.	Install replacement brushes. Clean brushes and boxes with unleaded gasoline. (Refer to Paragraph 7.)
	Dirty commutator.	If commutator is pitted, burned, or grooved, install replacement starter-generator. (Refer to EO 10B-10B-2 or EO 10B-10BA-2.)

STARTING SYSTEM

GENERAL

3 The starting system (see Figure 5-30) consists of a battery-starter switch, a starter controller, a starter-generator and a stop-starter switch. Associated equipment consists of an engine master switch and two external power relays. Starter operation is entirely automatic once the battery-starter switch has been placed in the STARTER position. To de-energize the automatic starting circuit, it is necessary to depress the stop-starter switch, which de-energizes the starter contactor relay in the starter controller, disconnecting power to the starter-generator. The system is wired so that the starter cannot be energized by the battery and 28-volt d.c. external power must be used for starting. An emergency ignition switch, on the right forward console, is used for an air start.

OPERATION OF STARTING SYSTEM

4 With external power applied to the aircraft, operation of the starter system is as follows: Momentarily placing the battery-starter switch in the STARTER position (engine master switch ON and throttle control lever outboard) causes current to flow through the starter contactor relay, closing the contacts. The contacts, in closing, connect the external power source to the starter winding through the series coil of the starter-controller undercurrent relay. The initial surge of power energizes the undercurrent relay, which keeps the contactor relay in an energized condition until the current flowing through the undercurrent relay falls off enough for spring tension to snap the undercurrent relay contact open. When the undercurrent relay contacts open at approximately 23% engine rpm, power in removed from the contactor relay which in

turn removes power from the starter winding. The starter-generator then operates as a generator and provides maximum output when the generator reaches approximately 51% rpm. For an air start, the emergency ignition switch, located on the right forward console, is used.

STARTER-GENERATOR

5 A 28-volt, 400-ampere starter-generator is installed on the front of the engine. The generator supplies power for the electrical system of the aircraft when the engine is operating under normal conditions. The starter-generator acts as a starter for cranking the engine until the engine attains approximately 23% rpm, when it begins to function as a generator. The unit is cooled by blast air entering the air intake duct and passing through the starter-generator into the engine accessory section. For further details on the starter-generator, refer to EO 10B-10B-2 or EO 10B-10BA-2.

REMOVAL OF STARTER-GENERATOR

6 In order to obtain access to the starter-generator, the nose fairing must be removed in the following sequence: (See Figure 5-29A.)

(a) Open access door.

(b) Loosen rear Marman hose clamp.

(c) Loosen three retaining bolts on forward section of fairing.

(d) Withdraw forward section of nose fairing.

(e) Loosen six retaining bolts on aft section of fairing.

(f) Withdraw aft section of nose fairing.

(g) For removal procedure, refer to EO 10B-10B-2 or 10B-10BA-2.

REPLACEMENT OF STARTER-GENERATOR BRUSHES

7 Install new starter-generator brushes as follows:

(a) Remove starter-generator. (Refer to EO 10B-10B-2 or EO 10B-10BA-2.)

(b) Remove brush inspection band and cooling cap.

(c) Cut lockwire, loosen brush terminal screw and remove terminal.

(d) Pull brush spring back as far as necessary and remove brushes.

NOTE

Brushes that are worn within 1/8 inch of the rivets or which have lost their treatment (indicated by white deposit on commutator) must be replaced.

(e) Inspect the commutator for grooved or burned condition. If burned or grooved, the commutator is unfit for further use without corrective measures. Inspect commutator for proper condition of lubricating film. This film reduces friction and brush wear and, when satisfactory, is of an even flat brown colour.

(f) If commutator has a good film, place and tie a piece of very fine sandpaper around commutator with sand side toward brushes. Install new brushes and rotate armature by hand to fit brushes properly. Carefully remove sandpaper and blow out dust. Run starter-generator as a motor for 24 hours at no load, with air of air blast for cooling, to seat brushes.

(g) If lubricating film is very thin or if new commutator has been installed, use brush seating compound. This procedure will destroy any remaining lubricating film but will seat brushes very quickly. Run starter-generator as a motor with no load for 24 hours or run as a generator for 3 to 4 hours, at one-half to full load with air blast, until a good film has developed.

NOTE

Brushes must be seated on the same commutator on which they are to be operated.

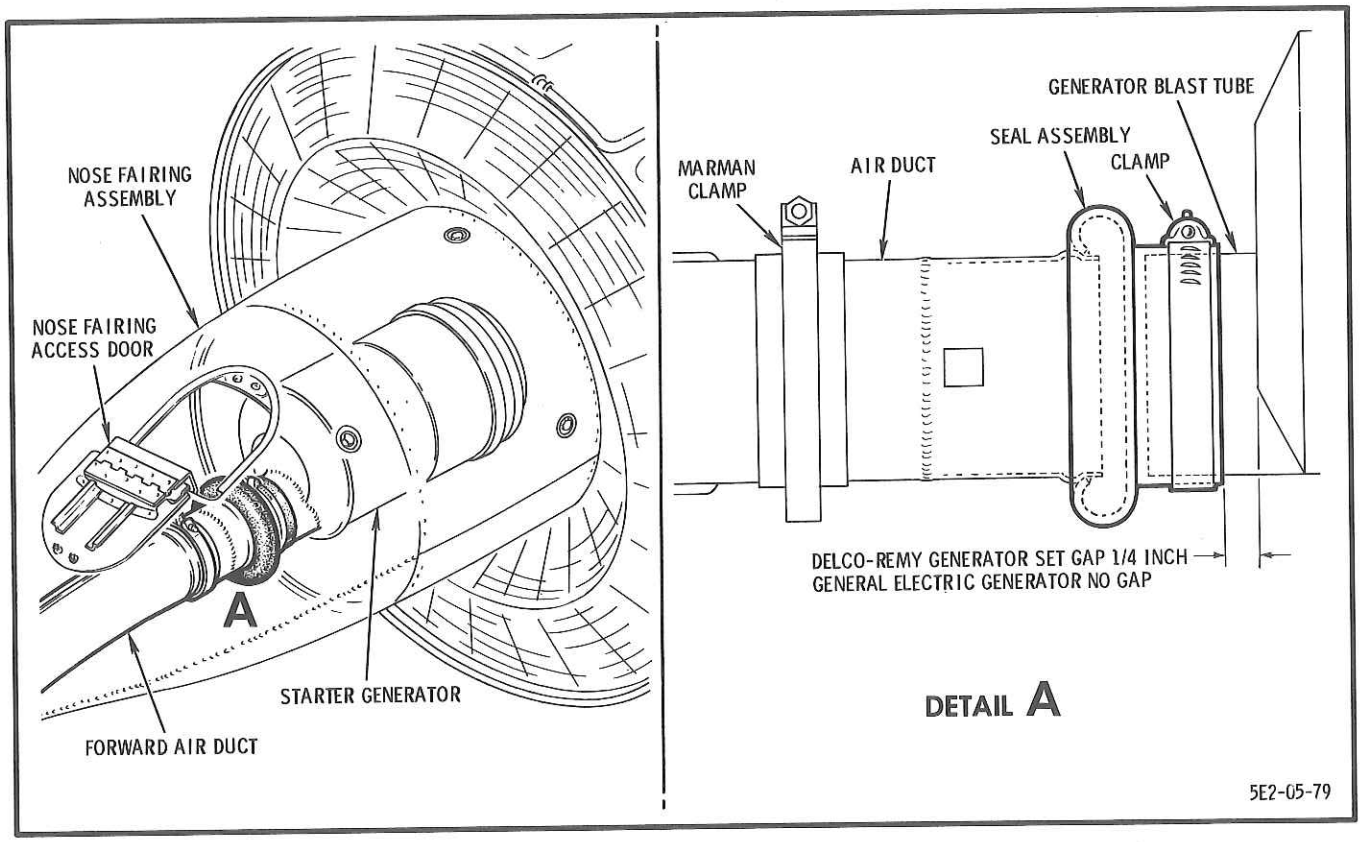

Figure 5-29A Engine Nose Fairing Assembly


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ROYAL CANADIAN AIR FORCE

EO 05-5E-2
24 Jan 58

ADVANCE REVISION

Serial #76 dated 7 Jul 60
(Sheet 1 of 1)

(This Advance Revision replaces Advance Revision Serial #66 facing page 423)

The sheet of this Advance Revision is to be inserted in the EO as follows:-

Sheet 1 facing page 423

Part 5, Section 7, para. 10, sub-para. (d) under "Caution"

Delete the following:

All retaining bolts must be torqued to 15 to 25 in. -lbs.

Add the following:

All retaining bolts on engine nose fairings modified in accordance with EO 05-5E-6B/16 must be torqued to 35 to 50 in. -lbs.

All retaining bolts on unmodified engine nose fairings must be torqued to 15 to 25 in. -lbs.

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF

TESTING OF STARTER-GENERATOR BRUSH HOLDER SPRING TENSION

8 Test brush holder spring tension as follows:

(a) Remove the brush inspection band.

(b) Using a spring-type hand scale, insert the scale hook under the spring-brush. Lift the scale until the brush spring just leaves the brush. The scale should read approximately 25 ounces minimum for a worn brush and 50 ounces for a new brush.

NOTE

If brush holder springs have a blue appearance, install replacement. This condition is indicative of overheating.

(c) Install replacement brush inspection band.

INSTALLATION OF STARTER-GENERATOR

9 For installation procedure, refer to EO 10B-10B-2 or EO 10B-10BA-2.

INSTALLATION OF ENGINE NOSE FAIRING

10 Install engine nose fairing as follows:

(a) Open access door.

(b) Open Marman vee-bend clamp and disconnect male duct coupling flange and hose from female duct coupling flange.

(c) Connect hose and male duct coupling flange to starter-generator air intake pipe and tighten rear Marman clamp.

(d) Install aft section of nose fairing to nose fairing support and tighten retaining bolts.

CAUTION

All retaining bolts must be torqued to 15 to 25 inch-pounds.

(e) Install forward section of nose fairing whilst aligning female to male duct coupling flange and tighten retaining bolts.

NOTE

To facilitate alignment of the male and female duct flanges, loosen the screw on the side of the starter-generator. This will allow the face of the starter-generator to be turned.

(f) Secure male and female duct coupling flanges with Marman vee-bend clamp.

(g) Close access door.

STARTER CONTROLLER

11 The starter controller, mounted within the engine compartment, connects the electrical system to the starter for engine starting. The controller consists of two relays within one unit, a starter contactor relay and an undercurrent relay. The latter relay serves as a locking relay for the starter contactor relay during the automatic starting of the engine. This type of starting eliminates the necessity of holding the starter switch closed during the cranking period. When the engine reaches 30% rpm, the PUSH TO STOP STARTER button should be pressed. This de-energizes the starter contactor relay and disconnects external power from the starter.

CAUTION

When connecting or disconnecting the hydraulic lines in the vicinity of the starter controller, exercise extreme caution to prevent short circuits on starter controller terminals.

IGNITION SYSTEM

GENERAL

12 The ignition system (see Figure 5-30) consists of an ignition control relay, high-energy ignition unit, two igniter plugs and, on aircraft 23001 to 23370 inclusive, a torch-igniter reducing valve. Control units necessary for the operation of the system consist of an engine master switch, a throttle relay, a starter controller and a starter switch. The system functions only during starting of the engine, and operates on 28-volt d.c. power. When the engine master switch is in the ON position, and the battery-starter switch is momentarily placed in the STARTER position, current simultaneously flows to the starter controller and the ignition control relay solenoid. The starter contactor relay in the starter controller then actuates to connect the

starter-generator. This action causes the undercurrent relay in the starter controller to make contact, thus completing the lock-in circuit to hold the ignition control relay which completes the ignition circuit to the throttle relay in its actuated position. With the throttle control lever in the outboard position, the throttle relay is de-energized and in this condition it completes the ignition circuit to the primary bus through the engine ignition circuit-breaker. Current then flows from the primary bus to the ignition vibrators which provide the high-tension power at approximately 1300 volts for Orenda 10 and 2800 to 3200 volts for Orenda 14 for the two igniter plugs installed in the interconnectors between combustion chambers 1 and 2, and between chambers 5 and 6. Ignition is maintained through the starter controller terminals S and C during operation of the starter and ceases when the starter controller cuts out automatically. An emergency ignition switch, wired in parallel with the ignition control relay contacts, is provided for making a windmilling air start.

TORCH-IGNITER REDUCING VALVE
(Aircraft 23001 to 23370 inclusive)

13 On aircraft 23001 to 23370 inclusive, a torch-igniter reducing-valve solenoid is incorporated to open the reducing valve which supplies fuel to the torch-igniter atomizers. For further details refer to EO 10B-10B-2.

IGNITER PLUGS

14 Two igniter plugs are used to ignite the fuel in the combustion chambers. The igniter plugs, of the high-energy surface-discharge type, have electrodes extending into the inner lining of the combustion chamber interconnectors. No gap adjustment can be made and the only servicing checks required are functional and visual. For further details, refer to EO 10B-10B-2 and EO 10B-10BA-2.

IGNITION SYSTEM CHECK

15 To check the functioning of the ignition system, proceed as follows:

WARNING

The voltage at the igniter plugs is high. Do not attempt any checking of plugs or exciter box until certain that the ignition circuit-breaker is open.

CAUTION

Prior to carrying out ignition check, ensure that no surplus fuel is left around engine. Air intake and tail pipe blanking covers must be removed.

(a) Ensure that all circuit-breakers, with the exception of Klixon circuit-breakers, are OFF.

(b) Disconnect cable from terminal C of the starter-generator.

(c) Connect one lead of a test light to the above cable and ground the second lead.

DANGER

Ensure that the cable disconnected from terminal C is not left in a position in which grounding can occur, especially on nearby fuel lines. Sub-paragraphs (b) and (c) must be carried out in one operation.

(d) Connect ground power supply using No. 1 external power receptacle.

(e) Switch on engine master and engine ignition circuit-breakers.

(f) Switch ON engine master switch.

(g) Place throttle control in advance position.

(h) Place starter switch in START position.

(j) Check that test light is on. Check audibly that both igniter plugs operate. On aircraft 23001 to 23370, check that torch-igniter reducing-valve solenoid operates.

(k) Open the starter switch. Ignition relay should not be energized. Test light should go out. Igniter plugs should not operate.

(m) Switch ON the emergency ignition switch checking that both igniter plugs operate and that the torch-igniter reducing-valve

solenoid operates. The test light should remain out.

(n) Switch OFF the emergency ignition switch. Igniter plugs should not operate.

(p) Place throttle control in retard position and turn OFF engine master switch.

(q) Open engine master and engine ignition circuit-breakers.

(r) Disconnect ground power supply.

(s) Disconnect test light from the starter cable and reconnect cable to terminal C of the starter-generator.

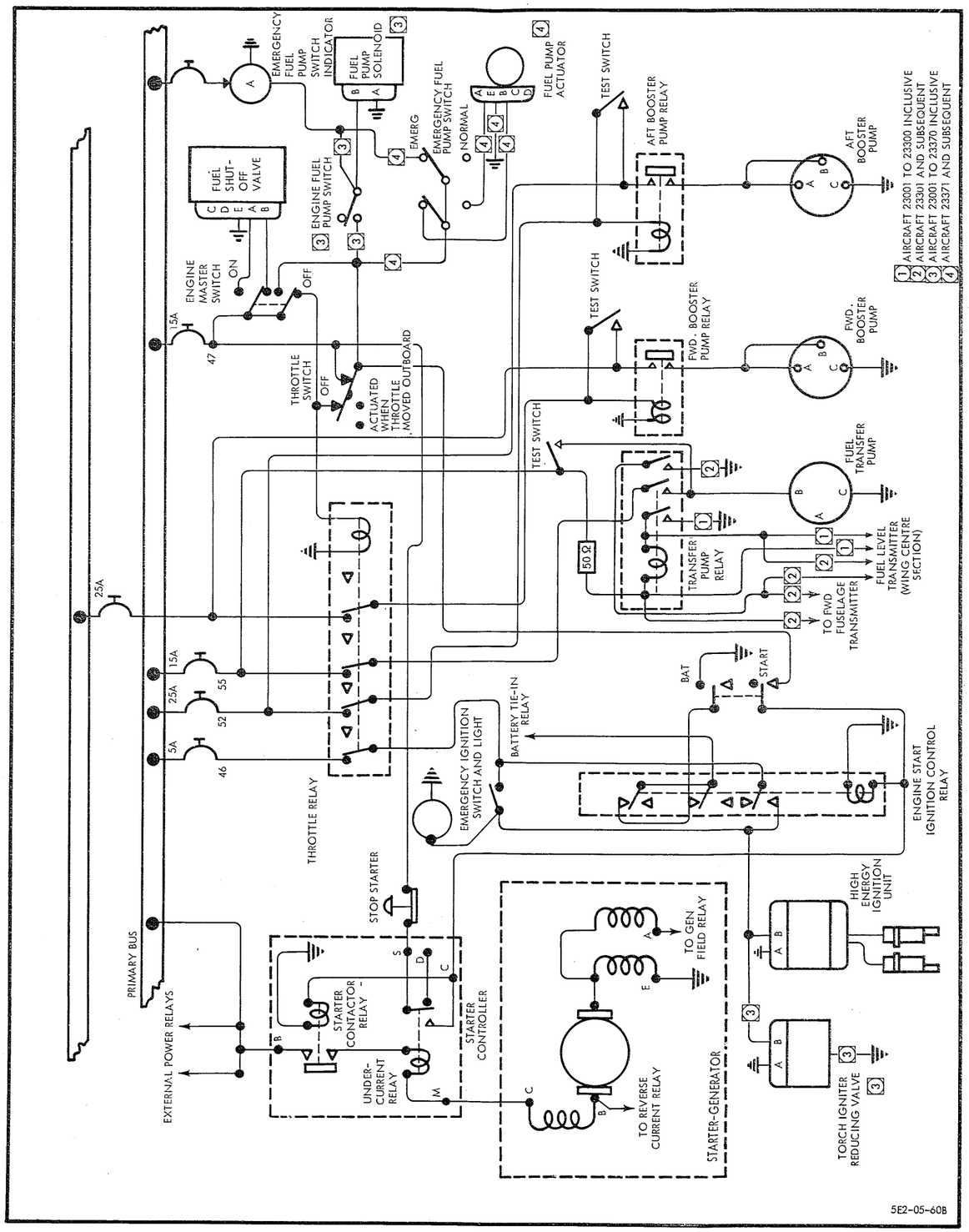

Figure 5-30 Starting and Ignition System - Schematic

PART 6

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PART 6

LIST OF ILLUSTRATIONS

INSTRUMENTS

SECTION 1 - INSTRUMENTS

SECTION 2 - PITOT-STATIC SYSTEM

PART 6 - SECTION 1

INSTRUMENTS

INSTRUMENTS

GENERAL

1 The instruments are classified into three groups: flight, engine and miscellaneous. The flight instruments consist of the accelerometer, radio compass, airspeed indicator, directional gyro, artificial horizon, machmeter, altimeter, turn and slip indicator and the rate-of-climb indicator. The engine instruments consist of the exhaust temperature indicator, tachometer, fuel quantity indicator, oil pressure indicator and, on aircraft 23001 to 23370 inclusive, two oil temperature indicators. The miscellaneous instruments consist of the cabin pressure indicator, voltmeter, loadmeter, clock and hydraulic pressure indicator. Pitot and static pressures, for operation of various flight instruments, are taken from the pitot and static manifolds located just forward of the instrument panel. For detailed information on the pitot-static system, refer to Part 6, Section 2, following. All instruments are front mounted on the instrument panel to simplify removal procedures. For location of the instruments on the panel, see Figures 6-1 and 6-1A.

INSTRUMENT PANEL

2 The panel is attached to a supporting frame which is mounted on rubber shock absorbers. To obtain access to the rear of the instrument panel, unlock the Camloc fasteners and pull the panel aft, being careful not to damage the instruments or connections.

FLIGHT INSTRUMENTS

ACCELEROMETER

3 The accelerometer, mounted above the upper right corner of the instrument panel, gives a measurement in G (gravity) units of the stresses imposed along the normal (vertical) axis of the aircraft. The mechanism consists of two masses so journalled that their reactions to acceleration along other axes are equal and opposite. Indications are thus caused only by accelerations along the vertical (z) axis. The instrument is calibrated from -5G to +10G. For instrument marking see Figure 6-2. No electrical or other connections are required for operation of the accelerometer.

AIRSPEED INDICATOR

4 The airspeed indicator incorporates a maximum airspeed indicating mechanism that automatically indicates allowable speed for the existing altitude of the aircraft. This is shown by means of a moving, luminous, red-striped, limit hand, mounted coaxially with the luminous airspeed pointer. The red hand is controlled by an altimeter-type aneroid which rotates the hand, as the aircraft gains or loses altitude, in such a manner that the airspeed limit indicated is synonymous with the Mach number to which the instrument is set. Mach numbers, in small figures from 0.6 to 1.0, are marked on the dial. The airspeed indicator is calibrated from zero to 700 knots. For instrument marking see Figure 6-2. The instrument is connected to the pitot and static manifold, the connections being identified by P for pitot and S for static pressures.

ALTIMETER

5 The barometric-type altimeter measures variations in pressure which are coincident with changes in altitude. Expansion or contraction of the diaphragm is multiplied and transmitted to the pointers. The instrument is equipped with three pointers: the long pointer registering 100-foot changes in altitude in increments of 20 feet, the wide pointer registering 1000-foot changes and the small pointer registering 10,000 foot changes. The instrument also includes a barometric scale, which may be set by the small knob on the bottom left corner of the instrument, and two triangular setting markers which move co-ordinately with the barometric dial when the setting knob is turned. These markers provide a setting of barometric pressure in feet. The instrument is connected to the static manifold.

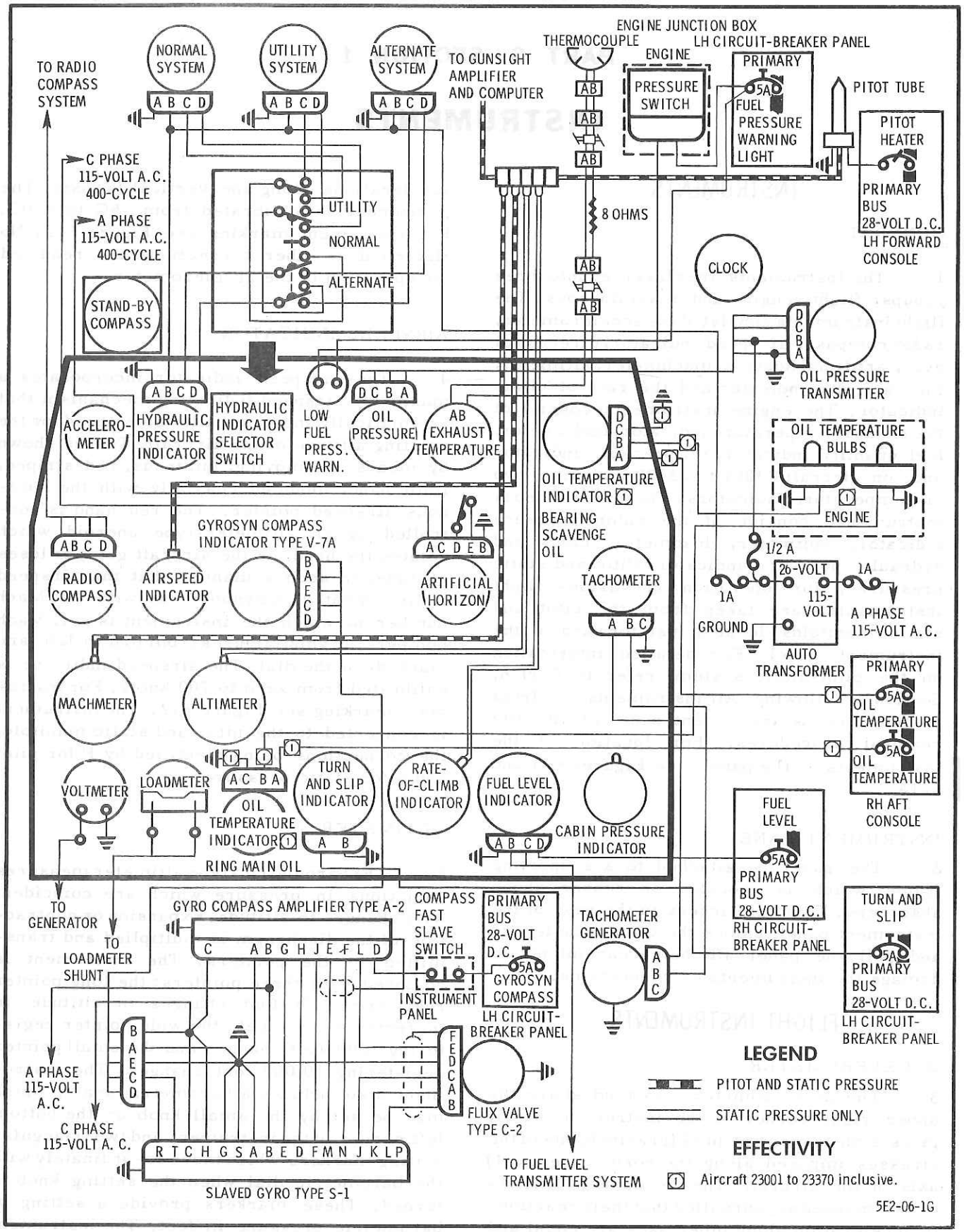
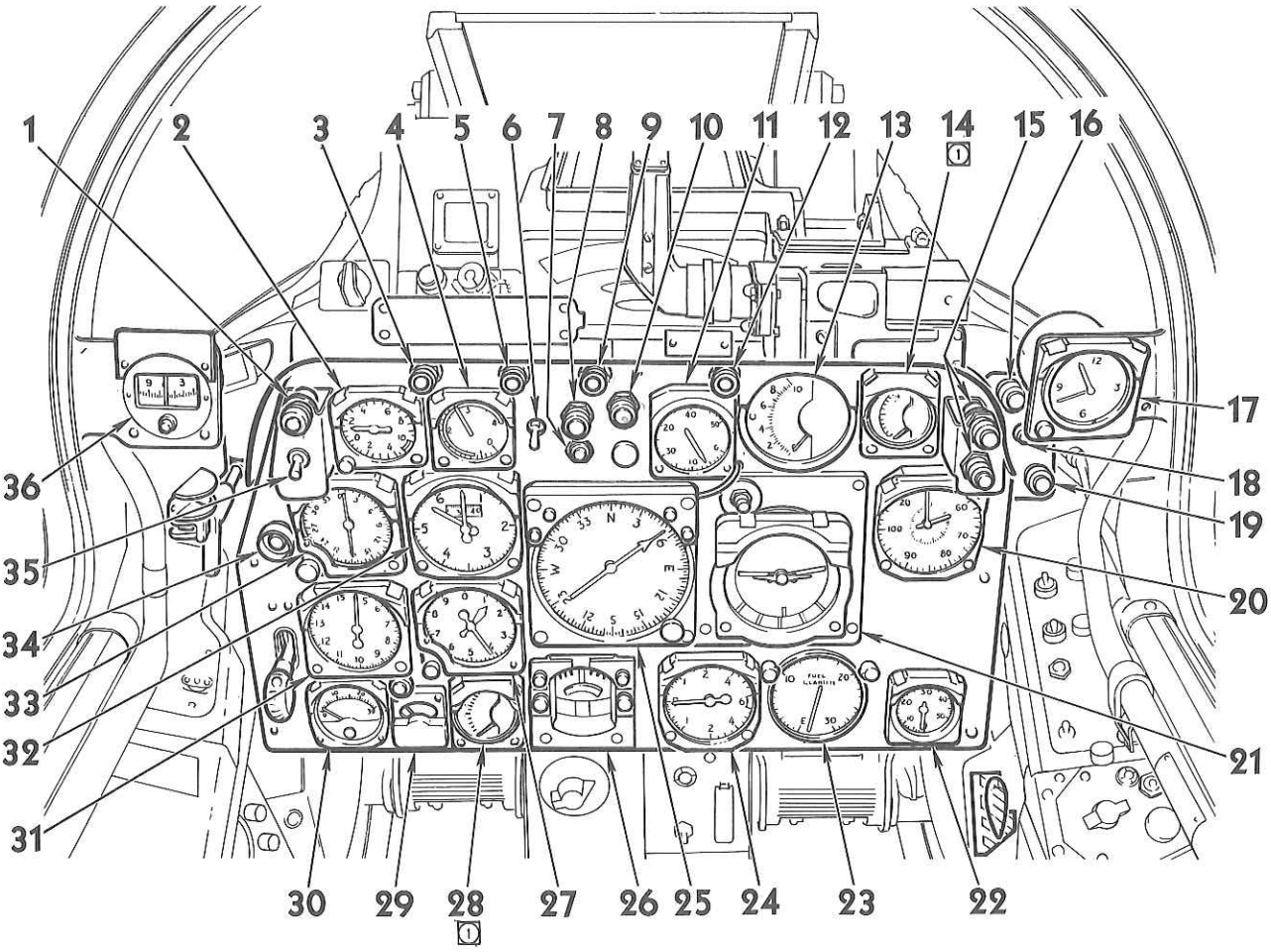


Figure 6-1 (M) Instrument System - Schematic



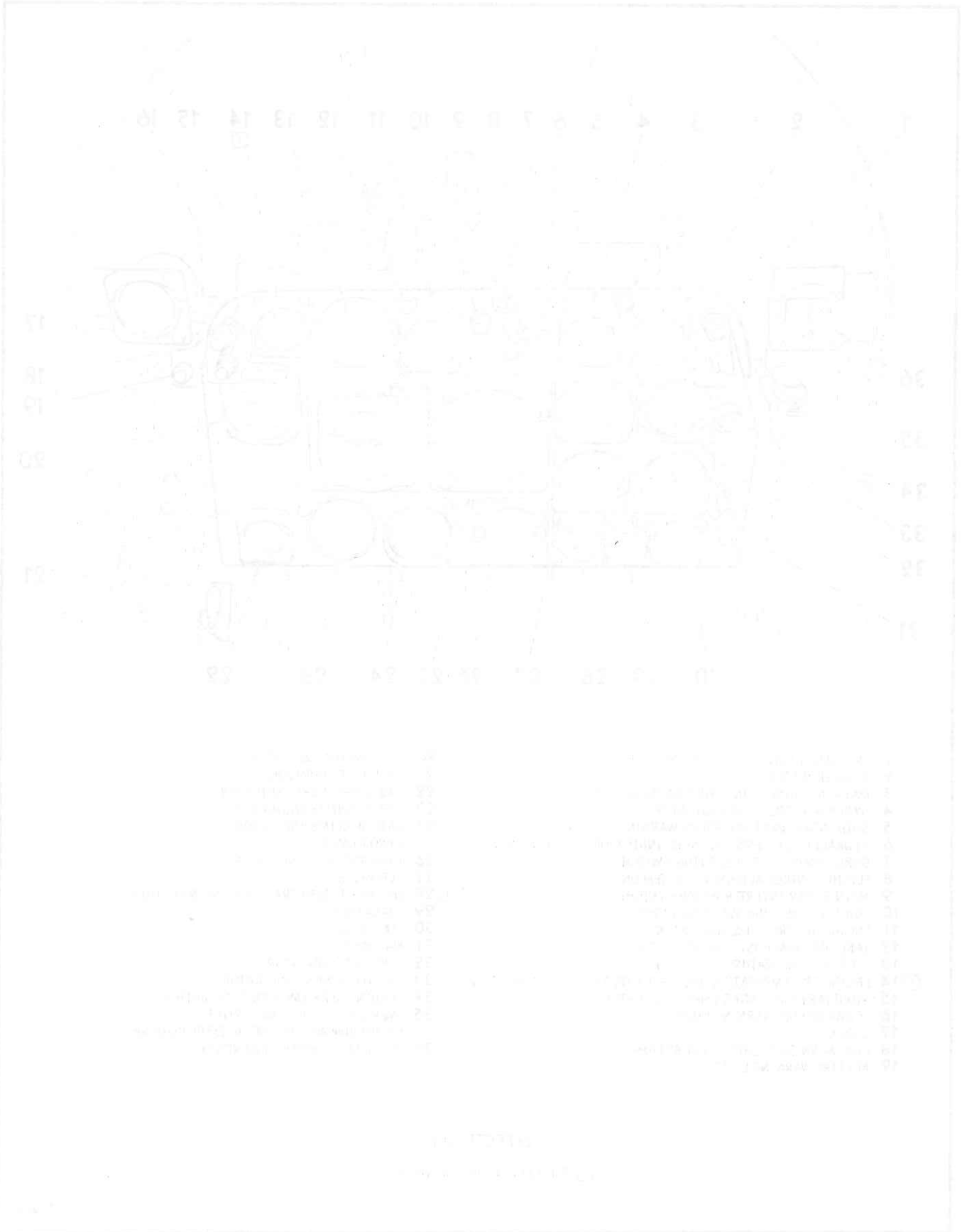
1 EMERGENCY FUEL PUMP WARNING LIGHT
2 ACCELEROMETER
3 MAIN INSTRUMENT INVERTER WARNING LIGHT
4 HYDRAULIC PRESSURE INDICATOR
5 BOTH INSTRUMENT INVERTERS WARNING LIGHT
6 HYDRAULIC SYSTEMS PRESSURE INDICATOR SELECTOR SWITCH
7 GYRO COMPASS FAST SLAVING SWITCH
8 FLIGHT CONTROL ALTERNATE SYSTEM ON LIGHT
9 MAIN RADAR INVERTER WARNING LIGHT
10 LOW FUEL PRESSURE WARNING LIGHT
11 ENGINE OIL PRESSURE INDICATOR
12 TAKE-OFF TRIM POSITION INDICATOR LIGHT
13 JET PIPE TEMPERATURE INDICATOR
① 14 ENGINE OIL TEMPERATURE INDICATOR (BEARING SCAVENGE OIL)
15 AUXILIARY FUEL TANKS EMPTY INDICATOR LIGHTS
16 FORWARD FIRE WARNING LIGHT
17 CLOCK
18 FIRE WARNING LIGHTS - TEST BUTTON
19 AFT FIRE WARNING LIGHT
20 TACHOMETER INDICATOR
21 ARTIFICIAL HORIZON
22 CABIN PRESSURE INDICATOR
23 FUEL QUANTITY INDICATOR
24 RATE OF CLIMB INDICATOR
25 GYRO COMPASS
26 TURN AND SLIP INDICATOR
27 ALTIMETER
① 28 ENGINE OIL TEMPERATURE (RING MAIN OIL)
29 LOADMETER
30 VOLTMETER
31 MACHMETER
32 AIRSPEED INDICATOR
33 RADIO COMPASS INDICATOR
34 LANDING GEAR EMERGENCY UP BUTTON
35 EMERGENCY FUEL PUMP SWITCH
(Inoperative aircraft 23001 to 23370 inclusive.)
36 MAGNETIC COMPASS (STANDBY)

EFFECTIVITY

① Aircraft 23001 to 23370 inclusive.

5E2-06-9

Figure 6-1A Instrument Panel



OFZ

ADVANCE REVISION

Serial #83 dated 1 Nov 60
(Sheet 1 of 1)

The sheet of this Advance Revision is to be inserted in the EO as follows:-

Sheet 1 facing page 433

Part 6,
Section 1, page 433, Figure 6-2 Instrument Markings
Delete the following:-

INSTRUMENT	RED RADIAL		GREEN ARC	YELLOW RADIAL	RED HAND SETTING	MACH NO.	YELLOW ARC	RED AND YELLOW ARC
	LONG	SHORT						
HYDRAULIC PRESSURE		3200 psi	2550 to 3200 psi				650 to 2550 psi	3200 to 4000 psi

Add the following:

INSTRUMENT	RED RADIAL		GREEN ARC	YELLOW RADIAL	RED HAND SETTING	MACH NO.	YELLOW ARC	RED AND YELLOW ARC
	LONG	SHORT						
HYDRAULIC PRESSURE		3250 psi	2470 to 3250 psi				650 to 2470 psi	3250 to 4000 psi

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF

ARTIFICIAL HORIZON

6M The artificial horizon provides the pilot with a visual indication of the aircraft attitude with respect to the ground. The system consists of an indicator and a gyro erection switch, both mounted on the instrument panel. The required 115-volt three-phase a.c. is supplied through two 1/2-ampere fuses by either the main or alternate three-phase inverters. A power failure indicator on the face of the instrument shows OFF when a power failure occurs. The gyro should settle to the erect position within 20 seconds after power is applied. When fast erection is required, the gyro erection switch should be depressed for a period not exceeding one minute, with a 30-second interval between successive depressions. For further information, refer to EO 20-20JA-2.

CAUTION

The one-minute depression period for the gyro erection switch must not be exceeded, as serious damage to the instrument can result.

GYRO COMPASS SYSTEM

7 The gyro compass system (see Figure 6-3) consists of a flux valve, an amplifier, a directional gyro control and a repeater-type instrument. The directional gyro control is automatically kept on a true magnetic heading

INSTRUMENTS	RED RADIAL LONG	RED RADIAL SHORT	GREEN ARC	YELLOW RADIAL	RED HAND SETTING	MACH NO.	YELLO
TACHOMETER	100.6%		34% TO 100%				
EXHAUST TEMPERATURE	850°C	700° C [2] 720° C [1]	280° C TO 650° C				
HYDRAULIC PRESSURE		3200 PSI	2550 TO 3200 PS				650 TO 2550 PSI / 3200 TO 4000 PSI
AIRSPEED		600 KNOTS			555 KNOTS	.95	
OIL PRESSURE							
ACCELEROMETER							
CENTRE BEARIN SCAVENGE OI		-30° C TO 140° C	30°C TO 140°C				
RING		- 30°C TO 70°C	30°C TO 70°C				

DELETED

EFFECTIVITY

[1] Aircraft 23612 and subsequent.
[2] Aircraft 23001 to 23611 inclusive.
[1] Aircraft 23001 to 23370 inclusive.

5E2-06-2F

Figure 6-2 Instrument Markings

by a flux valve transmitter in the left outer wing panel. The flux valve transmitter utilizes the north-south magnetic flux of the earth over synchro-type windings to electrically control the electro-magnetic precessing coils in the gyro through the use of synchros and an electronic amplifier. The system has no control switch and operates when power is connected to the primary bus and to the 115-volt, 400-cycle a.c. buses. For installation compensation and swinging of gyrosyn compass, refer to EO 20-25DC-2.

GYRO COMPASS FLUX VALVE TRANSMITTER

8 The flux valve transmitter is the direction sensing unit of the system. It consists of a hemispherical bowl, which houses the functioning assemblies, attached to the mounting flange with calibrated marks up to 10° on each side of the fore-and-aft axis of the unit. These marks are used as a reference for installation. The fundamental flux valve unit is suspended on a universal joint within the bowl and is weighted so that, within limits, it continuously responds to gravity. The bowl is filled with a damping fluid to prevent excessive swinging in flight. The compensator head can be utilized to correct flux valve for excessive deviation. The compensator head, located on top of the flux valve transmitter (see Figure 6-3) contains two magnets that are positioned by the two screw-type adjusting shafts. The shafts are coded by letters NS (to correct for north and south error) and EW (to correct for east and west error.)

DIRECTION GYRO CONTROL

9 The directional gyro control, located in the radio compartment (see Figure 6-3), contains the electrically-driven gyro whose spin axis is not only maintained tangentially to the surface of the earth but is also slaved, by means of the flux valve, to the earth's magnetic field for the purpose of furnishing a basic magnetic reference from which the degree of turn and the magnetic heading of the aircraft can be determined.

GYRO COMPASS SYSTEM AMPLIFIER

10 The gyro compass system amplifier, located in the radio compartment aft of the

cockpit, contains the circuits which amplify the signal from the flux valve unit and detect its phase before it is directed to the precession coils of the gyro.

GYRO COMPASS SYSTEM INDICATOR

11 The gyrosyn compass indicator, mounted on the instrument panel, indicates the magnetic heading of the aircraft as established by the flux valve transmitter and the directional gyro control. It consists of a synchro to which is attached a pointer. This pointer moves relative to a dial, calibrated in 2° increments, which indicates heading of the aircraft.

GYRO COMPASS FAST SLAVE SWITCH

12 Fast slaving of the gyro compass is accomplished by means of push-button switch located on the instrument panel. The switch, when pressed, de-energizes the slow slaving circuit, resulting in a faster true heading.

MAGNETIC COMPASS

13 The direct-reading, vertically-mounted, magnetic-type compass is for emergency or standby use. The compass is located on the lower left corner of the windshield frame. It consists of a metal bowl filled with compass fluid and semi-floating card which is graduated in 5° increments. A permanent-magnet compensator is attached to the compass for the purpose of correcting errors induced by stray magnetic fields in the aircraft. The compass should be corrected every 100 hours or once every three months and also when a change of equipment has been made which is likely to affect the instrument. For installation, compensation and swinging of magnetic compass, refer to EO 20-25-1.

COMPENSATION OF RADIO COMPASS

14 For radio compass compensation procedure, refer to Part 8, following.

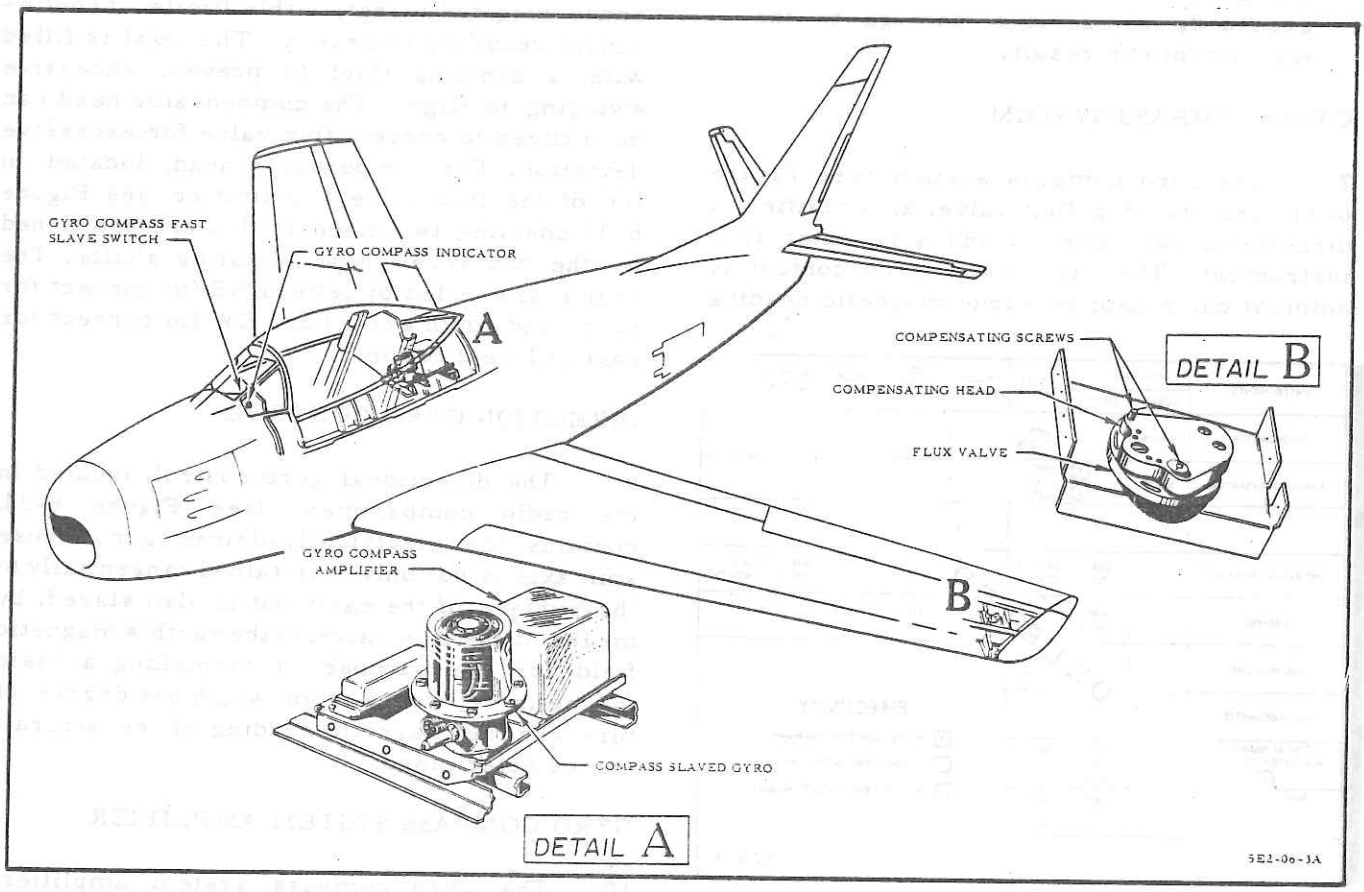


Figure 6-3 Gyro Compass System

MACHMETER

15 The machmeter provides an indication of the existing Mach number during flight. The machmeter is composed of an airspeed unit and an altitude unit. The airspeed unit is similar to the conventional airspeed mechanism. The altitude unit employs an evacuated diaphragm which, upon expanding as a result of altitude change, modifies the magnifying ratio of the mechanism. In this manner the effect of density changes are continuously counteracted. The machmeter is connected to the pitot and static manifolds.

TURN AND SLIP INDICATOR

16 The turn and slip indicator incorporates two instruments enclosed in one case but functioning independently of each other. The turn indicator applies gyroscopic principles to indicate a rate of turn about the vertical axis of the aircraft. The slip indicator shows lateral level whilst the aircraft is in straight flight, or the amount of slip or skid if the aircraft is turning. The turn indicator is controlled by an electrically-driven gyroscope which is connected to the 28-volt d.c. primary bus. The slip indicator is a ball-type inclinometer. Fluid in the tube serves to damp out vibrations between ball and tube and ensures smooth and accurate movements of the ball.

RATE-OF-CLIMB INDICATOR

17 The rate-of-climb indicator contains a sensitive diaphragm which, actuated by pressure differential, indicates the rate of change of the altitude of the aircraft. It is used both as an aid to maintain level flight and to indicate the correct rate of ascent or descent. The instrument is connected to the static manifold.

ENGINE INSTRUMENTS

EXHAUST TEMPERATURE INDICATOR

18 The exhaust temperature indicator shows the exhaust temperature [DELETED] rward section of the tail-pipe. The [DELETED] ent is connected to four thermocouples connected in parallel, which generate a small electrical potential to operate the instrument. For instrument marking see Figure 6-2.

FUEL QUANTITY INDICATING SYSTEM

19 The fuel quantity indicating system indicates the total fuel supply in all tanks except the auxiliary drop tanks. For information concerning the system, refer to Part 5, Section 5, preceding.

FUEL PRESSURE INDICATING SYSTEM

20 A low pressure fuel warning light, located on the instrument panel, indicates when the fuel pump inlet pressure drops below 3 psi. For further information on the fuel pressure indicating system, refer to Part 5, Section 4, preceding.

OIL PRESSURE INDICATING SYSTEM

21 The oil pressure indicating system consists of an autosyn-type pressure transmitter located on the top right side of the engine, accessible through a panel in the fuselage located between stations 210 and 225 on the right side of the aircraft. An indicator is mounted on the instrument panel. The system requires 26-volt, 400-cycle, single-phase alternating current and is connected to the auto-transformer through a 1/2-ampere fuse. Indications are in psi. For instrument marking see Figure 6-2.

OIL TEMPERATURE INDICATING SYSTEM

22 On aircraft 23001 to 23370 inclusive, the oil temperature indicating system consists of two indicators, mounted on the instrument panel, and two bulb-type thermometers, one installed at the outlet line from the high pressure filter and the other in the scavenge outlet from the centre bearing. For instrument marking see Figure 6-2. The system requires 28-volt d.c. supplied from the primary bus.

TACHOMETER INDICATOR

23 The tachometer indicator registers electrically the speed of the engine in percentage of rated rpm through electrical wiring from the tachometer generator, which is geared to the engine compressor rotor. For instrument marking see Figure 6-2.

LOADMETER

24 A loadmeter, located on the instrument panel, indicates the generator load as a percentage of the rated output of the generator.

CABIN PRESSURE INDICATOR

25 The cabin pressure indicator, located on the instrument panel, is an altimeter which uses cabin static pressure to indicate cabin altitude. No electrical or other connections are required.

HYDRAULIC PRESSURE INDICATING SYSTEM

26 The hydraulic system pressure indicator, through the medium of a selector switch, indicates the pressures of the utility system, normal surface control system or the emergency surface control system. Indications are shown individually by a single pointer. These indications are accomplished by electrical connections to transmitters located in the pressure lines of their respective hydraulic systems. For instrument marking see Figure 6-2.

VOLTMETER

27M A 0 to 30-volt voltmeter is connected to indicate the voltage of the d.c. electrical system. A cover plate is installed in the lower part of the instrument face to prevent breakage of the glass. For further information, refer to Part 7, following.

JET PIPE TEMPERATURE INDICATING SYSTEM

GENERAL

27A The JPT indicator system is installed to provide the pilot with an indication of the engine exhaust gas temperature. The complete system consists of an indicator located on the pilots instrument panel, a thermocouple assembly, the probes of which are installed in the engine exhaust pipe the necessary connecting leads which have a calibrated resistance, and a calibration resistor which is located in the RH radio compartment.

27B The system operates on the principle that when two dissimilar metals, such as chromel and alumel, from which the thermocouples and leads are manufactured, are joined together at each end to form an electrical circuit, an electric potential is generated which is proportional to the difference in temperature between the two ends of the circuit.

27C The EMF produced by the difference in the temperature between the hot junction (thermocouples) and the cold junction (within the instrument) is measured by the indicator in millivolts and shown on the scale in °C. The instrument will indicate the true temperature at the thermocouple, regardless of the ambient temperature. This is achieved by the use, within the instrument, of a compensating bimetallic spiral spring and a negative temperature coefficient resistor.

27D The thermocouple leads are identified by the colour of the insulation. The chromel (positive+) lead insulation is white and the alumel (negative -) lead insulation is green. It is essential to the operation of the system that the two leads are not cross-connected, i.e., alumel must be connected to alumel, chromel to chromel. The connections at the back of the instrument are identified C+ and A- for the chromel and alumel leads respectively.

27E The total resistance of the system is a critical factor to the operation, therefore when any part of the circuit is replaced, the procedure detailed in Paragraph 27F, following, should be carried out.

RESISTANCE CHECK

27F Carry out resistance check as follows:

NOTE

This procedure is to be carried out as near as possible to room temperature (25°C). Since the resistance of a thermocouple system is based on 0°C, the leads of the Wheatstone bridge should always be reversed after a reading is made, and a second reading taken. The true resistance is the average between the two readings:

Example = First reading - 8.05 ohms

Second reading - 7.97 ohms

Average reading = $\frac{8.05 + 7.97}{2}$ = 8.01 ohms

The reason for this is that the galvometer of the Wheatstone bridge is affected by the EMF generated by the thermocouples at temperatures above or below 0°C.

(a) Disconnect the thermocouple leads at the back of the instrument.

(b) Connect a Wheatstone bridge between the leads and check the average resistance as previously described. The average resistance must be 8.0 (±.05) ohms.

(c) Place a test thermometer near the instrument. The indicator should read the ambient temperature as shown on the test thermometer, within ±20°C.

(d) Connect the thermocouple leads to the instrument.

(e) Check that the indicator reads the ambient temperature within ±25°C.

SYSTEM RESISTANCE ADJUSTMENT

27G Carry out system resistance as follows:

(a) Disconnect the thermocouple leads from the instrument.

(b) Connect the ends of these leads together by means of a screw and nut.

(c) Remove the cover from the resistor, Part AN5534-1, which is located in the RH radio compartment.

(d) Check that the resistor is connected in series with the negative (alumel) lead.

NOTE

Only one of the two resistor spools within the resistor assembly is connected in the circuit, the other is a spare. However, if the average resistance of the circuit was found to be less than 8.0 (±.05) ohms, it will be necessary to disconnect the resistor spool being used and calibrate the system with the spare resistor. If the spare is to be used, connect one end of the resistor wire to one of the terminals; leave the other end of the resistor wire free. If the resistor already connected in the circuit is to be adjusted, disconnect one end of the resistor wire.

(e) Connect a Wheatstone bridge in series with the free end of the resistor wire and the negative thermocouple lead.

(f) Measure the average resistance.

(g) If necessary, gradually remove the resistor wire from the spool until an average resistance of 8.0 (±.05) ohms is obtained.

NOTE

Do not remove too much wire at a time as the resistance may drop below the required value.

(h) Remove the Wheatstone bridge and wind the free end of the resistor wire several times around the non-conducting post provided, to prevent unwinding of the spool.

(j) Connect the free end of the resistor wire to the vacant terminal so that the resistor is in series with the negative lead.

(k) Wrap the unused resistor spool with tape, taping in the wire ends.

(m) Disconnect the leads from each other at the instrument end. Connect the Wheatstone bridge between them.

(n) The average resistance must be 8.0 (±.05) ohms.

(p) Remove the Wheatstone bridge and reconnect the leads to the instrument.

(q) Check that the indicator reads the ambient temperature within ±25°C.

(r) Replace the cover on the calibrating resistor unit.

CHECKING ACCURACY OF COMPLETE SYSTEM

27H For checking the accuracy of the complete system, a Veritherm Jet temperature test set, Model T-9, is required. The Veritherm provides a means of heating the thermocouple probes in the jet pipe to accurately known temperatures. The amount of heat supplied is adjusted by turning a knob on the control panel. Similarly the resulting average temperature of the thermocouples can be accurately read at the control panel.

27J Since all calibration checks are made with the aircraft system completely intact, the results obtained are independent of the individual errors of the various components.

PREPARATION FOR CALIBRATION CHECK

27K In order to calibrate the system make the following preparations:

(a) Connect the unit to an a.c. supply (115 volts 50 to 400 cycles) and plug the harness cable into the socket on the control panel.

(b) Slide the four heaters over the jet pipe thermocouples. Two spreader springs are provided to hold the heater unit in place. The ends of the springs fit into cups on the handles of the heater units.

(c) Turn line switch on and selector switch to TEMP TEST. Pilot light will indicate if the supply voltage is on.

CALIBRATION CHECK OF AIRCRAFT SYSTEM

27M Increase heater voltage to maximum by turning the power input knob fully clockwise. This gives the fastest possible warm-up to the test temperature.

27N The temperature dial makes ten revolutions in covering the range 0 to 1000°C. The hundreds are read in the window at the top of the dial, while tens and units are read from the dial which rotates with the knob.

27P The temperature dial reads the temperature of the thermocouple when:

(a) The temperature is not changing rapidly.

(b) The balance indicator is at centre-scale.

27Q As the pointer of the balance indicator approaches centre scale, the power input should be reduced to a value which will stabilize temperature at the desired value. As practice is obtained in adjustment, it will be found that a given temperature can be obtained with little pause or overshoot.

27R The most important temperature to be checked will usually be that at 100% engine speed, since this temperature indication may determine the correct area adjustment of the jet final nozzle. The aircraft indicator should read 700°C (±12°C).

27S Checks at other temperatures in the engines operating range may also be required.

CAUSES OF SYSTEM INACCURACIES

27T The following is a brief resume of the likely causes for inaccuracy in the indicator reading:

(a) Instrument out of calibration.

(b) Resistance of system out of tolerance.

(c) System shorted to ground.

(d) Leads mutually shorted.

(e) Broken lead.

(f) Thermocouple broken at junction.

NOTE

Junction may be closed at low temperature and opened at high temperature.

(g) Leads crossed one or more times.

(h) Thermocouples out of calibration.

THERMOCOUPLES AND HARNESS

27U In most aircraft installations, a harness is used to connect four thermocouples in

parallel so that each thermocouple has an equal influence on the output voltage fed to the indicator. If a heater is removed from one thermocouple at a time with this connection, the indicator reading should drop slowly to about 3/4 of its initial value. If this test is repeated in turn with the other thermocouples, the same drop should be observed. If, when a heater is removed, no change in the indication takes place, then there is an open circuit in that thermocouple or that branch of the harness. If removing the heater causes a drop, but not as large a drop as with the other heaters, that thermocouple or branch of the harness is at least partially open or short-circuited.

27V It should be noted that an open circuit in one of the thermocouple branches may not drop the indication of engine temperature by more than a few degrees. The effect of having an open circuit in one branch however, will be to prevent that thermocouple being effective in averaging the temperature of the jet, which frequently has large temperature variations in it, and needs good temperature averaging.

27W When the heaters are being temporarily removed from the lower thermocouples in the jet pipe, the lower end of the spreader springs can be moved to adjacent heaters to keep the upper heaters in place.

27X Errors in the output of thermocouples, as compared to standard calibration, are almost always less than 10°C and do not change appreciably during aircraft service. Malfunction is much more likely to be due to either a break in the region of the thermocouple junction or due to either poor contact or short-circuits elsewhere in the thermocouple or harness.

LEADS TO INDICATOR - RESISTANCE SPOOL

27Y These can be checked by measuring the total circuit resistance at the cockpit indicator. This measurement can be made by disconnecting the cockpit indicator from the thermocouple lead, and connecting the Veritherms resistance test cable to the thermocouple lead. The resistance test cable, plugs into the control unit in place of the heater harness. This test should be done with the thermocouples cold. The normal value for the aircraft circuit resistance is 8 (±.05) ohms, which is measured on the Veritherm temperature dial (refer to manual provided with each serialed tester for the values).

COCKPIT INDICATOR

27Z The T-9 Veritherm tests the indicator first, by causing it to move gradually up-scale as the thermocouples are heated, thus showing up any stickiness in the movement. Secondly, the correct sensitivity of the indicator is checked during the overall temperature calibration of the system. The calibration of the indicator is not checked by itself, but is checked in conjunction with the thermocouples being used with it, so that the overall system error is measured.

CIRCUIT INSULATION CHECK

27AA So that the insulation to ground of the complete temperature circuit may be checked, a cable is provided in the Veritherm. To do this, connect one of the clips at the end of this cable to any part of the thermocouple circuit, and the other to any part of the aircraft structure. If the Veritherm is switched on, and the selector switch turned to LEAK TEST the balance indicator will show the condition of the circuit insulation. If the balance indicator remains in the green region, circuit resistance is suitably high. If the balance indicator reads in the red region, the circuit resistance is below about 20,000 ohms and may give trouble. This test should be done with the thermocouples still hot.

NOTE

Minimum allowable resistance for all Mark 5 Sabre aircraft is 3,000 ohms. Minimum allowable resistance for all Mark 6 Sabre aircraft is 20,000 ohms.

INSULATION RESISTANCE CHECK OF THERMOCOUPLES ONLY

27AB Carry out an insulation resistance check of the thermocouples as follows:

(a) Disconnect the thermocouple harness by means of the connector located at station 340, right-hand side.

(b) Connect an ohmmeter (0 to 200,000 ohms) between one pin of the plug to the thermocouple harness, and ground.

(c) The reading on the ohmmeter should comply with the minimum allowable resistance as specified in Note following Paragraph 27AA.

(d) Remove the ohmmeter and reconnect the connector at station 340, right-hand side.

INSULATION RESISTANCE CHECK OF LEADS ONLY

27AC Carry out an insulation resistance check of the leads as follows:

(a) Disconnect the leads from the back of the instrument.

(b) Disconnect the thermocouple harness by means of the connector located at station 340, right-hand side.

(c) Using a 500-volt bridge megger, check that the insulation resistance between both leads, and each lead and ground is 10 megohms minimum.

(d) Remove the megger and connect the leads to the instrument. Connect the connector at station 340, right-hand side.

NOTE

A megger is to be used to carry out an insulation check of the leads only. Insulation checks of the complete system may be carried out by using the Veritherm tester as described in Paragraph 27AA preceding, or an ohmmeter (0 to 200,000 ohms). Insulation checks of installed thermocouples are to be carried out using an ohmmeter of the same range.

PART 6 - SECTION 2

PITOT-STATIC SYSTEM

PITOT-STATIC SYSTEM

GENERAL

1 The pitot-static system (see Figure 6-4) consists of an electrically-heated pitot-static tube, a pitot manifold, a static manifold and the lines connecting the tube to the manifolds and the instruments. Drains are provided to remove moisture. The pitot-static tube is installed on the forward end of a boom which extends approximately 2-1/2 feet forward of the leading edge of the right wing tip. The boom is attached to the wing structure at the leading edge front spar and rear spar. Pitot and static pressure lines and the electric wiring for the heater are taken from the boom at the front spar. Pressure lines are routed along the front spar to manifolds mounted in the fuselage just forward of the instrument panel. A drain and sump are installed at the point where the lines emerge from the boom at the front spar. Two flexible drain lines are taken from the cross and tee connections on the pitot and static lines before the lines enter the gunsight amplifier and computer. The drain lines may be emptied by removing the plugs located on the left side of the fuselage nose section, under the gun openings and forward of the armour plate bulkhead. Ram pressure is taken from the manifold and routed to the airspeed indicator, machmeter and gunsight computer. Static pressure is taken from the static manifold and routed to the airspeed indicator, altimeter, rate-of-climb indicator, machmeter, gunsight amplifier and computer.

CAUTION

Keep static pressure and pitot pressure openings clear of dirt. A cover is provided for the pitot-static tube when the aircraft is on the ground.

TROUBLE SHOOTING

2 Trouble shoot the pitot-static system as follows:

TROUBLE	PROBABLE CAUSE	REMEDY
Pitot head does not clear itself of ice with pitot heater switch ON.	Circuit-breaker type switch defective.	Install replacement switch.
	Heating element in pitot head burned out.	Install replacement pitot head. (Refer to Part 2, Section 2, preceding.)
Instrument pointers show incorrect indications.	Leak in instrument cases.	Make case leak test. If found defective, install replacement. (Refer to Paragraphs 4 and 5.)
	Leak in pitot-static lines.	Test pitot and static lines for leaks. Install replacements for defective lines. (Refer to Paragraphs 4 and 5.)
	Leak in sight amplifier and/or computer.	Check amplifier and computer for leaks.
	Drains not correctly plugged.	Check that the plugs are properly inserted in drains.

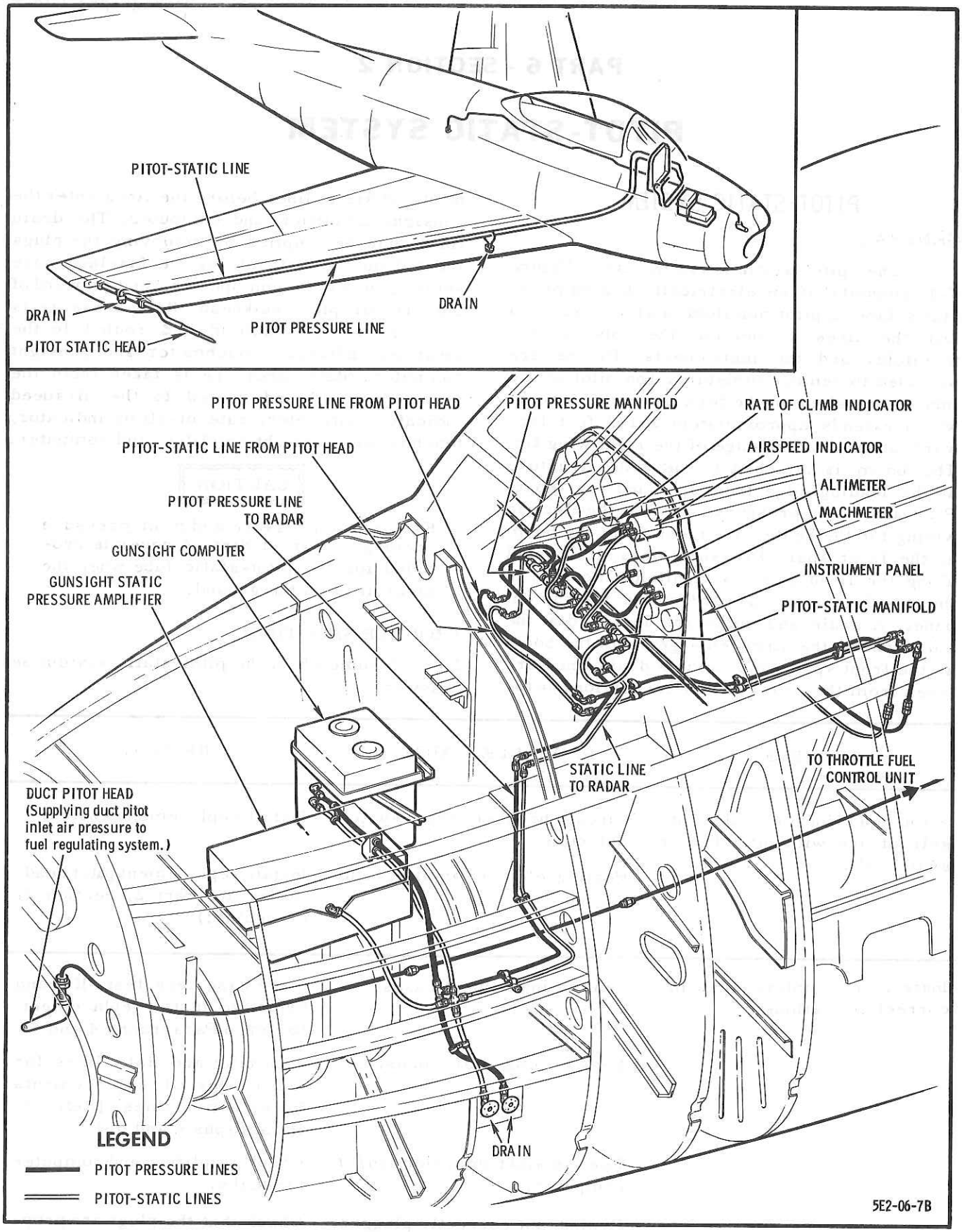


Figure 6-4 Pitot-Static System

PITOT-STATIC HEAD

3 The pitot-static head is a single unit which supplies both pitot pressure and static pressure to the various instruments. The head is mounted on the forward end of a boom at the right wing tip, with its axis parallel to the longitudinal axis or thrust line of the aircraft. The forward portion of the pitot head is open so that it may be subjected to impact pressure. Four holes on the side of the head supply the static pressure. The pitot head assembly is equipped with an electric heater in the forward end, which will prevent the formation of ice in the opening and consequent erroneous indications of airspeed. A switch-type circuit-breaker marked PITOT HEATER is located on the left console. For installation of pitot-static boom assembly, see Figure 2-26.

CAUTION

To prevent burning out of the heater elements, turn pitot heater switch to the OFF position when the aircraft is on the ground.

TEST PROCEDURE FOR PITOT-STATIC TUBE HEATER

4 To test pitot-static tube heater proceed as follows:

(a) Connect ground power supply to the No. 1 receptacle.

(b) Place pitot heater switch ON.

(c) Check that heat is generated at pitot-static tube. As soon as this has been ascertained, place switch OFF.

(d) Disconnect ground power supply.

TEST PROCEDURE FOR STATIC SYSTEM

5 To test the static system, proceed as follows:

(a) Drain any moisture from the lines.

(b) Connect static line of pitot-static tester to pitot tube using adapter.

(c) Apply vacuum until altimeter on aircraft instrument panel reads 10,000 feet. Close valve.

NOTE

While increasing or decreasing, the pressure change must not exceed 6000 feet per minute as indicated on the aircraft rate of climb indicator.

(d) The altimeter should not read less than 9100 feet after one minute.

NOTE

Tap altimeter lightly before taking readings.

(e) Increase pressure to normal by means of the vent valve and disconnect the pitot-static tester.

TEST PROCEDURE FOR PITOT PRESSURE SYSTEM

6 To test the pitot pressure system proceed as follows:

(a) Check that pitot lines are connected to ports marked P on the airspeed indicator and machmeter and to port marked PITOT and gunsight computer.

(b) Seal drain holes and static vents on pitot-static tube.

(c) Connect rubber hose of pitot-static checker to opening of pitot-static tube.

WARNING

Do not allow pressure to enter the static vents on the pitot-static tube.

(d) Turn selector switch on checker to pressure. Apply pressure slowly until airspeed indicator on checker reads 450 knots.

(e) Check that airspeed indicator on aircraft instrument panel reads 450 (±6) knots.

(f) Pinch off pressure source by means of a clamp on pressure hose.

(g) After one minute has elapsed, airspeed indicator must not read less than 445 knots.

NOTE

Tap indicator lightly before taking reading.

(h) Bleed off pressure by turning selector switch to dump.

(j) Remove rubber hose from pitot tube and remove seals from drains and static vents.

NOTE

Do not apply vacuum to the pitot lines.

DUCT PITOT HEAD

7 A pitot head is installed in the air intake duct to supply compressor inlet pressure air to the fuel regulating system (see Figure 6-4). The unit contains an electric heater to prevent ice formation in the opening. A switch-type circuit-breaker, marked DUCT PITOT HEATER, is located on the right console panel.

PART 7

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ELECTRICAL SYSTEM

PART 7

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ELECTRICAL SYSTEM

PART 7

ELECTRICAL SYSTEM

ELECTRICAL POWER AND LIGHTING SYSTEMS

GENERAL

1 A 400-ampere, engine-driven generator provides the primary source of d.c. power to the electrical system. This system is the single-wire type, with the metallic structure of the aircraft as the common ground. Static charges are grounded through a wire connected to the left landing gear strut. In case of malfunction of the generator system, or when generator output is less than the battery voltage, a 24-volt, 36 ampere-hour battery powers all electrical equipment except for the starter and the units connected to the secondary bus. Provisions are made for connecting an external power source directly to the primary bus, to the secondary bus through a bus tie-in relay, and to the starter controller. This permits engine starting and also the ground checking of equipment connected to the two buses. Damage to electrical equipment due to overvoltage is prevented by an overvoltage protective system. D.C. power distribution is made through a three-bus system. Inverters supply the a.c. power for operation of radar and instruments. Wiring is grouped in open bundles, with the exception of local areas where conditions require additional protection. Shielded wire and filter networks are used in some circuits for functional reasons. All controllable major electrical units are controlled from three panels (right and left console and centre pedestal switch panels) in the cockpit. Practically all control and distribution circuits are protected by toggle, push-pull or automatic circuit-breakers. For circuit-breaker and relay charts, location of the individual electrical units and detailed wiring diagrams, refer to Part 11, following.

WARNING

Do not remove junction box covers while the battery switch is in the ON position, while external power is connected, or while engine is operating. Serious fires may result.

TROUBLE SHOOTING

2 Trouble shoot the electrical system as follows:

TROUBLE	PROBABLE CAUSE	REMEDY
	BATTERY	
Electrolyte consistently below top of plates.	Leakage.	Install replacement battery. (Refer to Paragraph 5.)
	Boiling due to high generator voltage.	Install replacement voltage regulator.
Freezing.	Insufficiently charged.	Thaw slowly in a warm room. Charge battery.
Loss of capacity.	Loss of electrolyte.	Install replacement battery. (Refer to Paragraph 5.)

(Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Loss of capacity.	Low temperature.	Warm battery.
	High discharge.	Install replacement battery.
	Overcharging for long periods.	Install replacement battery. Install replacement voltage regulator.
	Internal short circuits.	Install replacement battery.
	Length of service.	Install replacement battery.
Battery discharged.	Reverse-current relay improperly adjusted.	Install replacement relay.
	Load left on or external short.	Check switches and wiring.
	Voltage regulator improperly adjusted.	Install replacement voltage regulator.
Reversal of polarity.	Battery charged in wrong direction.	Install replacement battery. (Refer to Paragraph 5.)
	EXTERNAL POWER RELAY	
Relay inoperative.	Improper connection. Defective wiring.	Check for open control circuit wiring and poor connections or ground in wiring.
	Relay holding coil shorted, burned out, or grounded.	Install replacement relay.
	STARTER-GENERATOR	
No output.	Bad bearings, broken inner shaft, or failure in the vibration dampener.	Install replacement generator. (Refer to EO 10B-10B-2.)
Low output.	Grease, dirt or oil on brushes or commutator. Insufficient brush spring pressure. Loose connections at brush terminal screws or elsewhere in generator. Grounded, shorted or open shunt field or armature.	Install replacement generator. (Refer to EO 10B-10B-2.)

TROUBLE	PROBABLE CAUSE	REMEDY
Fluctuating output.	Incorrect brush setting or internal failure of generator.	Install replacement generator. (Refer to EO 10B-10B-2.)
Abnormal output.	Overheating due to dirty or clogged ventilating tube or dirty internal air passage. Loose connections at the brush terminal screws. Poor commutator. Internal failure.	Clean air inlet tube. Tighten loose connections. Check brushes for correct fit to commutator. If generator is faulty, install replacement.
	REVERSE CURRENT RELAY	
Relay will not close at regulated voltage.	Generator control switch open.	Close switch.
	Generator voltage too low.	Check generator voltage, determine cause and correct as necessary.
	Reverse generator polarity.	Check generator polarity with a voltmeter. If reversed, install replacement generator.
	Defective relay.	Install replacement relay.
Relay will not open on reverse current.	Defective relay.	Install replacement relay.
Reverse current required to open relay is too high.	Defective relay.	Install replacement relay.
	GENERATOR OVERVOLTAGE RELAY	
False tripping (operating under 31 volts).	Defective relay.	Install replacement relay.
	SINGLE PHASE INVERTER	
Inverter fails to start.	No voltage at terminals.	Check power supply.
	Starting contactor not closed. Contactor coil open or shorted.	Install replacement inverter.

(Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Inverter fails to start.	Open armature.	Install replacement inverter.
	Open interpole winding or series field winding.	Install replacement inverter.
No voltage.	No d.c. excitation to alternator rotor.	Install replacement inverter.
	Brushes worn.	Install replacement brushes.
	Starting contactor contacts not properly closed.	Install replacement inverter.
	Defective inverter.	Install replacement inverter.
	Broken connection between 28-volt d.c. terminal and control chassis.	Repair connection.
Low voltage output.	Voltage regulator not adjusted properly.	Adjust voltage regulator.
	Voltage regulator not operating.	Install replacement voltage regulator.
	Defective inverter.	Install replacement inverter.
	High-resistance rotor brush contact.	Install replacement brushes or springs where necessary.
	High-resistance contacts on starting contactor.	Install replacement inverter.
	Poor ground connections.	Check all ground connections.
High voltage output.	Voltage regulator not adjusted.	Adjust voltage regulator.
	Defective voltage regulator.	Install replacement voltage regulator.
	Inverter operating above rated speed.	Same as for high frequency trouble.
	Alternator rotor grounded.	Install replacement inverter.
No voltage control.	Voltage adjustment potentiometer defective.	Install replacement inverter.

TROUBLE	PROBABLE CAUSE	REMEDY
Low frequency.	Frequency regulator not adjusted.	Adjust frequency regulator.
	Defective frequency regulator.	Install replacement inverter.
	Defective frequency control potentiometer.	Install replacement inverter.
	Input voltage below specified limits.	Check power supply.
High frequency.	Frequency regulator not adjusted.	Adjust frequency regulator.
	Defective frequency regulator.	Install replacement inverter.
	D.C. voltage input above specified limits.	Check power supply.
Rotary unit hunts.	D.C. voltage input bracket assembly loose.	Tighten mounting screws.
	Brushes not seated 100% in direction of rotation and 75% of brush width.	Run-in inverter for 4 hours.
Machine draws excessive current while running.	Defective inverter.	Install replacement inverter.
Motor brushes sparking or arcing.	Brushes worn or broken.	Install replacement brushes.
	Defective commutator.	Install replacement inverter.
Alternator brushes arcing.	Brushes worn or broken.	Install replacement brushes.
	Alternator rotor grounded. Slip rings defective.	Install replacement inverter.
	Brushes sticking.	Free brushes; clean holders.
Machine noisy or rough.	Bearing failure. Rotor unbalanced.	Install replacement inverter.

(Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Machine noisy or rough.	Mechanical interference.	Correct as required.
Radio noise level too high.	Filter failure.	Install replacement filter.
	New brushes not seated.	Run-in inverter for 4 hours.
	Parts of machine poorly bonded together.	Make sure all fastenings and electrical connections are tight.
Overheating.	Fan rubbing. Shorted or grounded windings.	Install replacement inverter.
	Air intakes blocked.	Clean air intakes.

BUS TIE-IN SYSTEM

3 Electrical power distribution is made through a divided bus system: battery, primary and secondary. The battery is connected directly to the battery bus, which in turn is connected to the primary bus through the battery bus tie-in relay and will power the primary bus when no other source of power is available. The primary bus, powered directly from an external power source or generator system, powers equipment essential to flight. The secondary bus powers equipment that is not considered essential to flight in the event of generator failure. This bus is connected to the primary bus through two bus tie-in control relays and a bus tie-in relay. One control relay is energized by external power connected to No.1 external power receptacle. The other is energized by generator power. In either case, current from the primary bus will energize the bus tie-in relay, thus connecting the primary and secondary buses together provided that the bus tie-in relay is closed. When no generator output or ground power is available, and the battery-starter switch is in the battery position, a circuit is completed through the two bus tie-in control relays to a red generator-off warning light on the instrument panel. Illumination of this light indicates there is no power available to operate the bus tie-in control relay and all electrical units connected to the secondary bus are inoperative, leaving the battery as the only source of power. The bus tie-in system is shown schematically in Figure 7-1. The buses and the equipment they power are shown in Figure 7-2.

BATTERY

4 A 24-volt, 36 ampere-hour battery is mounted in the centre of the nose compartment. The battery is connected directly to the battery bus, which is connected to the primary bus through a battery bus tie-in relay. Units connected to the battery bus will be powered by the battery when the generator output is insufficient, or an external power source is not connected to the No.1 external power receptacle. The battery bus tie-in relay is energized whenever the battery-start switch is in the battery position, providing that either the battery is connected, or power is applied at the No.1 external power receptacle, or the generator is operating. During starting it is impossible to energize the battery bus tie-in relay by operating the battery-start switch because the ground circuit of the relay is opened by the contacts of an engine starter-ignition control relay. The battery circuit is wired in this manner to prevent any possibility of starting the engine with the battery, the capacity of which is inadequate to withstand the heavy load imposed by the starter. All connections to the battery are of the quick-disconnect type.

REMOVAL OF BATTERY

5 To remove the battery proceed as follows:

(a) Remove the radar compartment access door.

(b) Remove the quick-disconnect plug from the battery.

(c) Free tie-down rods from slots in the battery cover.

(d) Remove battery vent tubes.

(e) Using sling, lift battery out of aircraft.

NOTE

Do not use battery vent as handgrip when removing or installing battery.

INSTALLATION OF BATTERY

6 To install the battery proceed as follows:

(a) Correctly position battery on mounting pad after making certain that battery is fully charged and that there is a 3/16-inch thick sponge-rubber gasket between the battery lid and the battery.

(b) Snap down cam snaps and check for tight fit of battery cover. If necessary, release cam snaps and adjust for proper fit.

(c) Install quick-disconnect battery plug.

(d) Connect vent lines.

(e) Install radar access door.

CAUTION

If external power is applied with battery removed, make certain that battery plug

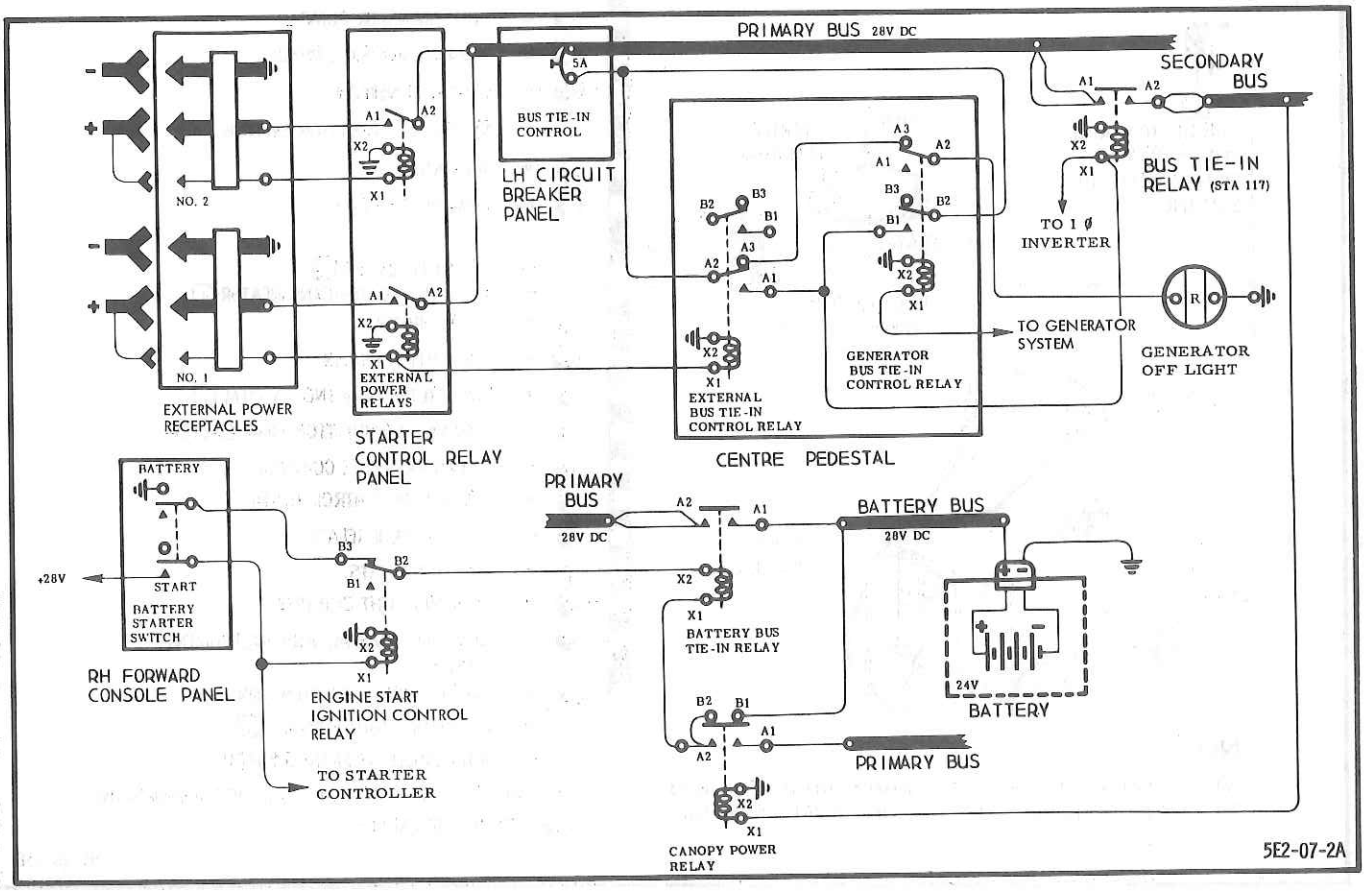

Figure 7-1 Bus Tie-in System

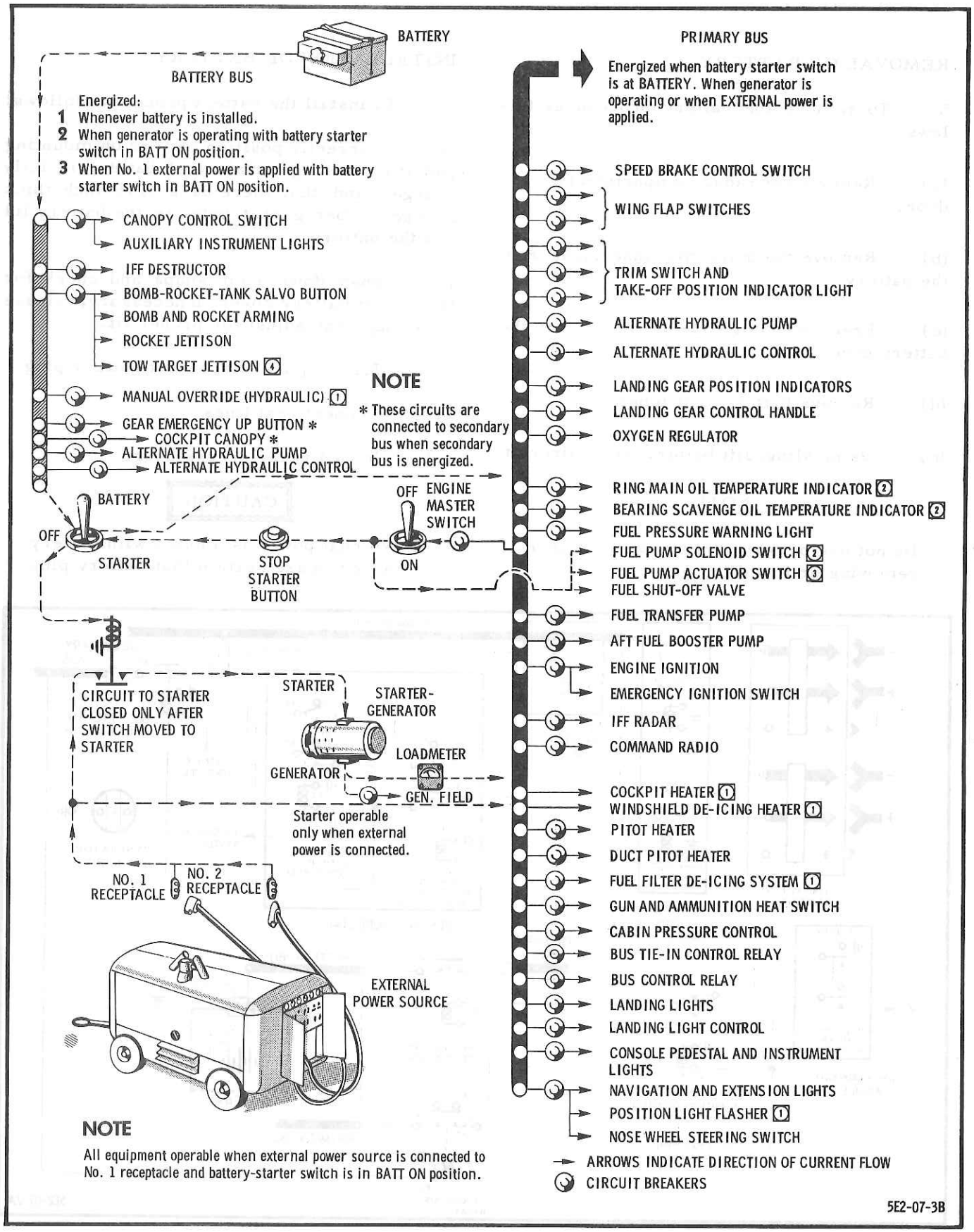

Figure 7-2 (Sheet 1 of 2) Electrical Power Distribution

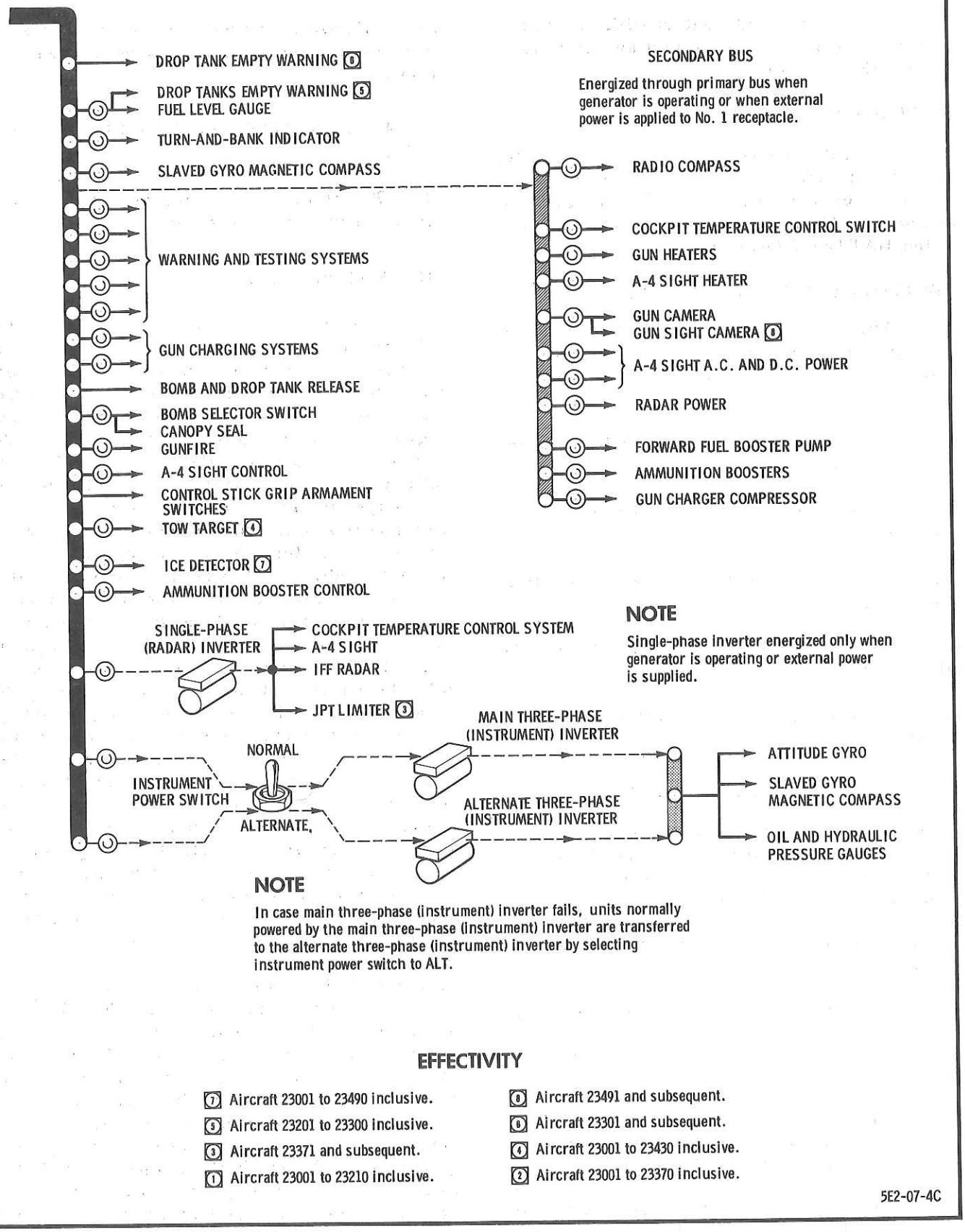

Figure 7-2 (Sheet 2 of 2) (M) Electrical Power Distribution

is taped to prevent contact with aircraft frame or that battery-start switch is in the OFF position.

BATTERY BUS TIE-IN RELAY

7 The battery bus tie-in relay connects the battery bus to, and disconnects it from, the primary bus (see Figure 7-1). The relay can be energized by placing the battery-start switch in the BATTERY ON position.

TESTING OF BATTERY BUS TIE-IN RELAY

8 With all switches in the OFF position and external power disconnected from the aircraft, test battery bus tie-in relay operation as follows:

(a) Place battery-starter switch in the BATTERY position.

(b) Close the bus tie-in control circuit-breaker.

(c) Check generator-off warning light illuminates.

(d) Place battery-starter switch into the OFF position.

(e) Check that generator-off warning light is extinguished.

NOTE

An operational test on the battery bus tie-in relay should be performed at every 25-hour inspection to make sure that the battery bus is being connected to the primary bus when the battery-starter switch is placed in the BATTERY position.

REMOVAL OF BATTERY BUS TIE-IN RELAY

9 To remove the battery bus tie-in relay proceed as follows:

(a) Remove the clamps and cords holding the wire bundles. Push the bundles into the relay compartment to obtain slack.

(b) Disconnect relay from relay cover by reaching under the cover and holding stop-nuts while removing attachment bolts.

(c) Partially remove cover for access to battery bus tie-in relay. Disconnect wires from relay.

INSTALLATION OF BATTERY BUS TIE-IN RELAY

10 To install the battery bus tie-in relay, reverse removal procedure.

GENERATOR SYSTEM

11M The generator system is comprised of the following units: generator, voltage regulator, reverse-current relay, loadmeter, voltmeter, overvoltage relay, generator field control relay and generator control switch. The engine-driven generator supplies power to the primary bus to which the secondary bus and battery bus are connected through the bus tie-in system. From these three buses, generator power is utilized for the entire electrical system when the engine is operating under normal conditions. The reverse-current relay connects the generator to or disconnects it from the electrical system, depending on the position of the generator control switch. The voltage regulator maintains a system voltage of 28 (±0.5) volts regardless of load variations on the generator. A loadmeter, indicating percentage of generator output, is connected between the BAT terminal on the reverse-current relay and the primary bus, and is shunted with a 50-millivolt shunt. The voltmeter is connected between the BAT terminal on the reverse-current relay and ground. A red light on the instrument panel is wired through the two bus tie-in control relays to the primary bus. When no generator power is available, a circuit from the primary bus through the two de-energized bus tie-in relays is completed to the red light. Illumination of this light, by battery power, indicates either that there is a failure of the generator or that generator output is not sufficient to close the reverse-current relay, thus preventing the generator from being placed on the line. When the generator is operating normally, the bus tie-in control relays, energized by the generator, will break the lamp circuit. In the event of an overvoltage condition, the overvoltage relay and generator field control relays operate to prevent damage to units in the electrical system. For the schematic

wiring of the generator system, see Figure 7-3. For further details, refer to Part 5, Section 7, preceding. For maintenance of starter-generator, refer to EO 40-70EB-2.

OVERVOLTAGE PROTECTIVE SYSTEM

12 The overvoltage protective system (see Figure 7-3) consists of an overvoltage relay, a generator field control relay and a red (generator-off) warning light. When an overvoltage condition of 31 volts or above occurs, the overvoltage relay closes and trips the generator field control relay. This relay opens the generator shunt field circuit and de-energizes the reverse-current relay which disconnects the generator from the distribution system and illuminates the red generator-off warning light on the instrument panel. The generator can be reconnected to the distribution system by momentarily holding the generator switch in the RESET position or by pressing the reset button on the generator field control unit. Either method energizes the reset coil inside the generator field control relay which resets the relay. When reset, the field control relay connects the generator to the distribution system, completes the generator shunt field circuit and extinguishes the red warning light.

CHECKING OF OVERVOLTAGE PROTECTIVE SYSTEM

13 To check the overvoltage protective system proceed as follows:

(a) Place all switches in the OFF position.

(b) Install temporary jumper from A to B terminals on the voltage regulator.

(c) Connect a 0 to 50-volt d.c. voltmeter of known accuracy between B terminal on the voltage regulator and ground.

(d) Connect external power to aircraft and start engine.

(e) Remove external power source.

(f) Place generator switch in the ON position.

(g) Place battery switch in the ON position.

(h) Gradually increase engine rpm while maintaining a continual visual check of voltmeter indication.

(j) Note voltage at which overvoltage relay disconnects generator from bus (31 to 33 volts normal operation).

NOTE

If voltage is in excess of the 33-volt limit or the system fails to operate, check units in overvoltage protective system. Install replacements for defective units.

CAUTION

Do not permit generator voltage to rise above 35 volts maximum. Shut down engine immediately if voltage exceeds this value.

(k) Check generator-off warning light for proper operation.

(m) Note voltage as indicated by voltmeter on instrument panel (approximately 2 volts normal condition).

(n) Remove jumper from A to B terminals on voltage regulator.

(p) Remove 0 to 50-volt d.c. voltmeter.

(q) Make operational check of generator system (normal 28-volt operation).

VOLTAGE REGULATOR

14 A carbon pile voltage regulator, mounted on the left side of the radio compartment, is accessible through the radio compartment door on the left side of the aircraft. The voltage regulator, by controlling the amount of resistance inserted into the field circuit of the generator, automatically maintains 28 volts on the electrical system, regardless of variations of generator speed and varying electrical load.

CHECK OF VOLTAGE REGULATOR

15 To check the voltage regulator proceed as follows:

(a) Connect a 0 to 50 voltmeter of 1% accuracy to terminal B of voltage regulator and ground.

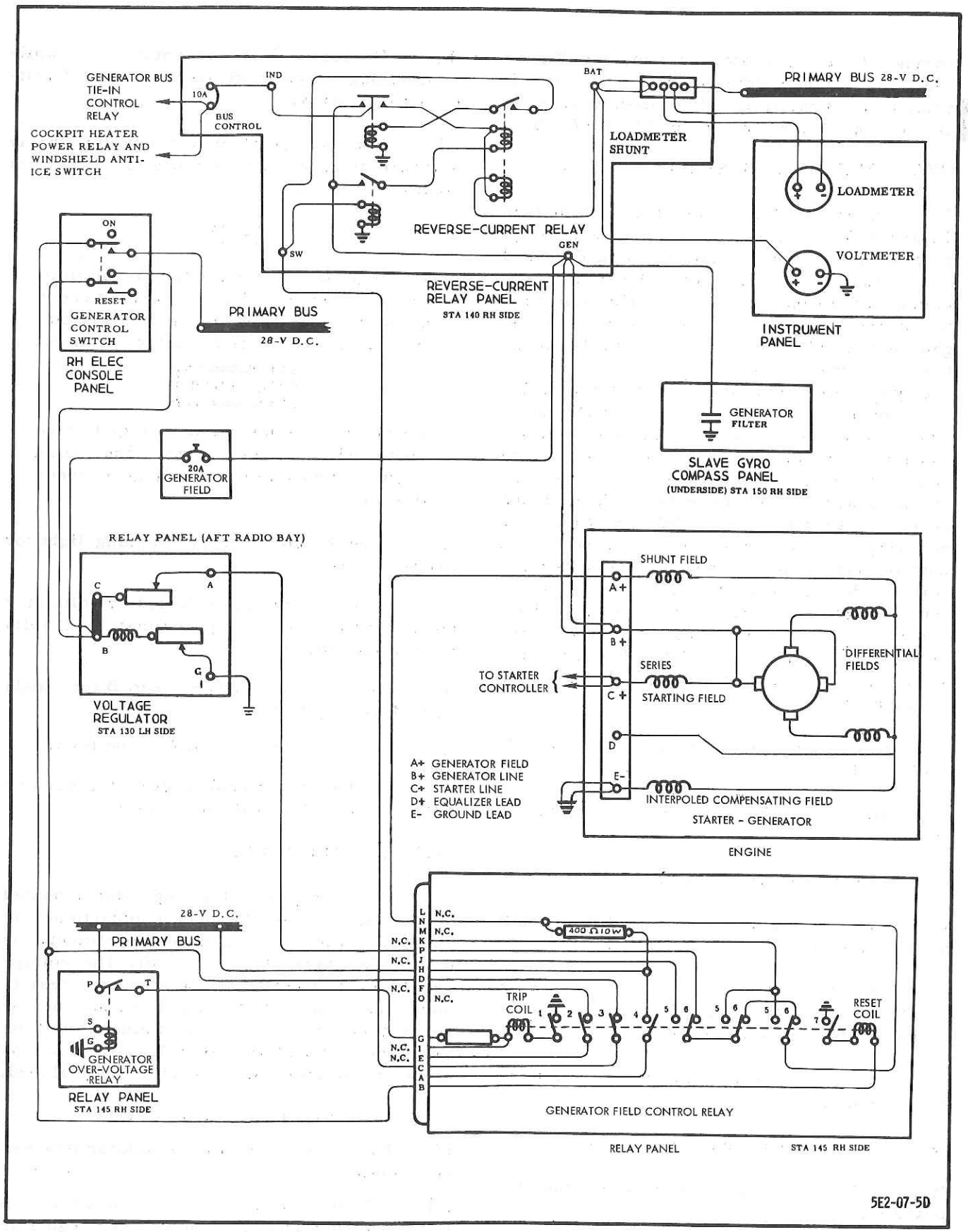

Figure 7-3 (M) Generator System

(b) Start engine (refer to EO 05-5E-1). With engine running at 34% rpm, battery starter switch in the BATT ON position and generator control switch ON, switch on a load of about 15% and run engine for 20 minutes to get regulator to working temperature.

(c) Increase engine speed to 50 to 90% rpm and increase load on generator to 50%. The voltage should not fall below 27.7 or exceed 28.3 volts. Regulators not within these limits should be removed for bench test servicing.

NOTE

Adjustments to voltage regulators must not be made on the aircraft, except for adjustment by means of the regulator rheostat only.

NOTE

If aircraft is operating in areas where average ambient temperatures are high, causing considerable boiling of the battery electrolyte, a voltage regulator which has been set as low as 27-1/4 volts may be installed.

REVERSE-CURRENT RELAY

16 A 600-ampere, reverse-current relay is mounted on the right side of the radio compartment. The relay is wired into the generator system to connect the generator to the battery or load when the generator switch is selected to the ON position and generator voltage exceeds the bus voltage by a value of from 0.35 to 0.65 volt, and to disconnect the generator from the battery or load when a reverse current of 35 amperes tends to drive the generator as a motor. This relay will not connect the generator to the system unless there is a load on the electrical system. As this relay is adjusted prior to installation in the aircraft, it will not require any further adjustment. In case of failure, install a replacement relay.

D.C. LOAD ANALYSIS CHARTS

16A For D.C. system load analysis charts and supplementary data, see Figures 7-3A and 7-4A.

ALTERNATING-CURRENT SYSTEM

GENERAL

17 The alternating-current system (see Figure 7-4) consists of a single-phase, 400-cycle, 1500 volt-ampere inverter, two three-phase, 400-cycle, 115 volt-ampere inverters, and an autotransformer. The single-phase inverter supplies power directly to the cockpit temperature control. IFF set and gunsight power relay. Direct-current for the single-phase inverter flows directly from the primary bus. Current for the inverter starting relay is routed through momentary contacts on the secondary bus tie-in relays. The inverter operates continuously whenever external or generator power is available. The main instrument three-phase inverter supplies power to the a.c. bus whenever the instrument power switch is in the NORMAL position, and when power is applied to the primary bus. The alternate three-phase inverter powers the a.c. bus when the instrument power switch is in the ALTERNATE position and when power is applied to the primary bus. The instrument inverters can be powered from the battery in the event of a generator failure, provided the battery-starter is placed in the BATTERY position. Warning lights for the inverters are located on the instrument panel.

SINGLE-PHASE INVERTER

18 A single-phase, 400-cycle, 1500 volt-ampere inverter is installed in the forward end of the nose section. The inverter is a grounded type motor-alternator with a laminated yoke assembly. The armature and rotor are connected on a common shaft. The unit employs two carbon-pile regulators which furnish automatic voltage and frequency regulation by controlling the current in the d.c. winding for voltage control and in the shunt field for

EQUIPMENT	NUMBER OF UNITS	AMPS PER UNIT	OPERATING TIME MINS	OPERATING CONDITIONS																									
				LOADING OR ANCHOR				START AND WARM-UP				TAXI				TAKE-OFF AND CLIMB				CRUISE				CRUISE - COMBAT				LANDING			
				AMPS	AVERAGE AMPS			AMPS	AVERAGE AMPS			AMPS	AVERAGE AMPS			AMPS	AVERAGE AMPS			AMPS	AVERAGE AMPS			AMPS	AVERAGE AMPS			AMPS	AVERAGE AMPS		
					1/2 MIN	2 MINS	15 MINS		1/2 MIN	2 MINS	15 MINS		1/2 MIN	2 MINS	15 MINS		1/2 MIN	2 MINS	15 MINS		1/2 MIN	2 MINS	30 MINS		1/2 MIN	2 MINS	30 MINS		1/2 MIN	2 MINS	5 MINS
A ARMAMENT																													
CAMERA (GSAP)	1	2.0	CONT	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
CHEMICAL TANK (M-10)	2	NEGL	0.1																												
MOTOR - AMMUNITION BOOST	4	14.0	See Supplementary Data																					72.0	17.3	4.7	0.6				
RELEASE - ROCKET PROJECTOR	1	1.5	See Supplementary Data																					1.5	0.2						
SIGHT - GUN ROCKET BOMB (A-4)																															
COMPUTER RESISTORS	8	1.19	CONT	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5				
RANGE SERVO	1	2.0	CONT	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0				
AMPLIFIER	1	5.0	CONT	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
SIGHT HEAD HEATERS (A)	4	2.37	CONT	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5				
SIGHT COMPUTER	1	8.5	CONT	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5				
SOLENOID - ROCKET JETTISON	8.0	8.4																													
SOLENOID - BOMB ARMING (S-2)	4	0.5	CONT																												
SOLENOID - BOMB RELEASE (S-2)	2	6.0	0.1																												
SOLENOID - DROP TANK RELEASE (R-3)	2	8.4	0.1																												
SOLENOID - PARACHUTE-FRAGMENTATION RELEASE (R-3)	2	15.5	0.1									-																			
SOLENOID - ROCKET ARMING (F-1)	16	0.3	CONT																												
CAMERA (GUNSIGHT) (AIRCRAFT 23211 TO 23300)	1	2.0	CONT	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
CHARGER - GUNFIRE (B-1)	6	1.9	See Supplementary Data																					11.4	3.8	1.0	0.1				
CHARGER - BOLT RELEASE (B-1)	6	3.5	NEGL																												
CHARGER - BOLT RETRACT (B-1)	6	2.2	See Supplementary Data																					13.2	4.4	1.1	0.1				
COMPRESSOR - GUN CHARGER	1	21.5	See Supplementary Data					20.0	20.0	20.0	6.7													20.0	20.0	5.0	0.4				
C FLIGHT CONTROLS																															
ACTUATOR - LATERAL TRIM BUNGEE	1	3.5	See Supplementary Data	3.5	0.6	0.1		3.5	0.6	0.1						3.5	0.1	0.1		3.5	0.1	0.1	0.1	3.5	0.2	0.2	0.2	3.5	0.2	0.2	0.2
ACTUATOR - LONGITUDINAL TRIM BUNGEE	1	3.5		3.5	3.5	0.9	0.1	3.5	0.6	0.1						3.5	0.6	0.5	0.5	3.5	0.4	0.4	0.4	3.5	0.7	0.7	0.7	3.5	0.7	0.7	0.7
ACTUATOR - RUDDER TRIM	1	3.5		3.5	0.6	0.1		3.5	0.6	0.1						3.5	0.1	0.1		3.5	0.1	0.1	0.1	3.5	0.2	0.2	0.2	3.5	0.2	0.2	0.2
ACTUATOR - WING FLAP	2	11.0						22.0	17.6	4.4	0.6					22.0	8.8	2.2	0.3									22.0	13.2	3.3	0.4
PUMP - ALTERNATE FLIGHT CONTROL SYSTEM RETURN AND SUPPLY	1	48.5		48.5	24.3	24.3	24.3	48.5	24.3	24.3	24.3	48.5	3.2	0.8	0.1	48.5	3.2	0.8	0.1	48.5	3.2	0.8	0.1	48.5	3.2	0.8	0.1	48.5	3.2	0.8	0.3
VALVE - ALTERNATE FLIGHT CONTROL SYSTEM RETURN AND SUPPLY	1	0.7		0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7																				
VALVE - NORMAL SYSTEM BY-PASS	1	0.75		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8																				
VALVE - SPEED BRAKE SOLENOID	1	0.9						0.9	0.3	0.1										0.9	0.1			0.9	0.1			0.9	0.1		
D DE-ICING ANTI-ICING																															
HEATER - PITOT	1	7.5	CONT									7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
HEATER - DUCT PITOT (AIRCRAFT 23001 TO 23490)	1	3.8	CONT									3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
ICE DETECTOR HEATER	1	7.0																													

5E2-07-9

Figure 7-3A (Sheet 1 of 3) D.C. Load Analysis Chart

EQUIPMENT	TOTAL NO. OF UNITS	OPERATING TIME IN MINS.	ELECTRICAL REQUIREMENTS PER UNIT						POWER FACTOR	VOLT REQ.	FREQ. RANGE	CONNECTED LOAD	
			115V 1-PHASE			115V 3-PHASE							
			VA	WATTS	VARS	VA	WATTS	VARS				WATTS	VARS
INVERTER - SINGLE-PHASE	1	CONT	1500.0										
GUNSIGHT	1	CONT	251.0	220.0	121.1				.876	±5%	380-420	220.0	121.1
RADAR SET	1	CONT	375.0	337.5	163.2				.9	±5%	380-420	337.5	163.2
IFF EQUIPMENT	1	CONT	244.0	219.6	106.4				.9	+8% -9%	320-1760	219.6	106.4
AMPLIFIER - COCKPIT TEMPERATURE CONTROL	1	CONT	6.7	6.4	2.0				.955	±4.4%	390-410	6.4	2.0
AMPLIFIER - WINDSHIELD ANTI-ICE	1	CONT	6.7	6.4	2.0				.955	±4.4%	390-410	6.4	2.0
RELAY - INVERTER FAILURE	1		5.63	2.87	4.84				.51			2.87	4.84
LIMITER - JET PIPE TEMPERATURE (3)	1	CONT	30.0	28.2	10.2				.94	±5%	380-420	28.2	10.2
										(4)	TOTAL	792.77	399.54
									.893		TOTAL VA	889.03	
										(3)	TOTAL	820.97	409.74
									.883		TOTAL VA	919.03	
INVERTER - INSTRUMENT	1 (2)	CONT				100				±9%	390-410		
INDICATOR - FUEL PRESSURE	1	CONT	3.12	0.6	3.06				.192	±10%	380-420	0.6	3.06
TRANSMITTER - FUEL PRESSURE	1	CONT	6.24	1.40	6.08				.224	±10%	380-420	1.40	6.08
INDICATOR - HYDRAULIC PRESSURE	1	CONT	3.12	0.6	3.06	(1)			.192	±10%	380-420	0.6	3.06
TRANSMITTER - HYDRAULIC PRESSURE	3	CONT	6.24	1.40	6.08				.224	±10%	380-420	4.2	18.24
INDICATOR - OIL PRESSURE	1	CONT	3.12	0.6	3.06				.192	±10%	380-420	0.6	3.06
TRANSMITTER - OIL PRESSURE	1	CONT	6.24	1.40	6.08				.224	±10%	380-420	1.40	6.08
CONTROL - SLAVED DIRECTIONAL GYRO	1	CONT											
INDICATOR - GYRO COMPASS	1	CONT				32	30.72	9.25	.96	±5%	380-420	30.72	9.25
AMPLIFIER - GYRO COMPASS	1	CONT											
TRANSMITTER - REMOTE COMPASS	1	CONT											
RELAY - INVERTER FAILURE	1	CONT	5.63	2.87	4.84				.51			2.87	4.84
ATTITUDE GYRO (FERRANTI)	1	CONT	20.0	12.0	16.0							12.0	16.0
											TOTAL	54.39	69.67
									.612		TOTAL VA	85.71	
INVERTER - (A4) GUNSIGHT	1	CONT											
INVERTER - PHASE 1 TO PHASE 2						54.0	32.5	43.2				32.5	43.4
INVERTER - PHASE 2 TO PHASE 3						23.0	9.8	20.7				9.8	20.9
INVERTER - PHASE 1 TO PHASE 3						23.0	9.8	20.7				9.8	20.9
									.521		TOTAL	52.1	85.2
											TOTAL VA	100	

(1) 26-VOLT, SINGLE-PHASE, 400-CYCLE, SUPPLIED BY A 115 TO 26 VOLT AUTOTRANSFORMER

(2) ONE AS STANDBY - ON ONLY WHEN OTHER IS OFF

(3) ON AIRCRAFT 23371 AND SUBSEQUENT

(4) ON AIRCRAFT 23001 TO 23370 INCLUSIVE

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Figure 7-3B A. C. Load Analysis Chart

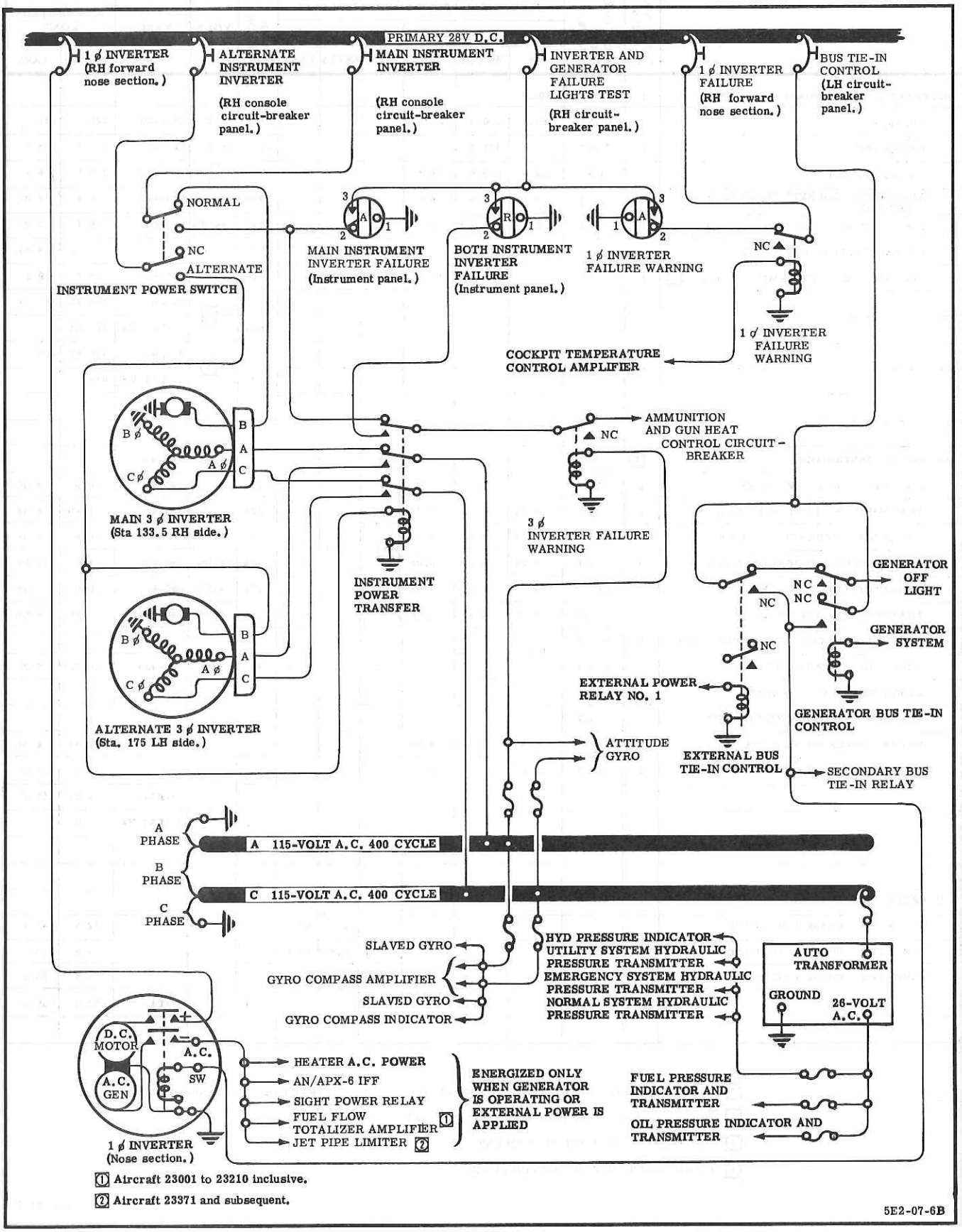

Figure 7-4 Alternating-current System

EQUIPMENT	NUMBER OF UNITS	AMPS PER UNIT	OPERATING TIME MINS	OPERATING CONDITIONS																											
				LOADING OR ANCHOR				START AND WARM-UP				TAXI				TAKE-OFF AND CLIMB				CRUISE				CRUISE - COMBAT				LANDING			
				AMPS	AVERAGE AMPS			AMPS	AVERAGE AMPS			AMPS	AVERAGE AMPS			AMPS	AVERAGE AMPS			AMPS	AVERAGE AMPS			AMPS	AVERAGE AMPS			AMPS	AVERAGE AMPS		
					1/2 MIN	2 MINS	15 MINS		1/2 MIN	2 MINS	15 MINS		1/2 MIN	2 MINS	15 MINS		1/2 MIN	2 MINS	15 MINS		1/2 MIN	2 MINS	30 MINS		1/2 MIN	2 MINS	30 MINS		1/2 MIN	2 MINS	5 MINS
E ENGINE INSTRUMENTS																															
FUEL LEVEL INDICATING SYSTEM	1	0.8	CONT	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
F FLIGHT INSTRUMENTS																															
AMPLIFIER - GYRO COMPASS	1	0.6	CONT	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
INDICATOR - TURN AND BANK	1	0.15	CONT	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
G LANDING GEAR																															
VALVE - FAIRING DOOR SOLENOID	1	0.9	See Supplementary Data													0.9		0.4										0.9	0.9	0.9	0.9
VALVE - NOSE STEERING SOLENOID	1	0.2	See Supplementary Data									0.2																0.2			
INDICATOR - POSITION (C-1)	3	0.03	CONT	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
H HEAT AND VENT																															
VALVE - HEAT EXCHANGE MODULATING	1	1.0	See Supplementary Data									1.0	0.2	0.2	0.2	1.0	0.2	0.2	0.2	1.0	0.2	0.2	0.2	1.0	0.2	0.2	0.2	1.0	0.2	0.2	0.2
VALVE - HOT AIR BY-PASS	1	1.0	See Supplementary Data									1.0	0.2	0.2	0.2	1.0	0.2	0.2	0.2	1.0	0.2	0.2	0.2	1.0	0.2	0.2	0.2	1.0	0.2	0.2	0.2
VALVE - DUMP COCKPIT	1	0.25	See Supplementary Data									0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
VALVE - COCKPIT AIR SHUT-OFF	1	1.1	See Supplementary Data					1.1	0.2																						
VALVE - RAM AIR SHUT-OFF	1	0.8	See Supplementary Data					0.8																							
HEATER - GUN (AN-J4)	6	4.17	CONT													25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
REGULATOR - COCKPIT PRESSURE	1	0.5	See Supplementary Data									0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
I IGNITION																															
IGNITION VIBRATOR	1	4.2						4.2	4.2	4.2																					
L LIGHTING																															
LIGHTS - AUXILIARY INSTRUMENT	2	0.3	CONT	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
LIGHTS - CONSOLE FLOOD	2	0.17	CONT	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
LIGHTS - CONSOLE AND PEDESTAL	16	0.04	CONT	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
LIGHTS - COCKPIT, UTILITY (C-4A)	1	0.17	5.0	0.2	0.2																										
LIGHTS - STANDBY COMPASS	1	0.19	CONT	0.2	0.2	0.2	0.2																								
LIGHTS - IFF DESTRUCTOR	2	0.04	CONT	0.1	0.1	0.1	0.1																								
LIGHTS - INSTRUMENT RING (AIRCRAFT 23301 TO 23370)	38	0.04	CONT	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
LIGHTS - INSTRUMENT RING (AIRCRAFT 23371 AND SUBSEQUENT)	36	0.04	CONT	1.5				1.5				1.5				1.5				1.5				1.5				1.5			
LIGHTS - LANDING AND TAXI	2	8.9	See Supplementary Data	8.9	4.5	1.1	0.1					8.9	8.9	8.9	8.9	17.8	17.8	4.5	0.6									17.8	17.8	17.8	12.5
LIGHTS - TAIL POSITION	1	0.8	CONT	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
LIGHTS - WING POSITION	2	0.75	See Supplementary Data	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
MOTOR - LANDING AND TAXI LIGHTS	2	2.14	See Supplementary Data	4.3	1.4	0.4						4.3	0.7	0.2		4.3	0.7	0.2										4.3	0.7	0.2	

5E2-07-10

Figure 7-3A (Sheet 2 of 3) D.C. Load Analysis Chart

frequency control. An externally adjustable rheostat is provided to permit manual setting of the a.c. output voltage. An internal relay is provided to close the d.c. input line and the a.c. output line. This relay prevents the inoperative inverter from being motorized and its output circuit from being paralleled with the load when the inverter control relay is closed. The inverter is protected with a 105-ampere circuit-breaker. The input and output circuits are equipped with radio filters.

THREE-PHASE INVERTERS

19 Two three-phase, 400-cycle, 115 volt-ampere inverters are installed in the left radio bay. One serves as the main inverter, the other as an alternate. The units are protected by 10-ampere circuit-breakers.

NOTE

When either the main or stand-by inverter becomes unserviceable, the replacement inverter will always be installed in the stand-by position regardless of which inverter has failed.

REMOVAL OF ALTERNATE THREE-PHASE INVERTER

20 To remove the alternate three-phase inverter, proceed as follows:

(a) Remove access cover door over cooling turbine.

(b) Remove left radio bay access door.

(c) Remove IFF destructor impact switch.

(d) Remove voltage compensator.

(e) Station one person on top of the aircraft to reach down through the access hole and, using a stubby Phillips screwdriver, hold the aft inverter mounting screws. A second person may then remove the nuts by reaching in through the left radio access panel opening.

(f) Remove the front mounting screws working through the radio access panel opening.

(g) Move inverter forward and out of the radio access panel opening.

INSTALLATION OF ALTERNATE THREE-PHASE INVERTER

21 To install the alternate three-phase inverter reverse the removal procedure.

ALTERNATING-CURRENT TRANSFER SYSTEM

22 The alternate-current transfer system (see Figure 7-4) consists of an instrument switch, marked NORMAL and ALTERNATE, and instrument power transfer relay, and an amber and red inverter failure warning light. When the instrument power switch is placed in the NORMAL position, all equipment connected to the a.c. bus is powered by the main three-phase inverter. Failure of the main three-phase inverter de-energizes the warning relay. The warning relay and the instrument power transfer relay then apply d.c. voltage to the amber main inverter failure warning light, causing it to light. Placing the instrument power switch in the alternate position energizes the alternate three-phase inverter and the instrument power transfer relay. The instrument power transfer relay connects the alternate inverter output to the a.c. buses. Failure of the alternate three-phase inverter de-energizes the failure warning relay. The failure warning relay in turn routes voltage through the momentary-contacts on the instrument power transfer relay to both instrument inverters warning light. Illumination of this light indicates that both inverters have failed.

A.C. LOAD ANALYSIS CHARTS

22A For A.C. system load analysis charts and supplementary data, see Figures 7-3B and 7-4A.

EXTERNAL POWER RECEPTACLES

GENERAL

23 Two external power receptacles (Nos 1 and 2) are installed on the left side of the fuselage above the trailing edge of the wing. Each receptacle is equipped with three contact pins, two large pins and one small. Each receptacle is connected to the primary bus through an external power relay. Each relay coil is connected to the small contact pin of the receptacle and becomes energized whenever an external

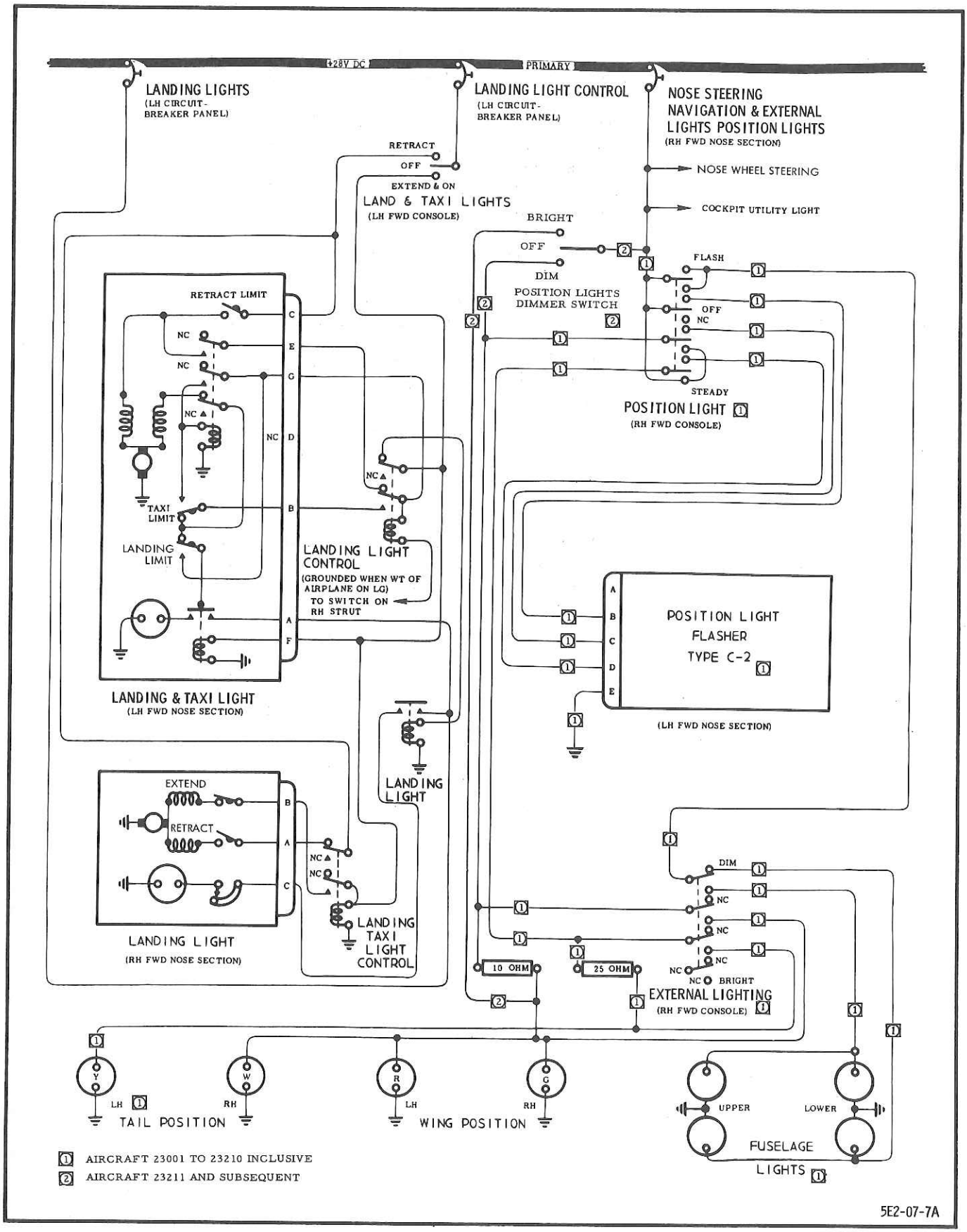

Figure 7-5 External Lighting System

power source is connected to the receptacle. A wire is connected between the relay coil of the No. 1 receptacle and the coil of the externally-powered bus tie-in relay so that the primary and secondary buses will be connected together when external power is connected to the electrical system. If the external power unit fails or is turned off, remove the external power plug from the No. 1 receptacle at once or place the battery-start switch in the OFF position. Failure to do so provides a path for battery current to flow through the jumper wire inside

the external power plug to the external bus tie-in control relay, placing the entire d.c. load directly on the battery. The No.1 receptacle should be used in all cases when an operational check of the electrical equipment is made, or when an external power unit employing one plug is being used. No connections are made between the No.2 receptacle and the bus tie-in control system. External power must be supplied to both receptacles for engine starting because of the heavy current required for this operation.

ELECTRICAL INDICATORS AND TRANSMITTERS

GENERAL

24 The electrically-operated instruments operate from two sources of power: 28-volt direct-current; and 115-volt and 26-volt, 400-cycle alternating current. Instruments operating from the 28-volt d.c. source are the turn and bank indicator, fuel level indicator, gyrosyn compass and, on aircraft 23001 to 23370 inclusive, two oil temperature indicators. Instruments operating from 115-volt a.c. source are the attitude gyro and the gyrosyn compass. An autotransformer drops the a.c. voltage down to 26 volts for operation of the oil pressure indicator and the hydraulic pressure indicator. For information pertaining to these instruments, refer to Part 6, Section 1, preceding.

EXTERIOR LIGHTING EQUIPMENT

GENERAL

25 On aircraft 23001 to 23310 inclusive, the exterior lighting equipment consists of four fuselage lights, two mounted in the aft portion of the canopy and two mounted on the underside of the fuselage below the cockpit, and four position lights, a red light installed in the left wing tip, a green light installed in the right wing tip and two tail-lights, one white and the other yellow. The fuselage and position lights are controlled by two switches, mounted on the right forward console, and a Type C-2 flasher unit. The fuselage and position lights switch has three positions marked STEADY, OFF and FLASH. With the switch in the STEADY position, the flasher unit is out of the circuit and all fuselage and position lights are on steadily. With the switch in the FLASH position, the fuselage lights are on steadily and the yellow tail-light alternates with the wing tip and white tail-lights. There is no time delay between flashes. The intensity of illumination of the fuselage and position lights is controlled by the dimmer switch which is marked DIM and BRIGHT. When the switch is in the DIM position, the dimming resistors are in series with the lights. When the switch is in the BRIGHT position, the resistors are by-passed and the lights burn at full brilliancy.

26 On aircraft 23211 and subsequent, the exterior lighting equipment consists of two wing position lights and a single tail-light. The lights are controlled from a position lights dimmer switch located on the right forward console. For the schematic diagram of the exterior lighting circuits, see Figure 7-5.

LANDING LIGHTS

27 Two 250-watt, retractable landing lights are mounted on the underside of the fuselage forward of the nose area. The landing light to the left of the centre-line is used for landing and taxiing, while the landing light to the right of the centre-line is used for landing only. (See Figure 7-5.) Both lights are controlled by the landing and taxi lights control switch located on the left forward console. In the EXTEND and ON position, power is routed through the landing lights control relay to the landing lights, causing the landing lights to illuminate and extend to the landing position. On touchdown, a switch, located on the right landing gear strut, is actuated, completing the ground circuit for the landing light control relay. When this relay is energized, power is routed to the left unit which further extends to the taxi position and simultaneously the right landing light assembly is turned off. Placing the landing and taxi lights switch in the RETRACT position turns off the left landing and taxi light and retracts both landing light assemblies. Limit switches within each landing light assembly control the extend of travel in either direction.

REMOVAL OF LANDING AND TAXI LIGHTS

28 To remove landing or taxi light assembly proceed as follows:

(a) Remove the screws securing fairing ring to lamp assembly.

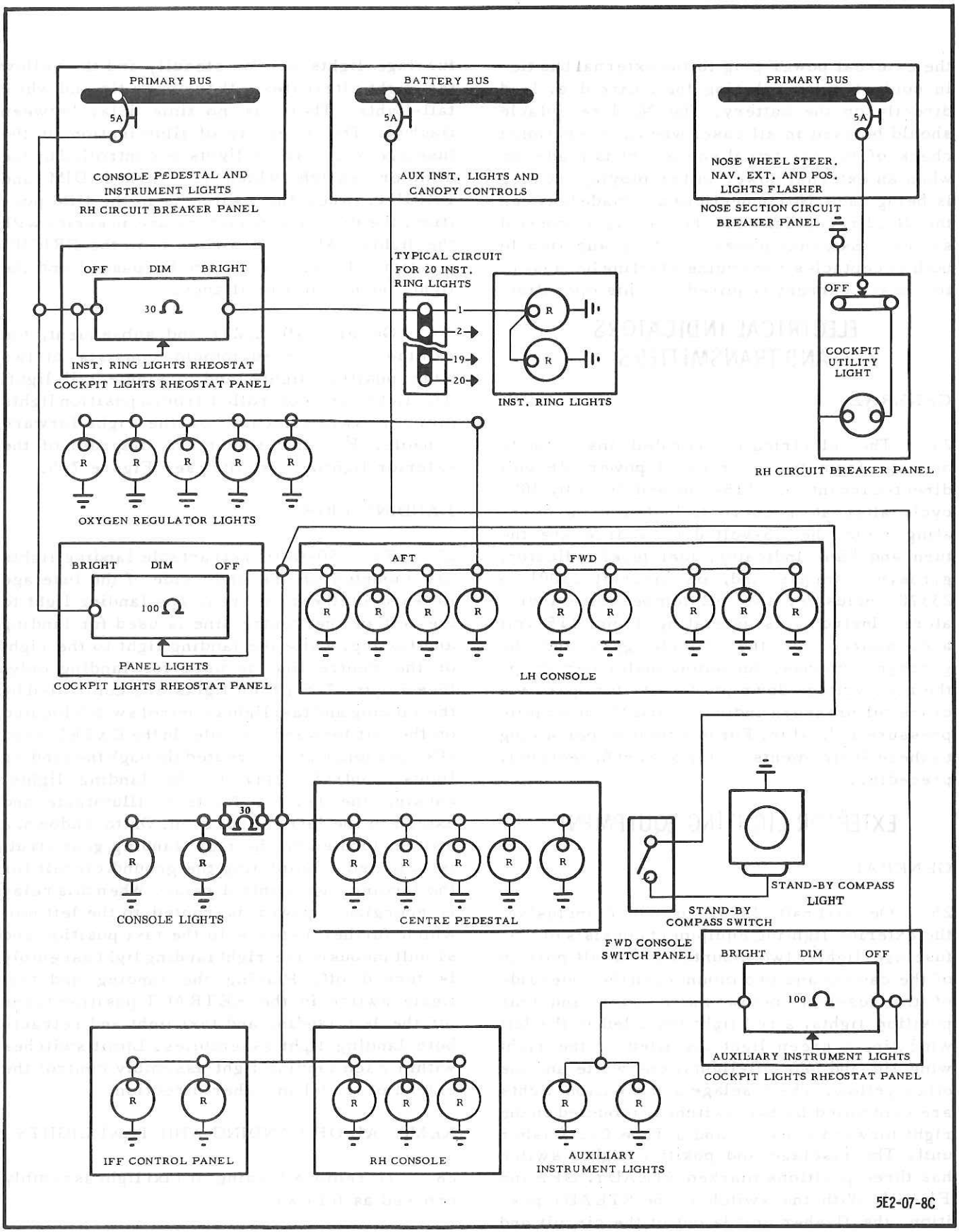

Figure 7-6 Interior Lighting System

(b) Remove five screws securing light assembly to nut-plate retainer ring.

(c) Remove nut-plate retainer ring.

CAUTION

Weight of lamp assembly must be supported during removal of nut-plate retainer ring to avoid possible injury to the screen covering the motor drive mechanisn.

(d) Drop the lamp assembly free of fuselage, break safety wiring on plug connector and disconnect.

INSTALLATION OF LANDING AND TAXI LIGHTS

29 To install landing or taxi light assembly proceed as follows:

NOTE

Check that the MIL-P-3036 (latest issue) protective coating applied around covers of the landing and taxi lights is not damaged.

(a) Connect wiring to lamp assembly and safety wire plug.

(b) Install nut-plate retainer ring.

(c) Secure lamp assembly to nut-plate retainer ring with five screws.

(d) Secure fairing ring to lamp assembly with six screws.

INSTALLATION CHECK OF LANDING AND TAXI LIGHTS

30 To check landing lights proceed as follows:

(a) Support the aircraft on jacks. Level aircraft.

(b) Set up aligning target at a distance of 12 feet from the centre-line of the nose wheel axle. By means of the ring sight and peep sight, align the target in its correct position.

(c) Connect ground power supply to No.1 external receptacle.

(d) Switch on landing lights and landing control circuit-breakers.

(e) Place the landing light control switch in EXTEND position. Both lights should extend and come on.

(f) Check that the extension time of the left light is not longer than six seconds.

(g) Check that both light beams coincide with the points on the target.

(h) With the landing lights extended, place the landing light control switch in the RETRACT position. Check that both lights retract flush with the underside of the nose.

(j) Place the landing light control switch in EXTEND position and operate the right strut safety switch. Check that the left light extends to taxi position as indicated on the target board and that the right light goes out.

(k) Still holding the right strut safety switch place the landing light control switch in the RETRACT position. Both lights should retract and the left light should go out as it retracts.

(m) Check that the retraction time of the left landing light is not longer than six seconds.

(n) Place the landing lights control switch in the OFF position.

(p) Switch off the landing lights control and the landing lights circuit-breakers.

CLEANING OF LANDING OR TAXI LIGHT SWITCH POINTS

31 Clean switch points as follows:

(a) Remove light cover assembly for access to switches.

(b) Dress the contact with a burnishing tool, being careful not to remove too much of the point material.

(c) Blow all foreign material from contacts and assembly.

(d) Install cover and check lamp for operation.

INTERIOR LIGHTING SYSTEM

GENERAL

32 The interior lighting equipment (Figure 7-6) consists of two auxiliary instrument panel floodlights, two console floodlights, 20 ring-type instrument lights, 17 console lights for edge illumination of the left console, right console, and centre pedestal, two lights for illumination of the IFF destructor panel, and a standby compass light. A cockpit utility light, located on the left console, is controlled by a rheostat with an OFF position, mounted on the light casing. A 100-ohm rheostat, located above the right console on the cockpit lights rheostat panel, controls brilliancy of the two auxiliary instrument panel floodlights, normally powered from the battery bus. If a battery is not available, these lights can be illuminated by placing the battery start switch in the BATTERY position. The lights then receive power from the primary bus when external or generator power is available. A 100-ohm rheostat, located on the cockpit lights rheostat panel, controls the brilliancy of the left and right consoles, centre pedestal, IFF destructor panel illumination and the console floodlights. A 30-ohm rheostat, located on the cockpit lights rheostat panel, controls the brilliancy of the instrument ring lights. The standby compass light switch is located on the right forward console and controls the standby compass light located inside the compass. Brilliancy of the standby compass light is controlled by the console light rheostat, located on the cockpit lights rheostat panel. Five red lamps provide illumination for the oxygen regulator located below the left console.

PART 8

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RADIO AND RADAR

PART 8

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RADIO AND RADAR

PART 8

RADIO AND RADAR

ELECTRONIC (RADIO) EQUIPMENT

GENERAL

1 The electronic equipment installed in the aircraft (see Figure 8-1) consists of the following:

EQUIPMENT	FUNCTION
VHF EQUIPMENT	Aircraft-to-aircraft and aircraft-to-ground communications.
RADIO COMPASS	Direction finding and orientation.
IFF RADAR	Aircraft identification.
RADAR AND GUNSIGHT EQUIPMENT	Fire control.

MAINTENANCE OF ELECTRONIC EQUIPMENT

2 The only field operations to be performed on electronic equipment are the checking and rectifying of faults in the external wiring and connections and the checking and replacement of fuses, switches and electron tubes. No attempt should be made to service units which are defective. Such units should be replaced by serviceable equipment and forwarded to repair shops for further attention.

NOTE

Correct operation of electronic equipment is dependent upon keeping to a minimum the radio interference produced within the aircraft. If any replacement electrical or electronic equipment is installed, care must be taken that all mechanical and electrical connections are correctly made and that all bonding is in place and correctly installed. If trouble is encountered, refer to applicable technical orders for information.

AN/ARC-502 COMMAND RADIO

3M The AN/ARC-502 radio provides a means of aircraft to aircraft and aircraft to ground communication. It operates on twenty-four crystal-controlled frequencies and consists of the transmitter, receiver, junction box, control panel and an antenna. The system requires 28-volt d.c. which is supplied from the primary bus through a 20-ampere circuit-breaker. The equipment has a range of approximately line of sight or an average range of 35 miles at an altitude of 1,000 feet and 135 miles at 10,000 feet, depending upon atmospheric conditions. For further information, refer to EO 35AA-5ARC502-2 and EO 35AA-5ARC302.

WARNING

Operation of this equipment involves the use of high voltages which are dangerous to life. Use every precaution when working on this equipment.

AN/ARC-502 CONTROL PANEL

4M The control panel, mounted on the right console, provides a means of remotely controlling the selection of any of the twenty-four pre-selected frequencies. The channel selected is indicated by the channel number appearing in an aperture on the control panel. Also mounted on the control panel are the VHF ON-OFF switch, a volume control potentiometer, and a D/F tone switch which may be used as a key when tone modulation is necessary.

Rapid VHF Test Panel

4AM On aircraft modified to EO 05-5E-6A/252, a rapid test panel, fitted with a jack and receptacle for the testing of the AN/ARC-502 equipment, is installed on the RH radio console. For wiring diagram, refer to Part 11, following.

AN/ARC-502 JUNCTION BOX

5M The junction box, located in the left radio

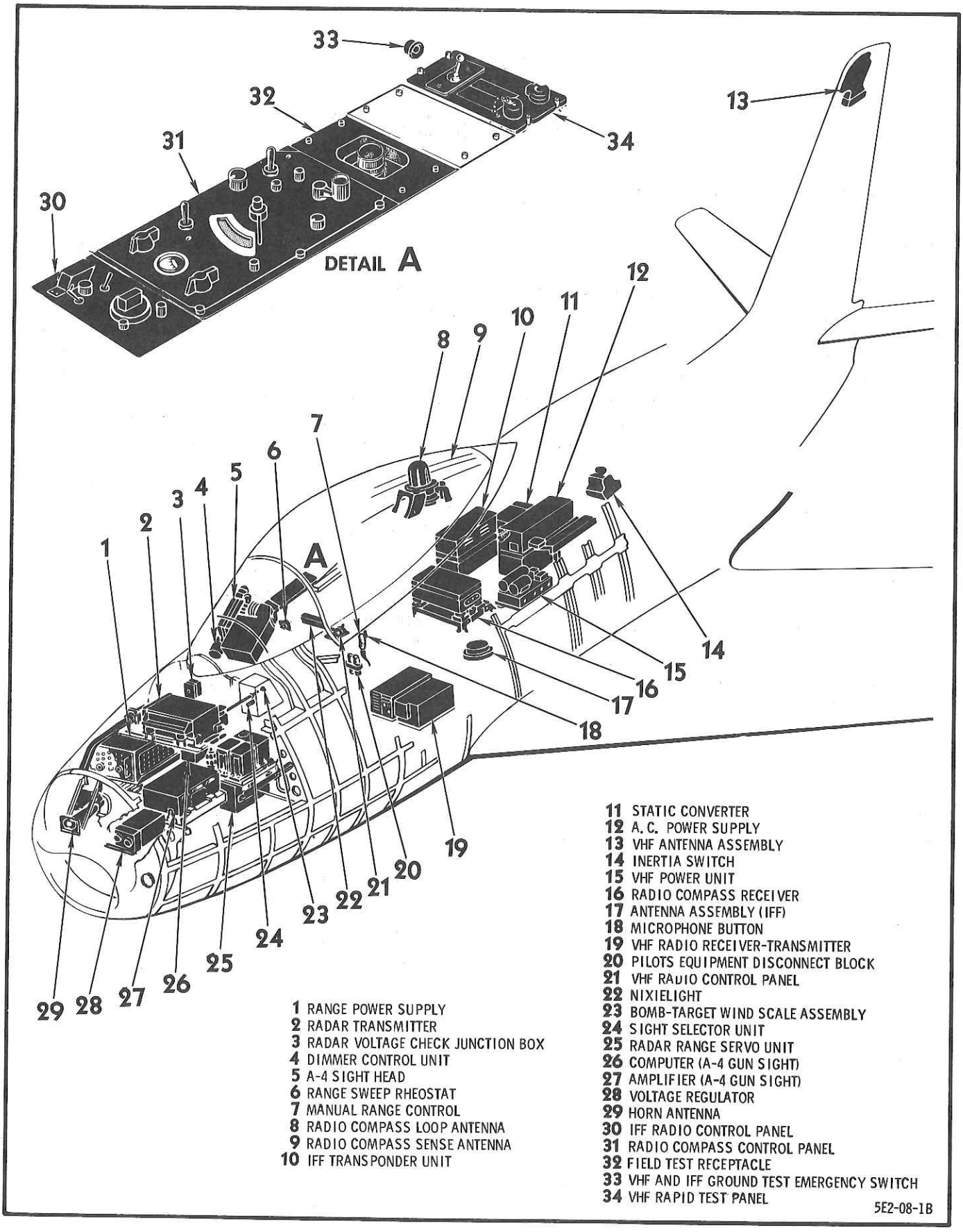

Figure 8-1 (M) Electronic Equipment Location

bay, is supported on four resilient mounts and performs two functions. It serves as a junction box for all interconnecting cables between the receiver, transmitter, power source and control panel, and also provides a mounting base for the two dynamotor units with their associated filters and fuses. The larger of the two dynamotors supplies power for the operation of the transmitter; the smaller supplies power for the operation of the receiver. The dynamotors are connected to the junction box through a three-pin socket on the bottom of each dynamotor and are secured to the junction box by four snap-slide fasteners on the base of each.

AN/ARC-502 TRANSMITTER AND RECEIVER

6M The transmitter and receiver are mounted on a retractable tray located on the underside of the aircraft between the two ammunition compartments. (Refer to Part 2, Section 1, preceding.) The tray is raised or lowered or by means of a crank, located in the left spent-ammunition compartment. The transmitter and receiver are supported on resilient mounts and are secured to these mounts by snap-slide fasteners. The trans-

mitter provides a crystal-controlled RF output ranging from 7 to 10 watts on any of the twenty-four channels, and provision is made for both voice and tone modulation (MCW). An electrically-operated channel selecting mechanism automatically selects the transmitter and the receiver simultaneously to the selection made on the control panel. On the front of the receiver are eight thumbwheels, identified A to H, which, after the installation of the crystals, must be selected to the operating frequency range of the crystals. For this purpose crystal position 1,2 and 3 may be considered as channel A, crystal positions 4, 5 and 6 as channel B, etc. As the selector mechanism can only be set for one frequency in each channel, the three crystals to each channel must not differ by more than that shown in table. The thumbwheels should be set to the highest operating frequency of the three crystals in each channel. The lowest operating frequency should then be selected and, by refering to the operating frequency indicator dial on the front of the receiver, selection of the correct frequency should be checked. Should it be incorrect, the thumbwheel should be adjusted slightly downwards in frequency until the selection is correct.

Maximum received frequency difference for any one channel vs operating frequency.	
Operating frequency	Maximum difference
100-110 mcs	2.5 mcs
110-125 mcs	4.5 mcs
125-156 mcs	6.0 mcs

Nixie Light

6AM On aircraft which have been modified to EO 05-5E-6A/277, a nixie light channel indicator is installed on the upper LH side of the instrument panel shroud. It works in conjunction with the channel change selector on the VHF control panel, which has been changed from a RH side to a LH side location.

NOTE

There will be an approximate delay of 8 to 10 seconds between the indication on the nixie light and completion of the channel change.

7M Also located on the front of the receiver is a squelch adjustment which will either increase or decrease the background noise level in the receiver. By rotating the adjusting shaft in a clockwise direction, the background noise level will be decreased, and by rotating it in a counter-clockwise direction the noise will be increased.

NOTE

Do not set the squelch adjustment higher than necessary for a tolerable noise level, as increasing the squelch action also prevents weak signal reception.

AN/ARC-502 ANTENNA

8M The antenna is located in the tip of the vertical stabilizer and is connected to the transmitter and receiver through a coaxial cable. The cable connects to the transmitter at a receptacle identified as antenna. The adjacent connection, identified as receiver, is for the antenna cable to the receiver. All exposed portions of the antenna cable must be taped with adhesive tape, Ref 33G/137, to prevent fraying.

CAUTION

Should the aircraft be painted, finish the vertical stabilizer tip which encloses the VHF antenna with lacquer, Specification MIL-L-7178 (latest issue).

VHF AND IFF DISTRESS SYSTEM

9M Transmission of a distress signal is effected by actuation of a microswitch, located on the ejection seat rail, when the seat is ejected. The ground test VHF and IFF emergency switch, located above the IFF control panel on the right side of the cockpit, is provided for ground testing of the distress circuit.

REMOVAL OF VHF TRANSMITTER-RECEIVER

10 Remove the VHF transmitter-receiver as follows:

(a) Release fasteners on access door located between spent-ammunition compartments on bottom of fuselage.

(b) Open left spent-ammunition compartment door and turn crank until transmitter-receiver, mounted on door, reaches a favourable position for detachment of cables.

(c) Disconnect plugs and antenna from unit.

(d) Remove transmitter-receiver from the mount.

SUPPLY VOLTAGE CHECK

11 Prior to the installation of transmitter-receiver, check for correct supply voltage as follows:

(a) Connect external power and close the AN/ARC-502 radio circuit-breaker.

(b) Using a 0 to 30-volt voltmeter, measure voltage between pins 1 and 2 on power junction box. This voltage should be 27.5 (±0.5) volts.

INSTALLATION OF VHF TRANSMITTER-RECEIVER

12 To install the VHF transmitter-receiver proceed as follows:

(a) Place the transmitter-receiver on mounting and secure in place.

(b) Turn crank, located in left spent-ammunition compartment, until door pulls up snug with fuselage.

(c) Lock fasteners.

(d) Close left spent-ammunition access door.

REMOVAL OF POWER UNIT

13 Remove power unit as follows:

(a) Open access door on left side of aircraft forward of station 166.

(b) Remove lockwires from retainers under power unit.

(c) Release unit retainers.

(d) Disconnect four electrical plugs.

(e) Lift unit from tray.

INSTALLATION OF POWER UNIT

14 To install the power unit reverse the removal procedure.

CHECKING VHF EQUIPMENT

15 The following additional equipment is required to check the VHF equipment.

(a) Constant-output megger, 500-volt d.c.

(b) Phantom antenna, TS-78/U or equivalent.

(c) Microphone, T-17 or equivalent.

(d) Headset, HS-33 or equivalent.

(e) Crystals (frequencies as required).

16 Carry out the check as follows:

(a) Check that all circuit-breakers are off except those necessary for check.

(b) Check that equipment is correctly mounted and connected and that there is no visible sign of damage.

WARNING

After turning set off, do not turn on again until one minute has elapsed. Do not turn off or change channels while the set is cycling. Be careful in handling as high voltages are used.

(c) Connect external power and close AN/ARC-502 radio circuit-breaker.

(d) Ensure that correct crystals are installed.

(e) Disconnect aircraft antenna lead and perform megger check. Reading should be infinity. Connect phantom antenna to the transmitter.

(f) Turn switch ON and select desired channel. See that channel is indicated on the nixie light.

NOTE

If the tuning motor does not stop after one minute, turn switch OFF and check the wiring connections.

(g) With microphone and head set plugged in and using phantom antenna, check all channels for correct tuning and operation.

(h) Check modulation of transmitter by noting increase in brilliancy of phantom antenna lights while speaking into microphone.

(j) Disconnect phantom antenna at transmitter and reconnect aircraft antenna.

(k) Check two-way communication.

(m) Adjust squelch control for desired background noise level.

(n) Check MCW operation by pressing D/F tone button.

(p) While checking, note that receiver tunes correctly to each channel by listening to characteristic background hiss or for a signal.

(q) Turn off equipment. Disconnect external power and open AN/ARC-502 circuit-breaker.

RADIO COMPASS EQUIPMENT

GENERAL

17 The radio compass is an airborne navigational instrument capable of providing an automatic visual bearing indication and aural reception of modulated r.f. signals, using both a non-directional sense antenna and a loop antenna.

18 The receiver, located in the radio compartment aft of the seat, covers the frequency range from 100 kilocycles to 1750 kilocycles in four bands as follows:

Band No.1	100 to 200 kilocycles
Band No.2	200 to 410 kilocycles
Band No.3	410 to 850 kilocycles
Band No.4	850 to 1750 kilocycles

19 The compass loop is installed in the aft portion of the canopy and is automatic in its

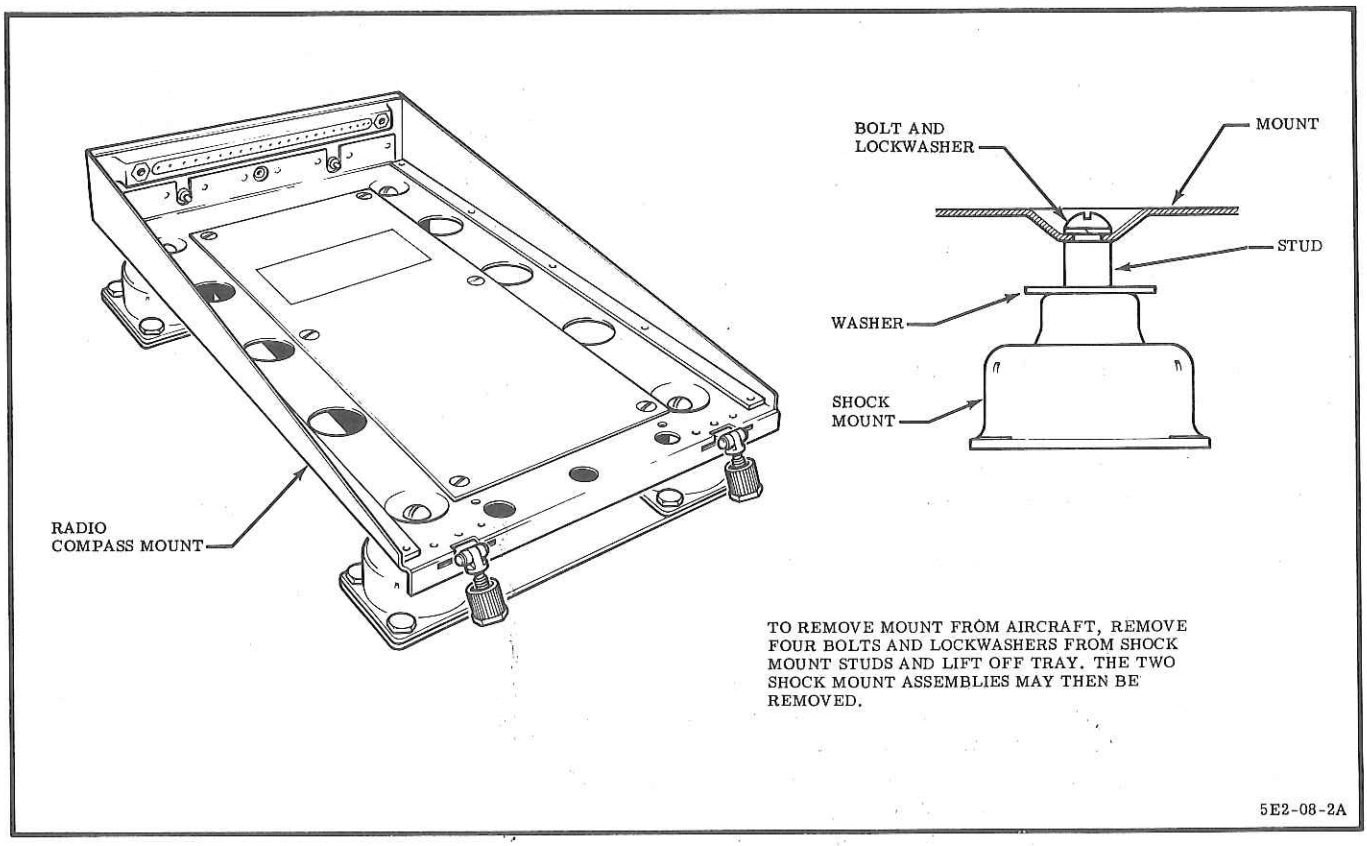

Figure 8-2 Radio Compass Mount

operation. The sense antenna is attached to the inside top portion of the canopy and is connected to the receiver by a flexible cable (see Figure 8-1). The radio compass indicator is mounted on the instrument panel with the controls mounted on the right console. Power for the radio compass is taken from the secondary bus through a 5-ampere circuit-breaker located on the left circuit-breaker panel. Average power consumption is 4 amperes.

RADIO COMPASS MOUNT

20M The radio compass mount has been designed to facilitate removal of the equipment for ground maintenance (see Figure 8-2). The vertical edge of the rear mounting bracket should be covered with four layers of pressure-sensitive tape to prevent chafing of the wires on the mounting tray.

REMOVAL OF RADIO COMPASS RECEIVER

21 To remove the radio compass receiver proceed as follows:

(a) Turn radio compass equipment OFF.

(b) Disconnect all leads from receiver.

(c) Loosen the knurled nuts and pull them forward on their swivels to free receiver.

(d) Slide receiver forward to disengage connecting pins from the sockets at the back, then lift off receiver.

INSTALLATION OF RADIO COMPASS RECEIVER

22 To install the radio compass receiver, reverse the removal procedure.

RADIO COMPASS LOOP CABLE DISCONNECT

23 The compass loop cable plugs into a junction box supported from the canopy beam (see Figure 8-3), and is connected to the three spring-loaded brushes within the junction box. The three cable wires, from the junction box plug to the receiver, are connected to three mating contact strips imbedded in a phenolic block, located on the canopy deck just aft of the seat. The spring-loaded action of the brushes maintains positive connection between the loop antenna and receiver even when the canopy is opened to approximately 2-3/8 inches.

OPERATIONAL CHECK OF THE RADIO COMPASS

24 To check the radio compass system proceed as follows:

(a) Connect external power. Close AN/ARN-6 radio compass circuit-breaker.

(b) Turn function switch on control panel to COMP.

(c) Using headset, check operation of volume control to see that it correctly controls headset volume.

(d) While listening, jar compass receiver to check for possible noise or intermittent reception.

(e) Place function switch at ANT position and check operation of equipment on all four

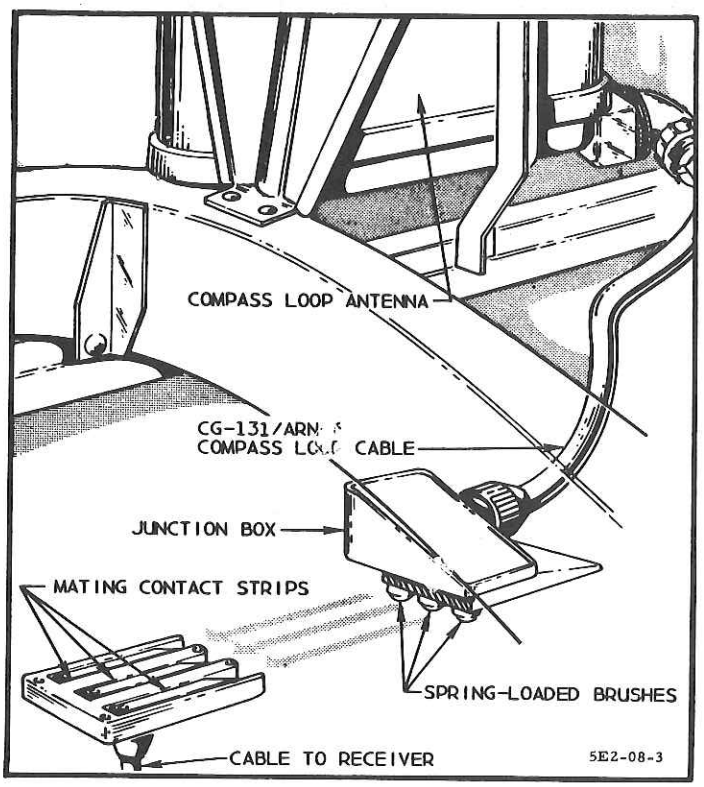

Figure 8-3
Compass Loop Disconnect Assembly

bands. Switch CW-VOICE switch to CW and check operation of beat-frequency oscillator.

(f) Switch to LOOP and check reception on all bands. Check operation of LOOP L-R switch. Direction and speed of loop rotation as indicated by indicator pointers are controlled by direction and amount of rotation.

(g) Park aircraft in area at least 200 feet away from metallic frame buildings, hills, power lines, railroads, or other large electrically conductive objects. Swing heading of aircraft so that it points exactly towards transmitting station. Turn function switch to COMP and tune equipment to this station. Indicator pointer should swing to zero index within 2°.

NOTE

The accuracy of this zero reading will depend upon the accuracy with which the fore-and-aft line of the aircraft was aligned with the direction of the transmitting station.

COMPENSATION OF RADIO COMPASS

25 The radio compass may be compensated as follows:

NOTE

This procedure is not to be carried out within two hours of sunrise or sunset.

(a) Zero beat determination:

(1) Determine bearing of a radio transmitting station within a radius of 60 miles from area in which aircraft is to be placed for compass compensation.

(2) By means of a landing compass, turn aircraft to this heading (for example, assume heading to be C to M175°).

(3) Turn the function switch to COMP.

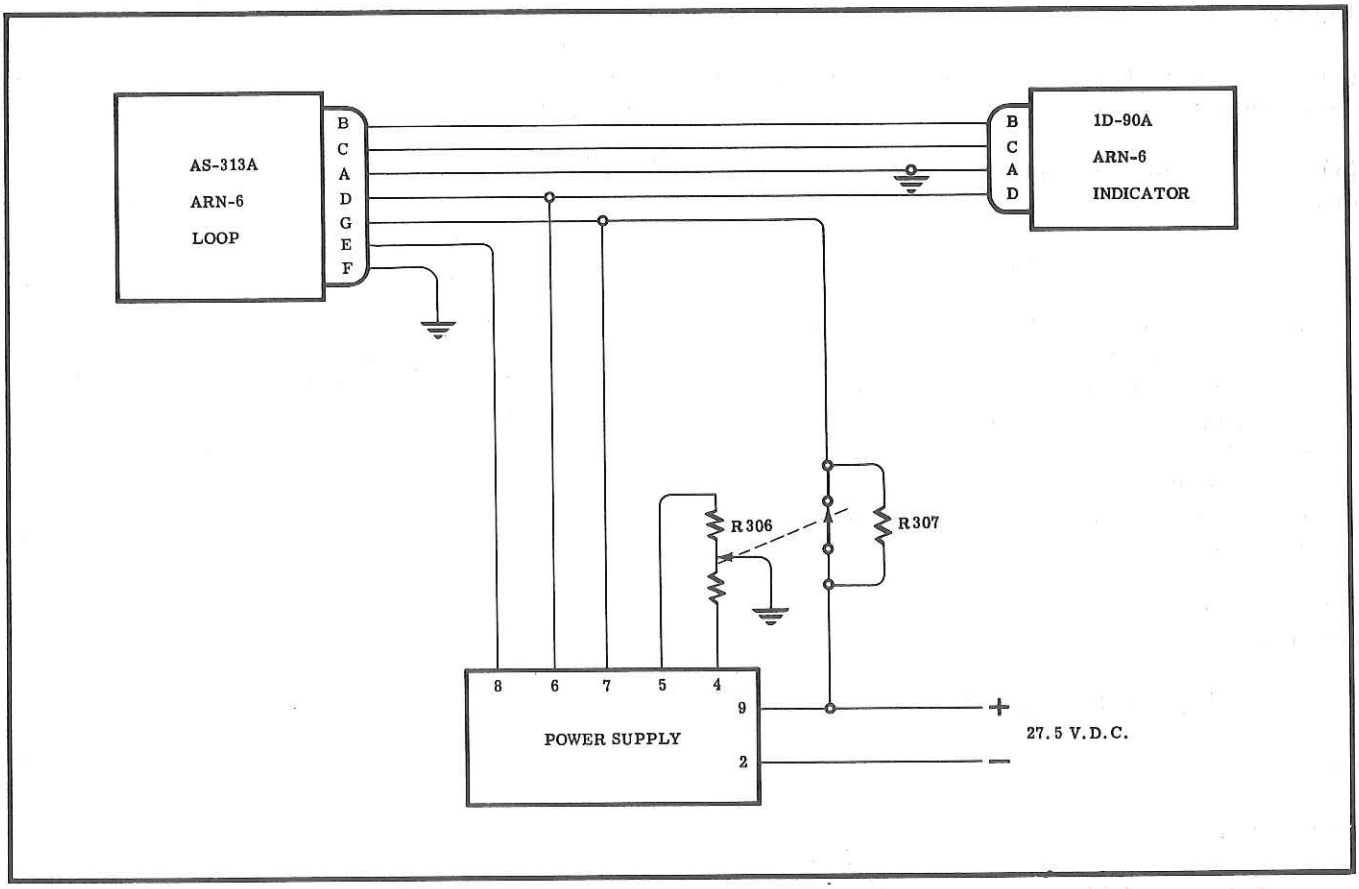

Figure 8-4 Radio Compass Loop Compensator Adjustment

(4) Tune the equipment to frequency of selected station.

(5) The indicator should swing to zero index within 2°.

NOTE

If the indicator pointer swings to 180° instead of 0°, the sensing is incorrect. Check wiring connections.

(b) Adjustment of loop compensator:

(1) Connect loop as shown in Figure 8-4.

(2) Remove the compensator adjustment cover.

(3) Rotate loop until loop pointer is at 15 on black scale.

(4) Turn screw next to 15 (or compenstor scale of the same colour on bottom of loop) until indicator reads figure on Column 2 of Figure 8-5.

(5) Rotate loop to next number and adjust corresponding screw.

(6) Continue to adjust screws in numerical order.

NOTE

Do not turn any of the compensating screws more than three complete turns at one time. If errors of greater than 25° are to be corrected or the rate of change per 30° exceeds 24°, set up 1/3 to 1/2 of the required correction on all screws, then repeat until all screws have been adjusted.

(7) Install the compensator adjustment cover and screw.

IFF RADAR EQUIPMENT

GENERAL

26M An IFF transponder is installed in the radio compartment aft of the cockpit. This transponder identifies the aircraft in which it is installed when correctly challenged by an interrogator associated with shore, shipboard or airborne radar equipment. The IFF radar equipment receives challenges initiated by an interrogator and transmits them back to the interrogator where they are displayed on the radar indicator. When a radar target is accompanied by a correct IFF reply, that target is considered friendly. Transmission of a distress signal is effected by the actuation of a microswitch, located on the ejection seat rail (see Figure 2-8), when the seat is fired. A switch, located above the IFF control panel on the right side of the cockpit, is provided for ground testing the distress signal circuit, which is tied in with the VHF radio (refer to Paragraph 9M, preceding). The IFF radar equipment requires both 28-volt d.c. and 115-volt 400-cycle single-phase a.c. for its operation. The antenna for the system is located on the underside of the fuselage on the centre-line at station 152. On aircraft 23001 to 23746 inclusive, the IFF destructor impact switch is located on the bulkhead at station 166, to the rear of the aft radio compartment. Two destructor warning lights are mounted on the fuse panel slightly below the transponder. On aircraft 23747 and subsequent and those aircraft modified to EO 05-5E-6A/224, the destruct system is removed.

REMOVAL OF IFF TRANSPONDER UNIT

27 To remove the IFF transponder unit, proceed as follows:

(a) Remove radio compartment access door on left side of the fuselage.

LOOP SCALE READING	COMPENSATOR CORRECTED BEARING
0	0
15	26
45	68
75	82
105	97
135	113
165	151
195	208
225	244
255	264
285	277
315	295
345	327

5E2-08-5

Figure 8-5 Radio Compass Compensating Chart

(b) Remove gunsight a.c. power supply.

(c) Disconnect cables from transponder.

(d) Stow all radio cables and bundles out of the way.

(e) Loosen the knurled retaining nuts on mounting rack so unit will be free to slide from rack.

(f) Back off forward knurled nut to half-way point on screw thread.

(g) Slide unit forward and off rack. Tilt unit inboard to face-up position and draw outboard. Rotate where necessary to clear obstructions.

(h) Remove unit through access door.

INSTALLATION OF IFF TRANSPONDER UNIT

28 To install the IFF transponder, proceed as follows: (See Figure 8-6.)

(a) Remove two top screws from face of transponder.

(b) Make sure all loose cables and wire bundles are clear of the area through which unit must travel.

(c) Back off forward knurled nut to half-way point on screw thread.

(d) With unit in face-up position, slide through access door and onto mounting rack.

(e) Draw unit outboard and off rack. Drop forward outboard end of the unit slightly so that upper aft corner is forward of the frame station 144-5/8.

(f) Rotate unit so that upper forward corner is forward and outboard of bonding terminal on frame at station 133-1/2 and upper aft corner is still forward of frame at station 155-5/8.

(g) With left hand under forward end of unit and right hand on upper end, rotate unit to upright position and push lower edge inboard until it rests in forward knurled retaining nut on mounting rack.

(h) Place both hands on face of unit and push onto rack over knurled nut.

(j) Secure unit to mounting rack with knurled retaining nuts.

(k) Connect cables to transponder and install two screws removed in Sub-paragraph (a), preceding.

(m) Install gunsight a.c. power supply.

(n) Install and secure radio access door on left side of fuselage.

OPERATIONAL CHECK OF IFF RADAR

29 Check the IFF radar as follows:

(a) Connect external power source to aircraft and close IFF radar circuit-breaker.

(b) Place switches labelled MODE 2 and MODE 3 on IFF control panel in OUT position unless otherwise authorized.

(c) Rotate MASTER selector to NORM position.

(d) Request ground radar control for check of correct reception of IFF transponder signals.

(e) Rotate MASTER selector to OFF position. Open IFF radar circuit-breaker and disconnect external power.

CHECKING IFF DESTRUCTOR SYSTEM

30 To check the IFF destructor system, proceed as follows:

CAUTION

Destructors will be fired if the destructor switch is turned to the ON position or if the impact switch is tripped, regardless of the setting of the master selector.

(a) Disconnect impact switch cable at IFF set. This will remove the supply voltage from destructors.

(b) Remove the three destructors from destructor sockets located on IFF set panel.

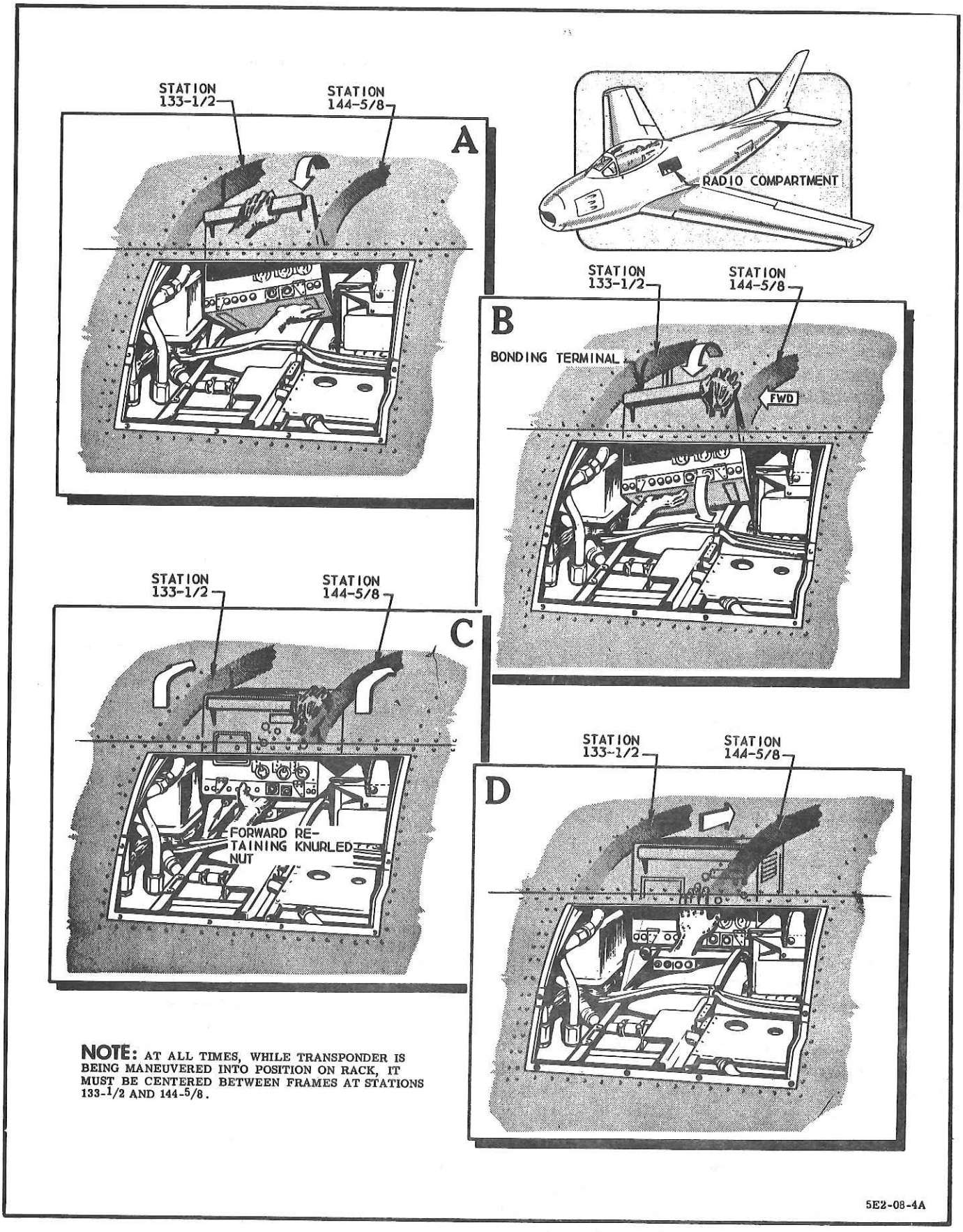

Figure 8-6 Installation of IFF Transponder Unit

(c) Place MASTER selector on IFF control console in OFF position.

(d) Raise destructor guard on control console and place switch in ON position. Check that warning lights are on.

(e) Using a suitable d.c. voltmeter, measure voltage on centre contact of destructor sockets. This should be within 0.5 volt of supply voltage.

(f) Place destructor switch in OFF position.

(g) Lockwire destructor switch in down position, using breakable safety wire.

(h) Measure voltage on centre contact of destructor sockets. Voltage should be zero. Warning lights should be off.

(j) Connect impact cable to IFF set.

(k) Displace pendulum arm until a sharp snap is heard.

(m) Measure voltage on centre contacts of destructor sockets. This should be within 0.5 volt of supply voltage. Warning lights should be on.

(n) Reset impact switch by inserting screwdriver in front side of switch casing and turning screw in a counter-clockwise direction to the stop. Slowly release screwdriver.

(p) Measure voltage on centre contact of destructor sockets. Voltage should be zero. Warning lights should be off.

(q) Test impact switch for resistance of minor jars and vibration by slapping side of impact switch with hand.

(r) Measure voltage on centre contact of destructor sockets. Voltage will be zero if impact switch did not trip.

(s) Install the three destructors removed in Sub-paragraph (b), preceding.

PART 9

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PART 9

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PART 9 - SECTION 1

BOMBING SYSTEM

BOMBING SYSTEM

GENERAL

1 Provisions are incorporated in the aircraft for the installation of a bomb rack on the underside of each outer wing section. Each bomb rack will accommodate single bombs from 100 to 1000 pounds, bomb clusters up to 500-pound size, an AN-M10 chemical tank or one Type R-3 fragmentation bomb rack assembly. Bombs are electrically released; singly in train, simultaneously, or salvoed (jettisoned unarmed). Bombs may be released either automatically or manually. Bomb aiming and automatic release may be accomplished through the use of the gun-bomb-rocket sight installation. The A-4 gun-bomb-rocket sight description, installation, checkouts and settings are described in Part 9, Section 6, following. For electrical schematic diagram, see Figure 9-1.

TROUBLE SHOOTING

2 Trouble shoot the bombing system as follows:

TROUBLE	PROBABLE CAUSE	REMEDY
Bomb rack mechanism does not lock.	Dirty or defective rack.	Clean or install replacement rack. (Refer to Paragraph 5.)
Bomb carrying hooks fail to open or open sluggishly when bomb rack is released electrically with bomb installed.	Internal friction caused by dirt or grit.	Clean or install replacement bomb rack. (Refer to Paragraph 5.)
Bomb carrying hooks fail to open when rack is released without bomb or weight installed.	Internal friction caused by grit or dirt.	Clean or install replacement rack. (Refer to Paragraph 5.)
Bomb racks do not release when a MANUAL-ALL release is attempted.	Bomb train selector switch in the OFF position.	Move bomb train selector switch to ALL.
	No power on circuit. Low voltage at rack.	Check power source. Check for defective wiring. (See Figure 9-1.)
	Defective bomb release switch.	Install replacement.
	Bomb release control relay stuck open or defective.	Repair or install replacement.
	Defective bomb release power relay.	Install replacement.

(Continued)

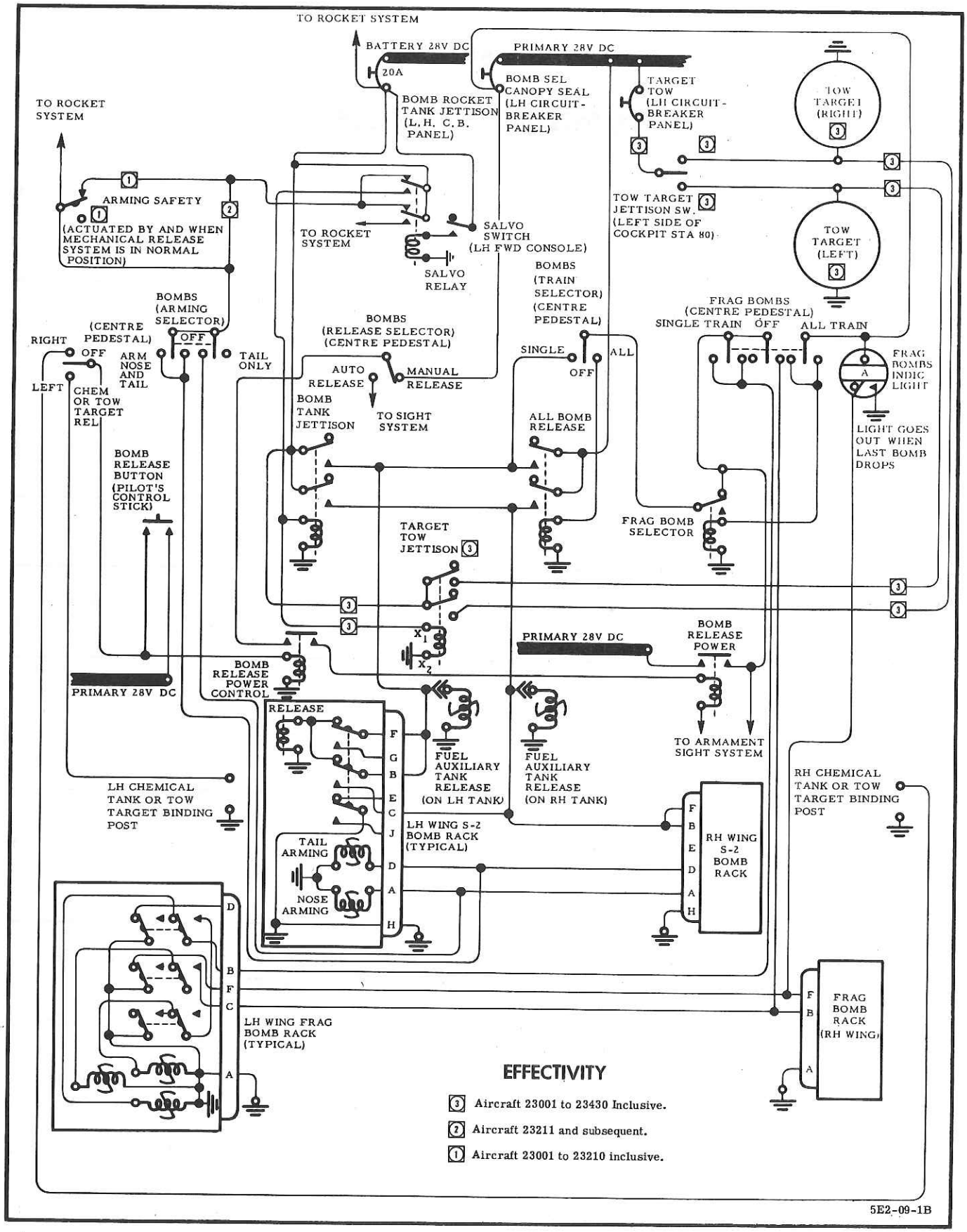


Figure 9-1 (M) Bombing System - Schematic

TROUBLE	PROBABLE CAUSE	REMEDY
Bomb racks do not release when a MANUAL-ALL release is attempted.	Defective bomb train selector switch.	Install replacement.
	ALL bomb release relay defective.	Repair or install replacement.
Only one rack releases when bomb train selector switch is placed on ALL and bomb release button switch is pressed.	Defective wiring between bomb train selector switch and inoperable rack.	Repair wiring. (See Figure 9-1.)
	Defective bomb rack wiring or release solenoid.	Repair or install replacement bomb rack. (Refer to Paragraph 5.)
	Defective wiring in salvo circuit.	Repair wiring. (See Figure 9-1.)
	Defective bomb rack.	Install replacement. (Refer to Paragraph 5.)
Bomb racks do not release when bomb salvo switch is actuated.	No power.	Check power source and correct. (See Figure 9-1.)
	Defective bomb and rocket salvo switch.	Install replacement.
With arming switch at either of the ON positions, respective arming wire is not held when bomb rack is tripped.	No voltage at rack.	Check power source and correct. (See Figure 9-1.)
	Low voltage at rack, causing faulty operation of arming solenoids.	Correct voltage supply. Check for poor terminal connections, defective wiring, etc. (See Figure 9-1.)
	Arming solenoid inoperative.	Install replacement rack. (Refer to Paragraph 5.)
With arming switch OFF and bomb rack locked, arming wire is held.	Wire retaining slide held in up position by dirt and grit.	Clean rack. (Refer to Paragraph 5.)

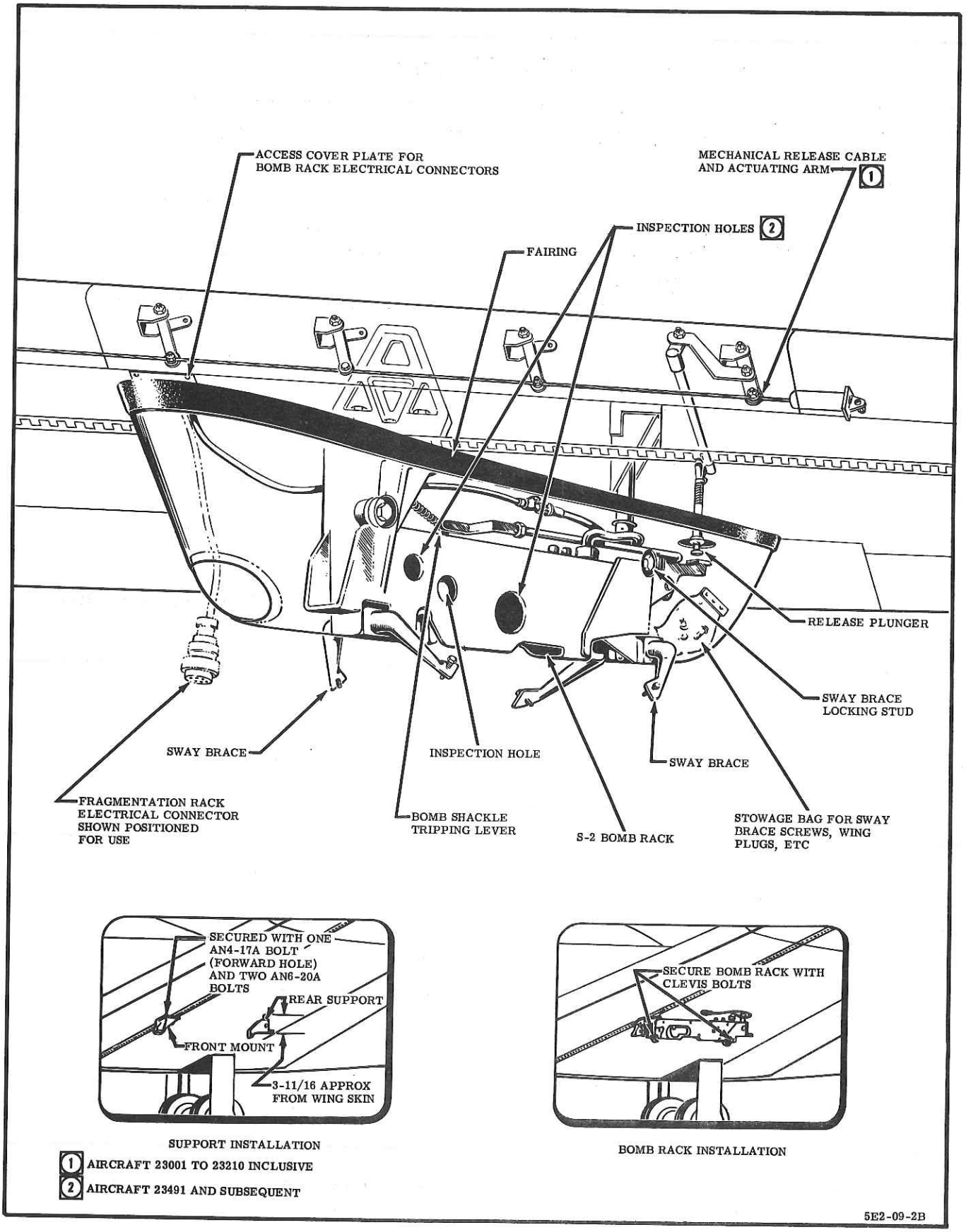


Figure 9-2 Bomb Rack Installation Details

TROUBLE	PROBABLE CAUSE	REMEDY
Fragmentation bombs are not tripped when system is set for a MANUAL-TRAIN fragmentation bomb release and bomb release button switch is pressed.	No power.	Check power source and correct. (See Figure 9-1.)
	Defective bomb release control, bomb release power and fragmentation bomb selector relays.	Repair or install replacement relays.
	Defective fragmentation selector switch.	Install replacement.
Fragmentation bombs release from left rack only when system is set for a MANUAL-TRAIN bomb release and the bomb release button switch is pressed.	Defective fragmentation bomb rack.	Install replacement. (Refer to Paragraphs 7 and 8.)
	Defective wiring between left fragmentation rack and right rack.	Repair wiring. (See Figure 9-1.)
Fragmentation bombs release from left rack only when system is set at ALL-TRAIN and bomb release button switch is pressed.	Defective wiring between fragmentation bomb selector switch and bomb rack.	Repair or install replacement for defective wiring. (See Figure 9-1.)
	Defective bomb rack.	Install replacement. (Refer to Paragraphs 7, 8 and 9.)

BOMB RACK INSTALLATION

GENERAL

3 Each bomb rack installation consists of a forward and an aft support assembly and an S-2 bomb rack. Two sway braces in the rack are adjustable for various diameter bombs. Wiring stowed inside the wing for the bomb rack and the fragmentation bomb rack is accessible through an access door just forward of the front bomb rack support fitting. A door is provided in the front of the bomb rack fairing to permit the fragmentation rack electrical connector plug to drop through the bomb rack fairing and connect to the socket on top of the fragmentation bomb rack. The mechanical release lever on the top of the bomb rack is provided to facilitate tests and loading procedures. This lever can be actuated by the use of a screwdriver through the hole provided on the right side of the bomb rack fairing. A second hole is provided in the fairing on the left side to permit inspection of the bomb rack lock mechanism. On aircraft 23491 and subsequent, two additional inspection holes are provided on the left side for visually checking the forward bomb latching. The larger hole provides inspection facility for modified bomb racks.

REMOVAL OF BOMB RACK

4 Remove the bomb rack as follows: (See Figure 9-2.)

(a) Loosen sway brace lockscrew and pull sway braces from housing in rack.

(b) Loosen the front and rear fairing supporting screws and drop fairing from rack.

(c) Disconnect and stow bomb rack wiring in wings. Install access door.

(d) Remove the two bolts supporting bomb rack.

(e) Rotate aft support assembly counterclockwise until the assembly is free.

(f) Remove the three mounting bolts from the forward support assembly.

(g) Install wing plugs in bomb rack mounting holes.

CAUTION

Screw plugs into wing so that they are flush with wing skin.

MAINTENANCE OF BOMB RACK

5 The bomb rack should require no maintenance or adjustment under normal use. The design is such that the side plate can be easily removed to accomplish any cleaning or replacement of parts. If a bomb rack cannot pass the test preliminary to loading bombs, or if it has been known to have a slow release or to have failed to release, it should be disassembled, cleaned and inspected. Defective units should be returned to the nearest depot for repair.

NOTE

To prevent adherence of dust and grit, do not lubricate any bombing equipment. Frequent cleaning will ensure trouble-free operation. Clean racks with solvent, Specification 3-GP-8 (latest issue), and dry with moisture-free air under pressure. Do not allow cleaning fluids to contact the solenoids located within the bomb racks.

INSTALLATION OF BOMB RACK

6 Before installing bomb rack, check that the racks and mounting holes in the wing are clean and free from oil, dust and corrosion. Install the bomb rack as follows:

(a) Secure the forward bomb rack support assembly to wing.

(b) Insert aft support assembly into the mounting hole and turn assembly clockwise until the small hole in the post is flush with the wing skin. Figure 9-2 indicates approximate distance rear mount lug should be away from skin. Rotate post only enough so that it will be in alignment with the front support assembly.

(c) Install bomb rack on support fittings.

(d) Open access door in wing just in front of the forward support fitting and connect bomb rack wiring to applicable socket in wing.

(e) Install bomb rack fairing.

(f) Insert forward and aft bomb sway braces into socket and secure in place with locking studs.

FRAGMENTATION BOMB RACK INSTALLATION

GENERAL

7 A type R-3 fragmentation bomb rack may be installed on the main bomb rack. Each rack weighs 126 pounds when empty. The racks may be jettisoned in an emergency by use of the normal bomb jettison (salvo) release. There are no provisions for arming or safetying individual parachute bombs. It is impossible to release individual bombs mechanically or to release individual bombs safe from the bomb rack. For completion of a safe salvo, the rack and bombs may be dropped in their entirety from the aircraft. Six individual bomb groups are stacked three deep in two tandem compartments. Each channel of bombs may be released separately, or all three channels may be released in a train of 18 bombs. The bomb release sequence is as follows: The tripping solenoid, located in the rear of the rack, operates and trips the bomb retaining door for one channel in the aft bomb compartment. The three bombs are released and, as the third bomb falls, a follower comes down. This follower, through a mechanical linkage, trips the bomb retaining door of the same channel in the forward compartment and, as the top bomb falls, the follower in this channel transfers the electrical power to the next channel.

MAINTENANCE OF FRAGMENTATION BOMB RACK

8 The fragmentation bomb rack is designed to operate without lubrication of any kind and must be kept free from oil and dust. If necessary, use cleaning fluid, Specification

3-GP-8 (latest issue), or similar. Be careful that no fluid enters the solenoids or switches.

INSTALLATION OF FRAGMENTATION BOMB RACK

9 Before installing bomb rack, first check the rack for cleanliness and make sure all moving parts operate freely without binding. Proceed as follows:

(a) Close the bottom door in the aft compartment of the bomb rack. Check that the door will lock and that the lock does not bind during travel.

(b) Close the bottom door of the forward compartment and force the follower in the aft compartment up against the top of the rack. Make sure that the door is locked. Allow the follower to come down and check to see that the door is unlocked.

(c) Force the follower in the forward compartment up against the top of the rack and check the continuity of the circuit through the skip switch.

(d) Remove the wing bomb rack fairing, remove the fragmentation rack connector plug from stowage clip in wing and drop through access hole in wing skin.

(e) Install bomb rack fairing with the door in the leading edge open and with the fragmentation rack connector plug through the opening.

(f) Install empty fragmentation rack in the same manner in which a bomb is loaded, engaging the electrical connectors as the fragmentation rack is brought into position.

(g) Install fragmentation rack on opposite wing.

(h) Temporarily fix the followers in the forward compartment of each rack in the up position. Latch aft compartment doors and make sure that the indicator light on the armament switch panel is illuminated.

(j) Set controls and check that fragmentation rack release solenoids operate. When the solenoids operate, check that aft compartment doors are unlatched. Then release forward compartment followers.

BOMB CONTROL SYSTEM

GENERAL

10 The all-electric demolition bomb control system consists of bomb arming circuits, a chemical release circuit and various release circuits (manual or automatic selective in combination bomb release). Controls for the operation of the bomb control system (see Figure 9-1) are as follows:

(a) A bomb salvo switch, marked JETTISON, located on the console just forward of the engine throttle control.

(b) A bomb release selector switch, marked MAN-AUTO, located on the armament panel.

(c) A bomb release selector switch, marked SINGLE ALL located on the armament panel.

(d) A bomb arming switch, marked ARM-NOSE & TAIL - OFF - TAIL ONLY, located on the armament panel.

(e) A chemical or two target release switch, marked RIGHT - OFF - LEFT, located on the armament panel.

(f) A fragmentation bomb selector switch, marked ALL TRAIN - OFF - SINGLE TRAIN, located on the armament panel.

(g) A bomb release button located on the control stick.

11 The arming circuit is automatically interrupted when bombs are salvoed (see Figure 9-1). The release of chemicals is controlled by the CHEM switch that selects either the left or right chemical tank to be ignited when the bomb release button is pressed.

CAUTION

Bomb train selector switch must be in the OFF position or the tanks will drop instead of releasing the chemicals.

12 The chemical tank igniter and ground terminals are provided in each wing near the

bomb rack fairing. The chemical tanks are jettisoned in the same manner as bombs.

MANUAL SELECTIVE ELECTRICAL RELEASE CIRCUIT

13 The manual selective electrical release circuit (see Figure 9-1), provides a choice of releasing the bombs singly or simultaneously. When the bomb release button switch is pressed with the bomb release selector switch in MANUAL and the bomb train selector switch in the SINGLE position, the left bomb rack will trip first. Pressing the bomb release button switch again will trip the right bomb rack. When the bomb train selector switch is in the ALL position and the bomb release button switch is pressed, both bomb racks will trip simultaneously. When the MANUAL-ALL release is accomplished, the salvo circuit as well as the normal bomb release circuit is energized, thus providing a dual release circuit.

AUTOMATIC BOMB RELEASE CIRCUIT

14 The automatic bomb release circuit provides for automatically releasing the bombs by means of a mechanism within the gun-bomb-rocket sight. When the bomb release selectro switch is in the AUTO position, the bomb train selector switch in the ALL position, and the bomb release button switch is held closed, the bombs drop from the bomb racks automatically as the release point is reached. When the bomb train selector switch is in the SINGLE position, only the left bomb will be released by the sight when the release point is reached. To release the right-hand bomb, a second impulse is required. To obtain this impulse, the pilot may pull out of the bombing run and make a second run. When the correct release point is reached, the right-hand bomb will be automatically released. The gun-bomb-rocket sight operation is described in Part 9, Section 6, following.

EMERGENCY RELEASE SYSTEMS

15 Emergency release of all external loads is accomplished as follows:

(a) The electrical emergency jettison circuit, when energized by closing the bomb and rocket jettison switch, jettisons all external loads (bombs, rockets or drop tanks). Closing this jettison switch energizes the bomb-rocket-drop tank jettison relay, routing power directly to the right and left racks, tripping the racks.

(b) On aircraft 23001 to 23210 inclusive, a mechanical release system is incorporated to allow the bombs to be salvoed in event of failure of the electrical salvo circuit (see Figure 9-3). Release of bombs is accomplished by pulling the emergency release handle located on the left side of the armament pedestal. An arming safety switch, accessible through the left console panel closeout cover, is incorporated in the mechanical release system. Initial movement of the emergency release handle removes pressure from the safety switch actuating pin. This cuts power from all arming circuits so that all external loads may be dropped in safe condition.

FRAGMENTATION BOMB RELEASE CIRCUIT

16 The fragmentation bomb release circuit provides a means of releasing fragmentation bombs in a train when R-3 fragmentation bomb racks are installed. (See Figure 9-1.) When the fragmentation bomb selector switch is in SINGLE TRAIN position, the bomb release selector switch in MANUAL, and the bomb release button on the control stick is held down, power is routed to the left bomb rack to trip the three bomb channels. Each channel contains six fragmentation bombs which are released in a train. As the last bomb drops, the current is then routed to the right rack to trip the three channels in a train release. A momentary depression of the bomb release switch will release only one channel of six bombs. The three channels of the rack will release when the bomb release switch is depressed for a short period. It is possible to release single channels from each rack by depressing the bomb release button switch momentarily as described. When the fragmentation bomb selector switch is moved to the ALL TRAIN position and the bomb release button switch is held down, current is routed to the racks to drop bombs simultaneously from both racks. The fragmentation bomb indicator light on the armament panel will be automatically extinguished when the last bomb has been dropped.

TESTING OF BOMB RELEASE SYSTEM

GENERAL

17 To test the bomb release system before loading bombs, check the bomb rack installation for security of attachment and safetying. On aircraft 23001 to 23210 inclusive, check that the manual release handle is in the fully retracted position. Proceed as follows:

(a) Check that bomb train selector switch and bomb arming selector switch and fragmentation bomb train selector switch are in the OFF position.

(b) Connect ground power to the No. 1 power receptacle.

(c) Place the bus tie-in control, the bomb rocket and tank jettison, and the bomb selector circuit-breakers ON. These circuit-breakers are located on the left circuit-breaker panel.

(d) Cock both bomb racks and place one arming loop at the forward and one at the aft solenoid of each rack.

(e) Turn bomb train selector switch to ALL. Turn bomb release selector switch to MANUAL.

(f) Press bomb release button switch on control stick once. Both racks should release simultaneously, as indicated by the opening of the bomb hooks. Loops should drop out.

CAUTION

Do not keep the bomb-rocket release button switch depressed for more than 10 seconds. Damage to release solenoids may result.

(g) Cock both bomb racks and again place the loops in racks.

(h) Turn bomb train selector switch to SINGLE.

(j) Leave bomb release selector switch in MANUAL.

(k) Press bomb-rocket release button switch once. Left bomb rack should release, dropping loops from rack.

(m) Press bomb-rocket release button switch again. Right bomb rack should release, dropping loops from rack.

(n) Cock both racks and again place arming wire loops in position.

(p) Leave bomb train selector switch in SINGLE and bomb release selector switch in MANUAL.

(q) Place bomb arming switch in TAIL ONLY.

(r) Press bomb-rocket release button switch once. Left rack should release and tail arming wire loop should be retained in rack.

(s) Press bomb release button switch again. Right bomb rack should release and tail arming loop should be retained in rack.

(t) Place bomb arming switch in the OFF position.

(u) Cock both racks and again place arming wire loops in position.

(v) Leave bomb release selector switch in MANUAL.

(w) Turn bomb train selector switch to ALL.

(x) Place bomb arming switch in NOSE AND TAIL.

(y) Press bomb release button switch once. Both racks should release simultaneously. All loops should remain in racks.

(z) Cock racks and check that loops are still firmly held in racks.

(aa) Leave bomb release selector switch in MANUAL.

(ab) Place bomb train selector switch in SINGLE.

(ac) Place bomb arming switch in NOSE AND TAIL.

(ad) Momentarily press BOMB-ROCKET-JETTISON (salvo) switch on left forward

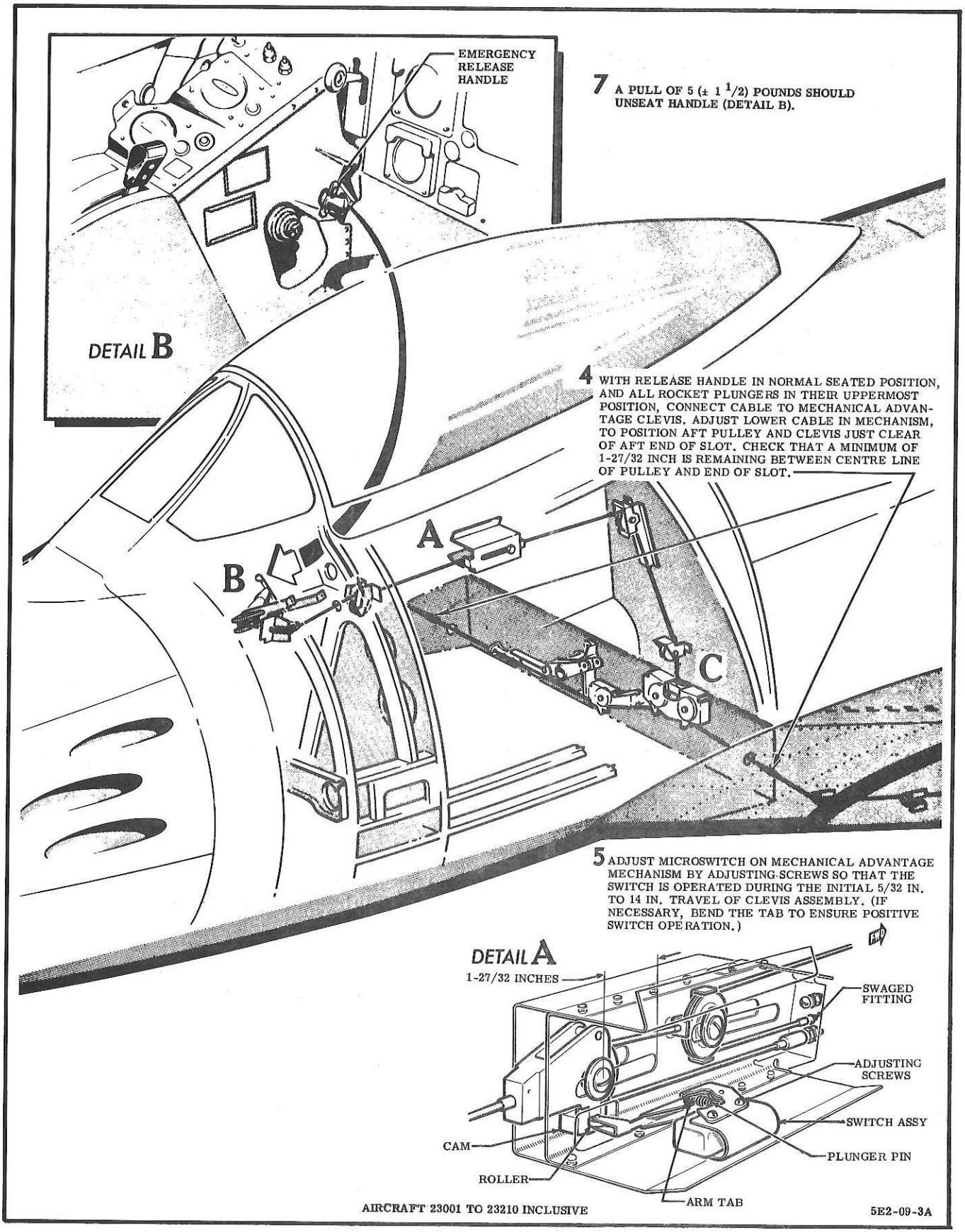


Figure 9-3 (Sheet 1 of 2) Mechanical Salvo Release System

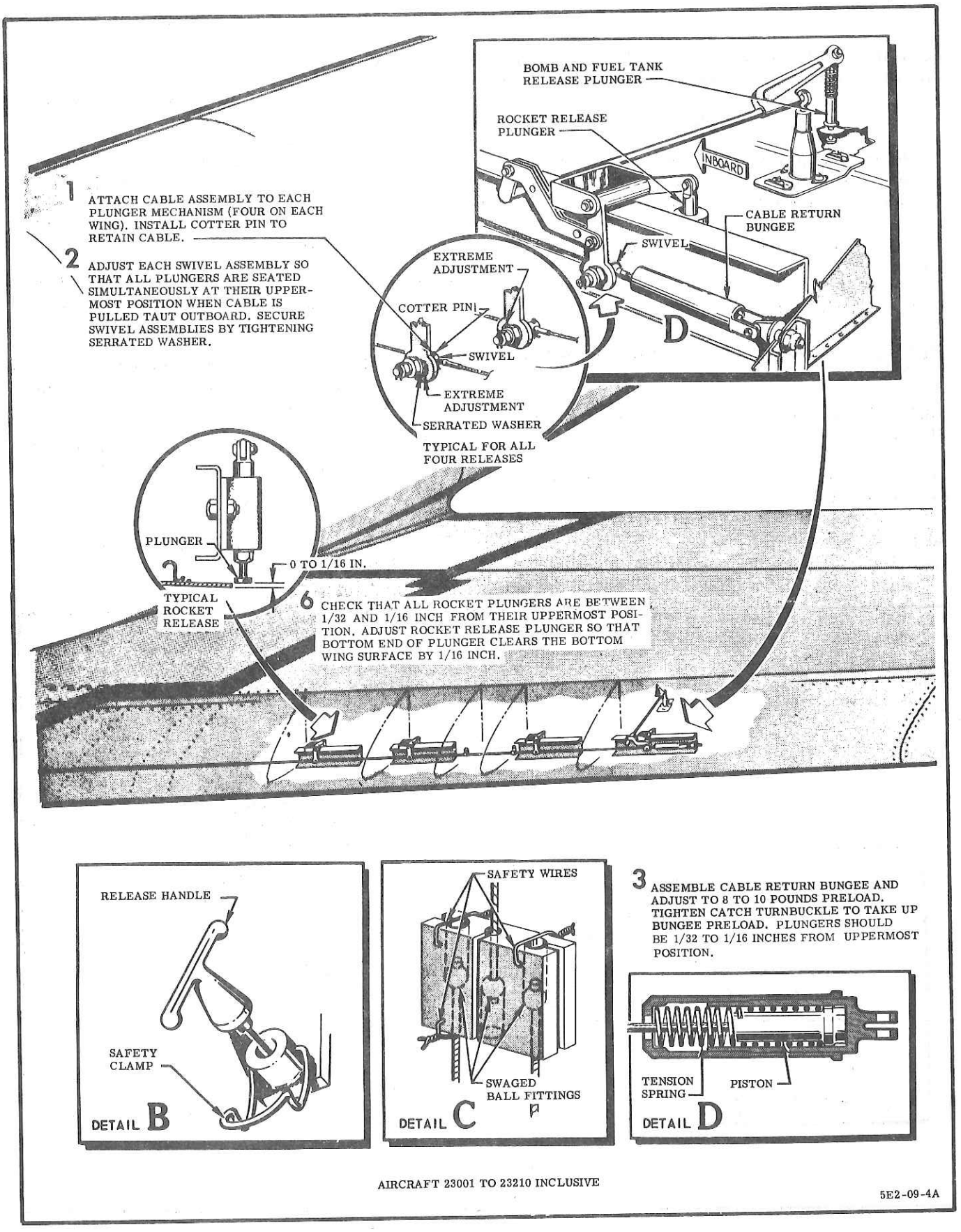


Figure 9-3 (Sheet 2 of 2) Mechanical Salvo Release System

console. Both bomb racks should release simultaneously and all loops should be released.

NOTE

Do not keep the salvo switch depressed for more than 10 seconds. Damage to release solenoids may result.

(ae) Place bomb arming switch in OFF position.

(af) Cock both racks.

(ag) Leave bomb release selector switch in MANUAL.

(ah) Leave bomb train selector switch in SINGLE.

(aj) Place the fragmentation bomb selector switch in ALL TRAIN.

(ak) Press bomb release button switch repeatedly. The racks should not release.

(am) Check that racks are still cocked.

(an) Leave bomb release selector switch in MANUAL.

(ap) Place bomb train selector switch in ALL.

(aq) Place the fragmentation bomb selector in SINGLE TRAIN.

(ar) Press bomb-rocket release button switch repeatedly. The racks should not release.

(as) Place the fragmentation bomb selector switch in OFF and release by pressing bomb-rocket release button switch.

(at) Load both racks with 25-pound weights or dummy bombs. Check racks.

NOTE

Ensure that weight is equally distributed on both hooks of each rack.

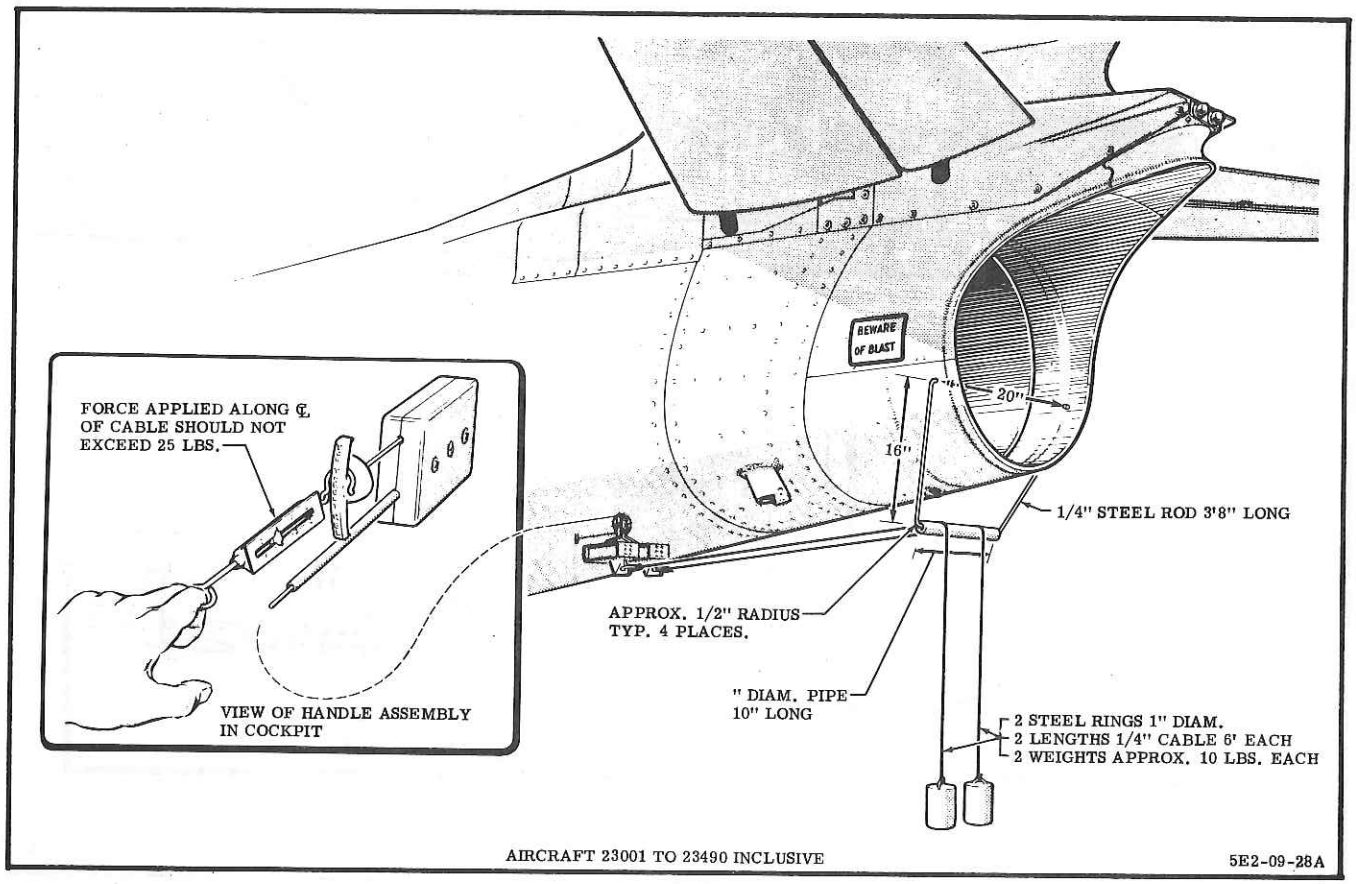


Figure 9-4 Testing Tow Target Jettison Mechanism

(au) Turn bomb train selector switch OFF.

(av) Press bomb-rocket release button switch repeatedly. No bomb should drop.

CHECKING MECHANICAL RELEASE SYSTEM

18 On aircraft 23001 to 23210 inclusive, check the mechanical release system as follows: (See Figure 9-3.)

(a) Cock both bomb racks and place loops in the forward and aft arming solenoids.

(b) Place the bomb, rocket and tank jettison circuit-breaker ON.

(c) Turn bomb arming switch to NOSE & TAIL.

(d) Pull the mechanical release handle out. Both bomb racks should release simultaneously, dropping loops from racks.

(e) Allow mechanical release handle to reseat.

TEST PROCEDURE FOR TYPE R-3 FRAGMENTATION BOMB RACK

GENERAL

19 To test the type R-3 fragmentation bomb rack operation, place the bus tie-in control, the bomb-rocket and tank jettison, and the bomb selector circuit-breakers ON. Proceed as follows:

(a) Install test racks filled with dummy bombs in position and connect plug.

(b) The fragmentation bomb indicator light should come ON.

(c) Place bomb release selector switch in MANUAL.

(d) Place the fragmentation bomb selector switch in SINGLE TRAIN.

(e) Press bomb release button switch on control stick. All bombs should clear from

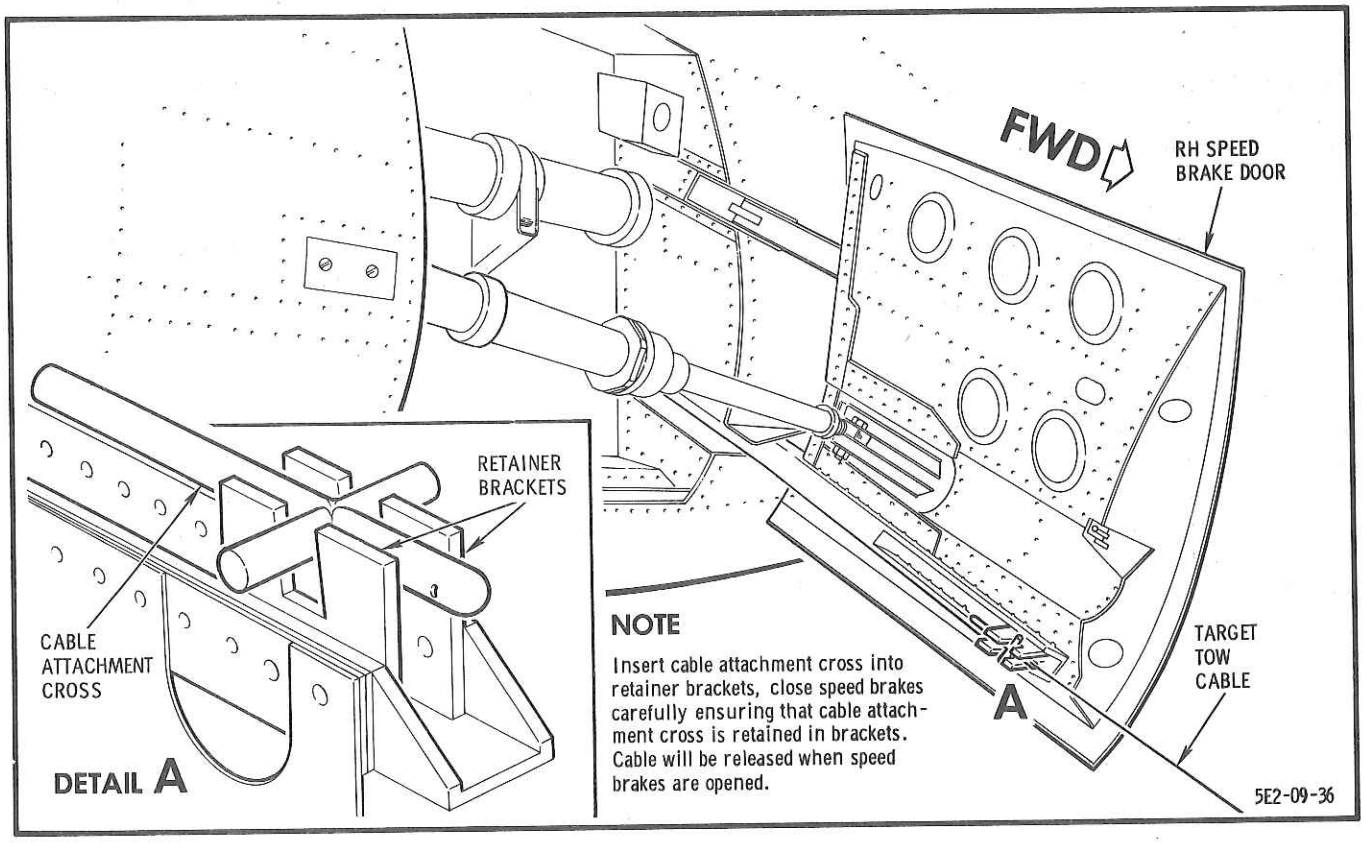


Figure 9-5 Speed Brake Target Towing Attachment

the left rack consecutively and subsequently all bombs should clear from the right rack consecutively. Fragmentation bomb indicator light should go out when the last bomb leaves the rack.

(f) Refill both racks with dummy bombs.

(g) The fragmentation bomb indicator light should come ON.

(h) Leave bomb release selector switch in MANUAL.

(j) Place the fragmentation bomb selector switch in ALL TRAIN.

(k) Press bomb release button switch on control stick once. All bombs should clear from racks simultaneously and fragmentation bomb indicator light should go out as the last bomb leaves the rack.

(m) Place fragmentation selector and bomb selector switches in the OFF position.

(n) Open circuit-breakers and remove test bomb racks.

TARGET TOW AND RELEASE MECHANISM INSTALLATION
(Aircraft 23001 to 23430 inclusive)

20 Each S-2 bomb rack will accommodate a canister containing an aerial banner-type target. The targets are electrically released from the canisters by means of the chemical or tow target release switch, and are attached by two retaining hooks on underside of fuselage at station 360. Electrical jettisoning is accomplished by means of a tow target jettison selector switch located on the left side of the cockpit. The mechanical jettison provision, located above the left console, is an emergency control, and releases the retaining hooks for both targets simultaneously. The normal electrical or manual bomb jettisoning system may be used for jettisoning the canisters from the bomb racks (see Figure 9-1).

TEST PROCEDURE FOR TARGET TOW JETTISON

21 To test the target tow electrical jettison system, proceed as follows:

(a) Push on the TARGET TOW JETTISON circuit-breaker located on the left aft circuit-breaker panel. Make sure that no other breakers are on.

(b) Connect external power source to No. 1 power receptacle.

(c) Cock both mechanisms by means of cocking rings.

(d) Place target tow jettison switch in LEFT position. Check that left mechanism is released.

(e) Place target tow jettison switch in RIGHT position. Check that right mechanism is released.

(f) Open TARGET TOW JETTISON circuit-breaker.

(g) Disconnect external power source.

TEST PROCEDURE FOR TARGET TOW JETTISON MECHANISM

22 For test procedure, see Figure 9-4.

SPEED BRAKE TARGET TOWING ATTACHMENT

23 An alternative method of attachment for towing of aerial targets is incorporated on the right-hand speed brake door. For method of attachment of tow cable refer to Figure 9-5.

PART 9 - SECTION 2

ROCKET SYSTEM

ROCKET SYSTEM

GENERAL

1 Eight removable rocket launchers may be installed to mount sixteen 5-inch HVAR rockets. The rocket launchers are fitted to the lower surface of the outer wing panels, four on each side. Each launcher carries two rockets, one mounted directly below the other. The rockets are aimed by means of the gun-bomb-rocket sight. Arming, firing, and jettison release are accomplished electrically. Information on the sight is contained in Part 9, Section 6, following.

TROUBLE SHOOTING

2 Trouble shoot the rocket system as follows:

TROUBLE	PROBABLE CAUSE	REMEDY
Rocket does not fire when selector switch is on SINGLE and bomb-release button is depressed.	No power on circuit.	Check power source. (See Figure 9-6.)
	Defective bomb-rocket release button switch.	Install replacement.
	Defective rocket release selector switch.	Install replacement.
	Projector release control reset knob not set.	Set projector release control.
	Snap switch within projector release control not closing contact.	Tighten snap switch mounting screws. Position adjustment screw until switch closes.
	Projector release control snap spring broken.	Install replacement.
	Projector release control resistor burned.	Install replacement.
	Projector release control coils not energized or not activating armature.	Check power source. (See Figure 9-6.)
	Projector release control finger contacts of finger assembly not touching disc contacts.	Install replacement contact finger assembly if broken.

TROUBLE	PROBABLE CAUSE	REMEDY
Rockets do not fire when selector switch is on AUTO and bomb-rocket release button switch is depressed.	No power on circuit.	Check power source. (See Figure 9-6.)
	Defective bomb-rocket releases button switch.	
	Defective rocket release selector switch.	
	Snap switch out of adjustment.	Position adjustment screw until snap switch operates.
	Snap spring broken.	Install replacement.
	Resistor burned out.	Install replacement.
	Armature return spring broken or out of position.	Install replacement or position spring.
	Finger contacts of finger assembly not touching disc contacts.	Install replacement if broken.
	Pawl out of adjustment.	Adjust.
Rocket stations dial will not reset to number desired or centre numeral under window.	Dial loose.	Remove panel assembly. Position dial properly and tighten screws.
	Ratchet assembly loose on shaft.	Position and tighten screws.
	Pawl not releasing ratchet.	Adjust armature stop pawl front and back stops with adjustable clips for spacing from ratchet when coils release armature.
	Pawl spring broken.	Install replacement.
Rocket jettison solenoids trip when aircraft is on ground and rocket jettison switch is actuated.	The rocket jettison solenoids should not trip on the ground unless the rocket jettison test switch is actuated or unless the rocket jettison safety switch is defective, the rocket jettison test switch contacts are closed or the relay circuit is grounded.	Install replacement for defective switch or defective wiring.

TROUBLE	PROBABLE CAUSE	REMEDY
When aircraft is on ground and while rocket jettison test is actuated, rocket jettison solenoids fail to trip.	No power on circuit.	Check power source. (See Figure 9-6.)
	Defective rocket jettison switch.	Install replacement.
	No power at rocket jettison relay.	Check power source. (See Figure 9-6.)
	Defective rocket jettison relay.	Install replacement.
	Defective wiring between rocket jettison relay and rocket jettison solenoids.	Repair. (See Figure 9-6.)
Improper sequence of rocket firing.	Defective wiring.	Check and correct. (See Figure 9-6.)
	Projector release control malfunctioning.	Install replacement.
	Projector release control not set correctly.	Reset.
Rocket arming solenoids are not energized when arming switch is placed at INSTANT position.	No power at rocket arming switch.	Check power source. (See Figure 9-6.)
	Rocket jettison switch defective.	Install replacement.
	Defective wiring between rocket arming switch and arming solenoids.	Repair. (See Figure 9-6.)

ROCKET CONTROL SYSTEM

GENERAL

3 The rocket control system is made up of three electrical circuits which control firing, arming and jettisoning. The following controls operate the rocket system; the bomb-rocket release button switch mounted on the control stick, the rocket station dial knob on the type A-3 projector release control on the left side of the cockpit outboard of the engine control, a rocket release selector switch, a rocket arming switch, a rocket jettison switch on the armament switch panel, and a bomb-rocket jettison (salvo) button, which is recessed in the left forward console. The rocket control system circuits are shown in Figure 9-6.

ROCKET FIRING CIRCUIT

4 The rocket firing circuit (see Figure 9-6), allows the rockets to be fired singly or automatically in a train. The circuit is controlled by the settings of the rocket selector switch and projector release control and is

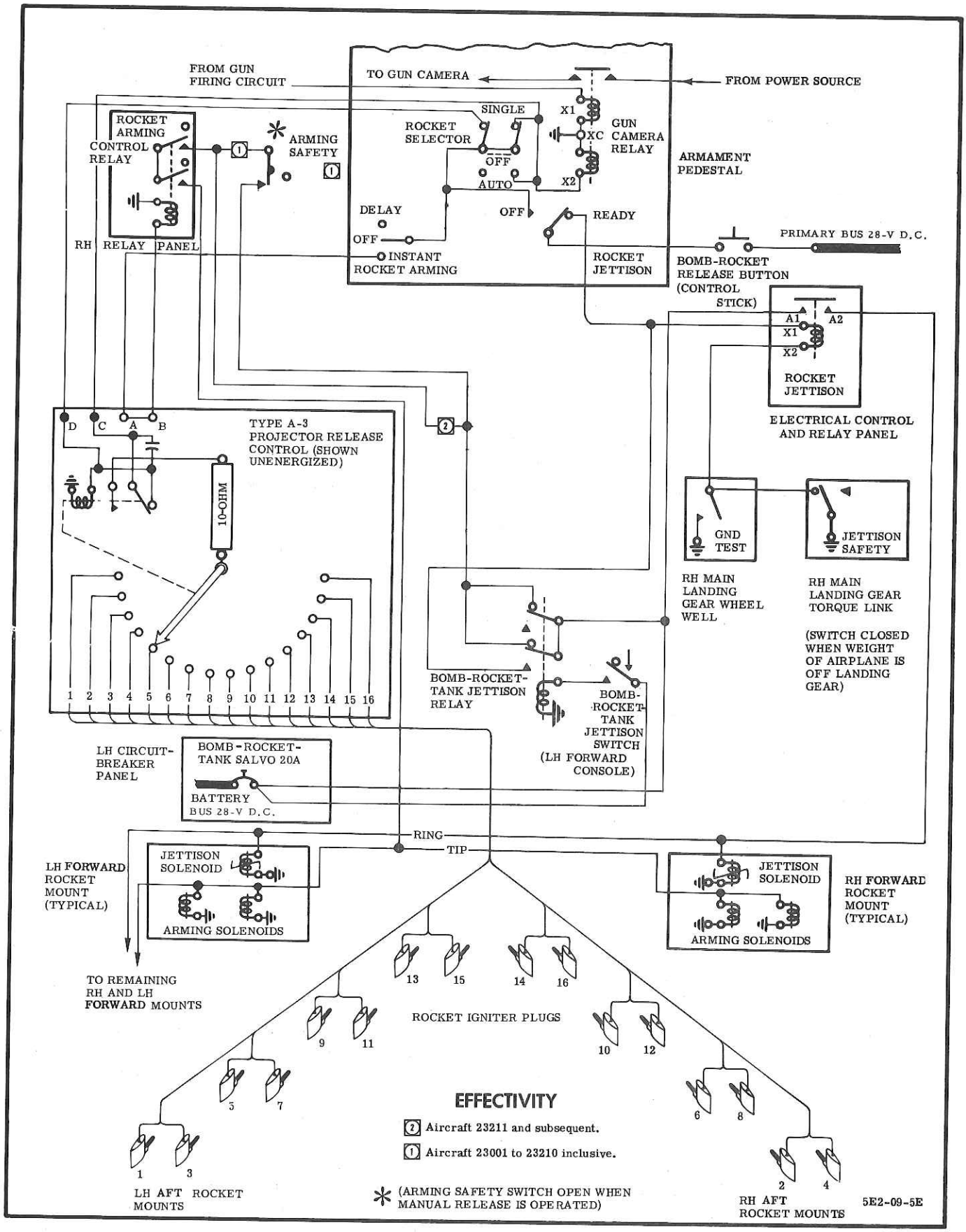


Figure 9-6 (M) Rocket Control System - Schematic

actuated by the bomb-rocket release button switch. When the selector switch is moved to the SINGLE position, one rocket is fired each time the bomb-rocket release button switch is depressed. By positioning the selector switch at AUTO, all rockets are fired in a train as long as the release button switch is held depressed. The projector or release control maintains approximately one-tenth second between release impulses. In both cases, power from the 28-volt primary bus is routed through the closed release and selector switch, through the type A-3 projector release control, to the igniter plugs on the rear rocket mounts. Rocket loading must be co-ordinated with the projector release control to ensure correct rocket firing sequence as the upper rocket must not be fired while lower rocket is still in place. The rocket firing sequence is shown in Figure 9-7. The gun camera circuit is energized simultaneously with the rocket firing circuit when the rocket selector switch is in either SINGLE or AUTO position and the release button is depressed.

ROCKET ARMING CIRCUIT

5 The rocket arming circuit (see Figure 9-6) controls the nose arming condition of the 5-inch HVAR rockets. These rockets have two fuses; a nose fuse and an internal fuse. The arming of the nose fuse is selective and, when armed, provides instantaneous detonation upon impact. The internal fuse is armed by rocket motor pressure, causing delayed detonation to occur after impact. The setting of the rocket arming switch regulates the arming condition of the nose fuse through the arming control units within the front rocket mounts (see Figure 9-8). When the switch is set at INSTANT, the arming control solenoids at each rocket station are energized simultaneously. This locks the pin in the arming unit, so that the catch retains the rocket arming wire when the rocket is released, thereby arming the nose fuse. The arming control unit solenoid is not energized when the arming switch is at DELAY, leaving the ball catch unlocked. Upon release, the rocket pulls the arming wire from the ball catch so that the nose fuse is unarmed. The arming circuit is de-energized when the bomb-rocket jettison (salvo) switch is pressed or the rocket jettison switch on the armament panel is in the READY position. The arming solenoids will allow the arming wires to drop when the arming circuit is cut off after rockets have been fired in a nose-armed condition. The internal fuse is armed only by rocket fire. It will not be armed when the rocket is released by the salvo or jettison switches. Arming control adjustment details are shown in Figure 9-8. For arming operation check, refer to Paragraph 15, following.

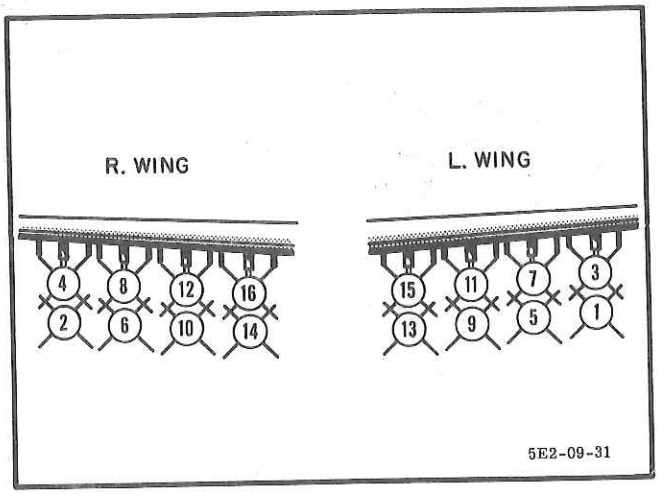


Figure 9-7 Rocket Firing Sequence

ROCKET JETTISON CIRCUIT

6 The jettison circuit allows rocket release in an unarmed condition only. Placing the rocket jettison switch at READY sets the circuit so that, when the bomb release button on the stick grip is pressed, power from the 28-volt d.c. primary bus is routed through the bomb release button and rocket jettison switch to energize the rocket jettison relay. Power is supplied from the battery bus to operate the rocket jettison solenoid. The rockets can also be jettisoned unarmed by depressing the bomb-rocket-tank jettison (salvo) switch on the left forward console (see Figure 9-6). Rockets cannot be jettisoned while the weight of the aircraft is on the landing gear struts, as a safety switch, mounted on the right main landing gear strut, is opened, breaking the rocket jettison relay ground circuit. A manually-operated test switch in the right main landing gear wheel well provides a means of grounding the jettison relay for testing the rocket jettison circuit on the ground.

MECHANICAL RELEASE SYSTEM

7 On aircraft 23001 to 23210 inclusive, a mechanical salvo release system is incor-

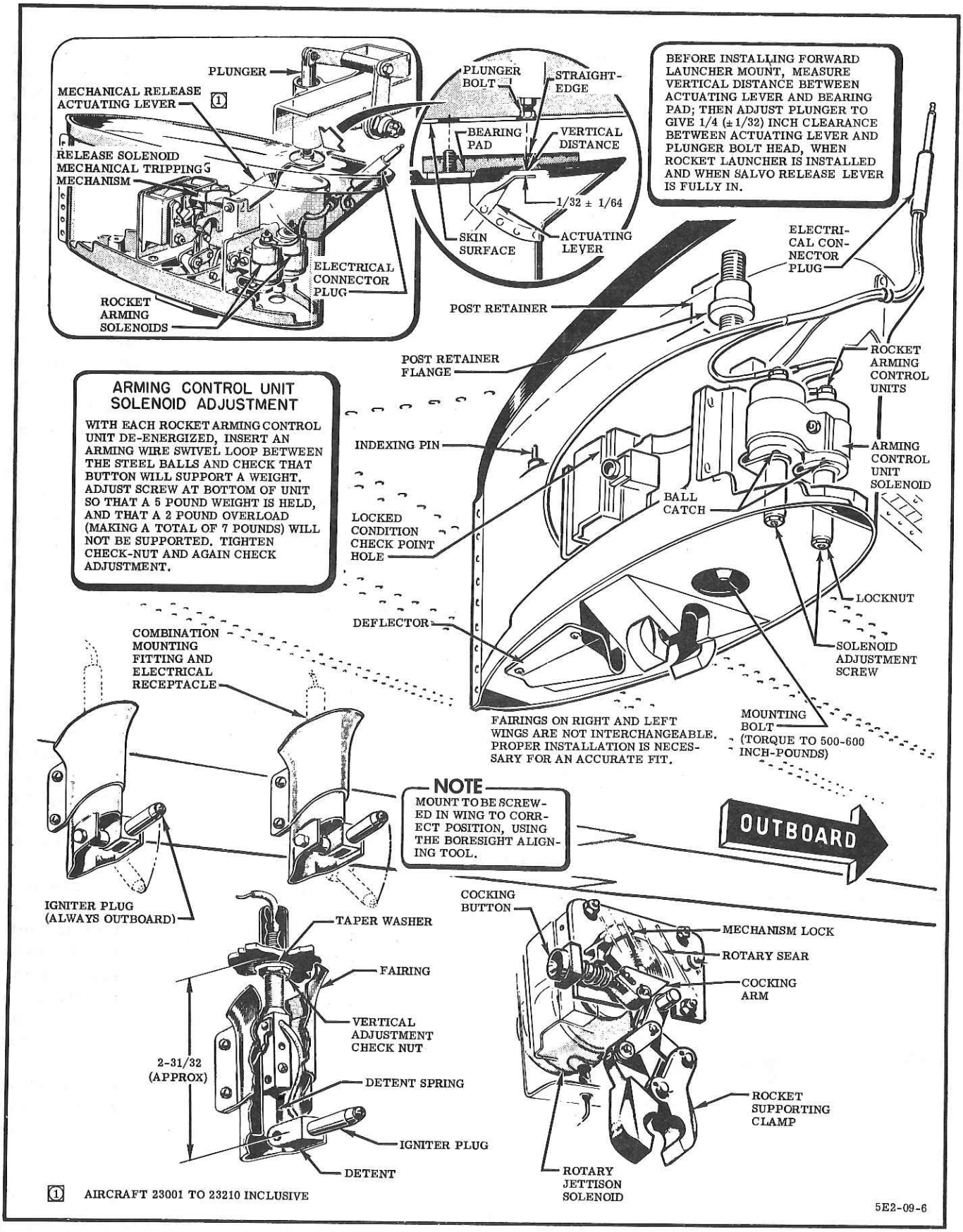
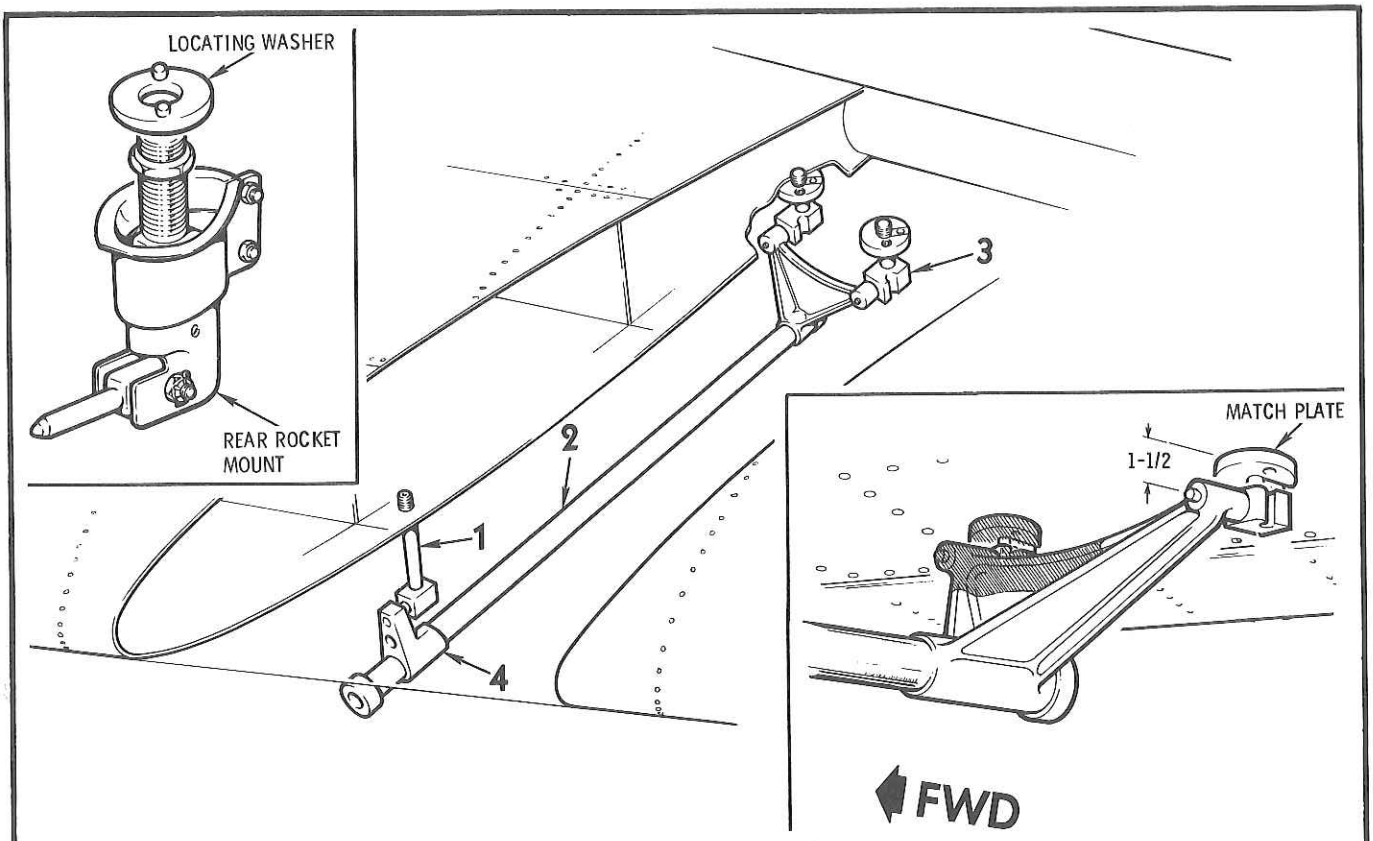


Figure 9-8 Rocket Launchers



NOTE

To eliminate the effect of slight variations in the positioning of the rocket rear mounts, new locating washers with two dowel pins are to be fitted. Necessary matching holes will be drilled in the wing lower skin.

STEPS

1 Remove the blanking plugs from the rocket mount holes.

2 Install two identical drill jigs (3) Part No. SF39510 LH (SF39511 RH), in the existing pair of holes for the rocket rear mount. (Both jigs are in the correct position for drilling when the horizontal pins are parallel, facing exactly forward, and the pin centre-lines are approximately 1-1/2 inches from the wing lower skin.)

3 Install fixture (1), Part No. SF39509, in existing rocket forward mount hole, with the face marked FWD forward. The fixture should have the shank shoulder bottoming against the wing fitting but it can be backed off to correctly position the marked face.

4 Place the rocket aligning telescope (2) Part No. T22816l, on the pins of the drill jigs and slide the pin of movable assembly (4) into the bushed hole in fixture (1).

5 Adjust special drill Part No. MST39530, (No. 30) so that drill will protrude 1/8 inch through the match plate on the drill jig when step butts against drill bushing.

6 Hold match plates up against the wing skin and drill holes in skin to required depth of 1/8 inch.

NOTE

Operation must be carried out eight times. When installing rocket rear mounts, 16 new washers, Part No. 140-68034-101, will be required to replace obsolete washers, Part No. 140-68034. The set of special tools required for this modification will be provided on request by AMCHQ.

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Figure 9-8A(M) Rear Rocket Mounts (Rework)

porated to permit the rockets to be jettisoned unarmed in case of power supply failure. The installation consists of a release handle located on the left side of the armament pedestal, the release mechanisms in the wings and the cable linkage between the release handle and the release mechanisms (see Figure 9-3). An arming safety switch is incorporated in the mechanical release. Initial movement of the release handle removes the pressure from the actuating pin of the safety switch so that the power is disconnected from all arming circuits.

PROJECTOR RELEASE CONTROL

GENERAL

8 The type A-3 projector release control is located on the left cockpit side panel, outboard of the throttle control. The unit is an intervalometer which is set, at the time of rocket loading, to control the sequence of rocket release during single or auto firing. Sequence control is accomplished by a stepping relay within the release control, which automatically advances a timer contact arm each time a rocket is fired. The contact arm moves across contacts in the unit, which are in the circuits to the rocket igniter plugs, thus progressively completing the circuits to fire the rockets in sequence. (See Figure 9-6.) A numbered dial, visible through the window in the release control assembly housing, shows the position of the timer contact arm, indicating the number of rockets that have been fired. The rockets must be loaded according to the proper firing sequence to coincide with the operation of the projector release control, ensuring correct rocket release. The hand reset knob on the projector release control housing is turned to set the time contact arm at position 1 before any rockets are fired so that all rockets will be released in proper sequence. Automatic release is effected when the rocket selector switch is in the AUTO position and the bomb-rocket release button switch is maintained in the depressed position. Sequence firing of the rockets then occurs at approximately one-tenth second intervals as determined by the action of the stepping relay. As long as the release button switch is depressed when the selector switch is at AUTO, the relay continues to open and close with one-tenth second delay in the the close position until the timer contact arm has completed its full sweep cycle. When the rocket selector switch is at SINGLE the rocket release and projector release control action is similar, except that rocket firing is selective. One rocket is released, and the projector control stepping relay is actuated once, each time the bomb-rocket release button switch is pressed.

ROCKET LAUNCHERS

GENERAL

9 Each of the removable rocket launcher assemblies consists of two aft mounts and a single forward mount. (See Figure 9-8.) The aft mounts, which incorporate the rocket igniter plug, have electrical connections within the mount post that make contact with an electrical receptacle in the wing when the mount is installed. The forward mount houses the rocket jettison unit and two arming solenoids. The rocket jettison unit consists mainly of a rotary solenoid, a rotary sear, a lock and a supporting clamp. The supporting clamp is held closed by the lock, which engages a shoulder on the rotary sear. Whenever the rotary solenoid is energized during salvo or jettison release, it rotates, lifting the lock from engagement with the sear. This permits weight of rocket, in conjunction with a booster spring, to open the supporting clamp, causing rocket to be released. Once the mechanism has been tripped, it is reset by pressing the cocking button on the right side of the front rocket launcher. This action manually rotates the rotary sear until the lock is engaged. The cocked condition of the front mount can be checked by insertion of a rocket shear wire into the hole in the mount fairing just aft of the cocking button. If the full length of the wire cannot be inserted, the mechanism is not locked. The two arming solenoids in each forward rocket mount accomplish rocket nose fuse arming. The rocket launchers have no provisions for azimuth adjustments. The aft mounts can be adjusted vertically for bore-sighting.

REMOVAL OF FORWARD ROCKET LAUNCHER ASSEMBLY

10 The forward rocket launcher assembly is removed by unscrewing the launcher mounting bolt from the wing and then lowering the launcher until the electrical plug can be pulled from the socket in lower surface of wing.

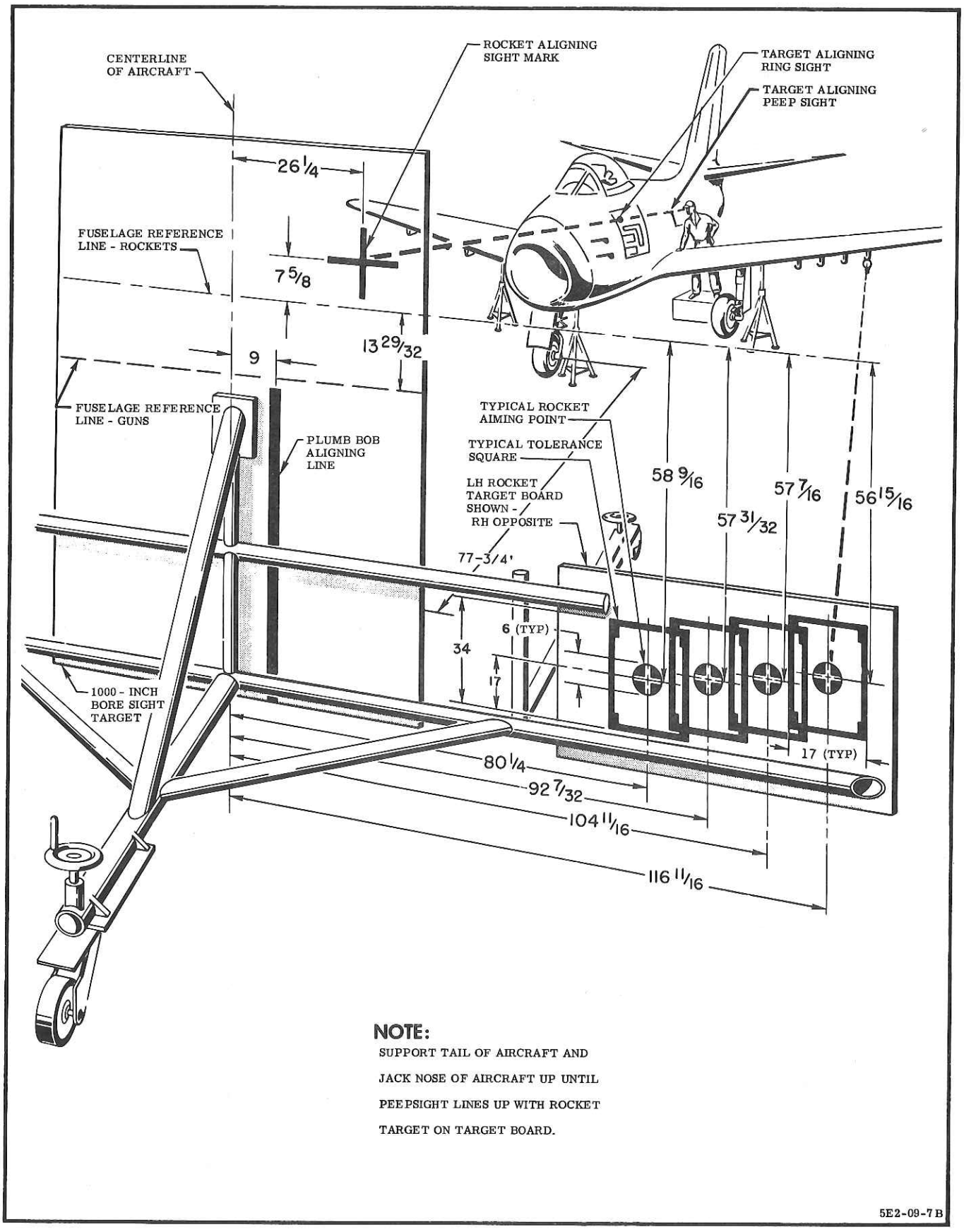


Figure 9-9 Rocket Boresighting Details

REMOVAL OF AFT ROCKET LAUNCHER ASSEMBLY

11 The aft rocket mount fairing must be loosened and lowered to remove the aft launcher assembly. The vertical adjustment check-nut is to be loosened, the indexing washer lowered, and the mount unscrewed from its socket in the wing. Ensure that modification EO 05-5E-6A/244 has been incorporated on aircraft 23001 to 23300 inclusive. (See Figure 9-8A.)

INSTALLATION OF FORWARD ROCKET LAUNCHER ASSEMBLY

12 Before installation of the forward rocket launcher assembly, inspect the mounting hole in the wing and remove any foreign matter. The launcher assembly should also be inspected for cleanliness and proper condition prior to installation. The launcher is installed as follows:

(a) Lift the launcher adjacent to mounting holes in the wing and insert the electrical connector plug into the socket just forward of the mounting bolt socket. Adjust rocket release plunger so that it extends clear of the wing surface by 1/4 inch.

(b) Position the launcher so the indexing pin is engaged. Screw the mounting bolt into the wing until the rocket launcher is snug against the wing surface. Torque bolt to 500 to 600 inch-pounds.

INSTALLATION OF AFT ROCKET LAUNCHER ASSEMBLY

13 Before the aft rocket launcher assembly is installed, the mounting holes in the wings should be inspected and any foreign matter in the holes should be removed. All aft rocket mount assemblies are identical, with the exception of the fairing and the arrangement of the igniter plug and spacer. There are right and left fairings to provide for the difference in right and left wing contours. The igniter plug and spacer should be arranged so that the igniter plug is outboard and the spacer inboard with respect to the centre-line of the aircraft. (See Figure 9-8.) The launcher assembly should be inspected for proper condition Install as follows:

(a) Loosen and lower mount fairing to gain access to the check-nut.

(b) Install check-nut and taper washer. Position the taper washer so that the key will be in the keyway on the outboard side of the rocket launcher centre-line.

NOTE

Ensure that the locating tabs on the taper washer engage in the locking slot on the wing without any azimuth movement of the mount. If a taper washer on a rear mount does not engage, then this rocket position must not be used. Rocket mounts must be removed from any positions where there is misalignment and these positions must be indicated in the L14 and reported by UCR.

(c) Insert the rocket launcher into the socket in lower surface of wing. Turn launcher until the igniter plug is facing forward and is 2-31/32 inches from the wing skin, as shown in Figure 9-8.

(d) Boresight rocket launcher. (Refer to Paragraph 14, following.)

(e) After boresight adjustments have been made, make sure the taper washer is correctly engaged. Tighten the check-nut.

(f) Slide fairing into engagement with the wing skin and tighten clamping.

BORESIGHTING OF ROCKET LAUNCHERS

14 Boresight rocket launchers as follows: (See Figure 9-9.)

NOTE

It is possible for the cross-hair disc in the rocket alignment scope to become misaligned by slipping out of its insert. This introduces an error in the harmonization of the rear rocket mounts. The cross-hair disc must be checked before harmonization is undertaken.

(a) Attach rocket boresighting tool. Check that the tool slides on and off without undue friction or binding and that the clearance between the face of the rear support igniter plug and the plug receptacle of the boresight jig does not exceed 1/8 inch on one plug when

the other is pushed completely into the plug receptacle.

(b) Check through the aft peep-hole of the tool to make sure that the cross on the tool appears to lie within the coloured tolerance square of the rocket support being checked.

NOTE

Vertical adjustment is accomplished at the aft mounts. There is no provision for azimuth adjustment. Rocket mounts which cannot be boresighted within the indicated tolerance should be rejected.

(c) Repeat for each rocket launcher mount.

ROCKET ARMING OPERATION CHECK

15 To check the arming control units, proceed as follows: (See Figure 9-8.)

(a) Connect ground power to No.1 receptacle.

(b) Push bomb-rocket and tank jettison circuit-breaker and bus tie-in circuit-breaker ON.

(c) Place rocket jettison switch and rocket arming switch OFF.

(d) Insert arming wire swivel loops in arming control units.

NOTE

The arming loop must hold when the arming solenoid is energized, and must be released by a pull of 5 to 7 pounds when the arming solenoid is de-energized.

(e) Place rocket arming switch in INSTANT.

(f) Press bomb-rocket button switch on stick grip. Arming solenoids should be energized and holding arming loops.

(g) Release bomb-rocket switch. Arming solenoids should be de-energized and arming loops should pull out.

(h) Place rocket jettison switch in READY.

(j) Press bomb-rocket button switch. Arming solenoids should be de-energized and arming loops should pull out.

(k) Still holding bomb-rocket button switch pressed, place rocket jettison switch in OFF. Solenoids should immediately be energized and holding arming loops.

(m) Release bomb-rocket button switch. Arming solenoids should be de-energized and arming loops should pull out.

(n) Press bomb-rocket button switch. Solenoids should immediately be energized and holding arming loops.

(p) Still holding bomb-rocket button switch pressed, also press bomb-rocket and tank jettison switch. Solenoids should be de-energized and arming loops should pull out.

(q) Release bomb-rocket button switch and bomb-rocket and tank jettison (salvo) switch.

(r) Press bomb-rocket button switch. Solenoids should immediately be energized and holding arming loops.

(s) On aircraft 23001 to 23210 inclusive, check the arming safety switch as follows:

(1) While holding bomb-rocket button switch pressed, pull mechanical release handle out 1-1/8 inches. Solenoids should be de-energized and arming loops should pull out.

(2) Still holding bomb-rocket button switch pressed, allow mechanical release handle to reseat. Solenoids should be energized and holding arming loops.

(t) Place rocket arming switch in OFF.

(u) Repeat procedure for each arming control unit.

PART 9 - SECTION 3

GUNNERY SYSTEM

GUNNERY SYSTEM

GENERAL

1 The gunnery system consists of six type M-3 .50-calibre machine guns and related equipment. Used in conjunction with the gunnery system is a gun camera, the AN/APG radar ranging equipment and a type A-4 gunsight installation. On aircraft 23491 and subsequent, a sight reticle camera is installed. The AN/APG radar equipment is described in Part 9, Section 4, following, and the type A-4 gunsight installation is described in Part 9, Section 6, following. The gun compartments are located below and on each side of the cockpit. A bank of three guns is located on each side with the ammunition containers below (see Figure 9-10).

TROUBLE SHOOTING

2 Trouble shoot the gunnery system as follows:

TROUBLE	PROBABLE CAUSE	REMEDY
One or more guns fail to fire.	Guns not loaded, charged, or headspaced.	Inspect and correct.
	Defective gun.	Repair or install replacement. (Refer to Paragraphs 9 and 10.)
	Faulty ammunition or links.	Inspect ammunition and links.
	Ammunition is jammed between booster motor and gun.	Lift release wire connected to anti-rollback switch and pull ammunition back over sprocket. Check ammunition chutes for bulges.
	Booster motor assembly malfunctioning during high-G loads.	Check last round switch and overfeed switch. If motor does not operate, install replacement.
	Damaged booster motor housing.	Repair housing.
All guns fail to fire.	No power supply.	Check power circuit.
	Defective gun firing switch.	Install replacement stick grip.
	Defective guns, sight and camera selector switch.	Install replacement.

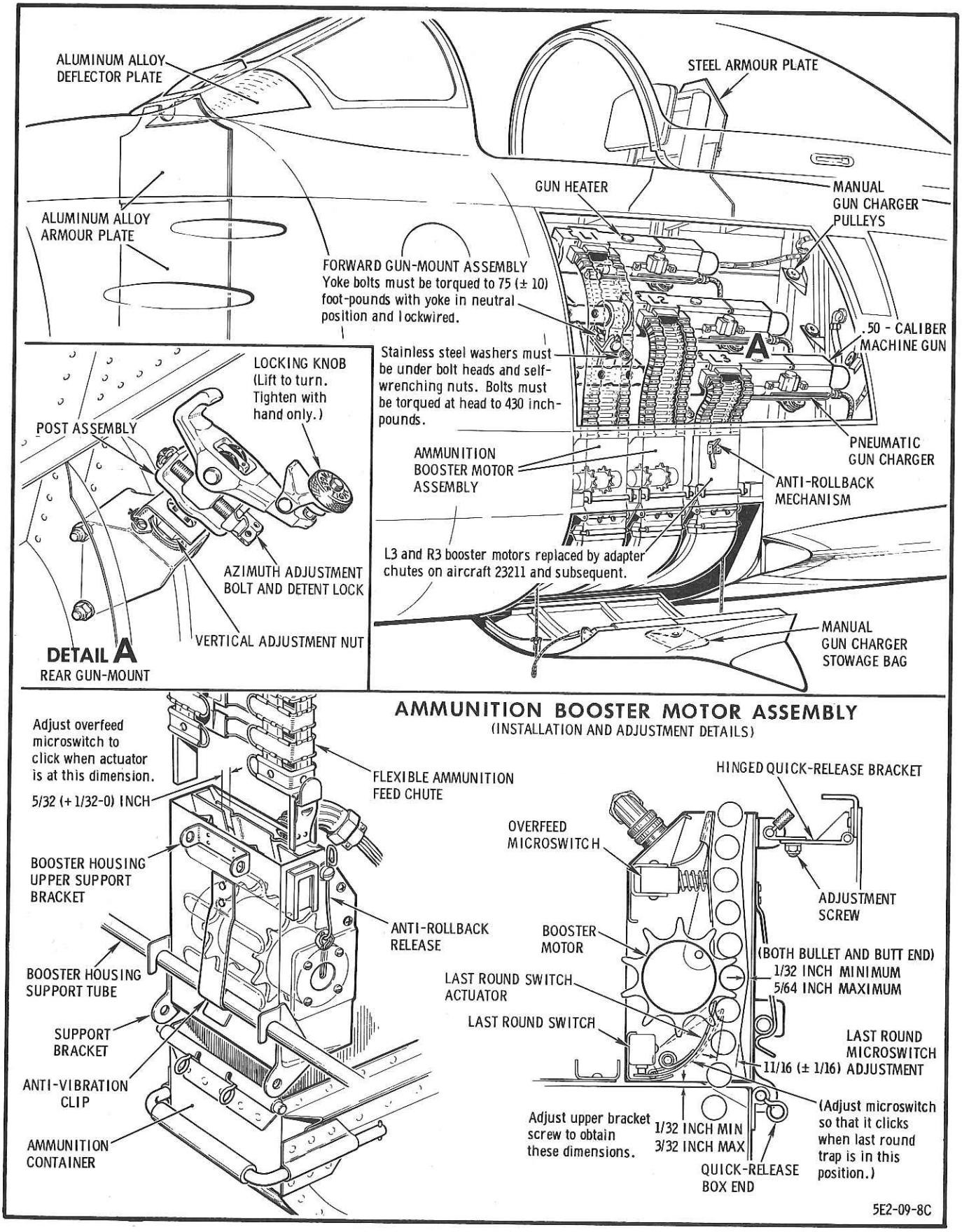


Figure 9-10 (Sheet 1 of 2) (M) Gun Installation Details

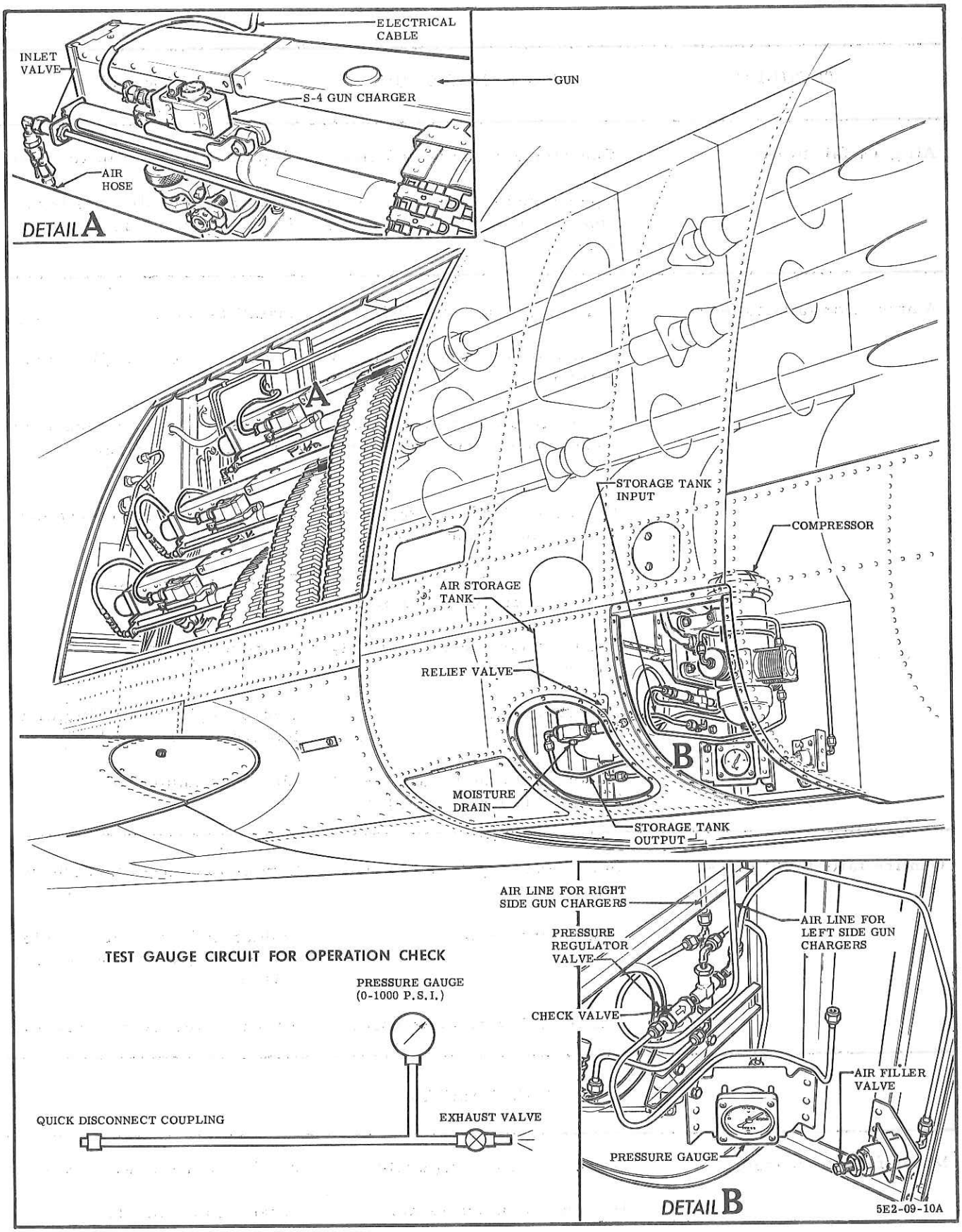


Figure 9-10 (Sheet 2 of 2) Gun Installation Details

TROUBLE	PROBABLE CAUSE	REMEDY
All guns fail to fire.	Gun firing relay is defective.	Repair or install replacement.
	Open circuit caused by loose connections or defective wiring.	Repair or install replacement for defective wiring.
Ammunition fails to feed.	Defective gun firing switch.	Install replacement stick grip.
	Ammunition boost relay is defective.	Repair or install replacement.
	Open circuit caused by loose connections or defective wiring.	Repair or install replacement for defective wiring.
	Damaged feed chute, preventing movement of belt.	Repair or install replacement chute.
	Ammunition container overloaded, causing belt to bind.	Remove part of ammunition.
	Feed chute not correctly attached to gun.	Correct attachment.
	Defective gun.	Install replacement (Refer to Paragraphs 9 and 10.)
	Faulty ammunition. (Split case, short round, etc.)	Check ammunition.
Gunfire fails to hit target.	Guns and sight not harmonized.	Harmonize. (See Figure 9-16.)
	Gun mounts loose.	Tighten and harmonize. (Refer to Paragraph 10. See Figure 9-16.)
	Gun barrel worn or warped.	Install replacement barrel.
	GUN CAMERA	
Motor fails to operate.	Defective gun firing switch.	Install replacement stick grip.
	Defective camera relay.	Install replacement.

(Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Motor fails to operate.	Camera circuit-breaker open.	Close.
	Motor brushes worn out.	Install replacement brushes.
	Open circuit.	Check wiring.
Motor runs but camera fails to operate.	Speed setting knob in neutral position.	Make sure speed setting knob is set on the desired speed. Set shutter speed knob to correspond with speed adjusting knob coupling. (Refer to Paragraph 37.)
Gear train stops. Clutch on motor slips.	Magazine jams, causing motor cut-out to open circuit.	Allow cut-out to cool. Install replacement magazine.
Magazine jams.	Magazine driving spline not properly engaged.	Install replacement magazine. Make sure magazine is inserted all the way into the camera. Move magazine so as to fully engage the spline. Make sure that the access cover closes easily without forcing.
	Damaged magazine.	Install replacement.
	Improper operation of film claw.	Using a gun camera GO-NO GO gauge, align guide rail at top of aperture plate so that film claw travels back and forth smoothly on even plane.
	Improper operation of magazine spline.	Make sure that the felt washer attached to the magazine driving spline is properly engaged between the clutch retract arm and the drive-shaft retaining spring. Install replacement magazine driving spline and/or clutch retract arm.

TROUBLE	PROBABLE CAUSE	REMEDY
Film image blurred (film moves, shutter opens).	Improper operation of film claw.	Using a gun camera GO-NO GO gauge, align guide rail at top of aperture plate so that film claw travels back and forth smoothly on even plane.
	Improper timing of shutter and film claw.	Time shutter and film claw.
Negative out of focus.	Lens assembly securing nuts loose.	Tighten the three nuts securing the lens.
	Dirty filter.	Clean. (Refer to Paragraph 29, following.)
Gun camera mount adapter cracking.	Overtightening of setscrew in bottom of adapter.	Install replacement adapter. Setscrew to be finger tight only. (Approximately 3 inch-pounds.)
	GUN HEATERS	
Gun heaters do not operate.	No power to heaters.	Check power source. (See Figure 9-11.)
	Open circuit caused by loose connection or defective wiring.	Install replacement or repair defective wiring. (See Figure 9-11.)

GUNNERY CONTROL SYSTEM

GENERAL

3 The gunnery control system is divided into the gun firing, gun heater, ammunition booster motor and gun camera circuits. On aircraft 23001 to 23210 inclusive, provision is made for heating the ammunition compartment. The gun heater, gun camera and ammunition booster circuits receive power from the secondary bus system. The gun firing and ammunition heat control circuits receive power from the primary bus system. Controls for the operation of the guns consist of the safety switch, marked GUNS-OFF-SIGHT-RADAR, mounted on the armament panel, the gun heater switch mounted on the armament panel, and the gun firing trigger switch mounted on the control stick. The radar and the gun-bomb-rocket sight controls, used in conjunction with the gun firing systems, are described in Sections 4, 5 and 6 following.

AMMUNITION BOOSTER MOTOR CIRCUIT

4M The ammunition booster motor assembly is shown in Figure 9-10 and the schematic wiring diagram in Figure 9-11. Once the booster motor circuit is energized, and provided ammunition is installed, the motor will run until compression of the ammunition belt within the chute causes an overfeed cut-out switch to open the circuit. As the gun fires,

the compression is alternately applied and removed, allowing the motor to run intermittently as the gun demands. When the ammunition is expended, the last-round switch, in the chute adjacent to the booster motor, shuts off the booster motor.

GUN HEATER CIRCUIT

5 The gun heater circuit is controlled by the heater switch on the armament pedestal switch panel. Movement of this switch to the HEATER position energizes the heater relay which routes power from the secondary bus to the heater on each gun.

AMMUNITION HEAT CONTROL CIRCUIT

6 For information
heating DELETED , section 1,

GUN FIRING AND CAMERA CIRCUITS

7 The gun firing and camera circuits are controlled by the gun safety switch mounted on the armament panel and the trigger switch installed on the control stick (see Figure 9-11). With the gun safety switch in the SIGHT-CAMERA-RADAR position, power is routed from the primary bus to operate the sight power relay which supplies power to the gun-bomb-rocket sight installation and to operate the radar equipment. Depressing the trigger switch to the first position supplies power from the primary bus to operate the film drive motor in the camera. A thermostatic heating element within the camera is energized by the secondary bus through the panel vibrator and GSAP camera circuit-breaker, located on the nose section circuit-breaker panel. The gunfire relay is not energized when the gun safety switch is in the SIGHT-CAMERA-RADAR position. With the gun safety switch in the GUNS position, power is routed from the primary bus to operate the sight power relay, which applies power to the sight installation and radar equipment. Pressing the trigger switch to the first position supplies power from the primary bus to operate the camera relay, starting the film drive motor. The second position of the trigger switch supplies power to energize the gunfire relay which supplies power from the primary bus to operate the gun charger electrical circuits. Guns and camera continue to operate as long as the trigger switch is held depressed.

GUNS AND ACCESSORIES

GENERAL

8 Each of the six .50-calibre machine guns is equipped with a gun heater and gun charger. A large door provides quick access to each bank of guns. A separate access door on each side of the fuselage is provided to remove and load ammunition containers (see Figure 9-10). Each gun is fed normally by 267 rounds of .50-calibre ammunition stowed in a removable container directly below the gun bay. Each ammunition container has a maximum capacity of 300 rounds. A booster motor assembly and flexible chuting boost the ammunition from the container to the gun.

CAUTION

A tail support or compensating ballast in the nose of the aircraft must be provided before removal of electronic equipment, guns or ammunition.

REMOVAL OF GUNS

9 To remove the guns proceed as follows:

(a) Remove gun heaters and gun chargers (refer to Paragraph 15, following).

(b) Open gun cover and remove ammunition feed link and ejection chutes.

(c) Loosen aft mount clamp by pulling out and turning locking knob.

(d) Pull out on forward mount pin while turning to overcome binding and lift guns from mounts. The blast tubes through which the gun barrels are inserted incorporate sufficient flexibility to permit the guns to be removed.

INSTALLATION OF GUNS

10 The guns must be cleaned, adjusted, serviced and checked for operation before installation, see Figure 9-10. The gun muzzles must be smooth and the forward barrel bearing

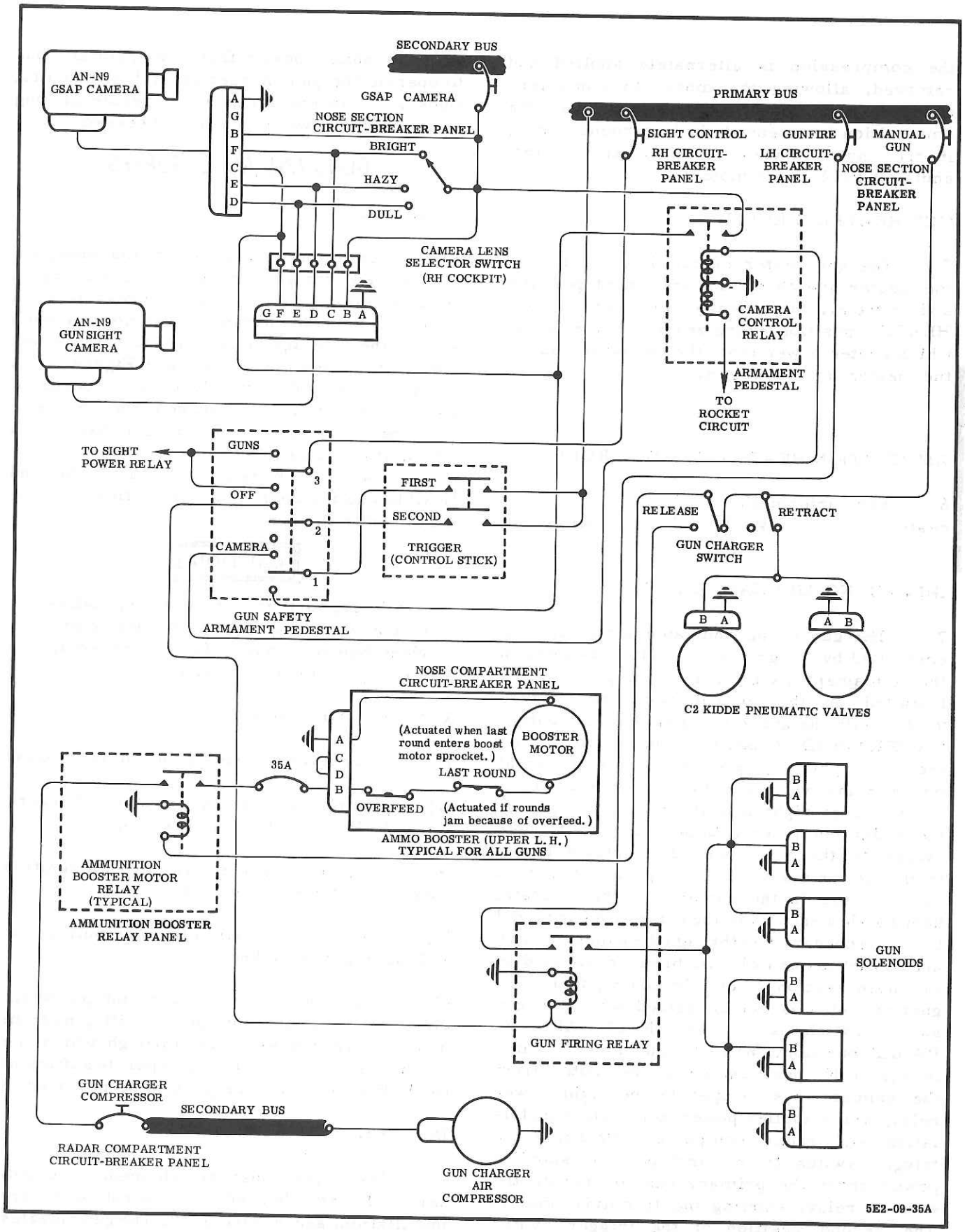


Figure 9-11 (M) Gun Firing System - Schematic

screws should be flush with the surface to prevent the locking of the gun muzzles to the blast tube snap ring seals. Proceed as follows:

(a) Insert gun barrel carefully into blast tube. Position gun in alignment for mounting. Forward mount will snap into engagement by the weight of the gun or with slight additional pressure. Pull on aft mount locking knob and turn finger tight. (See Figure 9-10.)

(b) Boresight guns if necessary. (Refer to Paragraph 43, following.)

(c) Install link ejection and feed chutes.

(d) Install gun heaters.

S-4 MANUAL GUN CHARGER

GENERAL

11 The manual gun charger system is an air-operated, manually-controlled unit. The charger holds to the rear when the gun is not being fired, thus preventing cook-offs, and allowing more effective barrel cooling. The charger is designed to cut off the air supply when the piston has reached the end of its stroke. This reduces the quantity of air required and increases the number of times the guns will charge before the compressor cuts in again.

NOTE

The gun charger switch must be placed in RELEASE before the guns can be fired and must be placed in RETRACT to hold the bolt in the retract position.

REMOVAL OF GUN CHARGER

12 To remove the gun charger unit, disconnect the electrical connector plug and the air pressure line from the gun charger. Pull the disconnect spider arm forward to release the gun charger from the gun. (See Figure 9-10.)

INSTALLATION OF GUN CHARGER

13 To install the gun charger, place in mounting position next to the gun (see Figure 9-10). Pull the disconnect spider arm forward and position the gun charger so that the wedge bolt engages in its mount. Release the disconnect spider. Install the air pressure hose and connect the electrical plug to the automatic gun charger.

WARNING

In order to avoid fouling the aileron bell-crank, the hose for the top left gun charger should be routed from the manifold block, under the rear mount on the No.2 left gun, behind the No.2 gun (i.e., inboard of the gun), to the quick-disconnect on the No.1 gun charger which, on this gun only, should be adjusted to point inboard rather than outboard.

AUTOMATIC GUN CHARGER AIR COMPRESSOR AND STORAGE TANK

14 The air compressor and storage tank are located on the right side just forward of, and below, the guns. The compressor consists of a motor-driven three-stage pump and an associated storage tank. A water drain is provided on the bottom of the tank to allow accumulated moisture to be removed. The pump maintains a pressure of 1500 (±25) psi in the storage tank for operation of the gun charger. A relief valve is incorporated in the system to relieve tank pressure if it becomes too high due to altitude changes. The storage tank must be charged on the ground from an external high-pressure source connected to the filler valve.

NOTE

The air compressor should not be used, under any circumstances, to build up the system from ambient atmospheric pressure to the required operating pressure. The function of the air compressor is to build up pressure to compensate for pressure losses due to gun charger operation.

REMOVAL OF AIR COMPRESSOR AND STORAGE TANK

15 To remove the air compressor and storage tank, proceed as follows:

(a) The following interconnecting air lines must be disconnected:

CAUTION

Before disconnecting charger lines, bleed air pressure by removing screw from bottom of air bottle drain and turning hexagonal drain nut 1/4 turn.

(1) The air lines interconnecting the compressor and storage tank.

(2) The air line which supplies the pressurized air to the automatic gun chargers.

(3) The air line from the compressor which terminates at the four-way junction.

(b) After removing these air lines, disconnect the electrical connector plug from the compressor.

(c) The compressor can be released by removing the four mounting bolts.

(d) To remove the storage tank, loosen the wing-screws on the two mounting straps.

INSTALLATION OF AIR COMPRESSOR AND STORAGE TANK

16 To install the air compressor, hold in mounting position next to the mount and insert the four mounting bolts as shown in Figure 9-10. Secure the mounting bolts. To install the storage tank, position within the mounting straps and tighten the wing-screws to secure. Connect the air lines to the compressor and storage tank and electrical connector to the compressor.

GUN CHARGER SYSTEM LEAKAGE TEST

17 To test the system for leakage, proceed as follows:

CAUTION

Every precaution must be taken to avoid accidents when this high-pressure air system is charged or being used.

(a) Disconnect hoses from gun chargers.

(b) Disconnect pressure line at air compressor.

(c) Connect air supply to filler valve (see Figure 9-10.)

(d) On aircraft 23491 and subsequent, open C2 control valves.

(e) Open supply valve on test stand slowly until gauge in aircraft reads 1500 psi.

CAUTION

Ensure that pressure in system does not exceed 2000 psi, otherwise the pressure gauge will be damaged.

(f) Check all fittings and units for leakage with soap solution consisting of 10 parts water to 1 part Turco fluid, LAC598. Check especially at the pressure line disconnected from air compressor. If there is leakage in this line, install replacement check valve.

(g) Check the C2 control valves in open and closed positions. Leave in closed position for remainder of test.

(h) Close supply valve and leave system pressurized for 1 hour. There must be no appreciable drop registered on aircraft gauge during this period.

(j) Reduce pressure in system to 0 psi. Reconnect lines at air compressor and to gunchargers. Disconnect air supply to filler valve. Remove all traces of soap solution.

GUN CHARGER SYSTEM OPERATION CHECK

18 To check operation of system, proceed as follows:

(a) Disconnect hoses from gun chargers.

(b) Connect air supply to filler valve.

(c) Tee a test gauge (0 to 3000 psi) into system between regulator and storage tank.

(d) Connect 1 gun charger hose to a line incorporating a pressure gauge (0 to 1000 psi) and exhaust valve (see Figure 9-10).

(e) On aircraft 23491 and subsequent, open C2 control valves.

(f) Build up pressure in system from test stand to 1500 psi. Check that pressure at gun charger is between 600 and 800 psi. Check at manifold for leaks.

(g) Vary supply pressure between 950 and 1500 psi and note that gun charger pressure on test gauge remains between 600 and 800 psi.

(h) Increase system pressure above 1500 psi and note when system relief valve operates. Valve should start to relieve at 1750 (±100) psi.

(j) Open exhaust valve at gun charger slowly to provide a bleed-off. Pressure should remain between 600 and 800 psi until system pressure drops below 925 psi.

(k) Recharge system to 1600 (±50) psi, then tighten 5/8 hexagon nut on filler valve.

(m) Disconnect test stand. Disconnect test gauge at gun charger and recouple lines to chargers. See that filler valve is not leaking. On aircraft 23491 and subsequent, close C2 control valve.

AMMUNITION BOOSTER MOTOR ASSEMBLY

19 The .50-calibre booster motor assemblies, consisting of an ammunition booster motor and switches mounted in a housing and installed directly above each ammunition container, assist the guns in lifting ammunition from the containers (see Figure 9-10). On aircraft 23211 and subsequent, no booster assemblies are provided for the lower left and right guns. On aircraft 23611 and subsequent, an anti-rollback mechanism is installed on the ammunition feed chute adapter assembly for the lower right and left guns. This prevents ammunition from sliding back into the ammunition box during loading. On each of the other four guns, the booster motor drives a double sprocket which engages the cartridges. The booster is also equipped with an anti-rollback device to prevent ammunition from creeping backwards. In case of a jam between the booster and the gun, a lift of approximately 1/4 pound (effecting a total travel of no more than 1/4 inch) must be exerted on the wire at the top forward face of the housing to release anti-rollback mechanism before ammunition can be pulled back through the sprockets. Lifting this lever does not cause the booster motor to free-wheel. A 30 to 35-pound pull is required on the ammunition to overcome the force of rotating the 120 to 1 gear ratio between the sprocket and booster motor. Refer to Paragraph 4, preceding, for information regarding the booster motor electrical circuit.

NOTE

In aircraft operating without booster motors in the lower gun positions, the gun feed mechanism pull is critical and excessive loads will reduce the speed of operation of the lower guns. Some reduction is acceptable, however, for maximum firing efficiency of lower guns, it is necessary to ensure that guns meet the required pull tests and that ammunition containers, feed chutes and link ejection chutes do not cause excessive friction. The following is the sequence of operations:

(a) Ammunition containers, feed chutes and link ejection chutes are to be checked for excessive friction.

(b) Aircraft 23211 to 23245 inclusive, must be checked to ensure that the sides of the bottom adapter 191-61110 are flared to prevent possible jamming of the cartridges. Adapters not flared are to be reworked as illustrated in Figure 9-12.

REMOVAL OF AMMUNITION BOOSTER MOTOR ASSEMBLY

20 Remove ammunition booster assembly as follows:

(a) Open gun compartment door.

(b) Disconnect ammunition feed chute.

(c) Disconnect electrical connector from booster motor.

(d) Open ammunition compartment door. Disengage latch connecting booster motor to ammunition container and lift ammunition booster motor from the aircraft.

INSTALLATION OF AMMUNITION BOOSTER MOTOR ASSEMBLY

21 Before installing the ammunition booster motor assembly, inspect the booster housing for distortion or similar damage. Make sure all parts operate freely and are adjusted properly (see Figure 9-10). Determine that the wiring has no abrasions, kinks or loose connections. The anti-rollback release lever wire should be straight and must operate freely in its guides. Install each ammunition booster motor as follows:

(a) Open gun bay and ammunition compartment doors.

(b) Position ammunition booster motor so that support hooks engage on a support rod and then engage upper latch with holes in flange at top of booster motor.

(c) Engage latch on ammunition container with holes in flange on booster motor.

(d) Secure electrical connector to booster motor.

GUN BLAST PANELS

22 Open-port gun blast panels are installed. Expendable rubber plugs are provided for insertion into the port openings to provide a seal against the entrance of dirt and water into the blast tubes. These plugs are blown free when the guns are fired.

REMOVAL OF GUN BLAST PANELS

23 Removal of the gun blast panels is accomplished as follows:

(a) Remove radar compartment access door.

(b) Disconnect clamps that secure the blast tubes to the blast panels at the two lower guns. The upper blast tube is not clamped to the blast panel. (See Figure 9-13.)

(c) Removal panel mounting screw.

(d) Slide panel forward and out to permit disengagement of the blast tubes from the blast panel.

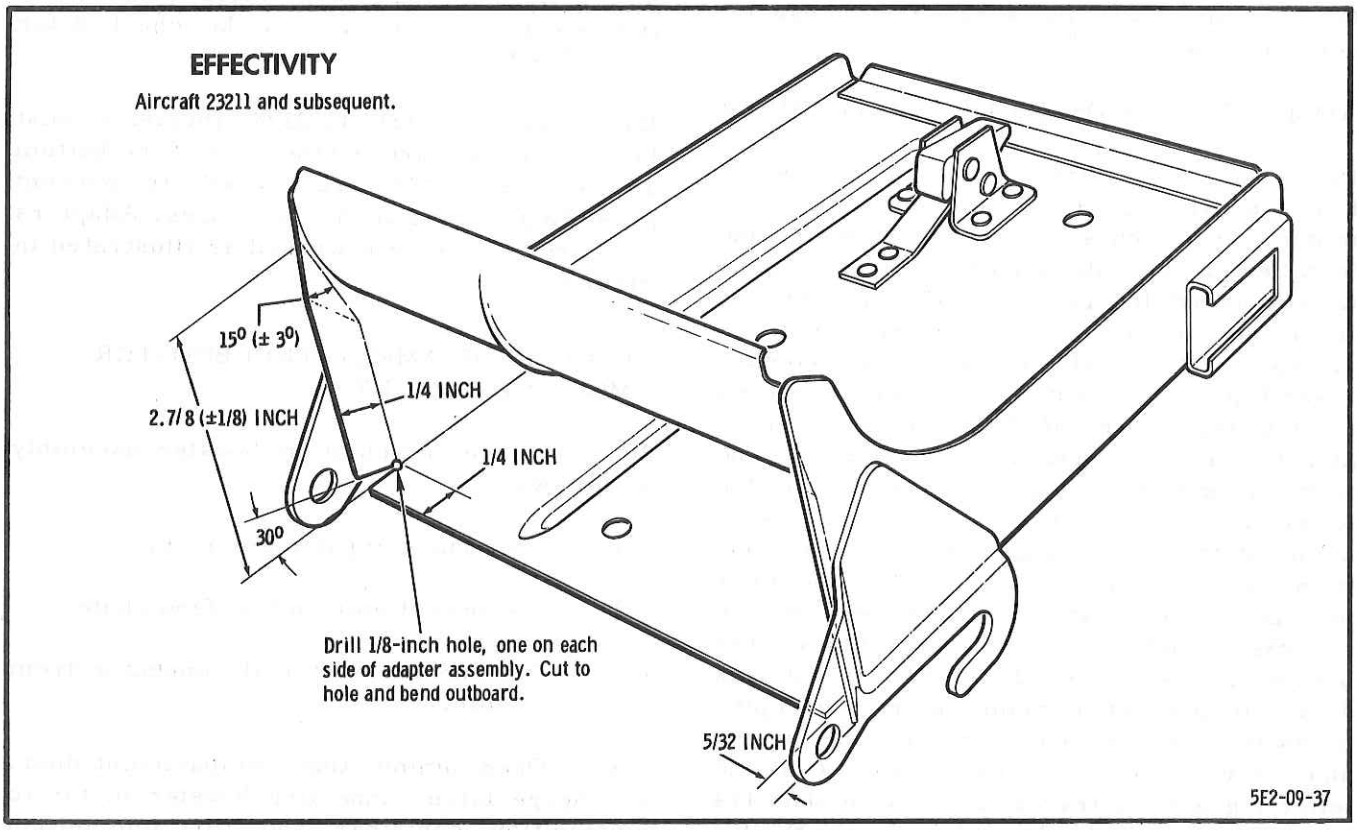


Figure 9-12 Lower Gun Adapter

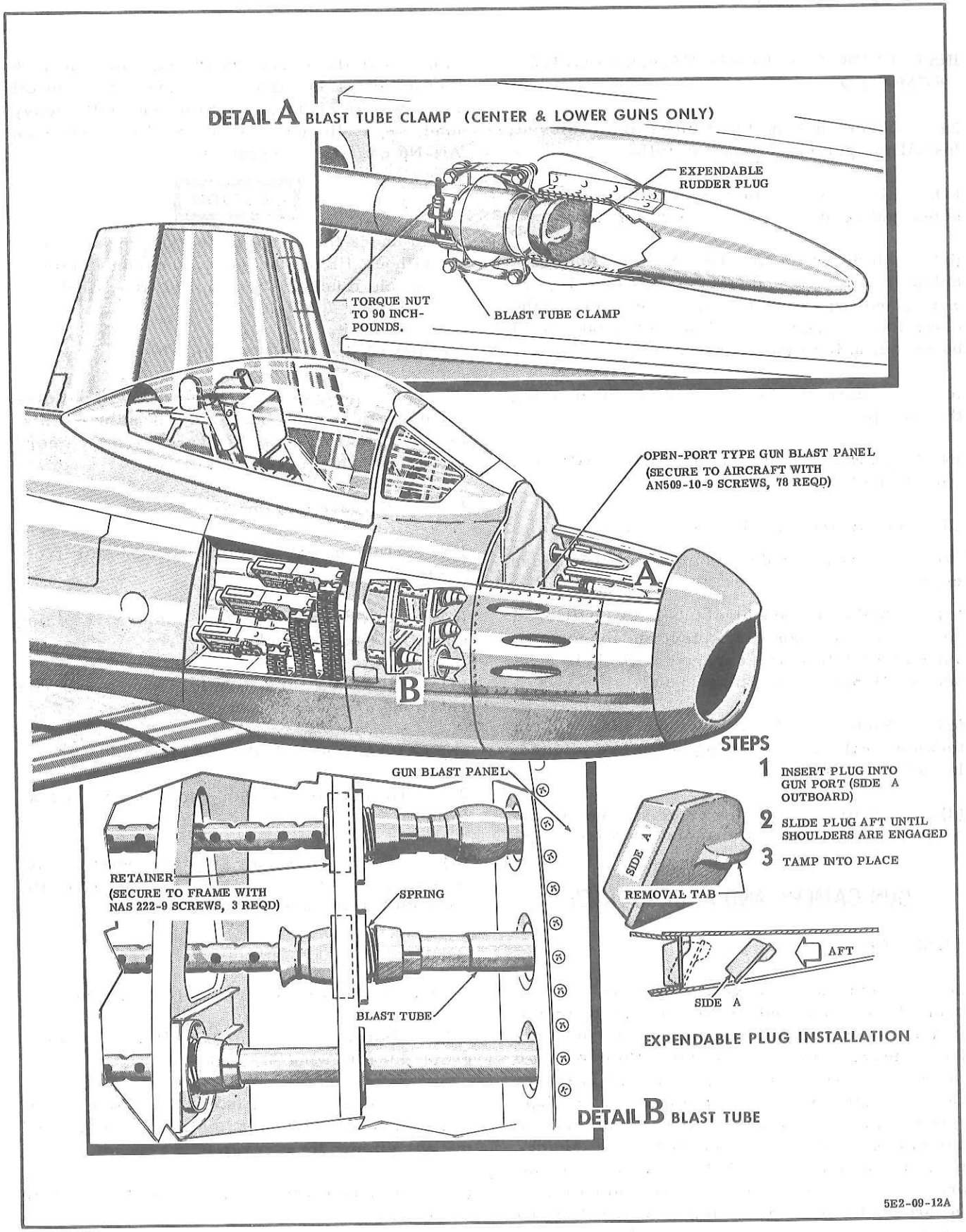


Figure 9-13 Gun Blast Panels

INSTALLING GUN BLAST PANELS - GUNS REMOVED

24 Check that the blast tubes are removed. Install the gun blast panel as follows:

(a) Lift blast panel into alignment with holes and secure with mounting screws.

(b) Slide the blast tubes through applicable holes in forward end of gun bay (see Figure 9-13), and engage with respective flange on the blast door. Secure aft end of each blast tube of bulkhead, using three screws.

(c) Secure the two lower blast tubes using the clamps provided.

INSTALLING GUN BLAST PANELS - GUNS INSTALLED

25 Install the gun blast panels as follows:

(a) Remove radar compartment access door.

(b) Make sure the blast tubes are positioned correctly. Lift panel into place and manoeuvre until blast tubes are engaged with their respective flanges on the blast panel.

(c) Slide panel aft against tube spring tension until panel mounting holes are aligned. Install mounting screws.

(d) Secure the two lower blast tubes to the blast panel, using clamps provided (see Figure 9-13).

GUN CAMERA AND ACCESSORIES

GENERAL

26 A gun camera, with a built-in overrun control, is installed on an adjustable mount in the lower forward portion of the fuselage (see Figure 9-14). On aircraft 23001 to 23370 inclusive, a Type AN-N6 gun camera is fitted. On aircraft 23371 and subsequent, a Type AN-N9 camera is installed. The gun camera and adjustable mount are secured to a shock-resisting mounting bracket. The camera mount provides azimuth and elevation adjustment. In order to prevent damage to the camera mechanism in the event of a film jam, a spring clutch is incorporated between the camera motor and the change gear train assembly. A motor cutout is also in the circuit to cut off the power in event of a jam or unusually heavy load. A radio noise filter is fitted when an AN-N6 camera is installed.

CAUTION

To check the operation of the gun camera without firing the guns, the gun safety switch must be positioned to SIGHT-CAMERA-RADAR.

REMOVAL OF GUN CAMERA

27 To remove the gun camera without disturbing elevation and azimuth adjustments, ensure that the glass forward of the camera is clean, then proceed as follows:

(a) Remove camera access cover.

(b) Disconnect electrical connector from camera.

(c) Cut lockwire from camera retaining screw and loosen lock-nut.

(d) Hold camera firmly, loosen camera retaining screw, and remove camera.

INSTALLATION OF GUN CAMERA

28 To install the gun camera proceed as follows:

(a) Position camera so that mounting plate is engaged with the mount in the aircraft. Tighten retaining screw and lock-nut.

NOTE

Tighten retaining screw only finger tight.

(b) Boresight the camera. (Refer to Paragraph 48, following.)

(c) Lockwire the camera retaining screw and lock-nut, the two adjustment screws and the adjustment lock-screw.

(d) Connect electrical connector plug to camera.

(e) Install camera access cover.

CLEANING OF GUN CAMERA

29 The lens and filter should be cleaned with a soft brush or with a special cleaning tissue. If neither brush nor tissue is available, use a soft lint-free cloth. Do not allow dust or finger marks to remain on the exposed surface of the filter or lens.

CAUTION

Do not use any liquid to clean lens, as liquid will seep through to the lens elements.

30 Remove dust from inside camera case and from the mechanism with dry air. Use a clean, soft lint-free cloth for dusting surfaces that can be easily reached and for removing particles or dust-contaminated lubricant. If necessary, moisten this cloth with solvent, Specification 3-GP-8 (latest issue), or equivalent.

GUN CAMERA HEATER

31 A heater resistor and a heater cut-out are provided within the camera. The heater cut-out closes at 7.2°C (45°F), turning the heater on, and opens at 32.2°C (90°F), turning the heater off.

GUN CAMERA LENS

32 The camera lens (see Figure 9-14) is 35mm in focal length, with a maximum aperture of f/3.5. Two lens adjustments are necessary, one for the camera speed of 16, 32 or 64 frames per second, and one for light conditions of B bright, H hazy, and D dull or f/3.5 (maximum opening for adverse light conditions). These lens adjustment are made by means of two knurled adjustment rings. The outer ring must be rotated first to position the desired camera speed figure opposite the fixed index mark. The inner knurled ring is then rotated to position the index mark opposite the desired light condition. The Type AN-N9 camera has an electrically-operated remote shutter control in addition to the manual controls.

NOTE

The camera lens is calibrated to compensate for the reduced light that results when using a filter. If filter is not used, diaphragm opening should be decreased one f number. For example, if f/11 is required with filter installed, use f/16 if the filter is removed.

SETTING GUN CAMERA LENS

33 The camera speed normally used is 16 frames per second. If it is desirable to photograph in slow motion, either 32 or 64 frames per second should be selected. If the camera is operating twice (32) or four (64) times as fast, the aperture must be increased in size in order to give each frame of film the same amount of light as would be available when operating a 16 frames per second. This is accomplished by setting the outer adjustment ring of the lens at the speed at which the camera is to operate and then setting the inner ring for the existing light condition. This will be clearly understood by opening the shutter and observing the size of the aperture at various combinations of lens adjustments. Compare the difference in the size of the aperture with the lens set at 64-H. The following aperture sizes correspond to the light classification of the different shutter speeds on the 35mm f/3.5 lens.

SHUTTER SPEED	BRIGHT	HAZY	DULL
64	f/8	f/5.6	f/3.5
32	f/11	f/8	f/5.6
16	f/16	f/11	f/8

GUN CAMERA SPEED CONTROL

34 The camera operates at any one of three speeds 16, 32 or 64 frames per second. The motor operates at a constant speed, the various camera speeds being achieved by changing the gear ratios by means of the speed control knobs until the index mark for the desired speed figure on the dial is opposite the fixed index mark on the camera case.

CAUTION

Do not change speed while the camera is in motion. Camera will not operate if speed control knob is set at an intermediate position between speed settings. Whatever speed is selected, make sure diaphragm guide on lens is set to the same speed.

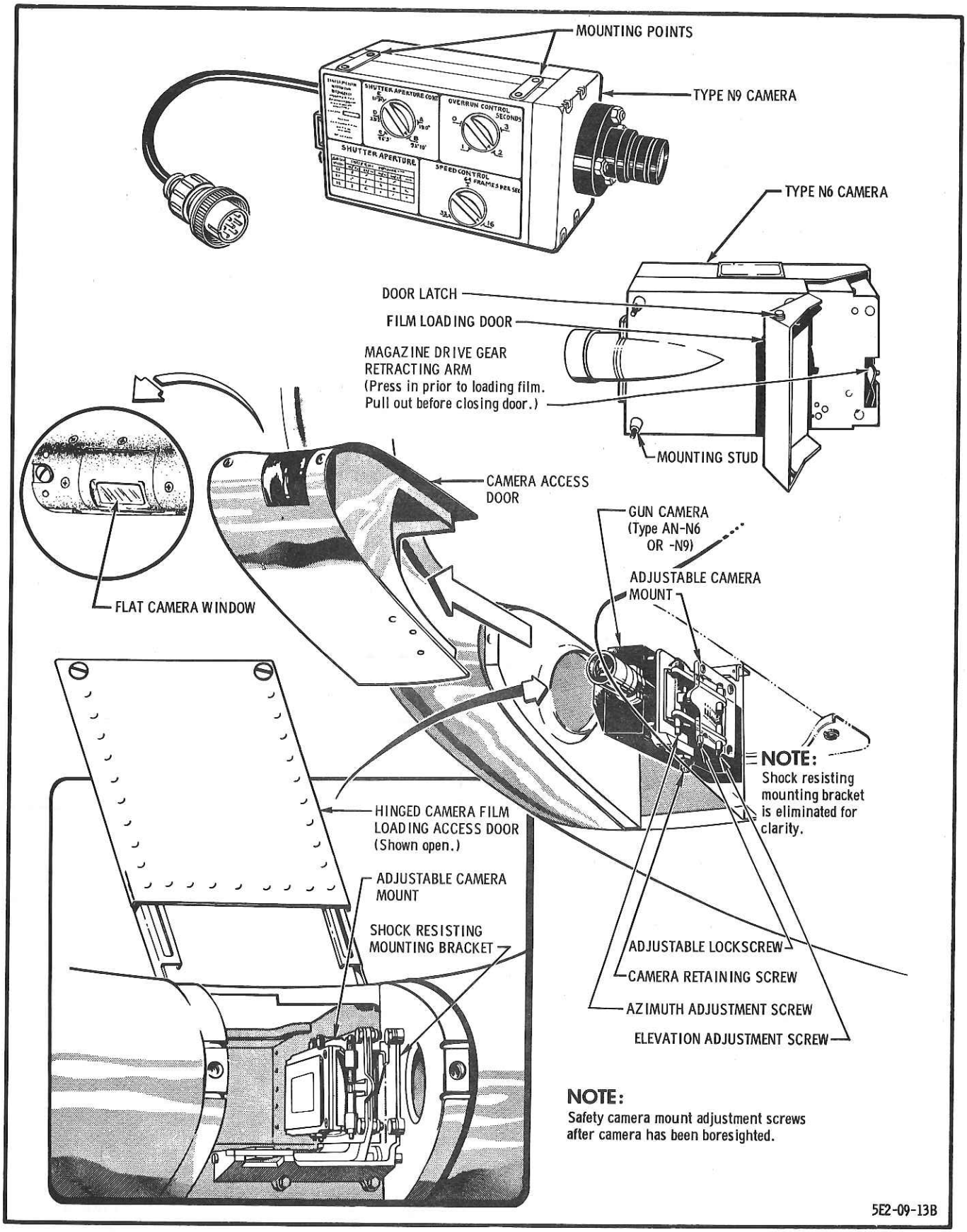


Figure 9-14 (Sheet 1 of 2) Gun Camera Installation Details

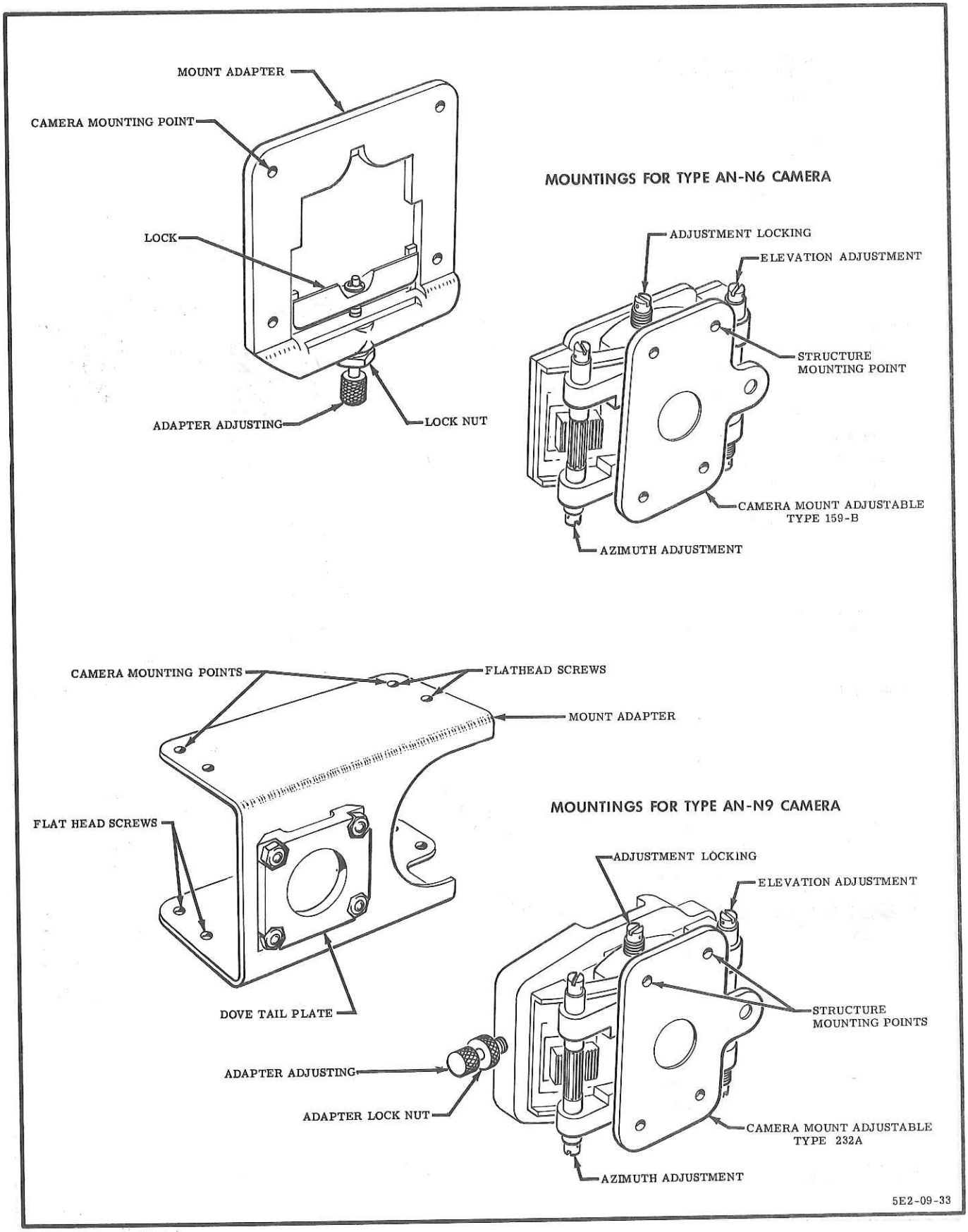


Figure 9-14 (Sheet 2 of 2) Gun Camera Installation Details

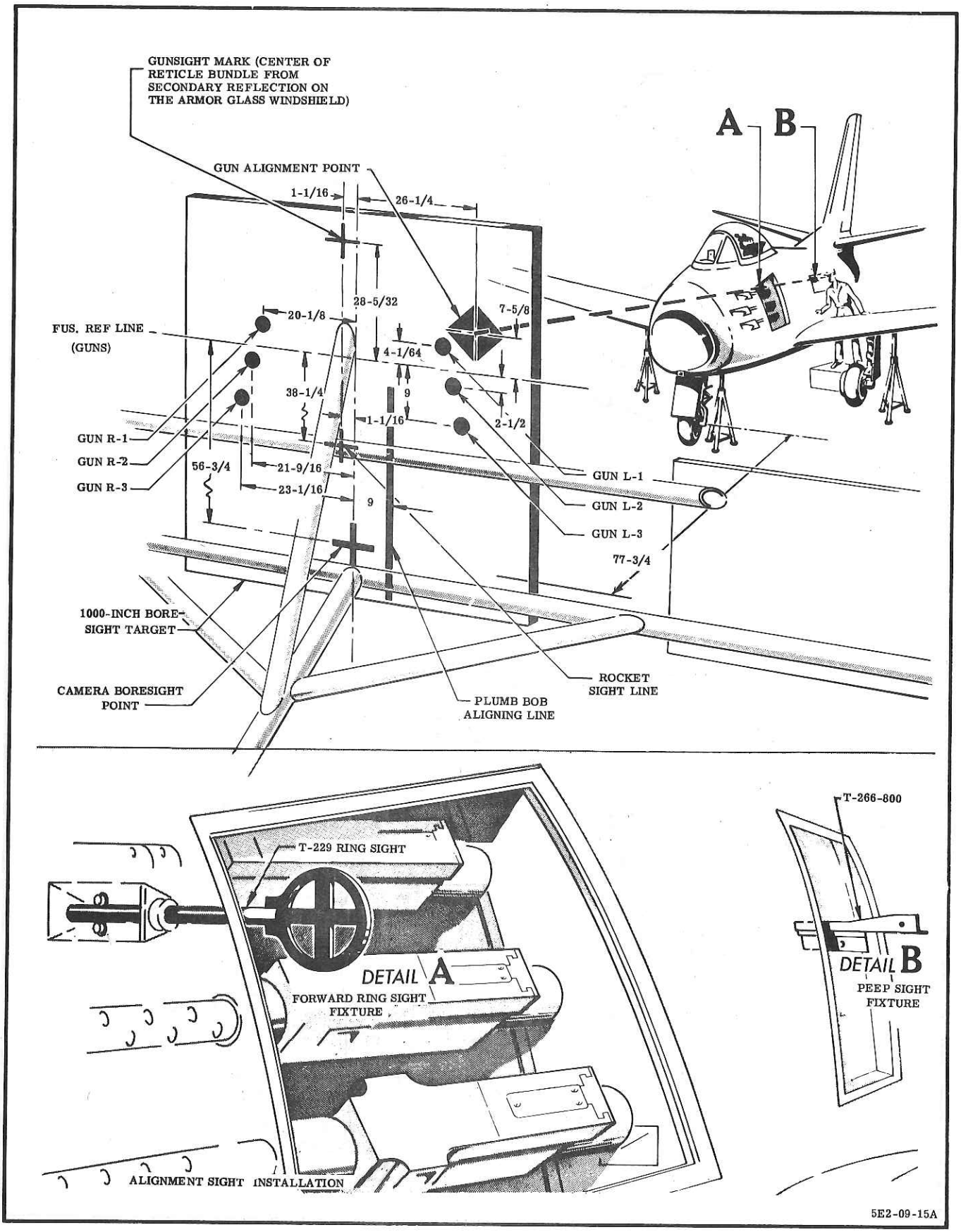


Figure 9-15 Boresighting Target Board

35 For all normal photography, use speed of 16 frames per second. For semi-slow motion, use 32 frames per second. For slow motion, use 64 frames per second.

GUN CAMERA FOOTAGE INDICATOR

36 The footage dial on the gun camera is external. The dial on the film magazine is not used. When the loaded camera contains a full film magazine, turn the footage indicator knob (see Figure 9-14), until the footage dial, just below, indicates 9. If the film magazine is partially used, set the indicator to correspond with the figure on the magazine footage indicator dial. During the film run, the dial will indicate the amount of film still remaining unexposed. The footage indicator is set by pushing in and turning the footage indicator knob.

GUN CAMERA OVERRUN CONTROL

37 The camera has an overrun control which can be set to operate the camera for one to five seconds after the camera switch has been released. It is also possible to render the overrun feature inoperative. Whenever the camera is operating on overrun, a pointer is released into the film aperture, thus being visible on the film when it is projected.

SETTING GUN CAMERA OVERRUN CONTROL

38 Set the gun camera overrun control as follows:

(a) Raise the side of the cover opposite the cable socket to avoid damaging the socket opening. Remove the top cover. (See Figure 9-14.)

(b) Loosen stop retainer stud and lock-screw and rotate the adjustable stop so that the index line for the desired time of overrun is set against the line on the index plate. Setting the stop on the index line zero will eliminate the overrun period. Tighten the stop retainer stud and lock-screw, after dipping threads in orange shellac.

NOTE

Do not disturb the overrun setting.

(c) Install the camera top cover by placing the socket opening over the socket and then carefully pressing down the opposite side of the cover until it is fully seated. Secure cover.

ALIGNING BORESIGHTING TARGET BOARD

GENERAL

39 Align the boresighting target board as follows: (See Figure 9-15.)

(a) Support the aircraft on jacks or floor stand. Level by means of a spirit-level placed across the levelling lugs in the nose wheel well.

(b) Position target board at a distance of 1000 inches from the mean front trunnion centre-line of the guns (see Figure 9-15).

(c) Screw the ring sight fixture (T229) into socket at forward end of the left gun bay.

[1](d) Place ring sight in upright position.

(e) Attach aft peep sight fixutre (T226).

(f) Position target board so that the vertical and horizontal angle between the extension of the fuselage reference line and the plane of the target will be 90° (±10°) when sighting through the peep sight and the ring sight.

(g) Suspend plumb-bobs from the plumb-bob points on the bottom of the fuselage as shown in Figure 9-16.

(h) Sight through these points to the plumb-bob alignment on the target. The target should be aligned laterally with the centre-line of the fuselage.

(j) Measure the distance to ground from the fuselage reference line marker.

(k) Raise or lower the target board until the reference line on the target board is a similar distance from the ground. The aligning sight should harmonize with the aligning sight mark on the target. Cross of ring sight, as seen through the rear peep sight, should appear to be superimposed upon the white

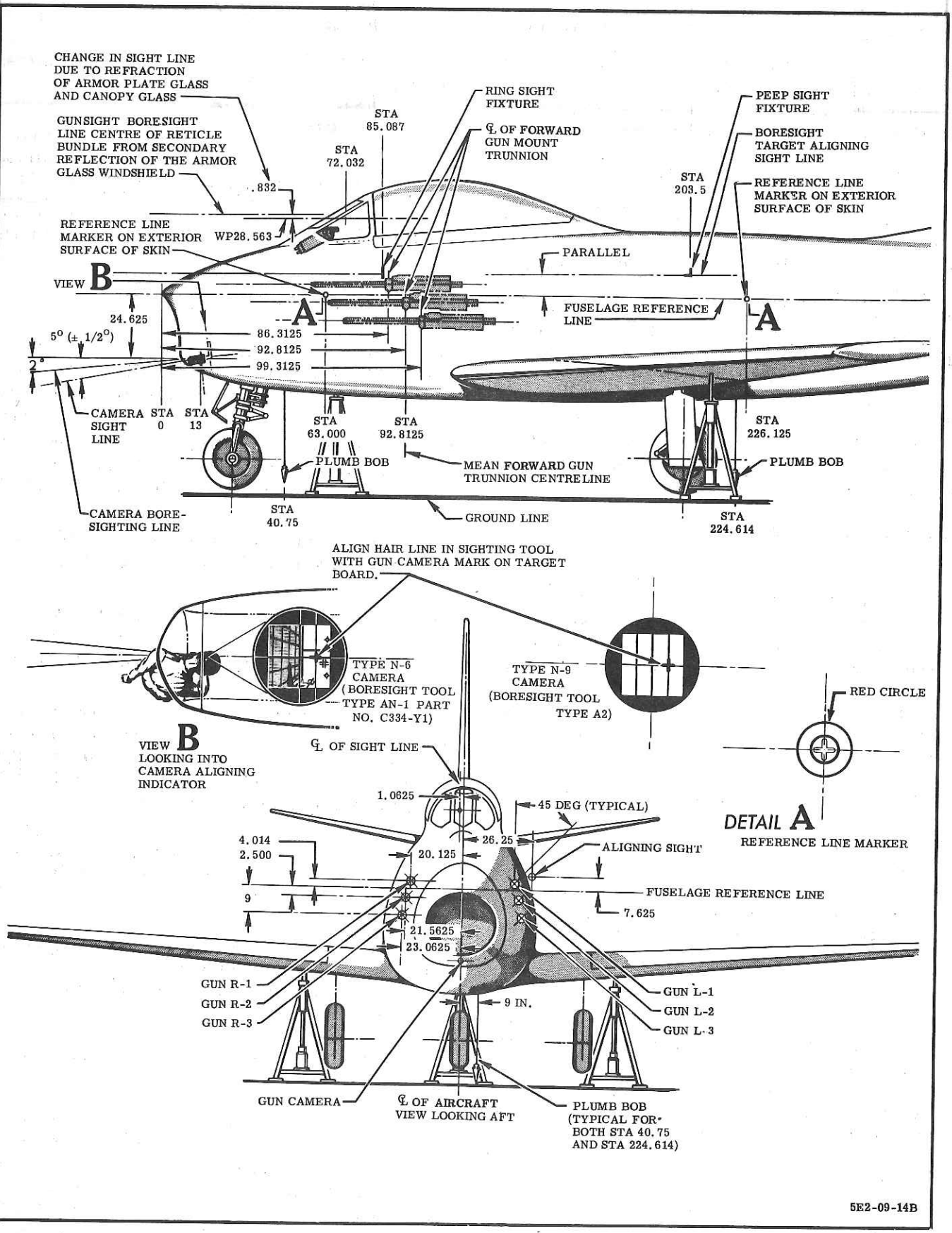


Figure 9-16 Harmonizing Guns, Sight and Camera

cross of the alignment pattern of the target so that the black cross of the ring sight has a white border of equal width all round.

NOTE

The above is only a rough check which can be made on level ground. For accurate alignment, the setting should be accomplished with the aid of a transit.

BORESIGHTING

GENERAL

40 Each gun is provided with a 1/4° adjustment in azimuth and elevation. Boresighting adjustments are provided at the aft mount only. Movement of the adjustment screws is prevented by detent springs.

BORESIGHTING GUNS

41 First position boresighting target as described in Paragraph 42, preceding. Using a breech-type boresight tool, align the guns with their respective marks on the target board as follows:

(a) Insert boresighting tool in the gun.

(b) Sight down the gun barrel and move the gun to its limits as indicated by semi-circles on the target board. Check that no part of the aircraft comes into view.

(c) In each of the limit positions, as indicated by the semi-circles, insert bore mandrel into gun barrel and check that it does not touch any part of the aircraft.

(d) Check that the gun and gun accessories (ammunition chute, ejection chute, solenoid wiring, etc.) are free and correctly positioned and do not bind in the intermediate and extreme positions.

(e) Align the gun with its respective mark on the target board.

NOTE

Differences between individual guns make a new alignment mandatory each time a replacement gun is installed. When removing guns for reasons other than replacement, serial numbers of guns and their positions in a particular aircraft should be noted. This will allow guns to be removed and subsequently installed in the same positions without boresighting.

(f) Upon completion of the gun boresighting operation, the following check should be made to ensure that blast panels are properly positioned and that sufficient clearances exist between the gun ports and gun barrels to prevent the bullet from striking the gun port.

(1) Insert in the barrel of each gun, in turn a .50-inch steel rod, approximately thirty-six inches in length and straight within a tolerance of 1/64 inch, chamfered at both ends at 45° for a distance of 1/16 inch.

(2) Slide a spool (fabricated from hardwood or metal to the length of 0.75 inch and an external diameter of 1.50 inch for the two upper, and of 1.75 inch for the four lower guns, the internal diameter being 0.50 inch within a close positive tolerance) along the rod until it reaches the coupling between the gun port and the blast tube. Note that at this point there is a constriction in the blast tube which prevents the spool from being pushed further. Throughout the gun port, the spool should slide along the rod smoothly without forcing. No binding between the gun port and the spool should occur and the rod should not be deflected during the check.

(3) If force has to be applied to slide the spool along the rod, investigate the installation and replace parts found defective.

NOTE

Make sure the spool is correct for the gun port being checked. Do not try to force the spool through the constriction in the blast tube.

BORESIGHTING GUN CAMERA

42 Access to the camera and mount is obtained by removing an access cover at the lower leading edge of the fuselage (see Figure 9-14). The forward camera mount adjustment screw provides the elevation adjustment, the

ROCKET FIRING FLIGHT CONFIGURATION

A GROSS WEIGHT, 14,560 POUNDS, INCLUDES THE FOLLOWING:
1. NORMAL CREW, OIL, AND FULL AMMUNITION.
2. 1/2 FUEL LOAD
3. 1/2 ROCKET LOAD

B ALTITUDE = 3250 FEET

C SPEED - 85% V MAX WITH DRAG OF 1/2 ROCKET LOAD: 429 KNOTS TAS

D AVERAGE ANGLE OF ATTACK FOR ABOVE CONDITIONS +1 DEGREE

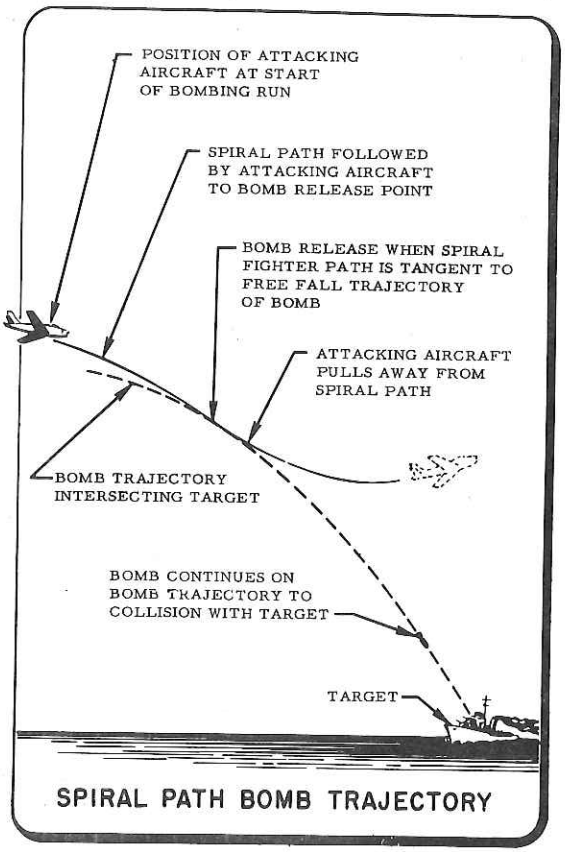
BORESIGHTING CONFIGURATION

A GUNS ARE BORESIGHTED PARALLEL TO FUSELAGE REFERENCE LINE AND CENTER-LINE.

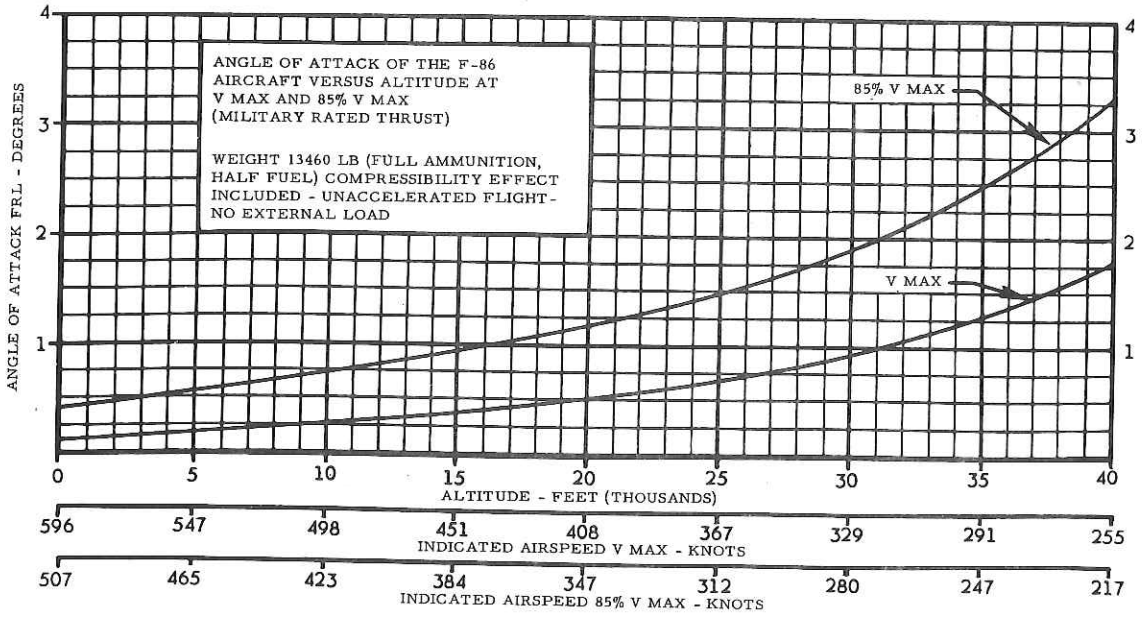
B GUN SIGHT LINE BORESIGHTED DOWN TO INTERSECT THE MEAN GUN BORE AT 750 YARDS FOR GUN FIRING.

C GUN SIGHT LINE DEPRESSED 3° 53' FROM FUSELAGE REFERENCE LINE FOR ROCKET FIRING. THIS CONDITION IS ACCOMPLISHED BY SETTING THE ROCKET DIVE ANGLE CONTROL TO 5 HVAR N AND ADJUSTING THE CAM FOLLOWER (INSIDE THE ROCKET SETTING UNIT) TO GIVE A LINE OF SIGHT OF 69 MILS BELOW THE FUSELAGE REFERENCE LINE.

D GUN SIGHT COMPUTER INSTALLED LEVEL TO FUSELAGE REFERENCE LINE.



SPIRAL PATH BOMB TRAJECTORY



5E2-09-16A

Figure 9-17 Boresighting Configuration

aft adjustment screw provides the azimuth adjustment and the middle screw locks both adjustments. To boresight the gun camera proceed as follows:

(a) Insert gun camera boresighting tool in the camera.

NOTE

Align camera so that it boresights correctly with the leading edge access cover in place.

(b) Type N-6 camera: Adjust the camera so that the intersecting lines of the boresight cross (sighting point) on target board appear midway between the horizontal line and the upper extremity of the vertical line in the boresight tool (see Figure 9-16).

(c) Type N-9 camera: Adjust the camera so that the intersecting lines of the boresight cross (sighting point) on target board coincide with the intersection of the vertical line and the top line of the three horizontal sighting lines in the boresight tool (see Figure 9-16).

(d) Lock and lockwire screws after camera is adjusted. Check that the camera does not foul or rotate.

BORESIGHTING CONFIGURATION

43 For information on boresighting configuration, see Figure 9-17.

GUNSIGHT CAMERA SYSTEM

44 A gunsight camera is mounted on the sight head to provide a film record of the sight reticle and target during operation of the sight system with the selector unit in gun and bomb positions. (See Figure 9-18.) The sight reticle camera is electrically connected in parallel with the normal gun camera system. Both cameras operate simultaneously when the gun safety switch is correctly positioned and the control stick trigger is pressed.

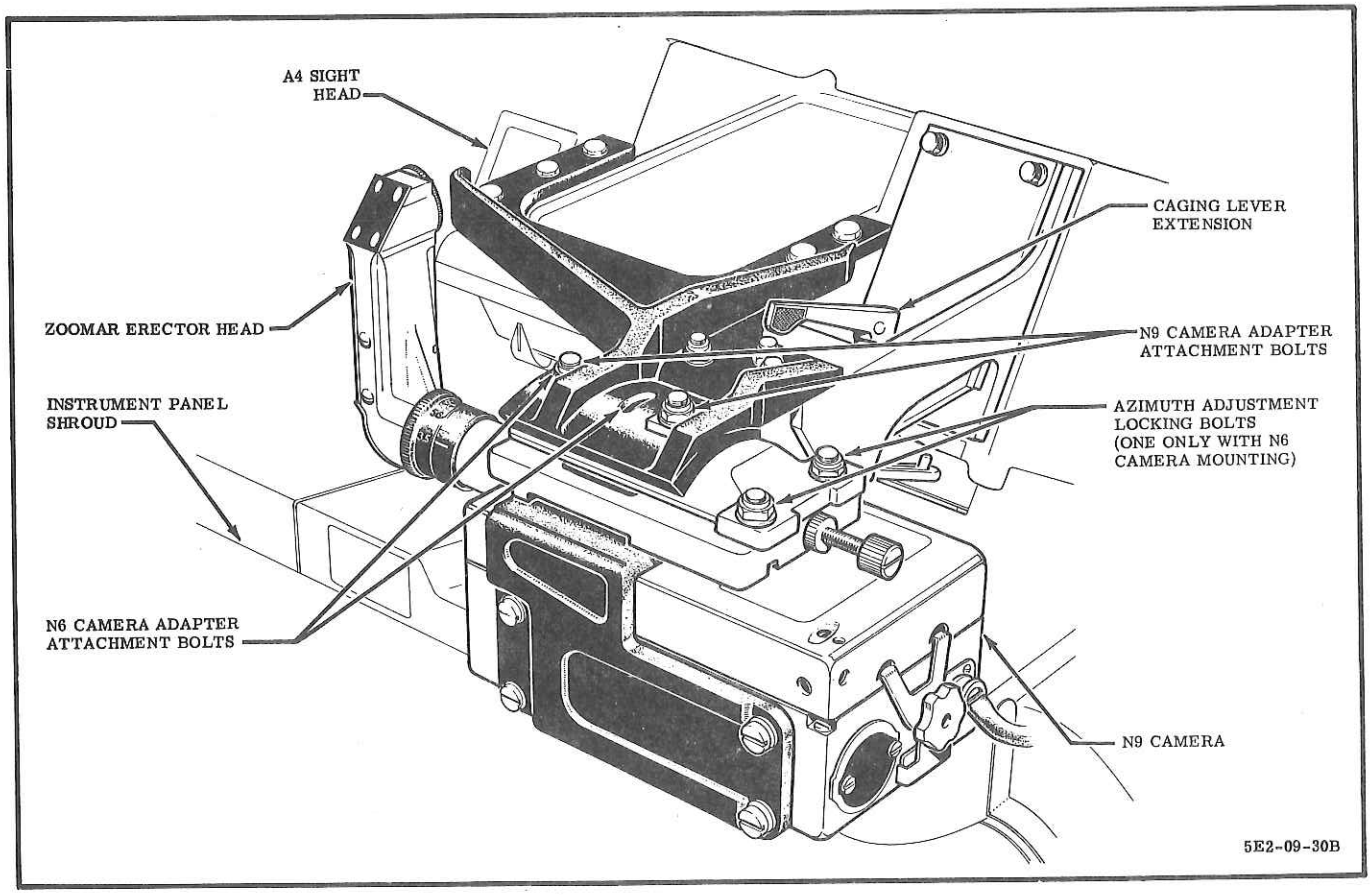


Figure 9-18 Gunsight Camera Installation Details

REMOVING GUNSIGHT CAMERA

45 To remove the sight camera, proceed as follows: (See Figure 9-18.)

(a) Disconnect electrical plug.

(b) Remove bolt and nut through kidney slot on mounting plate.

(c) Lift off camera and index plate.

HARMONIZING GUNSIGHT CAMERA

46 To harmonize the gunsight camera, proceed as follows:

(a) Install the boresighting tool in the aircraft.

(b) Loosen the two attachment bolts. (See Figure 9-15.)

(c) Tilt camera in its adapter until the horizontal line in the boresight tool coincides with the horizontal line of the sight mark on the target board.

(d) On the N-6 camera, tighten the left attachment bolt. On the N-9 camera, tighten the right attachment bolt.

(e) Loosen the locking bolt on the right of the adapter. On the N-9 camera, loosen the two locking bolts.

(f) Swivel the camera in azimuth until the vertical line in the boresight tool coincides with the vertical line of the gunsight mark on the target board.

(g) On the N-6 camera, tighten the locking bolt and the right attachment bolt. On the N-9 camera, tighten the two locking bolts and the left attachment bolt.

(h) Check that harmonizing has not been disturbed.

PART 9 - SECTION 4

RADAR RANGING EQUIPMENT

AN/APG-30 OR AN/APG-501 RADAR RANGING EQUIPMENT

GENERAL

1 On Sabre 5A aircraft, this equipment is removed and replaced by ballast, which is installed on existing mountings or attachment points (see Figure 9-19).

2 The radar ranging equipment is an automatic range determining device for use with the type A-4 gun-bomb-rocket sight. The radar performs functions of automatic search in range, tracking in range, and delivery of range information to the sight system through a range servo, only if the target is within the beam width of the horn antenna. Since the relationship between guns and radar antenna is fixed, range information will be immediately available to the sight when the radar is locked on a target and will be indicated by the on target light illuminating. The radar equipment consists of a horn antenna, a waveguide assembly, a frequency converter-transmitter unit, a power supply - range computer unit and a voltage regulator. All units of the radar system installed in the nose compartment are accessible when the nose access panel is removed. The components of the radar equipment are shown in Figure 9-19. The radar equipment receives 28-volt d.c. power from the secondary bus and 115-volt, 400-cycle, single-phase a.c. from the single-phase inverter. The d.c. circuit-breakers for the system are located on the single-phase circuit-breaker panel in the nose compartment. On aircraft 23001 to 23370 inclusive, AN/APG-30 radar equipment is installed. On aircraft 23371 and subsequent, AN/APG-501 radar equipment is installed.

WARNING

Operation of radar equipment involves the use of high voltages (5000-7000 volts) which are dangerous to life. Operating personnel must observe safety regulations at all times. Under certain conditions, dangerous potentials may exist in circuits due to charges retained by capacitors. To avoid casualties, always discharge and ground circuits prior to touching them. The TR and ATR tubes in the frequency converter-transmitter unit are sufficiently radioactive to be classed as dangerous. Removal and replacement of these tubes should be done with extreme caution to avoid breakage. In the event of tube breakage, do not handle glass particles or tube elements. Clear area as dangerous because of the possibility of radioactive gas being inhaled. Initiate decontamination procedures.

CAUTION

Do not apply 115-volt a.c. power to the radar equipment for more than five minutes unless the internal blowers are operating.

RADAR RANGING EQUIPMENT CONTROLS

3 The controls for the radar equipment consist of the gun safety switch located on the armament pedestal, the RADAR-OUT switch button located on the control stick grip, and the range sweep control located on the left forward side of the cockpit above the instrument panel. Whenever power is applied to the secondary bus, power is routed through the radar power circuit-breaker in the nose compartment to the voltage regulator which supplies power to the range power unit and the radar transmitter, holding the radar equipment in the standby condition. The gun safety switch must be in the OFF position for the radar equipment to be in standby. The gun safety switch is so wired that moving the switch to either the GUNS or the SIGHT - CAMERA - RADAR position puts the radar equipment in the on radar condition. The radar equipment cannot be placed directly in the on radar condition without a sufficient warm-up period; a three to four minute delay period is required to secure radar operation. Depressing the

[1] On MK5A aircraft this equipment is removed and ballast is installed.

ITEMS REMOVED	BALLAST WEIGHT
FREQUENCY CONVERTER TRANSMITTER	A-958
POWER SUPPLY RANGE COMPUTER	A-962
VOLTAGE REGULATOR	A-965
AMPLIFIER ASSEMBLY	A-968
RANGE SERVO UNIT	A-969
COMPUTER, BRACKET AND RING ASSEMBLY	A-972

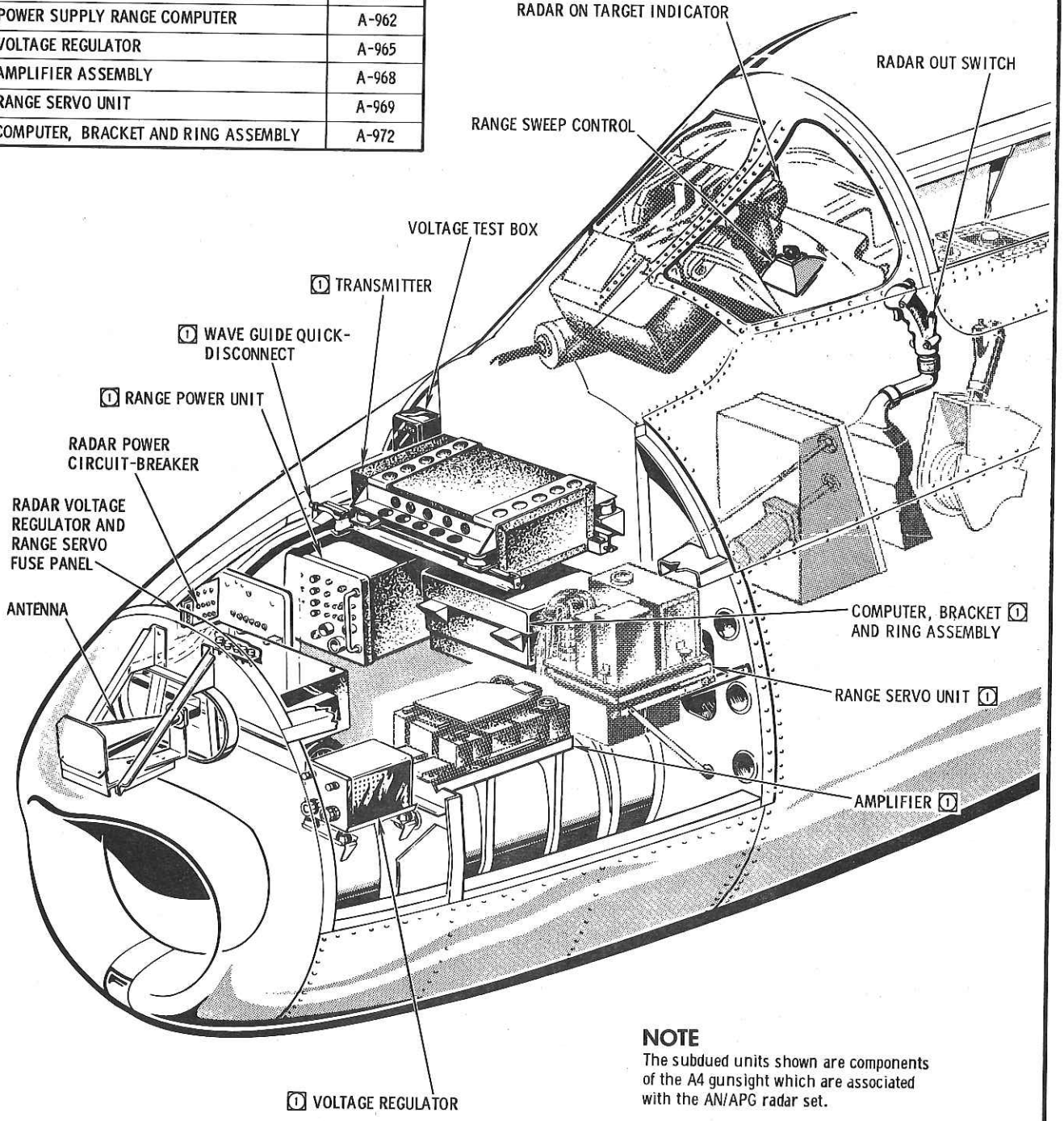


Figure 9-19 AN/APG Radar Equipment

RADAR - OUT switch causes the radar to become unlocked from its target and the range wil sweep out toward its maximum range or until it locks on another target, which will be indicated by the on target light becoming illuminated. The radar will lock on successive targets each time the RADAR - OUT switch button is depressed until it reaches its maximum range. It will then return to the minimum range and begin sweeping toward the maximum again. This action will be repeated until the radar becomes locked on another target. The range sweep control determines the distance the radar will range before returning to the minimum range. The range sweep control is marked MIN and MAX. If manual range control is desired, the radar output may be by-passed in the range servo unit by operation of the manual range control on the throttle control. Twisting the throttle control causes a microswitch to close, which in turn operates a relay to by-pass the radar output. Further rotation of the throttle control supplies a variable a.c. voltage to the sight installation for manual control of the gun-bomb-rocket sight. For further information on the range servo unit, refer to Part 9, Section 5, following.

AT-223/APG-30 OR AT-561/APG-501 ANTENNA

4 The radar ranging antenna is installed in the extreme nose of the aircraft and is a small conical horn having an elliptical cross section (see Figure 9-19). The horn shape and dimensions have been chosen to produce a desirable space pattern of radiated energy. A beam width of 18° at half power has been chosen to enable the range circuits to remain locked on the target even though the antenna momentarily may not be pointed directly on the target. The plastic lens is effective in reducing the side lobe intensity by retarding the speed of energy leaving through the centre of the lens. The horn antenna is used both for transmitting and receiving the radiated energy. On aircraft 23001 to 23370 inclusive, an AT-223/APG-30 antenna is installed. On aircraft 23371 and subsequent, an AT-561/APG-501 antenna is installed.

DIRECTIONAL COUPLER

5 On aircraft 23001 to 23596 inclusive, the directional coupler is connected in series with the waveguide, between the transmitter and the antenna. On aircraft 23597 and subsequent, the directional coupler is part of the frequency converter-transmitter RT-5005/APG-501 and is located inside the pressurized case of this unit. The coupler provides a convenient means of measuring transmitter power and receiver sensitivity. Great care must be taken at all times to prevent damage to the waveguide, coupler or horn antenna. Replacements for dented units must be installed immediately. A quick-disconnect is incorporated in the waveguide installation to simplify removal for maintenance.

RADAR TRANSMITTER UNIT

6 The radar transmitter unit is connected through the waveguide to the horn antenna. The transmitter unit contains the mixer duplexer, the magnetron circuit, the modulator sub-unit, the trigger sub-unit, the low-level intermediate frequency (i.f.) amplifier sub-unit and the automatic frequency control sub-unit.

TRIGGER CIRCUIT

7 The trigger circuit is a conventional free-running oscillator, the frequency of which determines the system pulse recurrence frequency. It may be synchronized with pulses of positive polarity from external sources such as a range calibrating marker generator. A portion of the grid resistance of the blocking oscillator is made variable so the repetition rate may be adjusted to 800 pulses per second.

MAGNETRON PULSING CIRCUITS

8 These circuits consist of the high voltage d.c. supply, the pulse forming network, discharging and charging circuits, magnetron and magnetron pulse transformer and magnetron average plate current metering circuits.

DELAY TIMER AND OVERLOAD CIRCUIT

9 The purpose of the delay timer is to prevent the application of high voltage to the magnetron and hydrogen thyratron before the filaments have heated to a sufficiently high temperature. The time delay is approximately three minutes. In the AN/APG-30 radar, use is also made of the timer thyratron to open the primary of the high voltage supply transformer

when the magnetron current from the supply exceeds a value approximately 100% greater than the normal value. In the AN/APG-501, excessive modulator current causes an overload relay to operate and open the plate transformer primary supply. This circuit is self-restoring and the plate supply resumes after a short time. If the overload is still present, another cycle of interruption will occur. When the overload persists for over five seconds, a further relay is actuated which de-energizes the delay timer. Normal operation will therefore resume only after the recycling of the three minute delay function.

DUPLEXER - TR AND ATR CIRCUITS

10 Both the pulse-modulated output signal from the magnetron oscillator and the received echo pulse pass through the antenna and duplexer. The duplexer is essentially a two-position waveguide switch which prevents the high power pulse from the transmitter entering the receiver crystal channel and thereby damaging the receiver crystal. It also keeps a portion of the echo signal from entering the magnetron and being dissipated there. In the AN/APG-30 the waveguide is pressurized to 5 psi to prevent arcing at high altitudes, and the local oscillator mount is pressurized to prevent changes in local oscillator frequency caused by variations in the size of the local oscillator cavity with changes in ambient pressure. In the AN/APG-501, this safeguard is effected by pressurizing the whole of the transmitter chassis through the use of a pressurized case.

MIXER

11 The mixing or heterodyning of the r.f. received signals and the r.f. AFC signals with the local oscillator signal produces in the respective crystal diodes sum and difference frequency currents which cause signal voltages at the first i.f. amplifiers in the receiver and in the AFC unit. Since the input circuits of these two amplifier units are tuned to 30 megacycles, signals outside a narrow frequency range centered at 30 megacycles are suppressed.

LOCAL OSCILLATOR

12 The local oscillator is a reflex cavity oscillator which operates at a frequency that is 30 megacycles from the magnetron frequency. An external tuning strut permits the spacing between the upper grid and the lower two grids to be varied. A coupling loop extends into the resonant cavity formed by the upper two grids to pick up the energy of oscillation. Mechanical tuning is accomplished by turning the bolt mounted on one side of the tube. The turning range is covered in two or three turns of the bolt.

FREQUENCY CONTROL UNIT - AFC

13 The frequency control unit maintains the i.f. within the bandpass characteristics of the i.f. amplifiers. The intermediate frequency for the AFC unit is produced by heterodyning a portion of the magnetron frequency and the local oscillator frequency. The i.f. frequency for the pre-amplifier is produced by heterodyning the receiver pulses (echoes) with a variable frequency local oscillator. The input transformers of the low level i.f. amplifier (pre-amp) and the frequency control unit (AFC) are tuned to pass the intermediate frequency. In order to maintain the intermediate frequency constant as the magnetron frequency drifts, it is necessary to control the local oscillator frequency by means of a device sensitive to changes in the intermediate frequency.

RECEIVER CIRCUITS

14 The receiver circuits convert the weak r.f. echo pulses into relatively strong video d.c. pulses which can be used by the range computer. The i.f. amplifier is divided into two sub-assemblies to provide amplification as close to the antenna as possible and still keep the equipment in this location small in size. The low-level amplifier is mounted in the radar transmitter unit and the high-level i.f. amplifier is mounted in the range supply unit. Electrically, the low-level i.f. amplifier and the high-level amplifier operate as a single unit, consisting of a series of amplifier stages, a diode detector, and four stages of video amplification. The fourth stage of video amplification acts primarily as a cathode follower with its output applied to the range computer. The i.f. amplifier utilizes seven stages of amplification with an intermediate frequency of 30 mc. Since a part of the transmitter pulse is received through the receiver (i.e.,

the main bang), and would appear as a target at zero range, the range gate might lock on it. A dunking circuit is designed to eliminate this possibility by cutting off the receiver for the duration of the main bang. The effects of input circuit resonance with the main bang are reduced by termination of the crystal current filter with a resistor.

I.F. AUTOMATIC GAIN CONTROL

15 Each i.f. stage is self-biased by means of a resistor. In addition, the gain of the i.f. amplifier as a whole (high-level and low-level) is varied by means of the automatic gain control voltage which is applied to the grid circuits. This voltage is applied through decoupling networks from the range computer.

RANGE COMPUTER TRACKING CIRCUIT

16 The primary function of the range tracking circuit is to separate the target being tracked from all other targets that may be detected and to provide a d.c. voltage proportional to the range of the desired target. The d.c. voltage is used primarily by the range servo unit and lead computing gun-bomb-rocket sight. In addition, these circuits provide a gated video signal for the automatic gain control circuit.

ON TARGET CIRCUIT

17 The on target circuit converts the negative video signal from the range tracking circuits into a relay action. The action of this relay switches the range tracking circuits from search to range track conditions. It also energizes the automatic gain control.

VIDEO AUTOMATIC GAIN CONTROL

18 The automatic gain control circuits reduce the variations in amplitude of the video signal being tracked. This is necessary because the gated coincidence tubes require video signals whose dynamic range is small. For optimum tracking, the intensity of target echoes varies over a wide range. The AGC circuits accomplish the desired end by varying the gain of the receiver in accordance with the peak value fluctuations of the signal being tracked.

AUTOMATIC NOISE LEVELLER

19 The purpose of the automatic noise-levelling circuits is to maintain the noise output of the receiver within close limits despite variations in the filament voltage of the local oscillator and receiver tubes. Such variations would normally cause large variations in the receiver noise output. The noise levelling permits adjustment of the on target circuits at greater sensitivity so that approaching targets may be detected at greater ranges. Unless the noise level is constant, the lock-on sensitivity cannot be set at its optimum value but must be set at a point where it will not lock on the greatest possible value of noise.

REGULATED POWER SUPPLY

20 The regulated power supply provides regulated 300 volts (positive) to the range computer, range servo, high-level i.f. amplifier and the i.f. sub-units. It supplies regulated 150 volts (positive) to the range computer, range servo, low-level and high-level i.f. amplifier and the AFC sub-unit. The regulated power supply also furnishes 250 volts (negative) to the range servo, AFC sub-unit and the trigger sub-unit.

PRIMARY POWER SUPPLY

21 The a.c power from the single-phase inverter is supplied to the equipment when the gun safety switch is placed in either the GUNS or the SIGHT-CAMERA-RADAR position. This energizes two relays and voltage is applied to the primary winding of the transformers. When the gun safety switch is in the OFF position and power is being supplied to the secondary bus, only one relay is energized and the radar equipment is in the standby condition.

WARNING

Do not permit the equipment to operate when the a.c. power frequency is less than 360 cycles.

RADAR ADJUSTMENTS

GENERAL

22 For detailed information of the circuits, circuit diagrams and adjustments on the AN/

APG-30 radar ranging equipment, refer to EO 30-210A-2. For information of the AN/APG-501 equipment, refer to EO 30-210D-2.

HANDLING OF RADAR COMPONENTS

23 The radar system components are fragile and are delicately adjusted and should be handled with care to preserve their accuracy. Some units contain vacuum tubes, resistors, etc., and should be protected from shocks. Exposure to the elements must be avoided.

REMOVAL AND INSTALLATION OF RADAR EQUIPMENT

24 The radar equipment installed in the aircraft has been bench-checked as a complete system. This is necessary because the various components must be aligned to work in conjunction with each other. In the event of a component in a radar system becoming faulty, it is necessary that the complete system be removed, the faulty component repaired or replaced, and the components bench-checked and aligned as a complete system before installation. If necessary, a replacement of the complete radar system should be installed using components which have been bench-checked and aligned as a complete system.

REMOVAL OF RECEIVER-TRANSMITTER

25 Remove the receiver-transmitter as follows:

(a) Disconnect flexible waveguide from transmitter by releasing the waveguide quick-disconnect.

(b) Disconnect power, trigger, and i.f. cables from transmitter.

(c) Remove the securing bolt from the top of each of the four shock mounts. Lift entire mount assembly and receiver-transmitter out of its mounting area.

REMOVAL OF POWER SUPPLY UNIT

26 Remove the power supply unit as follows:

(a) Remove receiver-transmitter.

(b) Disconnect circuit-breaker panel brace assembly from the forward support channel for the transmitter.

(c) Remove transmitter forward support channel by removing four fixing bolts.

(d) Disconnect all cables from the power supply unit and remove wing-nuts. Slide nut forward and lift from mount.

INSTALLATION OF RECEIVER-TRANSMITTER

NOTE

The power supply unit must be installed prior to installing the receiver-transmitter.

27 Install the receiver-transmitter as follows:

(a) Install receiver-transmitter support channel using four fixing bolts.

(b) Secure receiver-transmitter to shock mounts, using four bolts through fixing holes in receiver-transmitter mount. Make sure bonding straps on shock mounts are secured between receiver-transmitter mount and shock mount.

(c) Connect electrical plugs to receiver-transmitter.

(d) Secure brace assembly between battery compartment circuit-breaker panel and lateral support for the receiver-transmitter.

INSTALLATION OF THE POWER SUPPLY UNIT

28 To install the power unit, proceed as follows:

(a) Place power supply in its mounts, making certain that the securing pins on rear of mount are fully engaged in power supply unit.

(b) Tighten and lockwire the wing-nuts.

PART 9 - SECTION 5

RANGE SERVO UNIT

RANGE SERVO UNIT

GENERAL

1 The type RS-311 range servo unit (see Figure 2-20) is used in the MA-3 fire control system to provide proper interconnection between the radar ranging, or manual ranging, and the sight computing system. The range servo unit receives range input data either manually or from the radar and converts it into a form required by the sensitivity circuits and by the reticle dimensioning servo of the sight. (For location of range servo unit, refer to Part 9, Section 6, following.)

TROUBLE SHOOTING

2 Trouble shoot the range servo system as follows:

TROUBLE	PROBABLE CAUSE	REMEDY
Range dial does not respond to manual and radar range signals.	Blown fuse.	Install replacement.
	Faulty amplifier.	Install replacement.
	Faulty power supply.	Install replacement power supply.
	Faulty mechanism.	Install replacement.
Radar dial does not respond to radar signal but does follow manual range signal.	Faulty chopper or 12AX7 tube.	Install replacement modulator, chopper or 12AX7 tube.
	Faulty relay or resistor chain.	Install replacement adapter.
	Loss of 28-volt d.c. power.	Check 28-volt supply from terminal L to terminal J on adapter test board.
	Faulty adapter.	Install replacement.
	Faulty manual range control unit (part of sight).	Install replacement unit.
Range dial has excessive sustained hunt in responding to both manual and radar range signals.	Faulty mechanism.	Install replacement.
Range dial responds sluggishly to both manual and radar range signals.	Low line voltage.	Check terminal F to terminal J for 115-volt a.c. and terminal J for 28-volt d.c. on adapter test board.

(Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Range dial responds sluggishly to both manual and radar range signals.	Faulty amplifier.	Install replacement.
	Faulty power supply.	Install replacement power supply.
Slope and zero-set controls cannot align range dial to radar signal.	Faulty resistor chain.	Install replacement adapter.
Range dial not illuminated.	Faulty pilot lamp (1-401).	Install replacement.
Range servo cannot be aligned to sight.	Faulty mechanism.	Install replacement.

COMPONENTS

3 The range servo consists of two basic parts, the electronic part and the positioner part (mechanism). The electronics part converts range data into a usable signal input for the positioner part. The latter reacts to this signal by providing outputs which are commensurate with stiffness current requirements and reticle dimensioning requirements. The electronics part contains the power supply, the modulator and adapter, and the amplifier. The positioner part (mechanism) and the four units of the electronics part are functionally packaged, plugging into an over and under type of chassis, which is in turn fastened to a shock mount in the aircraft.

REMOVING RANGE SERVO

4 To remove the range servo disconnect the electrical plugs. Loosen the Dzus fasteners on the adapter, modulator and mechanism units (four fasteners on each) and remove them from the base assembly in that order. Loosen the two knurled nuts on the forward side of the shock mount. Lift forward end of range servo up and remove from mount.

INSTALLING RANGE SERVO

5 To install the range servo, place the unit on the shock mount and tighten the two knurled nuts on the forward side of the unit. Install sub-units (mechanism, modulator and adapter units) and secure by means of the four fasteners on each unit. Connect electrical plugs. Due to

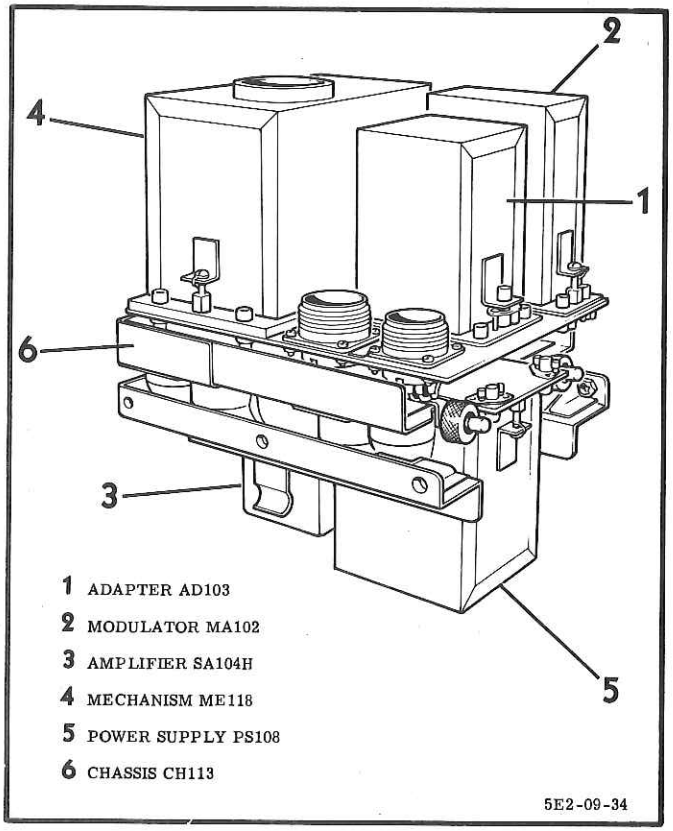


Figure 9-20 Range Servo Unit

the limited working space, some difficulty may be experienced in mounting or dismounting the range servo. Where this difficulty is encountered, the following course of action is recommended:

(a) Enlarge the existing lockwire holes of the locking nuts, using a No.40 drill.

(b) Manufacture a tightening tool from 0.090-inch hinge-pin wire or equivalent. This is done by taking 4-1/2 inches of the wire, and making a right-angle bend 3/8 inch from one end.

(c) Fitting the 3/8-inch section into the holes in the lock-nuts and using the 4-1/2-inch section for a handle provides an easy means of tightening the lock-nuts.

RANGE SERVO OPERATION

6 There are no control switches for the range servo unit. Whenever power is supplied to the secondary d.c. bus and the single-phase inverter is running, the range servo unit is ready for operation in the normal time required for vacuum tubes to warm up. In cold or sub-zero operation, a fifteen-minute warm-up is required in order that the heater units can perform their function.

POWER SUPPLY REQUIREMENTS

7 The range servo receives 28-volt d.c. power from the secondary bus through the sight heater circuit-breaker on the left circuit-breaker panel: 115-volt, 400-cycle, a.c. from the single phase inverter; and 150-volt regulated d.c. at 10 milliamperes from the AN/APG radar-ranging system (radar reference voltage). The 115-volt, 400-cycle power is fused in the power supply unit. Included in the mechanism is a thermostatically-controlled heater and pilot light.

FUNCTION OF RANGE SERVO COMPONENTS

8 The functions of the components of the range servo unit are as follows:

(a) The power supply unit provides voltages required by the components of the range servo and by the manual range control.

(b) The modulator unit converts the d.c. radar range signal and its associated feedback signal into an a.c. error signal which is coupled to the amplifier. This error signal is a voltage indicative of the amount of range motor movement required to match the range servo output with its input.

NOTE

The manual range signal by-passes the modulator unit.

(c) The amplifier unit provides amplification for the converted radar range a.c. error signal or the manual range a.c. error signal so that they are of sufficient magnitude to drive the mechanism.

(d) The adapter unit contains a relay necessary for switching the range servo from the radar mode of operation to the manual mode or vice versa. In addition, the adapter receives the manual range a.c. signal and its associated feedback signal in order to provide a manual range error signal for the amplifier input. A test panel and two adjustment potentiometers (range slope and range zero) are also contained in the adapter.

(e) The mechanism unit supplements the range data output of the amplifier with additional information required to produce correct stiffness current values for particular conditions of range, range rate and gun station velocity.

MODES OF OPERATION

9 With the fire control system in manual operation, sensitivity currents and reticle dimensioning are controlled by operation of the manual range control on the throttle quadrant of the aircraft. Turning the manual control places the sight in manual operation by actuating a pair of microswitches; rotation of the control produces variations in reticle diameter as well as changes of stiffness current. The stiffness current provides the sight with data representative of projectile time, which is related to gun station velocity, air density, present range to the target and range rate or rate of closure. The function of the range servo unit is therefore twofold. First, it must provide the proper input to the sensitivity amplifier so

that correct values of stiffness current produce the required restraint on the computer shafts and secondly, it must couple that value of signal to the reticle dimensioning servo which will result in the correct reticle diameter for a given range and target wingspan. Rotation of the manual range control positions a potentiometer arm on a resistor element which is connected across 28-volt, 400-cycle a.c. The amplitude of the voltage available at the potentiometer arm depends on its position on the resistor. Since the position of the arm is adjusted by rotation of the manual range control, the voltage at the potentiometer arm varies with the degree of rotation of the manual range control. This variable a.c. voltage on the potentiometer arm is directed, via the adapter, to the amplifier where it is compared with a feedback signal from the range drive motor in the mechanism. The feedback signal is indicative of the range drive motor shaft position. The resultant difference signal is amplified and coupled to the control field of the range drive motor; the range drive motor shaft position varies with the amplitude of the signal applied to the control field. The range drive motor, therefore, varies exactly as the manual range control is varied. The range drive motor shaft is geared to a tachometer and to the arms of several potentiometers whose voltage outputs during manual ranging thus depend on the position of the manual range control. The feedback potentiometer provides a voltage required to complete the servo loop which permits control of the range drive motor by the manual range control. The range potenti-

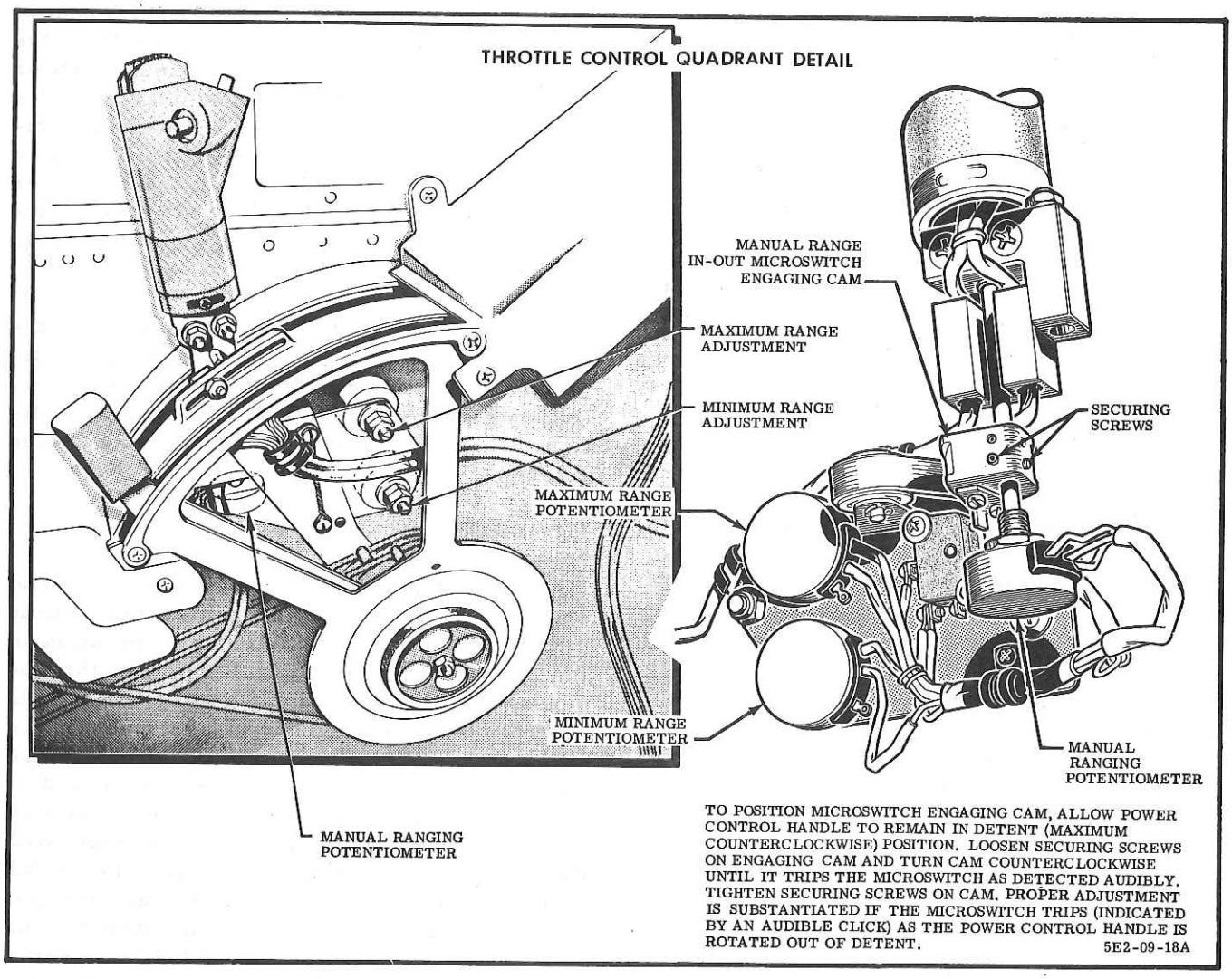


Figure 9-21 Manual Range Control Adjustment

ometer produces a signal which is coupled to the range amplifier in the sight. The output of the range amplifier is in turn used in determining the reticle dimension. Three sensitivity potentiometers are required in order to provide a voltage properly relating the sensitivity to range. The three potentiometers are used in order to restrict the sight consideration of the sensitivity factor to three fundamental elements to simplify the sight design. The difference voltage from two of the potentiometers is applied direct to the sight. The voltage from the third potentiometer is modified in the air density unit, to compensate for air density variations. The air density unit is located in the sight amplifier.

10 A tachometer is also geared to the range drive motor. It develops a voltage whose amplitude is a function of the speed of rotation of the range drive motor shaft. Since changes in the motor shaft position indicate change in range, the tachometer output is proportional to changes in range per unit time, that is, the tachometer voltage is a function of range rate. The voltage output of the tachometer is used to modify the sensitivity current for varying range rate. Additional factors affecting the design parameters of the range servo are gun station velocity and types of ammunition. The proper servo output as related to gun station velocity is obtained by positioning a link on a resistor network. This adjustment is done during installation. Link positions for 300,400 and 500 knots are available in the base plate of the mechanism unit. (Refer to Part 9, Section 6.) The mechanism unit also provides the correct ballistic data for .50 ball ammunition. The gun station velocity signal and ballistic correction are combined with the tachometer signal. The resultant signal is combined with a second sensitivity potentiometer and the total is combined with the third sensitivity potentiometer to provide one input to the sensitivity amplifier in the sight. The remaining sensitivity potentiometer signal is combined with the air density signal to provide the second input to the sensitivity amplifier.

11 The operation of the range servo in the radar mode is similar to its operation in the manual ranging. However, the radar information is received by the range servo as d.c. signal, whereas the manual range information is received as an a.c. signal. To accomodate the use of a d.c. input signal in the radar mode, two changes are made:

(a) The voltage output of the feedback potentiometer is changed to d.c. by removing the 28-volt, 400-cycle a.c. from the feedback potentiometer and replacing it with a calibrated d.c. voltage. This is accomplished by means of a microswitch-actuated relay when the pilot releases the manual range control. When this d.c. feedback voltage is compared with the d.c. input (radar voltage), a resulting d.c. error signal is determined.

(b) The d.c. error signal is converted to a.c. by means of a circuit (chopper) in the modulator. The resulting a.c. error signal is an input to the amplifier, which provides the voltage required to control the range drive motor. All other functions of the range servo are identical for radar and manual modes of operation.

12 For detailed information on the adjustment and electrical schematic diagrams of the RS-311 range servo unit, refer to EO 30-240A-2.

A-4 SIGHT MANUAL RANGING CONTROL INSTALLATION

GENERAL

13 The manual ranging control (see Figure 9-20) is supplied for use on overland targets at altitudes of less than 5000 feet where radar ranging with AN/APG radar is impossible or in case of failure of the radar. This installation consists of a potentiometer which is mounted at the base of the throttle control. The throttle control twist grip, by means of shafting, turns the potentiometer. The potentiometer feeds a.c. voltages to the amplifier in the servo unit, in proportion to the amount of rotation of the handle. Movement of the twist grip in a clockwise direction decreases the range signal; counter-clockwise movement increases the range signal. When the twist grip reaches the maximum range position, linkage within the electrical unit actuates a microswitch which transfers the range signal from manual range to radar range control. The twist grip is spring-loaded to maintain the control in the maximum range position when using radar ranging.

ADJUSTMENT OF MANUAL RANGE CONTROL INSTALLATION

14 After the AN/APG radar unit and the A-4 gun-bomb-rocket sight installation have been checked, turn on sighting system and allow a 15-minute warm-up period. As soon as the warm-up period has elapsed, adjust the manual range control installation as follows:

(a) Remove friction wheel from quadrant centre-shaft by loosening lock-nut and then rotating wheel counter-clockwise until the wheel disengages from the shaft. (See Figure 9-21.)

(b) Remove quadrant access coverplate.

(c) Adjust the minimum range potentiometer so that, when the twist grip is rotated to the full clockwise position, the range dial on the sight head will read 1150 to 1200 feet.

(d) Adjust the maximum range potentiometer so that, when the twist grip is rotated clockwise just beyond the microswitch tripping position, the range dial on the sight head will read 2700 to 2750 feet.

(e) Check that the sight reticle moves down as the range dial reading changes from a smaller range to a greater range, and increases in size as the range dial reading changes from a greater range to a small range.

(f) Check that the sight reticle decreases in size as the range dial reading changes from a smaller range to a greater range, and increases in size as the range dial reading changes from a greater range to a smaller range.

(g) Again check the twist grip throw in both directions. Make sure the adjustments accomplished during Sub-paragraphs (c) and (d), preceding, are still in effect.

(h) Install electrical unit access cover.

(j) Install quadrant access door.

(k) Install friction wheel on quadrant centre-shaft and secure with lock-nut.

PART 9 - SECTION 6

A-4 GUN-BOMB-ROCKET SIGHT

A-4 GUN-BOMB-ROCKET SIGHT

GENERAL

1 On Sabre 5A aircraft, the equipment detailed in Figure 9-22 is removed and replaced by ballast. The sight head is still operative and can be used as a reflector sight.

2 The A-4 gun-bomb-rocket sight (see Figure 9-22) automatically solves the MA-3 fire control problems for gunfire from fixed guns, for bombing and for rocket fire. The automatic feature enables the pilot to direct his full attention to the selected target but the aircraft must be flown so that the circle of diamond-shaped dots that form the reticle image is continuously superimposed on the target under attack. The pilot is required to fire the guns or launch the rockets manually. During the bombing mode of operation, the bombs are released automatically or manually while the aircraft is manoeuvering in a dive-bombing run on the target. In the rocket or bombing modes of operation and in gunfire operation, the radar supplies range information only. Visual contact with the target is required at all times. The sight requires target range and rate of change of range information, which is normally supplied from the radar ranging set and the range servo. In the absence of radar range data, the pilot has a manual means of determining the range of the target.

TROUBLE SHOOTING

3 Trouble shoot the A-4 sight system as follows:

TROUBLE	PROBABLE CAUSE	REMEDY
No reticle image visible.	No 28-volt d.c. power.	Check power source.
	Dimmer control knob is in dim position.	Rotate the dimmer control switch until the image appears.
	Defective lamp (1-121).	Install replacement.
	Defective contact base.	Install replacement sight head.
Very slow range dial operation.	28-volt a.c. power low.	Readjust voltage.
	28-volt a.c. frequency too far off 400 cycles.	Readjust frequency.
	300-volt d.c. power low.	Readjust voltage.
	Defective range amplifier.	Install replacement range amplifier.
No variation of reticle diameter during ranging.	No 300-volt d.c. power.	Check power source.
	No 28-volt a.c. power. (Continued)	Check power source.

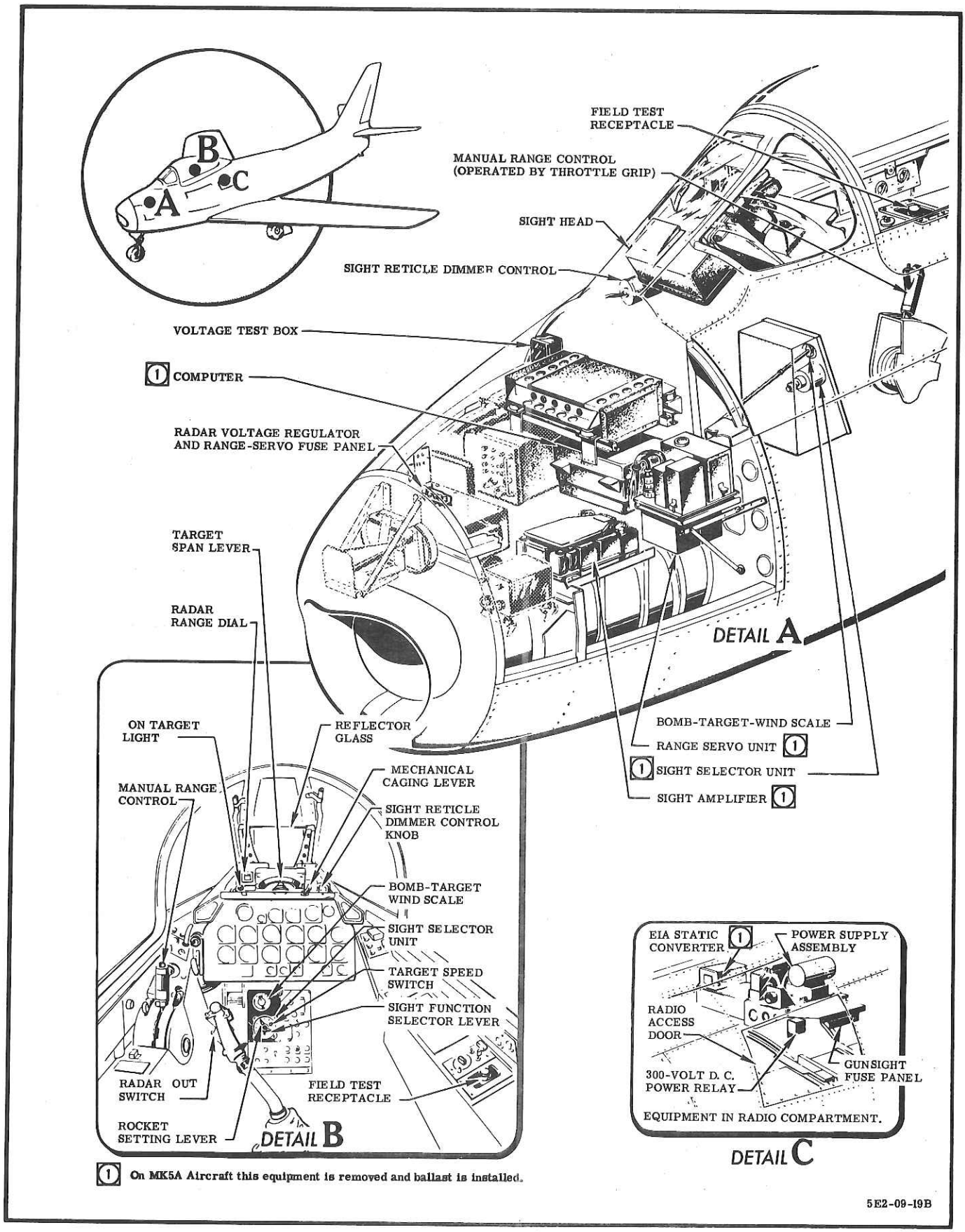


Figure 9-22 (Sheet 1 of 2) A-4 Sight System

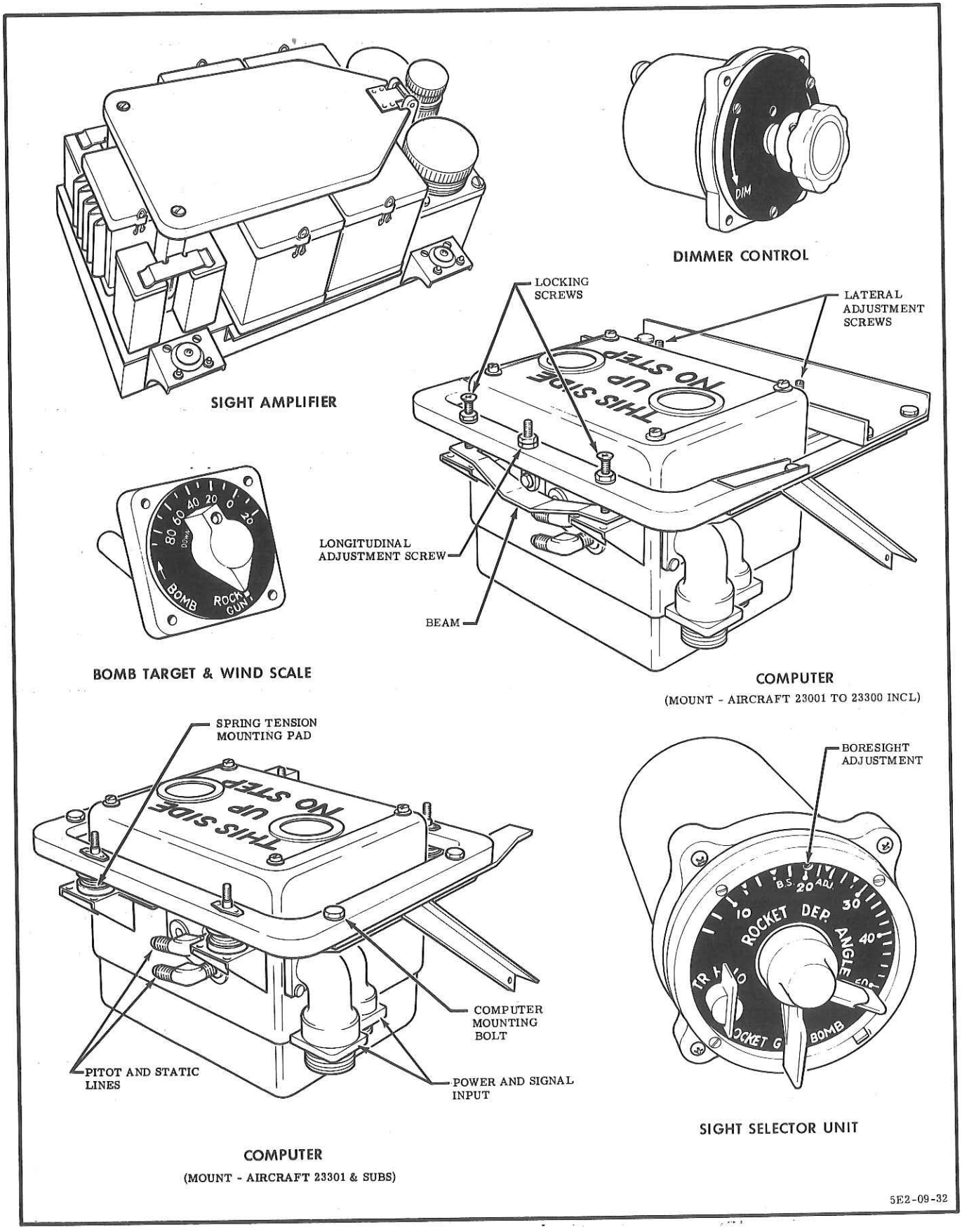


Figure 9-22 (Sheet 2 of 2) A-4 Sight System

TROUBLE	PROBABLE CAUSE	REMEDY
No variation of reticle diameter during ranging.	Defective range motor B-122.	Install replacement sight head.
	Defective range amplifier.	Install replacement.
	Faulty range servo unit.	Install replacement.
No sensitivity current.	No 300-volt d.c. power.	Check power source.
	Poor connection at P-221 on sensitivity amplifier.	Check contact.
No depression of reticle in bombing function.	Elevation torque motor not being grounded through relay K-302 (contacts 2 and 4) and resistor R-299.	Install replacement K-302 or replacement adapter unit in the sight amplifier.
No return to gunnery function when radar-out button is depressed.	Defective radar-out switch.	Install replacement switch.
	Defective solenoid in selector switch.	Install replacement selector switch assembly.
No rotation of gyro.	No 28-volt a.c. power.	Check power source.
	Open contact leaves on gyro contact assembly.	Install replacement computer.
No up and down deflection of reticle.	No 300-volt d.c. power.	Check power source.
	No 28-volt a.c. power.	Check power source.
	Defective elevation.	Install replacement elevation amplifier.
	Prediction mirror obstructed.	Install replacement sight head.
Reticle remains at extreme left at all times.	Poor connection at P-201A on deflection amplifier.	Check contact.
	Defective deflection amplifier.	Install replacement amplifier.
	Defective deflection torque motor.	Install replacement sight head.

TROUBLE	PROBABLE CAUSE	REMEDY
No reappearance of reticle within 30 seconds after sight is placed in bombing function.	Sight head bombstop adjustment is out of adjustment.	Adjust.
Sensitivity current beyond allowable.	300-volt d.c. power supply beyond limits.	Check power supply voltage.
	Defective sensitivity amplifier.	Install replacement.
	Defective adapter unit.	Install replacement.
	Defective density unit.	Install replacement sight amplifier rack.
	Defective stiffness motor.	Install replacement computer.
No return of range dial to 600 foot mark when sight is mechanically caged.	Faulty K-121 relay.	Install replacement sight head.
	Faulty S-123 switch.	Install replacement head.
Very slow travel of reticle to bottom of combining glass in gunnery function.	Defective K-304 relay.	Install replacement.
	Defective sensitivity amplifier.	Install replacement amplifier.
	Open elevation torque motor winding.	Install replacement sight head.
	Open elevation stiffness motor winding.	Install replacement computer.
No cycling of elevation or deflection damper heaters.	No 28-volt d.c. current.	Check power source.
	Faulty heater thermostat.	Install replacement computer.
	Defective heater.	Install replacement computer.
No elevation to nullify gravity drop correction when system is set at long ranges caged.	Defective caging switch.	Repair switch.
	Defective caging relay, K-306.	Install replacement.
	Elevation gyro gimbal obstructed.	Install replacement computer.

TROUBLE	PROBABLE CAUSE	REMEDY
Elevation, deflection and sensitivity channels inoperative.	No 28-volt a.c. power to microsyn excitation line.	Check power source.
	Open L-101 reactor in microsyn excitation line.	Install replacement computer.
No variation in deflection stiffness current when TR-HI-LO switch is moved from HI to TR.	Defective switch in selector switch assembly.	Install replacement selector switch assembly.
	Defective K-103 relay.	Install replacement computer.
Reticle disappears suddenly when dimmer control is turned clockwise.	Open winding in potentiometer of dimmer control.	Install replacement dimmer control.

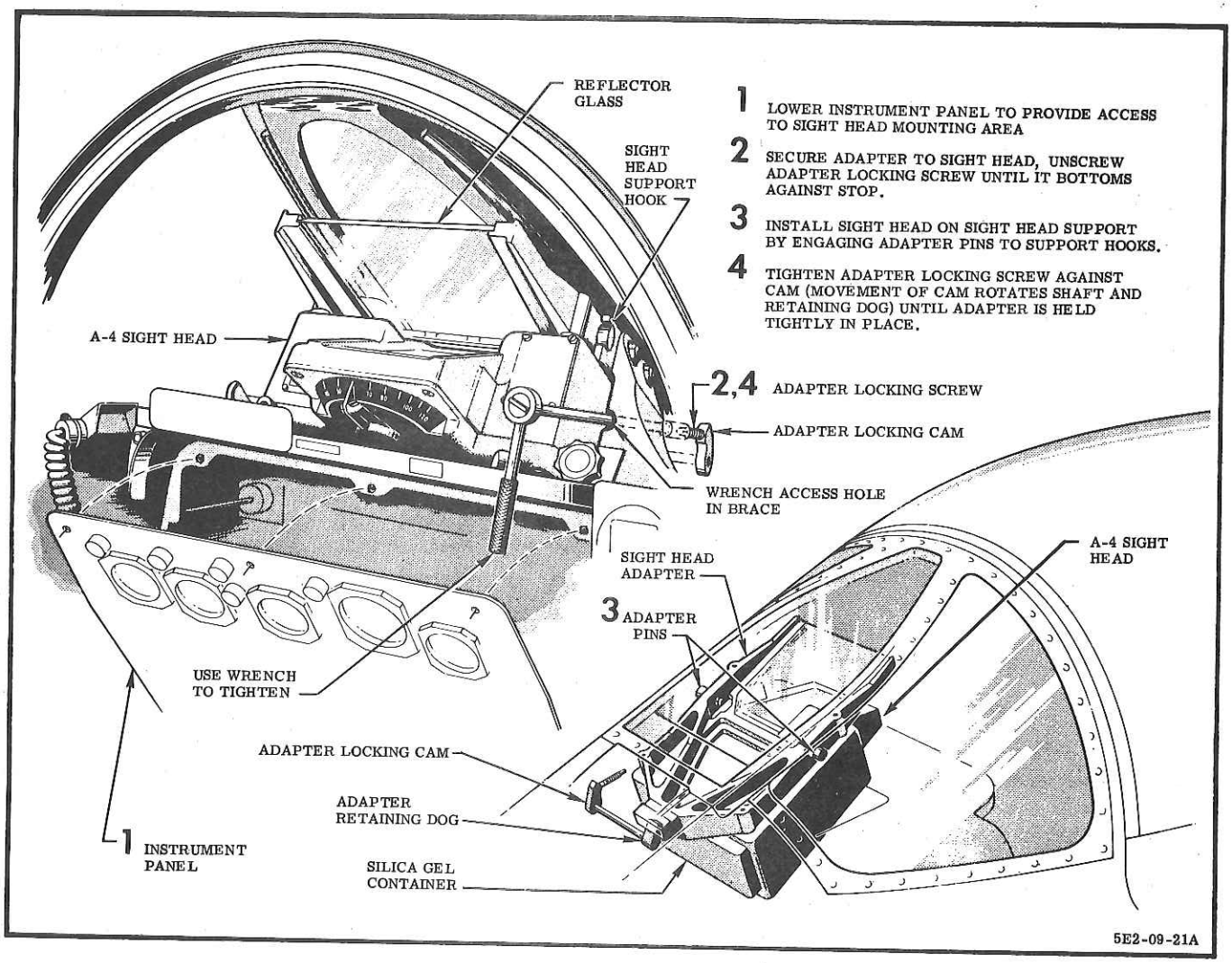


Figure 9-23 Sight Head Adjustment and Installation

A-4 SIGHT COMPONENTS

GENERAL

4 The A-4 sight (see Figure 9-22) consists of six principle components: the sight head, computer, sight amplifier, bomb-target-wind scale, selector switch assembly and the dimmer control.

SIGHT HEAD

5 The sight head is installed forward of the instrument panel and below the windshield. It contains the electrical, mechanical and optical components which produce and position the pattern of light projected to the reflector glass. The principal components of the sight head are the mirror drive and caging assembly, and the range assembly. The only two operating controls for the sight head, the wing-span control lever and the cage - uncage lever, are located on the rear of the sight head. A radar on target light, located on the left side of the sight head, indicates that the radar equipment is locked on the target while tracking.

CAUTION

To prevent damage to the prediction mirror mechanism, the caged - uncaged lever should always be placed at CAGED during take-off and landing, when hard bumps or shocks may be encountered.

REMOVAL OF SIGHT HEAD

6 To remove the sight head, proceed as follows: (See Figure 9-23.)

NOTE

When the sight head is being installed or removed, the windshield should be protected by suitable material to prevent it being scratched by the frame assembly.

(a) Lower instrument panel.

(b) Unscrew adapter locking screw until it bottoms against stop.

(c) Disconnect electrical leads from sight.

(d) Prepare to support sight head while pulling aft to disengage sight head from the mount attachment.

INSTALLATION OF SIGHT HEAD

7 For sight head installation procedure, see Figure 9-23.

COMPUTER

8 The computer (see Figure 9-21) contains the mechanical and electrical components which convert the motions of the aircraft and other input data to usable form for the three functions of sight (gunfire, bombing and rocket fire). The principal components are the elevation prediction motor assembly, the deflection prediction motor assembly, the accelerometer element assembly, the elevation gyro assembly and the deflection gyro assembly. The assemblies are mounted on top of the corresponding prediction motor assemblies. The computer is mounted in the aircraft on four shock mounts. Through this mounting, the angular velocities and linear accelerations of the aircraft are transmitted to the gyro assemblies and the accelerometer. Pitot pressure and static pressure are supplied to the computer from pitot and static lines with connections at the pitot pressure tube and adapter. These connections supply air pressure to the accelerometer element assembly. A connector assembly provides a mechanical linkage between the bomb target and windscale and the accelerometer element assembly within the computer. Two windows are provided in the computer top cover to permit a visual check on rotation of the gyros.

REMOVING COMPUTER

9 To remove the computer, proceed as follows:

(a) Remove the AN/APG transmitter located directly above computer.

(b) Disconnect pitot and static lines, power input and signal input cables and B-TW shaft.

(c) On aircraft 23001 to 23300 inclusive, remove computer mounting screws and lift computer from its mount. On aircraft 23001 and subsequent, remove computer and mount complete from aircraft.

INSTALLING AND LEVELLING COMPUTER

10 To install and level the computer on aircraft 23001 to 23300 inclusive, proceed as follows: (See Figure 9-21.)

(a) Install computer in mount and secure mounting screws.

(b) Level aircraft.

(c) Loosen locking screws, then adjust lateral and longitudinal levelling screws until computer is level. Lock levelling screws.

(d) Screw down locking screws until they just touch beam, then tighten locking screw lock-nuts.

(e) Connect power input and signal input cables, pitot and static lines, and shaft from B-TW dial to B-TW drive coupling.

NOTE

On aircraft 23301 and subsequent, the computer and mount are installed together in the aircraft as a complete assembly and should not require levelling. If levelling is necessary, the computer mounting bolts (see Figure 9-21) may be shimmed. On no account must the spring tension mounting pads be used for levelling.

SIGHT AMPLIFIER

11 The amplifier (see Figure 9-22) contains the principal components necessary for the amplification of the input voltage from the various channels of the sight system. Five plug-in units, mounted in the sight amplifier assembly, are held in place by springs attached to the underside of the removable cover. They are a deflection amplifier, an adapter unit, an elevation amplifier, a sensitivity amplifier and a range amplifier. Six plug-in relays are mounted in octal sockets on the amplifier rack adjacent to the plug-in amplifiers. Four of the relays are held in place by springs attached to the cover mounting posts while two are held in place by springs attached to the cover. An air density unit is mounted within the amplifier rack. It is connected to the static pressure line through the static pressure tube and adapter.

BOMB, TARGET AND WIND SCALE

12 The bomb target and wind scale unit, located on the armament pedestal (see Figure 9-22) is used during the bombing mode of operation. It consists of a rotatable pointer and a fixed dial. The pointer is mounted on the outer end of a short shaft which projects through the dial and terminates in a universal joint. The universal joint is connected to a shaft leading to the computer. Rotation of the bomb target and wind scale knob transmits a corresponding rotation to the accelerometer element in the computer. The scale is graduated in terms of knots upwind and downwind.

SELECTOR SWITCH ASSEMBLY (Part No. 686862, Variable)

13 The selector switch, located on the armament pedestal (see Figure 9-22), is used as a sight control for switching to the desired mode of operation and for making corrections required in gunfire operation. A selector switch knob, located at the upper portion of the dial, may be moved to any position on the graduated scale, from six to fifty mils depression angle. A BOMB-GUN-ROCKET knob, located at the upper portion of the dial plate, may be positioned to BOMB, GUN, or ROCKET, as desired. The TR-HI-LO knob, located on the left side of the dial plate, is provided for use during gunnery missions. The selection is determined by the rate of closure of the aircraft to the target. A solenoid rotates the BOMB-GUN-ROCKET knob back to GUN from either the BOMB or ROCKET position when the radar-out button is depressed.

NOTE

Some aircraft are provided with a selector switch (Part No. 672636) which differs from the variable selector switch (Part No. 686862) in that it has six fixed rocket depression angle positions in lieu of the graduated scale. The two units are interchangeable.

DIMMER CONTROL

14 The dimmer control located on the right of the sight head (see Figure 9-22), controls the brilliancy of the reticle image.

SIGHT POWER SUPPLIES

15 The A-4 sight power supplies consists of the E1A static converter, Eicor inverter and a 3-phase transformer. These units are located in the radio compartment (see Figure 9-22). The E1A static converter receives 115-volt, 400-cycle a.c. from the single-phase inverter and supplies 300-volt d.c. at 2.70 amperes to the sight. The Eicor inverter receives 28-volt d.c. and supplies 115-volt, 400-cycle three-phase a.c. A three-phase transformer steps down 115-volt, 400-cycles a.c. to 28 volts.

NOTE

When the Varo E1A static converter (RCAF-8EB/1216 is replaced by Mercury Electronic converter (RCAF-8EB/1621), an aluminum plate provides the offset mounting required to prevent fouling in the rear compartment. This plate may be locally manufactured as per EO 05-5E-6A/182.

SIGHT CONTROLS

GENERAL

16 In addition to the controls described, the following controls are used in the operation of the gun-bomb-rocket sight: the radar-out switch, installed on the control stick; the gyro electrical caging control, installed on the throttle control; the gun safety switch (ON puts the sight and radar on), installed on the armament panel; range dial and target span lever, installed in the centre of the sight head; a sight reticle lamp filament selector switch, and a mechanical caging lever, which mechanically fixes the mirror in a zero prediction position, installed on the top right side of the sight head. The radar-out switch controls action of the radar ranging equipment and also functions in conjunction with the indicator light, marked on target, installed on the sight head. The on target indicator light illuminates when the radar ranging equipment has detected and locked on a target. The sight dimmer controls the intensity of the reticle image illumination. When the sight is not being used, the dimmer controls should be maintained in the dim position. The electrical caging switch on the throttle control is provided to stabilize the reticle image prior to making an attack. The mechanical caging lever, on the right side of the sight head, is pushed to the right to cage the mirror in the head, and to the left to uncage the mirror. The lever also actuates switches which open the elevation and deflection motor circuits in the sight head and provide a fixed reticle circle image. Gun-bomb-rocket sight chart of switching and operation is shown in Figure 9-24.

HANDLING OF A-4 SIGHT COMPONENTS

GENERAL

17 The sight head unit is an optical instrument with viscous fluid dampening on the mirror drive. This unit not only has fragile parts but is also restricted for carrying, storing and mounting. The horizontal axis, parallel to the upper cylindrical section of the sight head, must always be horizontal, and the upper part of the sight head, containing the prediction mirror and glass cover, must never be lower than the base which incorporates the silica gel container. After removal from the aircraft or shipping container, the sight head should be carried base down, and when placed on a bench should be placed with surface having four mounting bosses in a near horizontal plane. The mechanical caging lever must always be in the CAGE position before removal of the sight head from the aircraft and must remain in the CAGE position at all times except during testing or checking periods. The computer unit is an electrical instrument containing gyros which have viscous dampers to restrain the velocity of motion of the gyros. Handle this unit in such a manner that the vertical axis is never tipped in any direction more than 45° from the vertical. In order to protect the mechanical parts from damage, do not subject the unit to jolts or jars during handling exceeding 5G. Always leave the shipping plugs in the static and pitot connections until after installation. The sight amplifier is an electronic unit containing vacuum tubes, relays, and resistors. Protect this unit from shocks in the same manner as any radio equipment is protected. Always leave the shipping plug in the static connection until the sight amplifier is installed. There are no restrictions on the position in which this unit may be stored

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A4. GUN-BOMB-ROCKET SIGHT CHART OF SWITCHING AND OPERATION

	B.T.W. DIAL	SIGHT SELECT. UNIT	ELECT. CAGING BUTTON	DEFLECTION STIFFNESS CURRENT	ELEVATION STIFFNESS CURRENT	PILOT'S BOMB RELEASE	MECHAN. CAGING LEVER	RANGE MANUAL OR RADAR	BOMB SELECT SWITCH	SIGHT HEAD ELEVATION MIRROR	SIGHT HEAD DEFLECT MIRROR	WINGSPAN CONTROL
GUN FIRE APPROACH	ANY SETTING	GUN FIRE	CLOSED	MAX.	MAX.	OPEN	UNCAGED	EITHER	AUTO	FOLLOWS COMPUTER	FOLLOWS COMPUTER	SET IF MANUAL RANGE USED
GUN FIRE TRACKING	ANY SETTING	GUN FIRE	OPEN	VARIES WITH RANGE.	VARIES WITH RANGE	OPEN	UNCAGED	EITHER	AUTO	FOLLOWS COMPUTER	FOLLOWS COMPUTER	SET IF MANUAL RANGE USED
BOMBING APPROACH	SET WIND	BOMB	CLOSED	MAX	MAX. THROUGH 1 COIL ONLY	OPEN	UNCAGED	NOT USED	AUTO	DEPRESSED TO STOP	FOLLOWS COMPUTER	NOT USED
BOMBING TRACKING AUTO RELEASE	SET WIND	BOMB	OPEN	ZERO	ZERO	CLOSED	UNCAGED	NOT USED	AUTO	DEPRESSED TO STOP	FOLLOWS COMPUTER	NOT USED
BOMBING TRACKING MANUAL RELEASE	SET WIND	BOMB	OPEN	ZERO	ZERO	CLOSE WHEN RETICLE EXTINGUISHED	UNCAGED	NOT USED	MANUAL	DEPRESSED TO STOP	FOLLOWS COMPUTER	NOT USED
ROCKET APPROACH	ANY SETTING	ROCKET SET TYPE DIVE ANGLE	CLOSED	FIXED VALUE	FIXED VALUE	OPEN	UNCAGED	EITHER FOR INFORMATION ONLY	AUTO	FOLLOWS COMPUTER PLUS FIXED ROCKET DEPRESSION	FOLLOWS COMPUTER	SET IF MANUAL RANGE USED
ROCKET TRACKING	ANY SETTING	ROCKET SET TYPE DIVE ANGLE	OPEN	FIXED VALUE	FIXED VALUE	OPEN	UNCAGED	EITHER FOR INFORMATION ONLY	AUTO	FOLLOWS COMPUTER PLUS FIXED ROCKET DEPRESSION	FOLLOWS COMPUTER	SET IF MANUAL RANGE USED
FIXED SIGHT	ANY SETTING	ANY SETTING	OPEN	ZERO	ZERO	OPEN	CAGED	NOT USED	AUTO	FIXED	FIXED	SET TO 60° FOR 100 MIL RETICLE

Figure 9-24 Gun-Bomb-Rocket Sight Switching

or carried. The dimmer control, sight selector switch and the bomb target wind control are not restricted in any manner as to handling, except for the normal care which should be exercised to prevent breakage or other physical damage. Exposure to the elements should be avoided.

MAINTENANCE OF A-4 SIGHT COMPONENTS

18 Maintenance of the sight components consists mainly of keeping the units clean, and installing of replacement silica gel cells and reticle bulbs. Clean the windshield, the rect-

angular window in the sight head through which the reticle image passes, the range dial window in the sight head and the range servo unit, with a soft, lint-free cloth which may be dampened with warm, soapy water. After cleaning the surface, thoroughly dry with a soft, lint-free cloth. Keep the bomb-target-wind scale, sight selector dial and dimmer control dial free from dirt and film.

OPERATIONAL CHECK OF SYSTEM

19 Check the system as follows:

(a) Connect external power supply to No. 1 receptacle.

(b) Close bus tie-in circuit-breaker.

(c) Place the bomb-target-wind scale in ROCKET GUN position, and the sight selector unit in GUN position.

NOTE

Check that the elevation gyro is rotating in a counter-clockwise direction as viewed through the window of the computer cover. This may be done by observing the gyro when the system is turned off and turned on.

(d) Move mechanical caging lever back and forth from CAGE to UNCAGE and check to see that the reticle image flickers as the lever is moved. Leave in the UNCAGE position.

(e) Rotate dimmer control through its range and see that the light of the circle and dot varies accordingly. Adjust brightness to suitable level.

(f) Operate circle and dot switch in both positions and check that the reticle stays on each position.

(g) Rotate the target wing span dial and check to see that the diameter of the circle of the reticle image also changes. When the circle is at its greatest diameter, the target span should also indicate maximum figure.

(h) Install jumper wire from pin insert B (connector No. 3108LB-20-155) to radar voltage regulator, to pin insert D (connector No. 3106B-20-27P) to radar power unit. (Refer to A-4 sight wiring diagram, Part 11, following.)

(j) Place the bomb-gun-rocket selector switch in BOMB position.

(k) Check that the sight reticle depresses and goes out. The reticle should reappear again at the BOMB position after a few seconds.

(m) Press radar-out switch and check that the bomb-gun-rocket switch goes back to GUN position.

(n) Place the bomb-gun-rocket selector switch in ROCKET position, and rocket setting selector switch in position 5-inch HVAR-N.

(p) Check that the sight reticle depresses.

(q) Press radar-out switch and check that the bomb-gun-rocket selector goes back to GUN position.

(r) Press electrical cage switch and check that the sight reticle moves up to the normal electrical CAGED position.

SIGHT HARMONIZING

GENERAL

20 If the gun-bomb-rocket sight system is removed from the aircraft, the sight must be harmonized with the target board. Set up the target board as described in Part 9, Section 3, preceding, and proceed as follows:

(a) Position the boresight target board a distance of 77 feet, 8-1/2 inches directly in front of the aircraft. Measure from the nose wheel axle centre-line (aircraft on jacks and nose wheel strut fully extended) to obtain this dimension. This measurement represents the proper position of the 1000-inch target board.

(b) Level the aircraft.

(c) Align the target board vertically and laterally to the aircraft by use of the peep-sight and cross-hair aligning tools.

(d) Boresight the rocket system. (Refer to Part 9, Section 2, preceding.)

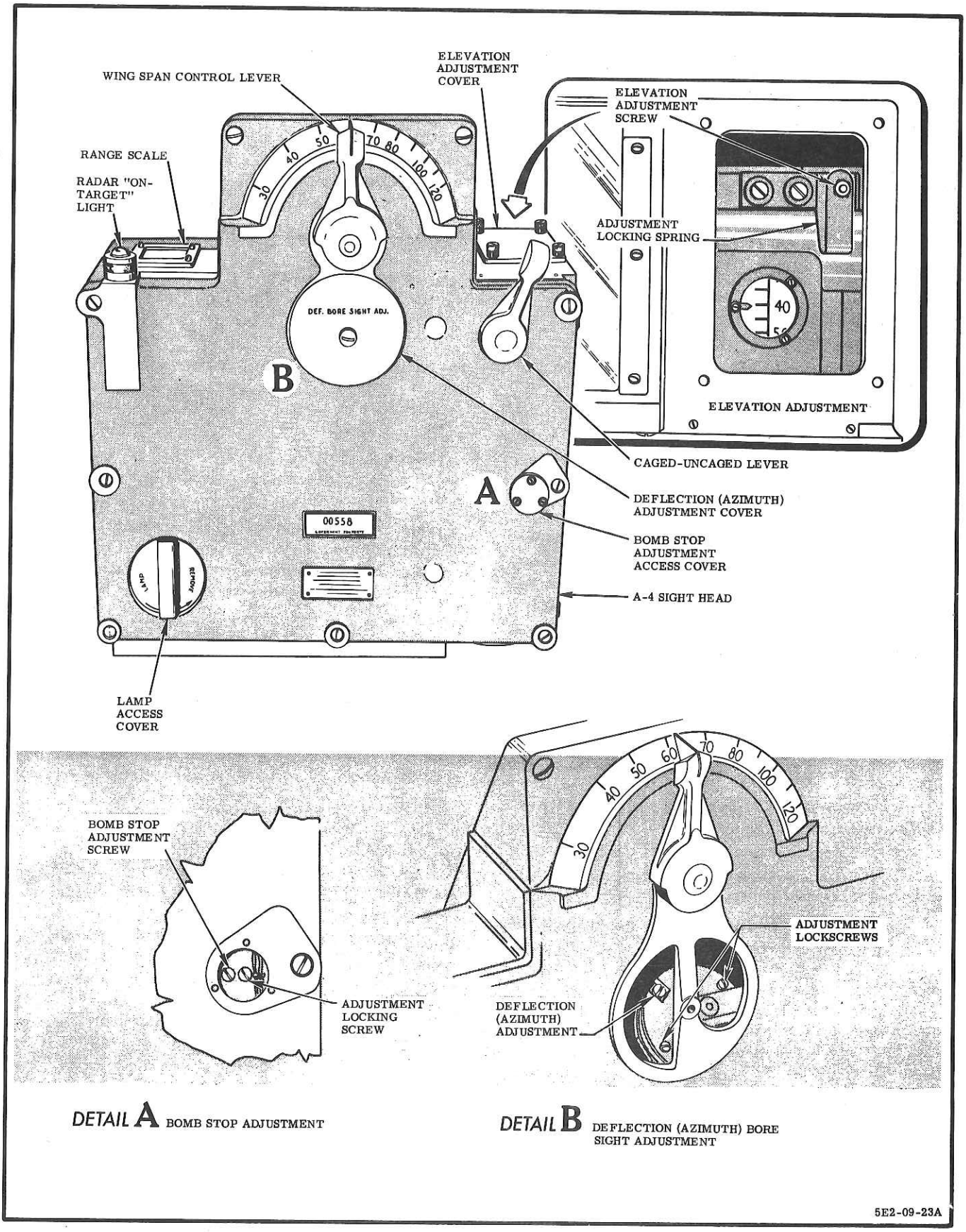


Figure 9-25 (Sheet 1 of 2) Sight System Boresighting Adjustment

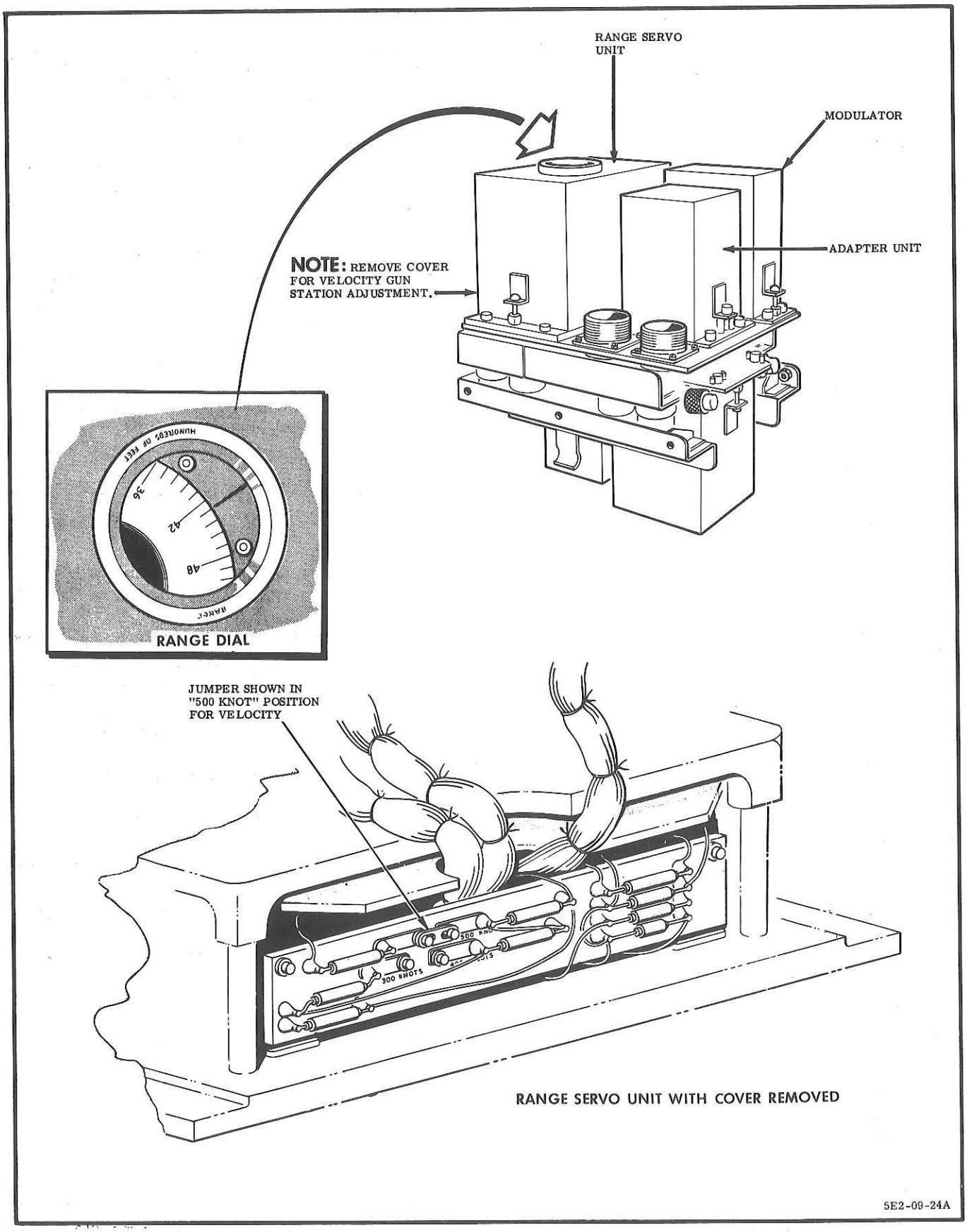


Figure 9-25 (Sheet 2 of 2) Sight System Boresighting Adjustment

(e) Boresight the gunnery system. (Refer to Part 9, Section 3, preceding.)

(f) Boresight the gun camera system. (Refer to Part 9, Section 3, preceding.)

BORESIGHTING AND TESTING SYSTEM

21 To boresight and test the system, a system analyser (1,000,012) may be used. Prepare the aircraft for harmonization. Refer to Paragraph 20, preceding, and proceed as follows:

(a) Remove radar access door.

(b) Connect external 28-volt d.c. power source. Close a.c. circuit-breakers and set instrument power a.c. switch to NORMAL.

(c) With the proper test equipment, check the availability of correct voltages and frequencies at the voltages test box. The a.c. potential between phases should be 28 (±3) volts and the frequency should be 400 (±10) cycles. The 300-volt d.c. power supply from the static inverter should be 300 (±3) volts.

(d) Through the computer cover window, observe that the elevation gyro is rotating counter-clockwise by watching gyro when it is stopped and then turning on the 28-volt, 3-phase, 400-cycle power.

(e) When the correct operating temperatures are reached after about 15 minutes or after heater lights on test units begin cycling, electrically cage the sight and observe that the target index dot is superimposed on the sight mark of the target board.

(f) If target dot is not on the target mark, remove sight head elevation and deflection (azimuth adjustment) cover plates. (See Figure 9-25.) Mechanically cage the sight by moving the mechanical lever to the CAGED position, which will prevent damage to the mirror drive linkage when adjustments are made. To align the target index dot to target board aiming mark, loosen the deflection adjustment lock-screws and turn the deflection (azimuth) adjustment screw left or right until index dot is superimposed on aiming point on target board. For elevation correction, push in on socket wrench to unlock adjustment and then turn nut in direction required. Install deflection cover plate as soon as possible to prevent entry of dirt or moisture.

(g) Turn caging lever to UNCAGE to free mirror drive mechanism and wait until index dot stabilizes. Speedier stabilization will result if electrical caging button is pressed.

(h) Move caging lever repeatedly from CAGE to UNCAGE position and check that index dot movement is restricted to a circled area of 3 mils, caged or uncaged.

(j) By using a 0 to 500 milliammeter or by observing that there is no sensitivity current to elevation or deflection stiffness motors, verify that the 300-volt d.c. power supply is interrupted when sight is mechanically caged.

Switch Settings		Reticle Tracing Index Displacement in Mils
Selector Switch	2.75 FFAR-S	9 to 17
	2.75 FFAR-N	18 to 26
	5 HVAR-S	38 to 46
	5 HVAR-N	47 to 55
	2.25 SCAR-S	50 to 58
	2.25 SCAR-N	64 to 72
Variable Selector Switch	10 mils	9 to 19
	20 mils	20 to 28
	30 mils	29 to 39
	40 mils	39 to 49
Check that the total sensitivity currents for the various rockets agree with the sight factory test sheet figures within ±2 milliamperes.		

Figure 9-26 Table of Rocket Depression Angle Reticle Displacement

(k) Check that the reticle illumination does not flicker on and off when sight head is caged. Check that sight returns to gun function when sight head is caged and that sight returns to gun function when the radar-out switch is depressed.

(m) Set gun-bomb-rocket selector to BOMB position and bomb-target-wind scale to zero knots. Measure distance the reticle moves from bomb stop to the point where lamp circuit is opened when the mirror motor is manually rotated away from bomb stop. This must be 4 (±1) mils.

(n) Move the gun-bomb-rocket selector to the various rocket-type positions and measure that the index dot depression relative to the target board mark is as shown in Figure 9-26.

(p) Electrically cage sight and check that index dot is superimposed on the target board mark. Set range servo unit for a range of 5400 feet and the gun-bomb-rocket selector knob to TR. See that correct deflection and elevation temperatures are reached (noted when lights cycle).

(q) While observing stop watch on test unit switches, deflect target index dot to both left and right at least 175 mils. Release the switch. Each time the switch is released, measure the time of travel of index dot on the target board between 150 and 55 mils. Deflect the target

Range (Feet)	Tolerances (Feet)
600	(±60)
1200	(±60)
2400	(±70)
3600	(±70)
4500	(±80)
5400	(±120)
6000	(±120)

Figure 9-27 Table of Ranges and Tolerances

Deflection Stiffness Current		
Density Ratio	Target Speed Ratio	Range (Feet)
0.6	1.0 TR.	4500
0.6	1.0 TR.	3600
0.6	1.0 TR.	2400
0.6	1.0 TR.	1200
*1.0	1.0 TR.	3600
0.6	0.8 HI.	3600
*1.0	0.8 HI.	3600
0.6	1.2 LO.	3600
*1.0	1.2 LO.	3600

Elevation Stiffness Current	
Density Ratio	Range (Feet)
0.6	5400
0.6	4500
0.6	3600
0.6	2400
0.6	1200
*1.0	3600

NOTE

Items noted by an asterisk are for sight systems having density units installed. Density ratio of 1.0 is equivalent to 29.26 in. Hg (0 feet altitude). Items not so noted are for sight systems not having density units, but having equivalent networks corresponding to 0.6 density ratio or 15.56 in. Hg (16,175 feet altitude).

Figure 9-28 Table of Deflection and Elevation Stiffness Current

index dot in elevation both up and down, and measure the time of travel between 100 and 37 mils. The average characteristic time for at least three successive deflections should be 4.55 (±0.60) seconds for a sight having a density of 1.0 (0 feet altitude) and 2.90 (±0.50) seconds when ratio is 0.6 (16,175 feet altitude). Do not adjust computer heater thermal switches on the basis of this test.

(r) Check dimmer control to see that reticle brightens and dims when knob is turned in corresponding direction.

(s) Check that reticle image is obtained in both primary and secondary position of filament switch.

(t) Check following voltages and currents, which can be measured at P-302 on the amplifier deck. Pin L is ground.

(1) L to K: 28-volt, 400-cycle a.c. A phase to B phase.

(2) L to W: 28-volt, 400-cycle a.c. A phase to C phase.

(3) K to W: 28-volt, 400-cycle a.c. B phase to C phase.

(4) J to L: 28-volt d.c. in computer.

(5) Z to L: 300-volt d.c. supply from E-1A static computer.

(6) D to L: 300-volt d.c. supply from sight head.

(7) K to R: Microsyn excitation current (a.c. ma).

(8) Y to E: Total sensitivity current (d.c. ma).

(9) V to A: Elevation sensitivity motor current (d.c. ma).

(10) Q to A: Deflection sensitivity motor current (d.c. ma).

(u) Set target span dial on sight to 60 feet. When sight is in mechanical caged position,

Range	Density Ratio	Total Current Velocity Gun Station		
		500 Knots	400 Knots	300 Knots
1200	1.0	50.2 ma.	50.0 ma.	49.9 ma.
2400	1.0	33.2 ma.	32.9 ma.	32.5 ma.
3600	1.0	24.5 ma.	24.1 ma.	23.6 ma.
4500	1.0	19.9 ma.	19.5 ma.	18.9 ma.
5400	1.0	16.5 ma.	16.2 ma.	16.0 ma.
1200	0.6	50.7 ma.	50.5 ma.	50.4 ma.
2400	0.6	34.8 ma.	34.5 ma.	34.2 ma.
3600	0.6	27.3 ma.	26.9 ma.	26.4 ma.
4500	0.6	3	23.1 ma.	22.6 ma.
5400	0.6	20.6 ma.	20.4 ma.	20.1 ma.

Figure 9-29 Table of Sensitivity Amplifier Ideal Total Current

range dial should drive to 600-foot range and then stop. At these settings reticle diameter should be 100 (±4) mils.

(v) With target span dial set to 90 feet, setting servo unit dial to the range shown in Figure 9-27 should produce the corresponding ranges.

(w) Set velocity gun station jumper in servo unit to 500 knots as shown in Figure 9-25. With ranges, target ratios and density inputs, as shown in Figure 9-28, the sight system should reproduce sensitivity motor currents noted in Figure 9-29 within tolerance of 2 milliamperes.

(x) With range set at 3600 feet, depress characteristic time switch on test unit until target index dot is deflected to the right at least 100 mils, then release switch. Allow 30 seconds for target index dot to return and settle to zero and note dot position on target scale. Repeat foregoing procedure deflecting dot to left. Total spread between position of target index in returning to zero from right must not exceed 3 mils.

(y) Deflect target index dot up and down from zero with setting point approximately 8 mils below zero. The total spread between position of target index in returning to rest from up and down position should not exceed 3 mils.

(z) To check gravity drop, set range at 3600 feet. Electrically cage sight, and check that index dot is on target zero. Uncage sight and measure target index dot depression. For sight system having density ratio of 1.0, value should not exceed 8 (±1) mils. For system not having density units (density ratio of 0.6), value should not exceed 6 (±1) mils.

(aa) Move gun-bomb-rocket selector to BOMB position. Target index dots should drop 177 (±8) mils from electrical caged position. During this test, target index dot light will be extinguished until computer bomb stop is reached, at which time light will again illuminate. Press electrical caging button to speed dot settling. If necessary remove sight head bomb stop adjustment access cover and loosen adjustment lock-screw, (see Figure 9-25). Turn adjustment screw in either direction until reticle image appears and mark adjustment screw position. Turn screw in opposite direction until image is extinguished and mark screw position. Turn adjustment screw until midway between two marked positions. Recheck setting, then tighten lock-screw.

22R For detailed information on the A-4 gun-bomb-rocket sight, refer to EO 30-230B-2.

PART 9 - SECTION 7

MILITARY LOAD

AMMUNITION AND LOADING PROVISIONS

GENERAL

1 Each gun is normally fed 267 rounds of .50-calibre ammunition which is stowed in a removable container directly below the gun bay. Each container has a maximum capacity of 300 rounds. A large door provides quick access to each bank of guns. A separate access door on each side of the fuselage, just below the gun bay, is provided to remove and load the ammunition containers. (See Figure 9-30.) A hook, installed in the same location, is provided to lift the ammunition belt from the container through the booster motor and flexible feed chute. Gun chargers are installed. The ammunition compartment access doors, when lowered to the first stop, provide support for ammunition containers while they are being engaged with their respective racks. Ejected cases and links are retained in special compartments to the front and rear of the ammunition compartment.

LOADING OF AMMUNITION

2 Prior to loading ammunition, make sure all armament switches are off. Open the gun bay and ammunition access doors (set the ammunition access doors in the semi-lowered position), and make sure that the guns have been inspected for proper headspace, timing and security of mounting. Make sure that all the feed chutes are aligned with the ammunition containers and gun feedways and that chutes are secure. Load the ammunition as follows:

(a) Disengage quick-release pins of ammunition tanks and withdraw tank approximately six inches.

(b) Lower ammunition loading hook through the booster motor and engage with the first empty link of the ammunition belt.

(c) Draw the ammunition belt upwards and engage the quick-release pins with the double sprockets of booster motor.

NOTE

On aircraft 23211 to 23610 inclusive, the belt must be held in position to prevent it from falling back into the tank.

(d) Return ammunition tank to correct position and engage the quick-release pins with the booster motor bracket.

(e) Draw belt up through the ammunition chute to the gun.

CAUTION

When loading, never apply a strong pull to the booster motor unless it is held down firmly or is properly engaged with the ammunition tank. To avoid undue force on booster motor while loading, ensure that the ammunition is correctly engaged in the double sprockets of the motor.

REMOVAL OF EXPENDED BELT AND CASES

3M The expended belt links and cases are routed from the guns through fixed chutes to the expended ammunition compartments located fore and aft of the ammunition containers on both sides of the aircraft (see Figure 9-30). They consist of phenolic sheets covered with neoprene for added protection. Access to the forward stowage compartment is obtained by opening access doors on each side of the nose landing gear wheel well. The links and cases are removed from the aft compartments by opening access covers just aft of the ammunition compartment doors.

WARNING

Before entering the nose wheel well area, be certain that the nose gear drag brace ground lock assembly and the nose gear door ground safety lock are in place and secure.

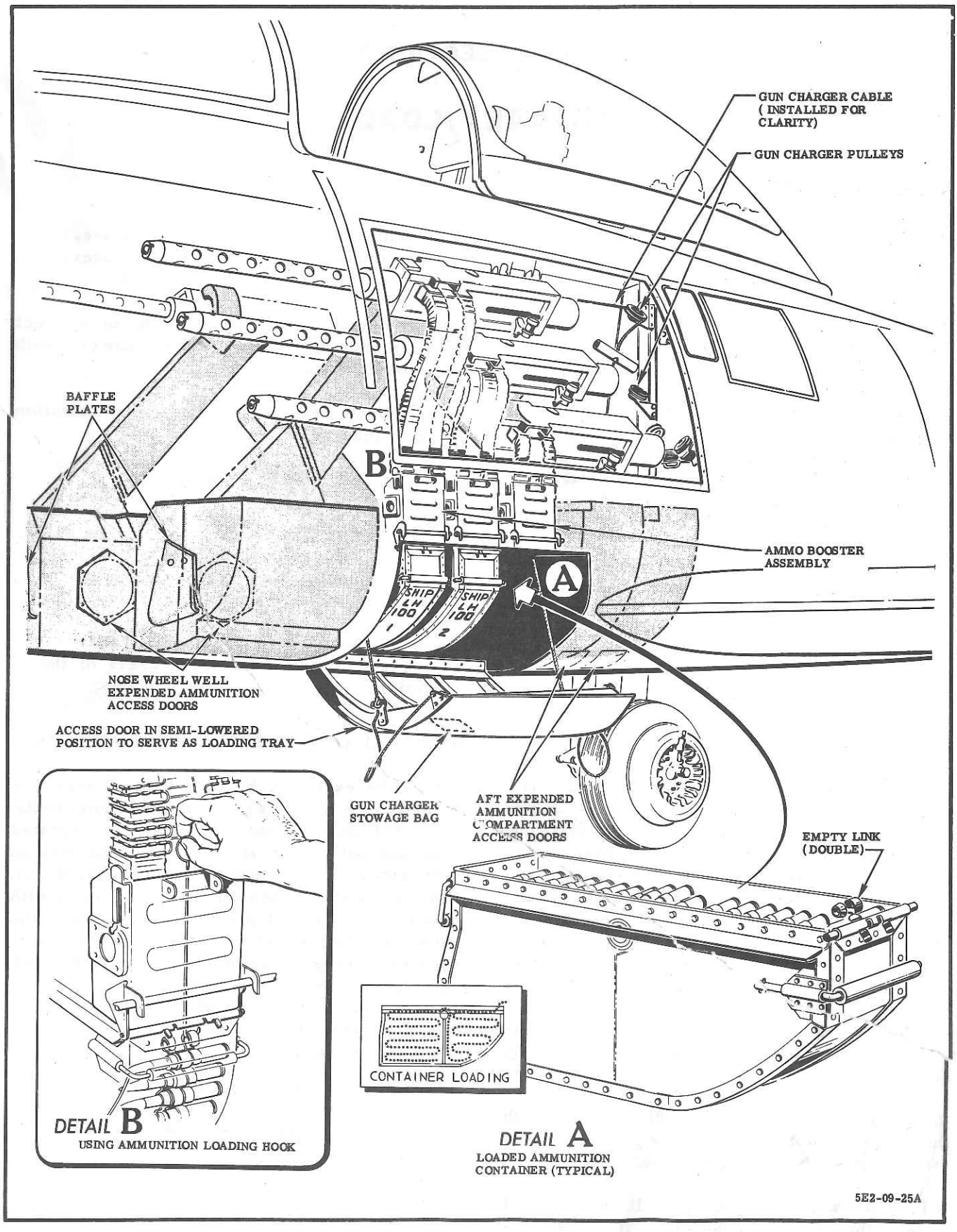


Figure 9-30 (M) Loading Ammunition

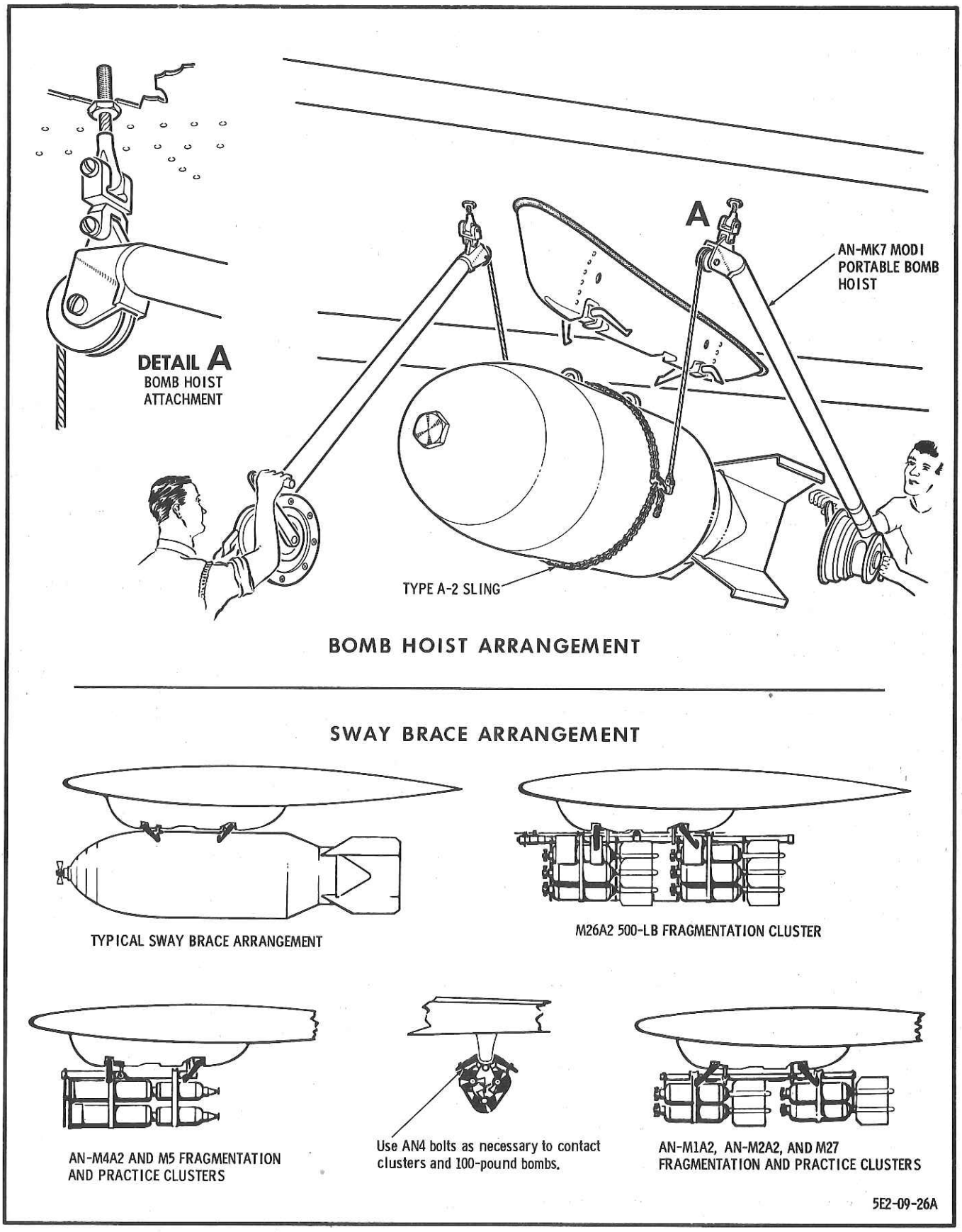


Figure 9-32 Bomb Hoisting

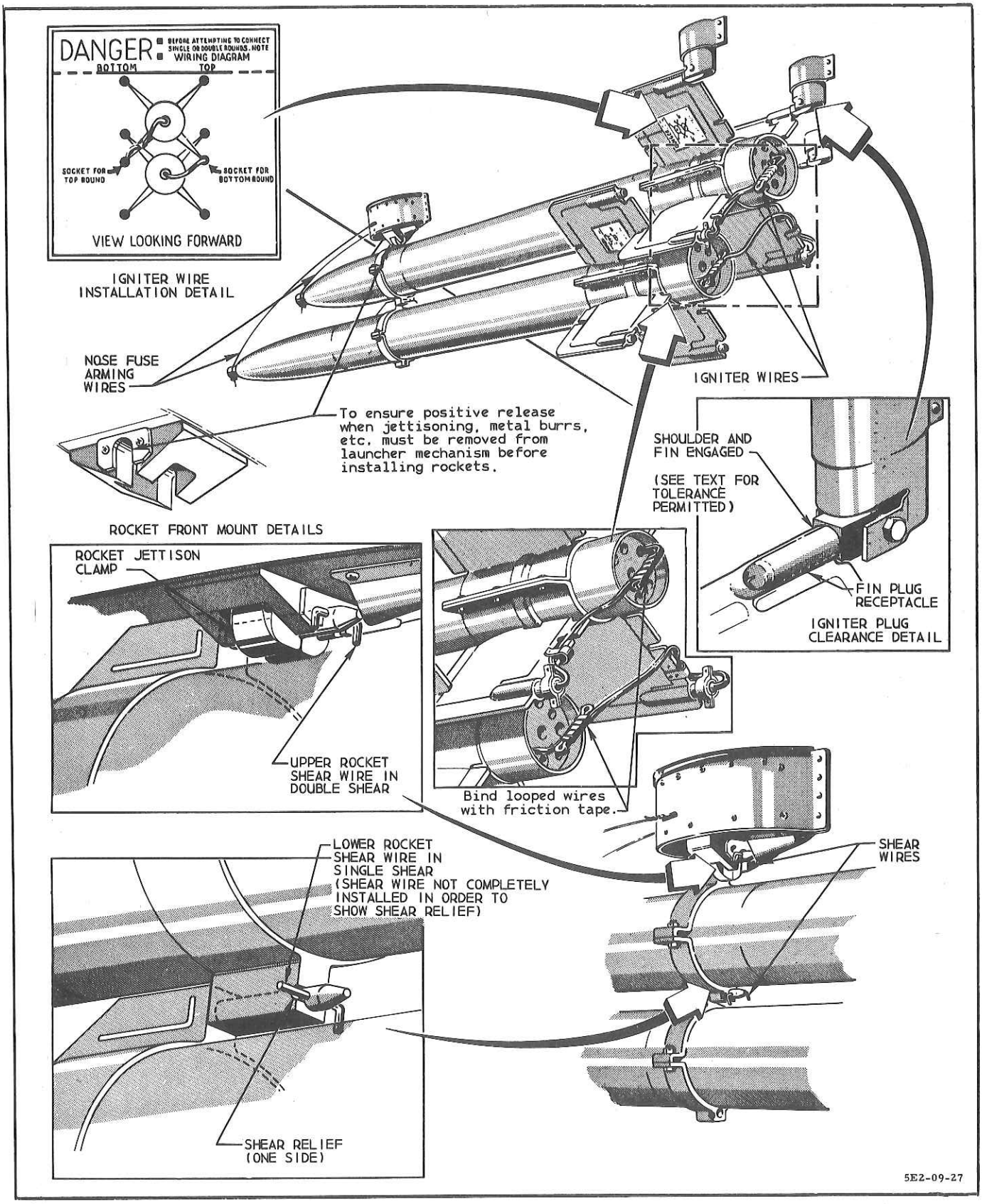


Figure 9-33 Rocket Loading Details

(g) Using a modified Type B-2 electrical circuit tester (modification consists of the addition of lead No.8), plug the leads into the lower sockets of the upper rounds. While holding the tester in position visible to a person in the cockpit, signal to energize each successive rocket circuit by depressing bomb-rocket release button at both the single, with 2-second minimum duration of the impulse, and automatic rate. The proper release sequence is shown in Figure 9-7. Any glow, even slight or momentary, from a lamp out of proper sequence, indicates malfunction and the mission must be cancelled until the malfunction is rectified. After testing one wing, remove tester leads and repeat procedure on opposite wing.

(h) Complete the arming and fusing of rockets in usual manner.

(j) After the engine is started prior to taxiing and while the aircraft is pointed toward an uninhabited area containing no buildings, first remove the metal shipping container from the nozzle and igniter cable and then connect the rocket igniter cables. The left rear mount is wired to fire the bottom rocket. Rocket pin plug receptacles are cross wired, and connection of the igniter plugs will always be the same as shown in diagram on fin. Plugging in must proceed completely across all launcher stations, the armourer passing under the fuselage after completing the inboard station on one side, and then to the other wing, inboard to outboard.

WARNING

As the engine will be running, keep clear of the nose and tail of the aircraft. The plug-in is to be accomplished by a predesignated man upon a signal from the pilot and in an area cleared of personnel. The armourer must stand at arms length at the side of, and never behind the rocket being plugged in, nor immediately behind or in front of any plugged-in rocket.

CAUTION

To prevent the lower rocket from blasting the upper rocket igniter cable loose, thereby leaving a dead upper rocket on the rack, make sure the igniter leads are secured as shown in Figure 9-33. Signal pilot when plug-in operations are completed.

LOADING AND PREPARATION OF GUN CAMERA

6 Access to the gun camera is attained by removing a cover plate in the lower leading edge of the engine air intake duct (see Figure 9-14). Film may be loaded and camera settings can be adjusted without removing camera mount. Prior to loading the gun camera, make the following checks:

(a) Check that the camera has been boresighted.

(b) Make sure that the gun camera is in proper working order. Camera operations may be checked with the gun camera installed on the aircraft or may be checked on the bench.

(c) Clean the camera lens and filter, also the window in camera access door. This is a very important factor in obtaining successful operation of the camera.

(d) Set the overrun control, if necessary, to predetermined requirements for overrun time. Overrun settings may be seen through window in camera case.

(e) Check the number of feet of unused film in the magazine and set film footage dial on camera accordingly. If a full magazine is to be used, turn the footage indicator knob until the footage dial indicates zero. If the film magazine is partially used, set the footage indicator to correspond with the figure on the magazine footage dial. In order to set the film footage dial, it is necessary to push in while turning the dial knob.

(f) With the film magazine in proper working order, press both ends of film loading door latch and open the door. Retract the magazine drive gear engagement arm to allow for the magazine loading. Insert the film magazine all the way into the magazine chamber with the aperture towards the lens and the magazine footage indicator toward the mounting side of the camera. Move the magazine drive gear engagement arm over the end of the magazine as far as it will go, thereby engaging

the magazine driving gears. Close the magazine access cover.

NOTE

Retracting the magazine drive gear engagement arm will disengage the film magazine drive gears to permit removal of the film magazine. When pulling the arm out after inserting the film magazine, take care to force the driving gears into engagement. Be sure the film magazine is pushed in all the way. The camera door will not close unless the arm is pulled out and the magazine driving gears are properly engaged. As the film magazine is inserted into the camera, the film opening is pushed open automatically.

(g) Set the shutter speed to 16, 32 or 64 exposures, or frames, per second, as required by turning the shutter speed knob on the side of the camera.

CAUTION

Do not change the shutter speed while the camera is running. Always have the index marks on the shutter speed knob in exact alignment with the index mark on the camera case.

(h) Rotate the outer adjustment ring until the diaphragm opening guide corresponds to the shutter speed setting.

CAUTION

Care must be taken to adjust the outer knurled adjustment ring for shutter speed, before setting the inner knurled adjustment ring for light conditions.

NOTE

The shutter speed knob must always be set at the same speed as that of the diaphragm opening guide of the lens.

(j) Rotate the inner knurled adjustment ring to anticipate light conditions B-bright H-hazy, D-dull or f3.5.

(k) Install the camera access door.

UNLOADING OF GUN CAMERA

7 To unload the gun camera, proceed as follows: (See Figure 9-14.)

(a) Remove gun camera access door.

(b) Press both ends of the gun camera door latch on the camera and open the door.

(c) Retract the magazine drive gear engagement lever and pull the film magazine out.

PART 10

PHOTOGRAPHIC

(Refer to Part 9, Section 3)

PART 11

TABLE OF CONTENTS

ELECTRICAL AND ELECTRONIC DIAGRAMS

PART 11

LIST OF ILLUSTRATIONS

ELECTRICAL AND ELECTRONIC DIAGRAMS

(Continued)

PART 11

ELECTRICAL AND ELECTRONIC DIAGRAMS

ELECTRICAL AND ELECTRONIC DIAGRAMS

GENERAL

1 This part contains information on the electrical and electronic wiring of the aircraft. For method of using the wiring diagram data, see Figure 11-1. For chart of electrical and electronic symbols, see Figure 11-2. When reading wiring diagrams, note the flags (squares with circles and numbers enclosed) which denote where changes have been made and their effectivity.

2 To facilitate wiring installation and identification, each wire is marked with a letter-number combination stamped on the wire at intervals of 6 to 18 inches throughout its length. This code does not apply to the internal wiring of equipment. The following is the identification code for wiring in the Sabre MK 5 and 6 aircraft.

NOTE

Heading from left to right, the first number is to differentiate between cables having the same cable identification.

A ALL ARMAMENT AND BOMBING CIRCUITS

- AB Bombing
- AC Camera
- AG Guns
- AK Chemical
- AR Rockets
- AS Sights

C FLIGHT CONTROL CIRCUITS

- CB Dive Brakes
- CS Alternate Hydraulic
- CT Trim Tabs
- CW Wing Flaps

D DE-ICING OR ANTI-ICING CIRCUITS

- DD De-icing Control
- DP Pitot Heaters

E ENGINE INSTRUMENT CIRCUITS

- ED Fuel Flow
- EF Fuel Quantity
- EG Oil Pressure
- EP Oil Temperature (Main Oil)
- ES Tachometer
- EU Fuel Pressure
- EV Hydraulic Pressure
- EY Oil Temperature (Centre Bearing Scavenge)
- EZ Exhaust Temperature

F FLIGHT INSTRUMENT CIRCUITS

- FB Turn and Slip Indicator
- FH Attitude Gyro
- FR Gyro Compass

G LANDING GEAR CIRCUITS

- GA Actuator and Retraction
- GC Wheel Steering

H HEATING AND VENTILATING CIRCUITS

- HC Cabin Heater
- HG Gun Heater
- HV Ventilation Control

J IGNITION CIRCUITS

- JD Ignition Vibrator

K ENGINE CONTROL CIRCUITS

- KS Starter

L LIGHTING CIRCUITS

- LE Extension
- LJ Instrument
- LL Landing
- LN Navigation

M MISCELLANEOUS

- MR Enclosure Operation Release, Locks, etc.
- MT Target Tow

N GROUND NETWORK WIRING

Any wire that completes the circuit to the ground network from an equipment item is designated with the letter N. In explanation, it may be said that any wire with an N circuit function letter could be connected to the aircraft ground network without malfunctioning of the circuit.

NA	Ground, Armament
NC	Ground, Flight Control
ND	Ground, De-icing or Anti-icing
NE	Ground, Engine Instruments
NF	Ground, Flight Instruments
NG	Ground, Landing Gear
NH	Ground, Heating and Ventilating
NJ	Ground, Ignition
NK	Ground, Engine Control
NL	Ground, Lighting
NM	Ground, Miscellaneous
NP	Ground, Power
NQ	Ground, Fuel and Oil
NR	Ground, Radio Navigational and Communications Equipment
NS	Ground, Radio Operated Equipment
NV	Ground, Inverter
NW	Ground, Warning Devices
NX	Ground, Jet Pipe Limiter

P POWER

All wiring of battery, generator, voltage regulator, alternator field, field supply, rectifier output, generator load equalizer resistor and their controls, etc. has the P classification. All d.c. power wiring for more than one circuit is identified by the letter P with no additional circuit designation letter. This includes feeders from reverse-current relays to buses, from batteries to buses, etc. All d.c. feeders or d.c. power wiring up to the protector for an individual circuit (other than the ground network) is identified by two letters; the letter P and a circuit designation letter as shown in the following:

PA	Power, Armament
PC	Power, Flight Controls
PD	Power, De-icing or Anti-icing
PG	Power, Landing Gear
PH	Power, Heating and Ventilating
PP	Power, Generator Control, Battery Control
PQ	Power, Fuel and Oil
PV	Power, Inverter

Q FUEL AND OIL

QB	Fuel Booster Pump Motor
QF	Fuel Transfer Pump Motor and Control
QT	Throttle Control, Fuel Pump Motor

R RADIO NAVIGATIONAL AND COMMUNICATIONS EQUIPMENT

RN	Radio Navigation
RV	VHF Radio
RW	VHF Radio

S RADAR OPERATED EQUIPMENT

SG	Gun Laying Radar
SX	Recognition Radar

V INVERTER CONTROL

VX	Inverter A.C. Control

W WARNING DEVICES

WA	Warning, Armament
WD	Warning, Windshield Anti-ice and Ice Detector
WF	Warning, Flight Instrument
WG	Warning, Landing Gear
WH	Warning, Heat, Vent & Press
WM	Warning, Miscellaneous
WP	Warning, Power
WV	Warning, Inverter
WW	Warning, Oxygen

X A.C. POWER

All a.c. feeders or a.c. power wiring up to an individual circuit (such as protectors) other than the ground network is designated by the letter X. All external wiring of alternators, inverters and control equipment has the X classification.

XA	A-phase of Three-phase Power
XB	B-phase of Three-phase Power
XC	C-phase of Three-phase Power
XN	Neutral or Ground Wire of Three-phase Power
XV	Inverter (Single-phase)

EQUIPMENT	NUMBER OF UNITS	AMPS PER UNIT	OPERATING TIME MINS	OPERATING CONDITIONS																											
				LOADING OR ANCHOR				START AND WARM-UP				TAXI				TAKE-OFF AND CLIMB				CRUISE				CRUISE - COMBAT				LANDING			
					AVERAGE AMPS				AVERAGE AMPS				AVERAGE AMPS				AVERAGE AMPS				AVERAGE AMPS				AVERAGE AMPS				AVERAGE AMPS			
				AMPS	1/2 MIN	2 MINS	15 MINS	AMPS	1/2 MIN	2 MINS	15 MINS	AMPS	1/2 MIN	2 MINS	15 MINS	AMPS	1/2 MIN	2 MINS	15 MINS	AMPS	1/2 MIN	2 MINS	15 MINS	AMPS	1/2 MIN	2 MINS	30 MINS	AMPS	1/2 MIN	2 MINS	5 MINS
M MISCELLANEOUS																															
ACTUATOR - CANOPY	1	15.5	See Supplementary Data					15.5	5.2	1.3	0.2	15.2			0.1													15.5			0.3
RELAY - FIRE DETECTOR	1	1.2																													
RELAY - MISCELLANEOUS POWER AND CONTROL		0.2	See Supplementary Data	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
VALVE - CANOPY SEAL	1	0.3	See Supplementary Data													0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
P POWER																															
BATTERY (CHARGING)	1																														
INVERTER - RADAR 1-PHASE	1	72.7	CONT	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	86.3	86.3	54.0	32.3	64.8	64.8	40.5	17.6	43.2	43.2	27.0	11.7	21.6	21.6	13.5	10.7
INVERTER - INSTRUMENTS 3-PHASE	2	7.9	CONT	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
INVERTER - A-4 GUNSIGHT 3-PHASE	1	11.9	CONT	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	7.9	7.9	7.9	7.9
Q FUEL AND OIL																															
PUMP - MAIN FUEL BOOSTER (B-5)	2	16.0	CONT					32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
PUMP - FUEL TRANSFER (B-5C)	1	9.3																		9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3				
ACTUATOR - FUEL FLOW CONTROL (AIRCRAFT 23371 AND SUBS)	1	4.5						4.5	4.5	4.5		4.5	4.5	4.5		4.5	4.5	4.5						4.5	4.5	4.5		4.5	4.5	4.5	
FUEL - PRESSURE SWITCH (AIRCRAFT 23371 AND SUBSEQUENT)	1	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		0.5	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
VALVE - EMERGENCY FUEL SYSTEM (AIRCRAFT 23301 TO 23370)	1	1.0						1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
VALVE - FUEL SHUT-OFF	1	2.9	0.1					2.9	0.1																			2.9	0.1		
R RADIO																															
COMPASS - RADIO	1	4.5	CONT																	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
VHF - COMMAND RECEIVING	1	5.5	CONT	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
VHF - COMMAND TRANSMITTING		12.0	See Supplementary Data																												
S RADAR																															
IFF	1	1.0	CONT													1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0					1.0	1.0	1.0	1.0
RADAR SET	1	3.0	CONT	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
W WARNING DEVICES																															
HORN - LANDING GEAR WARNING	1	1.0	0.5																												
INDICATOR LIGHTS - MISCELLANEOUS	10	0.17	NEGL																									1.0	1.0	0.3	0.1

FOR PURPOSE OF THIS ANALYSIS THE AIRCRAFT ARMAMENT LOAD IS ASSUMED TO CONSIST OF THE FOLLOWING EQUIPMENT

6 MACHINE GUNS

12 ROCKETS

CAMERA HEATERS ON CONTINUOUSLY EXCEPT WHEN MOTORS ON

THE FOLLOWING ALTERNATE ARMAMENT LOADS ARE NOT INCLUDED IN THIS ANALYSIS

A- 2 - DEMOLITION OF PARA-FRAG BOMBS

B- 2 - CHEMICAL TANKS

C- 2 - DROP TANKS

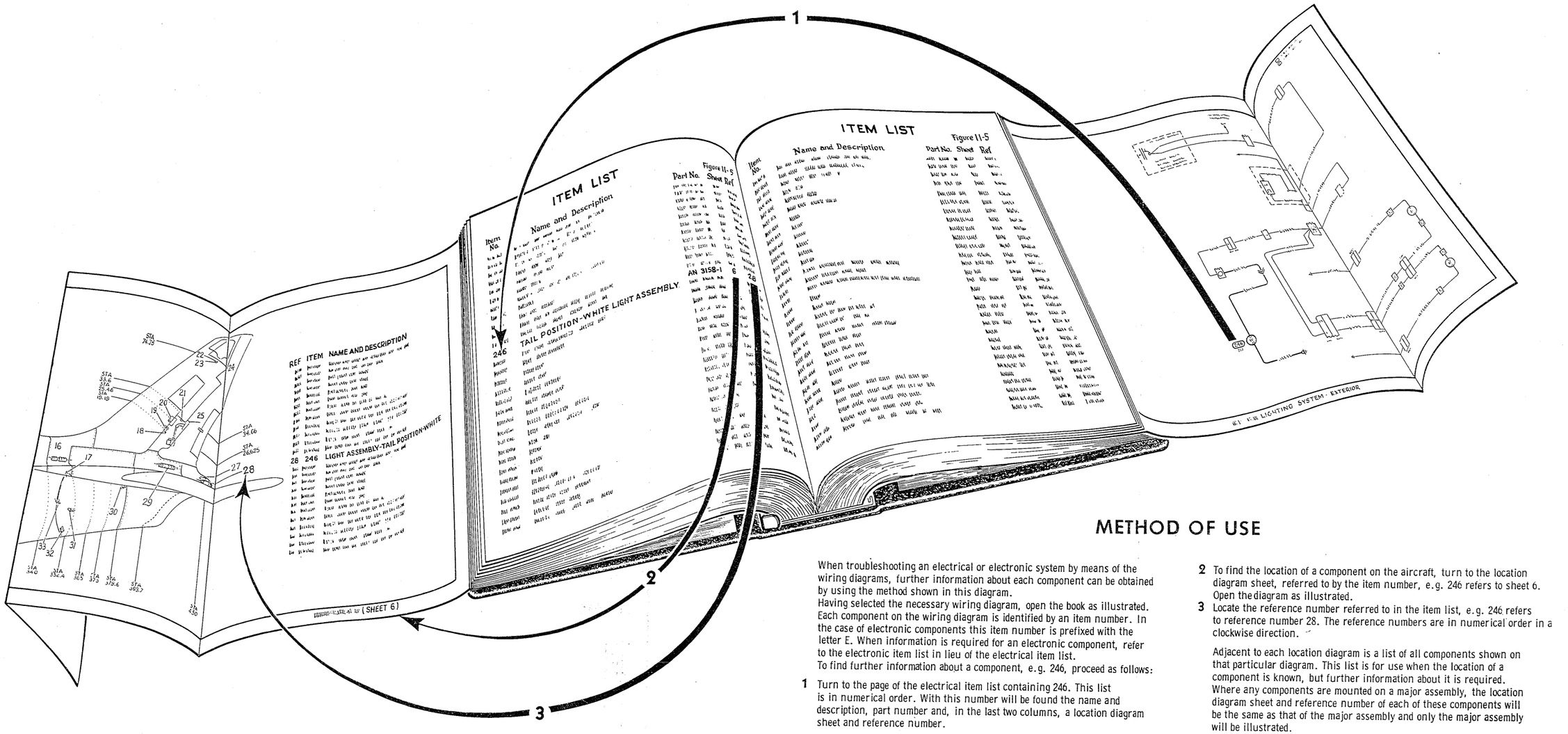
THE SPARE 3-PHASE INVERTER OPERATES WHEN THE MAIN 3-PHASE INVERTER IS OFF

5E2-07-11

Figure 7-3A (Sheet 3 of 3) D.C. Load Analysis Chart

EQUIPMENT	LOADING OR ANCHOR	START AND WARM-UP	TAXI	TAKE-OFF AND CLIMB	CRUISE	CRUISE - COMBAT	LANDING
MOTOR - AMMUNITION BOOSTER	OFF	OFF	OFF	OFF	OFF	10 SEC PER 15 MIN	OFF
RELEASE - ROCKET PROJECTOR	OFF	OFF	OFF	OFF	OFF	3 SEC	OFF
SOLENOID - GUN FIRING	OFF	OFF	OFF	OFF	OFF	10 SEC PER 15 MIN	OFF
CHARGER - GUN (RETRACT)	OFF	OFF	OFF	OFF	OFF	10 SEC PER 15 MIN	OFF
COMPRESSOR - GUN CHARGER	OFF	3.5 MIN FROM 1350 PSI CUT-IN TO 1500 PSI CUT-OUT	OFF	OFF	OFF	30 SEC	OFF
ACTUATOR - LATERAL TRIM BUNGEE	5 SEC	5 SEC	OFF	1 SEC PER 45 SEC	1 SEC PER 30 SEC	1 SEC PER 15 SEC	1 SEC PER 15 SEC
ACTUATOR - LONGITUDINAL TRIM BUNGEE	30 SEC	5 SEC	OFF	1 SEC PER 7 SEC	1 SEC PER 10 SEC	1 SEC PER 5 SEC	1 SEC PER 5 SEC
ACTUATOR - RUDDER TRIM	5 SEC	5 SEC	OFF	1 SEC PER 45 SEC	1 SEC PER 30 SEC	1 SEC PER 15 SEC	1 SEC PER 15 SEC
ACTUATOR - WING FLAP	OFF	1 OP UP (.2 MIN) 1 OP DOWN (.2 MIN)	OFF	1 OP UP (.2 MIN)	OFF	OFF	1 OP DOWN (.3 MIN)
VALVE - SPEED BRAKE	OFF	1 OP OPEN (5 SEC) 1 OP CLOSE (5 SEC)	OFF	OFF	4 SEC PER 6 MIN	4 SEC PER 3 MIN	1 OP (5 SEC) AT BEGINNING OF PERIOD. 1 OP (5 SEC) AT END OF PERIOD
VALVE - FAIRING DOOR SOLENOID	OFF	OFF	OFF	1 MIN OP BEGINNING .5 MIN AFTER START OF PERIOD	OFF	OFF	CONTINUOUS
VALVE - NOSE STEERING SOLENOID	OFF	OFF	5 SEC PER 1 MIN	OFF	OFF	OFF	5 SEC PER 1 MIN
VALVE - STRUT SOLENOID	OFF	OFF	OFF	7 SEC OP BEGINNING .5 MIN AFTER START OF PERIOD	OFF	OFF	10 SEC OP AT BEGINNING OF PERIOD
HEATER - WINDSHIELD ANTI-ICE	OFF	OFF	OFF	OFF	OFF	OFF	OFF
HEATER - COCKPIT	OFF	CONTINUOUS	CONTINUOUS	30 SEC	AVERAGE 1/4 FULL LOAD	AVERAGE 1/4 FULL LOAD	CONTINUOUS
REGULATOR - COCKPIT PRESSURE	OFF	OFF	CONTINUOUS	CONTINUOUS	CONTINUOUS	CONTINUOUS	CONTINUOUS
VALVE - AIR SHUT-OFF	OFF	6 SEC	OFF	OFF	OFF	OFF	OFF
VALVE - DUMP	OFF	OFF	OFF	OFF	OFF	OFF	OFF
VALVE - HEAT EXCHANGER MODULATING	OFF	OFF	1 SEC PER 5 SEC	1 SEC PER 5 SEC	1 SEC PER 5 SEC	1 SEC PER 5 SEC	1 SEC PER 5 SEC
VALVE - HOT AIR BY-PASS	OFF	OFF	1 SEC PER 5 SEC	1 SEC PER 5 SEC	1 SEC PER 5 SEC	1 SEC PER 5 SEC	1 SEC PER 5 SEC
VALVE - RAM AIR	OFF	1 SEC	OFF	OFF	OFF	OFF	OFF
LIGHT - FUSELAGE	FUSELAGE POSITION LIGHTS SHOWN ON BRIGHT FOR ALL CONDITIONS EXCEPT FOR CRUISE-COMBAT IN WHICH DIM LIGHTS ARE ON						
FLASHER - POSITION LIGHT	OFF	OFF	OFF	OFF	OFF	OFF	OFF
LIGHT - LANDING AND TAXI	15 SEC (1 LIGHT)	OFF	CONTINUOUS (1 LIGHT)	.5 MIN (2 LIGHTS) BEGINNING OF PERIOD	OFF	OFF	2 MIN (2 LIGHTS) CONTINUOUS (1 LIGHT)
MOTOR - LANDING AND TAXI LIGHT	10 SEC (2 LIGHTS)	OFF	5 SEC (2 LIGHTS)	5 SEC (2 LIGHTS) AFTER 1 MIN	OFF	OFF	5 SEC (2 LIGHTS) BEGINNING OF PERIOD. 1 SEC (1 LIGHT) AFTER 2 MIN. 5 SEC (2 LIGHTS) END OF PERIOD
ACTUATOR - CANOPY	OFF	10 SEC	5 SEC AT END OF PERIOD	OFF	OFF	OFF	5 SEC AFTER 2 MIN
VALVE - CANOPY SEAL	OFF	OFF	OFF	CONTINUOUS	CONTINUOUS	CONTINUOUS	2 MIN BEGINNING OF PERIOD
RELAYS - MISCELLANEOUS POWER AND CONTROL	1/4 OF TOTAL NUMBER OF RELAYS OPERATING SIMULTANEOUSLY, CONTINUOUSLY						
VALVE - EMERGENCY FUEL SYSTEM REGULATION	OFF	CONTINUOUS	14 MIN AFTER 1 MIN	CONTINUOUS	CONTINUOUS	CONTINUOUS	CONTINUOUS
VALVE - MAIN FUEL SYSTEM REGULATION	OFF	OFF	3 SEC	OFF	OFF	OFF	OFF
VHF RADIO (TRANSMITTING)	1 MIN PER 15 MIN	1 MIN PER 5 MIN	1 MIN PER 5 MIN	1 MIN PER 15 MIN	1 MIN PER 10 MIN	1 MIN PER 5 MIN	1 MIN PER 5 MIN
PUMP - ALTERNATE FLIGHT CONTROL - SYSTEM HYDRAULIC	NORMAL HYDRAULIC SYSTEM OPERATING - PUMP OPERATES 2 SEC EACH 15 MIN: ALTERNATE FLIGHT CONTROL SYSTEM OPERATING WITH SOME CONTROL STICK MOVEMENT - PUMP OPERATES 2 SEC ON 4 SEC OFF IN ALL CONDITIONS, EXCEPT CRUISE - COMBAT, AND LANDING, IN WHICH PUMP OPERATES CONTINUOUSLY. LOADING OR ANCHOR, START AND WARM-UP OPERATING CONDITIONS ARE INCLUDED IN LOAD ANALYSIS DATA.						
VALVE - ALTERNATE FLIGHT CONTROL SYSTEM RETURN AND SUPPLY	ON WHEN ALTERNATE FLIGHT CONTROL SYSTEM ON (LOADING OR ANCHOR - START AND WARM-UP INCLUDE THIS LOAD)						
VALVE - NORMAL SYSTEM BY-PASS							
							5E2-07-13

Figure 7-4A Load Analysis Chart - Supplementary Data



METHOD OF USE

When troubleshooting an electrical or electronic system by means of the wiring diagrams, further information about each component can be obtained by using the method shown in this diagram.

Having selected the necessary wiring diagram, open the book as illustrated. Each component on the wiring diagram is identified by an item number. In the case of electronic components this item number is prefixed with the letter E. When information is required for an electronic component, refer to the electronic item list in lieu of the electrical item list.

To find further information about a component, e.g. 246, proceed as follows:

1 Turn to the page of the electrical item list containing 246. This list is in numerical order. With this number will be found the name and description, part number and, in the last two columns, a location diagram sheet and reference number.

2 To find the location of a component on the aircraft, turn to the location diagram sheet, referred to by the item number, e.g. 246 refers to sheet 6. Open the diagram as illustrated.

3 Locate the reference number referred to in the item list, e.g. 246 refers to reference number 28. The reference numbers are in numerical order in a clockwise direction.

Adjacent to each location diagram is a list of all components shown on that particular diagram. This list is for use when the location of a component is known, but further information about it is required. Where any components are mounted on a major assembly, the location diagram sheet and reference number of each of these components will be the same as that of the major assembly and only the major assembly will be illustrated.

5E2-11-123A

Figure 11-1 How to Use Wiring Data

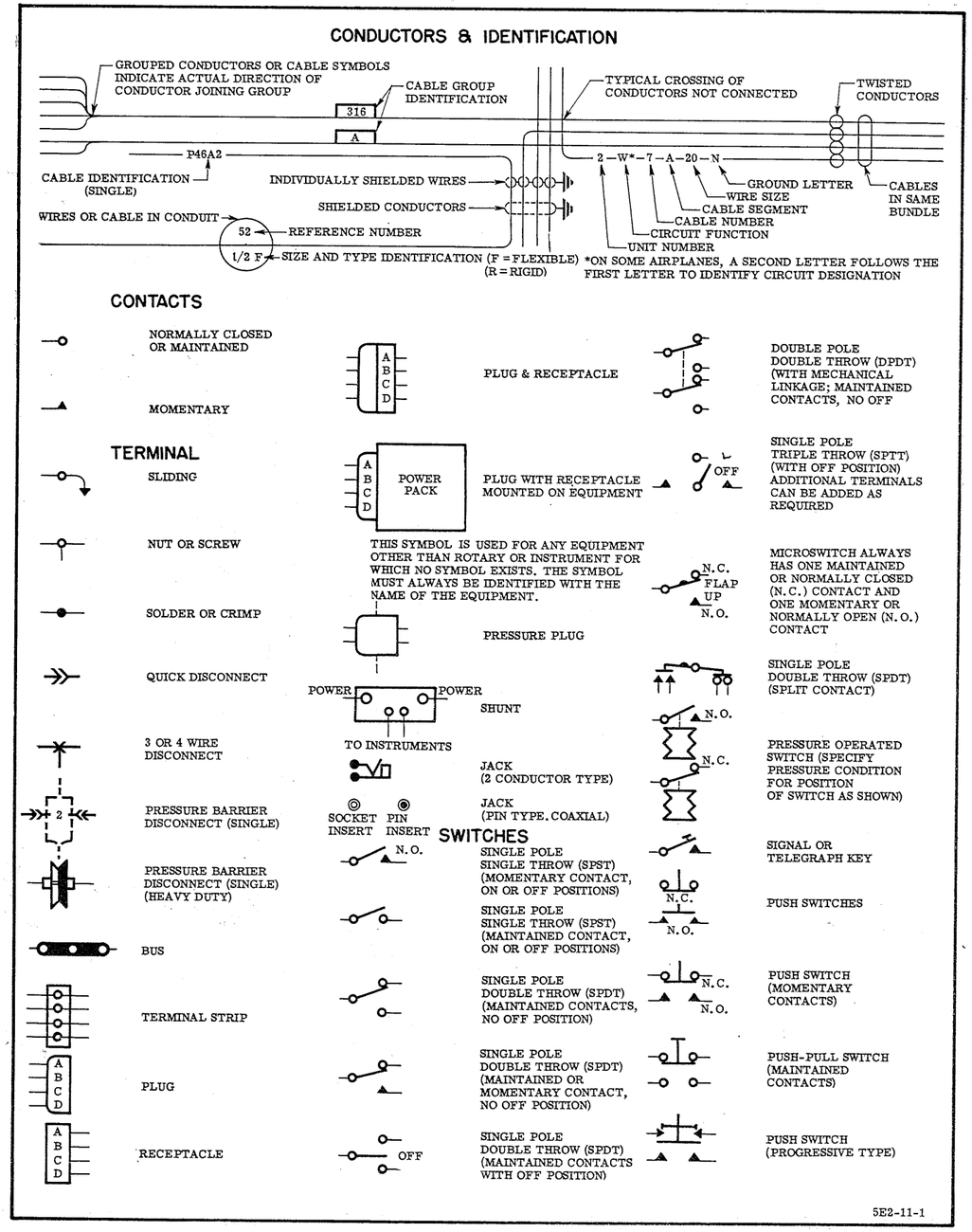


Figure 11-2 (Sheet 1 of 4) Electrical Symbol Chart

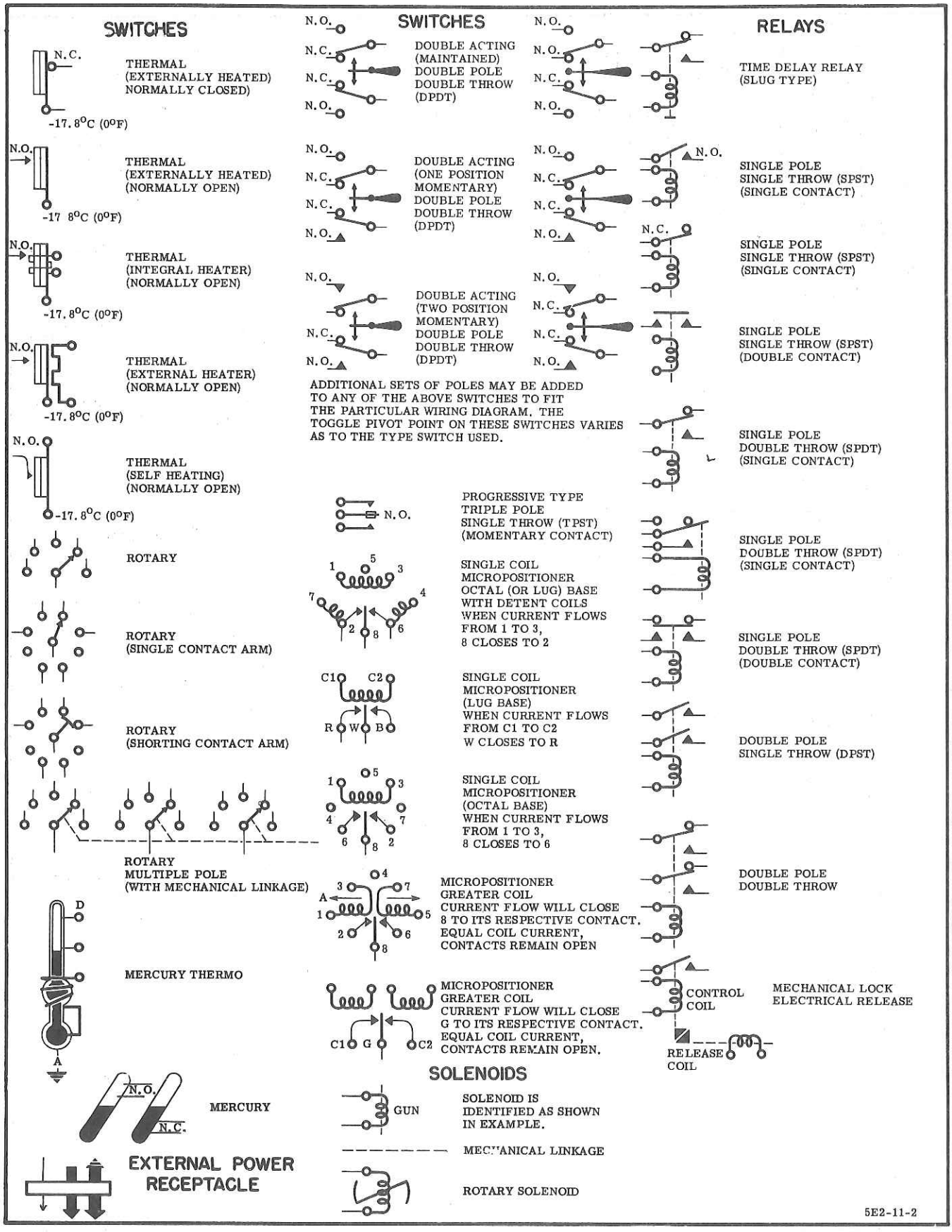


Figure 11-2 (Sheet 2 of 4) Electrical Symbol Chart

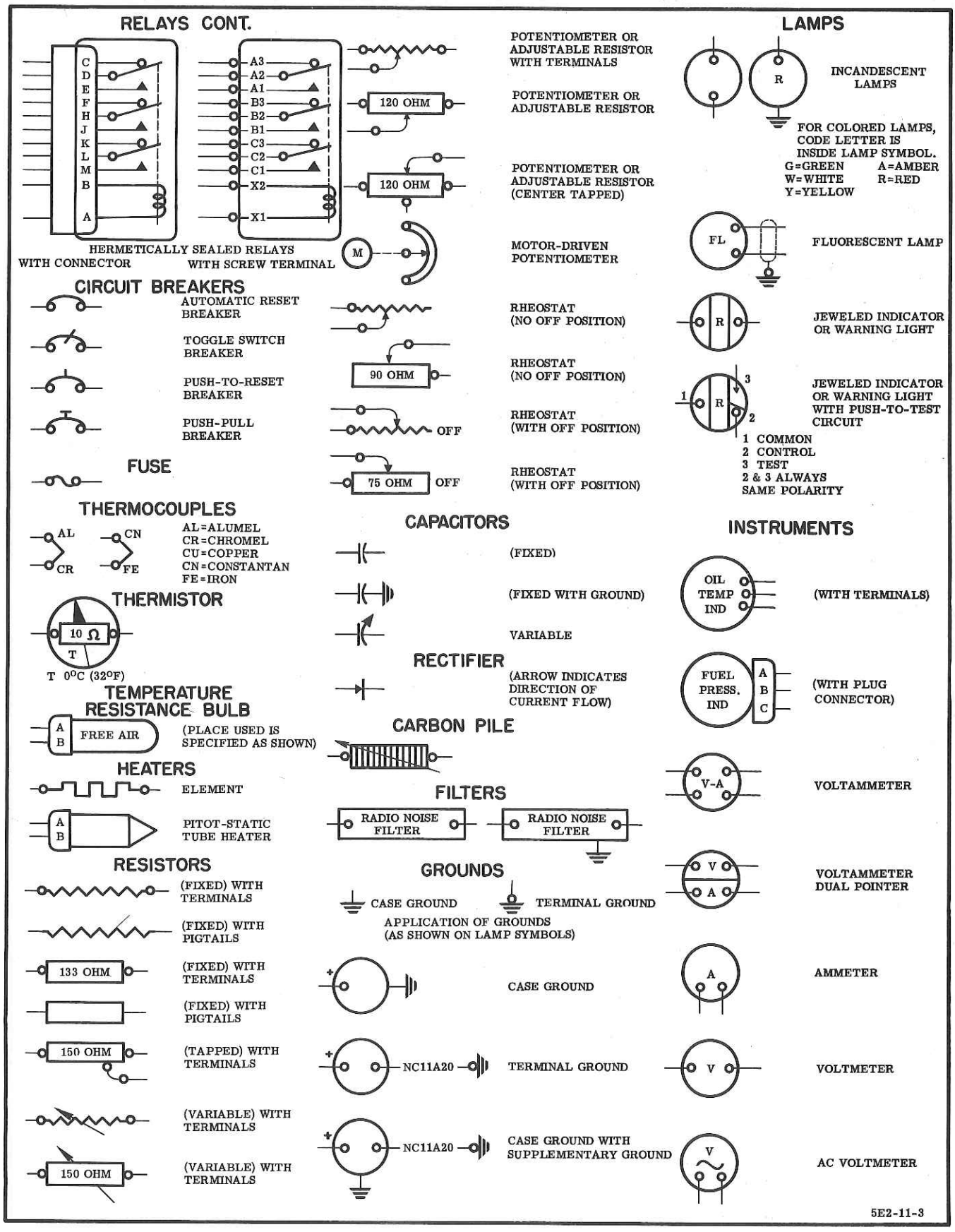


Figure 11-2 (Sheet 3 of 4) Electrical Symbol Chart

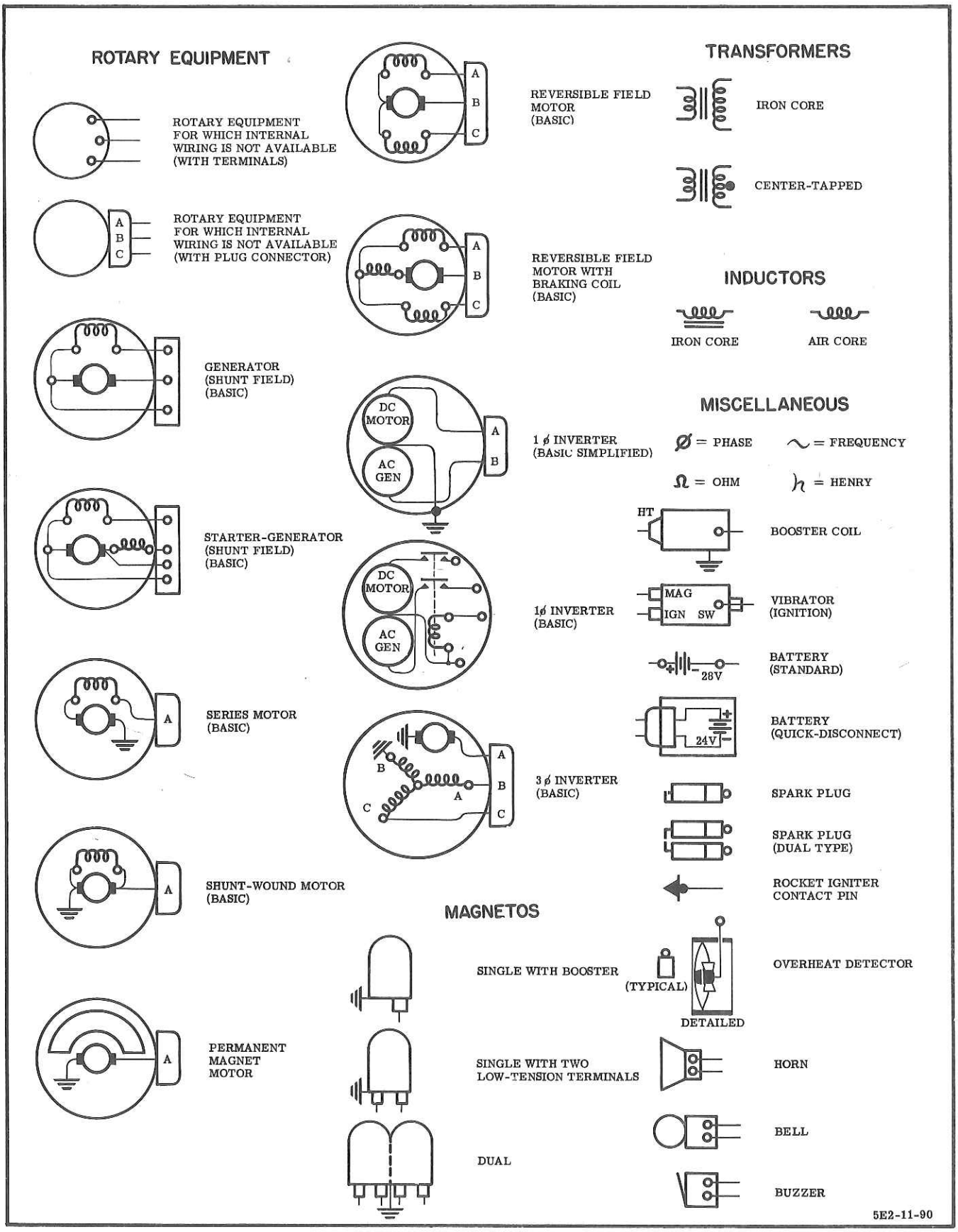
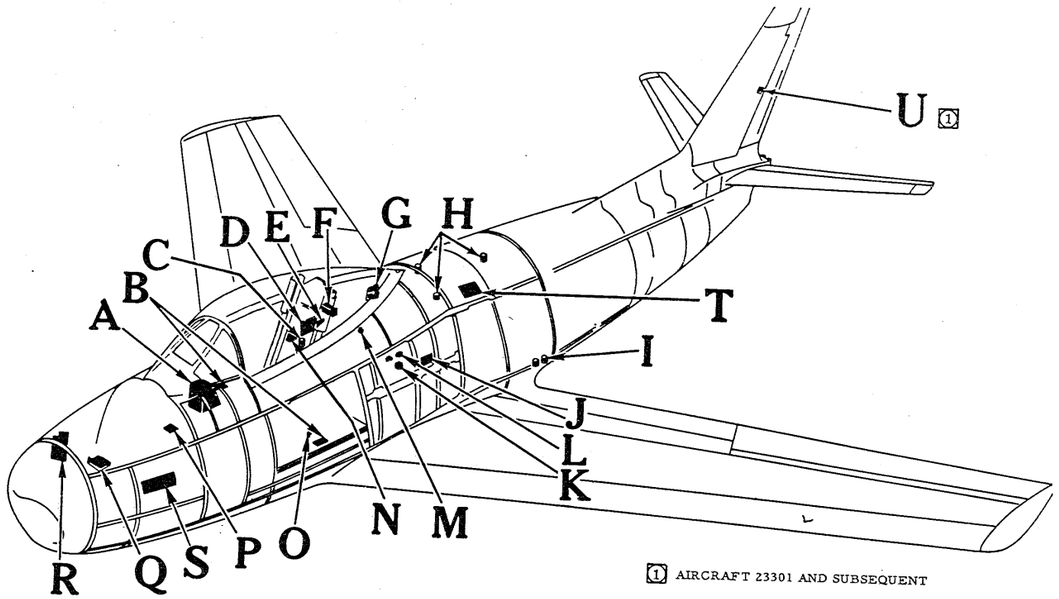


Figure 11-2 (Sheet 4 of 4) Electrical Symbol Chart



1 AIRCRAFT 23301 AND SUBSEQUENT

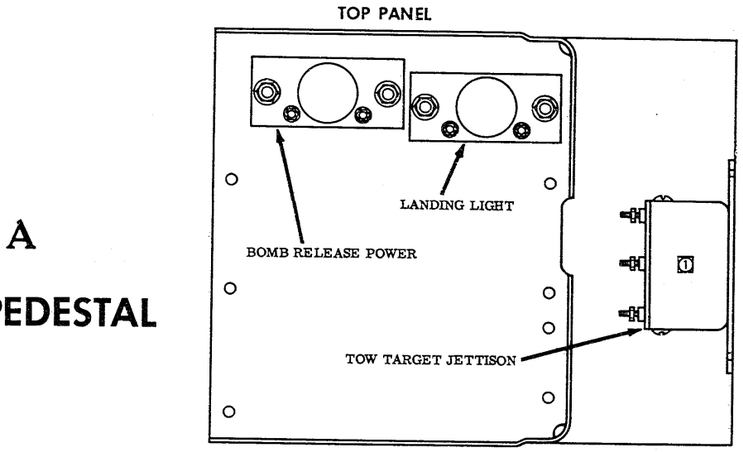
RELAY LOCATION CHART-TABLE OF CONTENTS

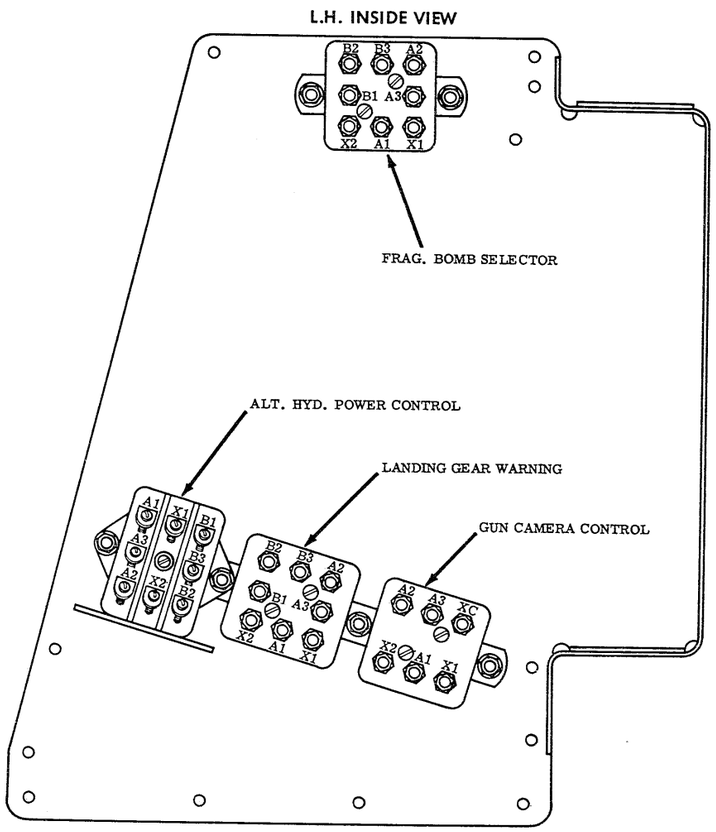
5E2-11-4

Figure 11-3 (Sheet 1 of 7) Relay Location Chart

DETAIL **A**

CENTRE PEDESTAL

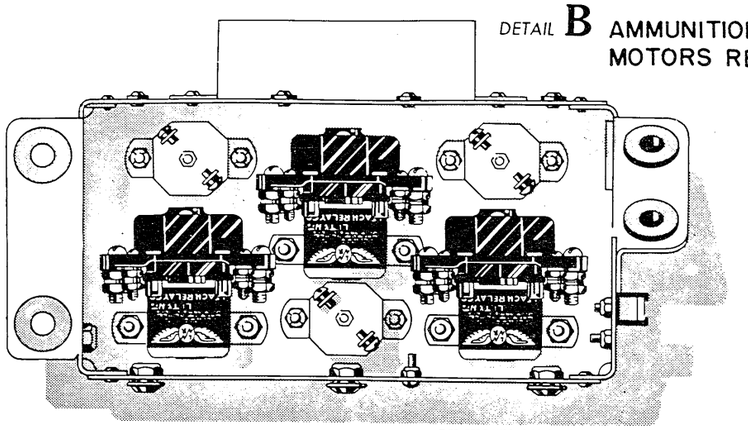




1 AIRCRAFT 23001 TO 23430 INCLUSIVE

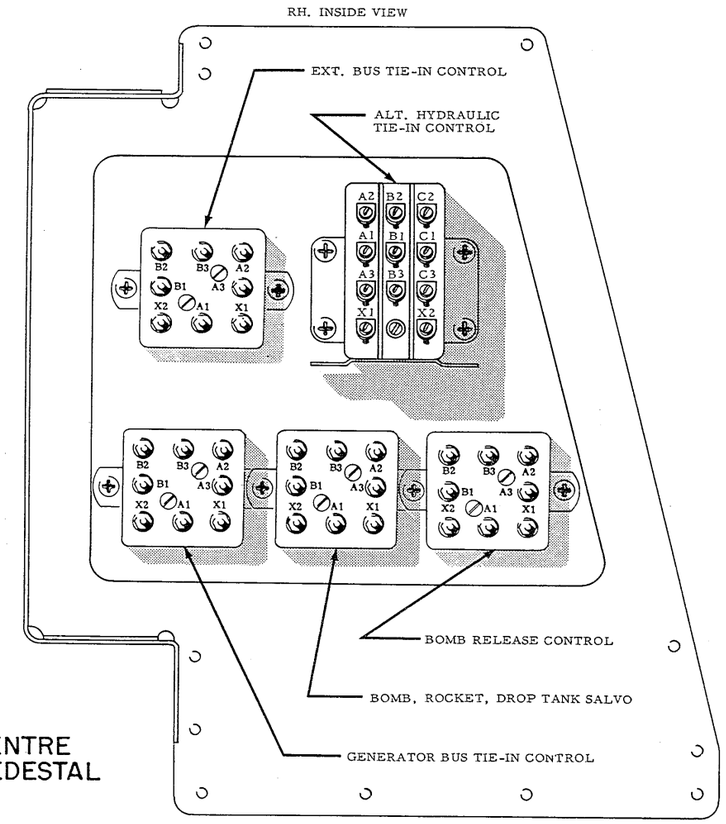
5E2-11-5A

Figure 11-3 (Sheet 2 of 7) Relay Location Chart



DETAIL **B** AMMUNITION BOOSTER MOTORS RELAY PANEL

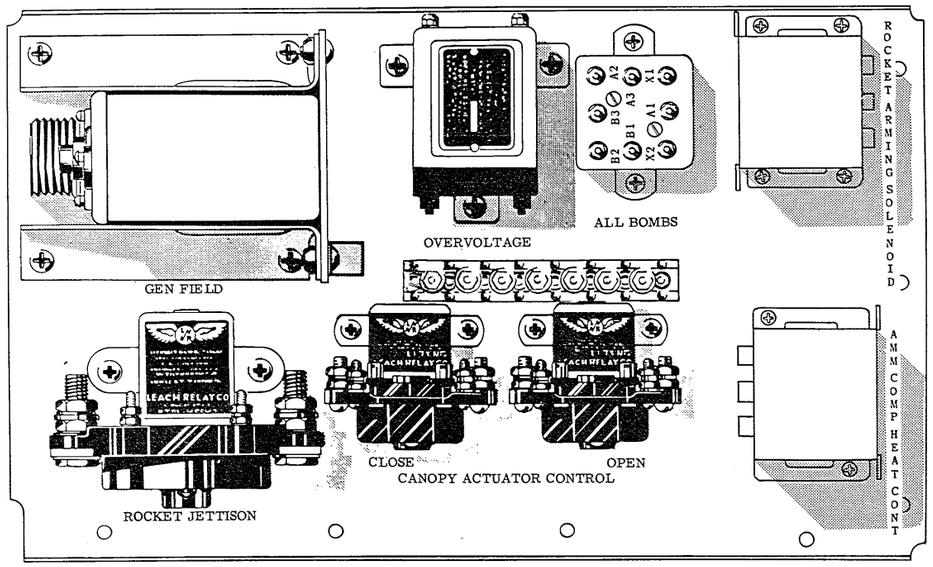
RH SHOWN-LH OPPOSITE.



DETAIL **A** CENTRE PEDESTAL

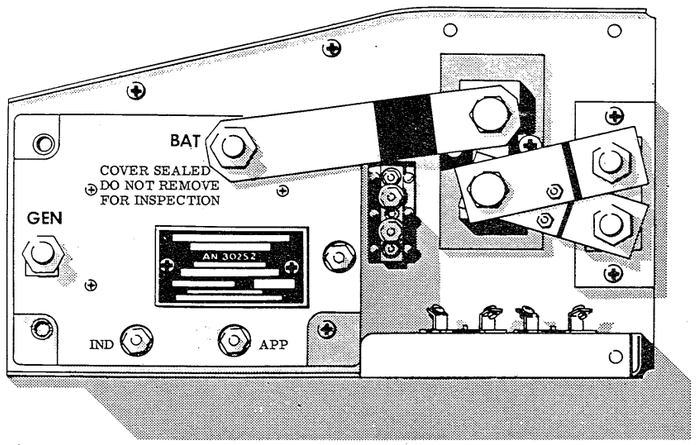
5E2-11-6

Figure 11-3 (Sheet 3 of 7) Relay Location Chart



DETAIL **D** ELECTRICAL CONTROL AND RELAY PANEL

DETAIL **C** REVERSE-CURRENT RELAY PANEL



5E2-11-7A

Figure 11-3 (Sheet 4 of 7) Relay Location Chart

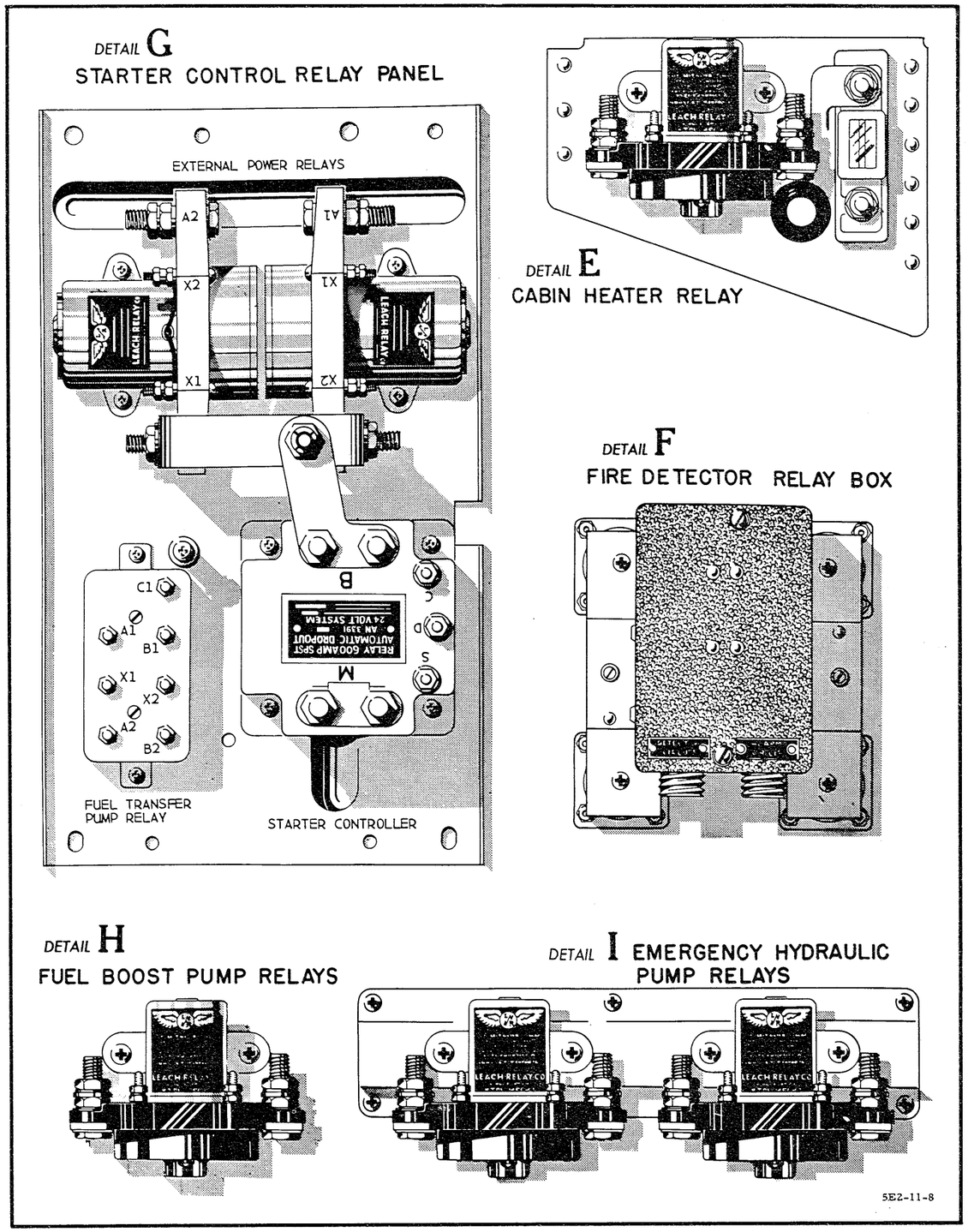


Figure 11-3 (Sheet 5 of 7) Relay Location Chart

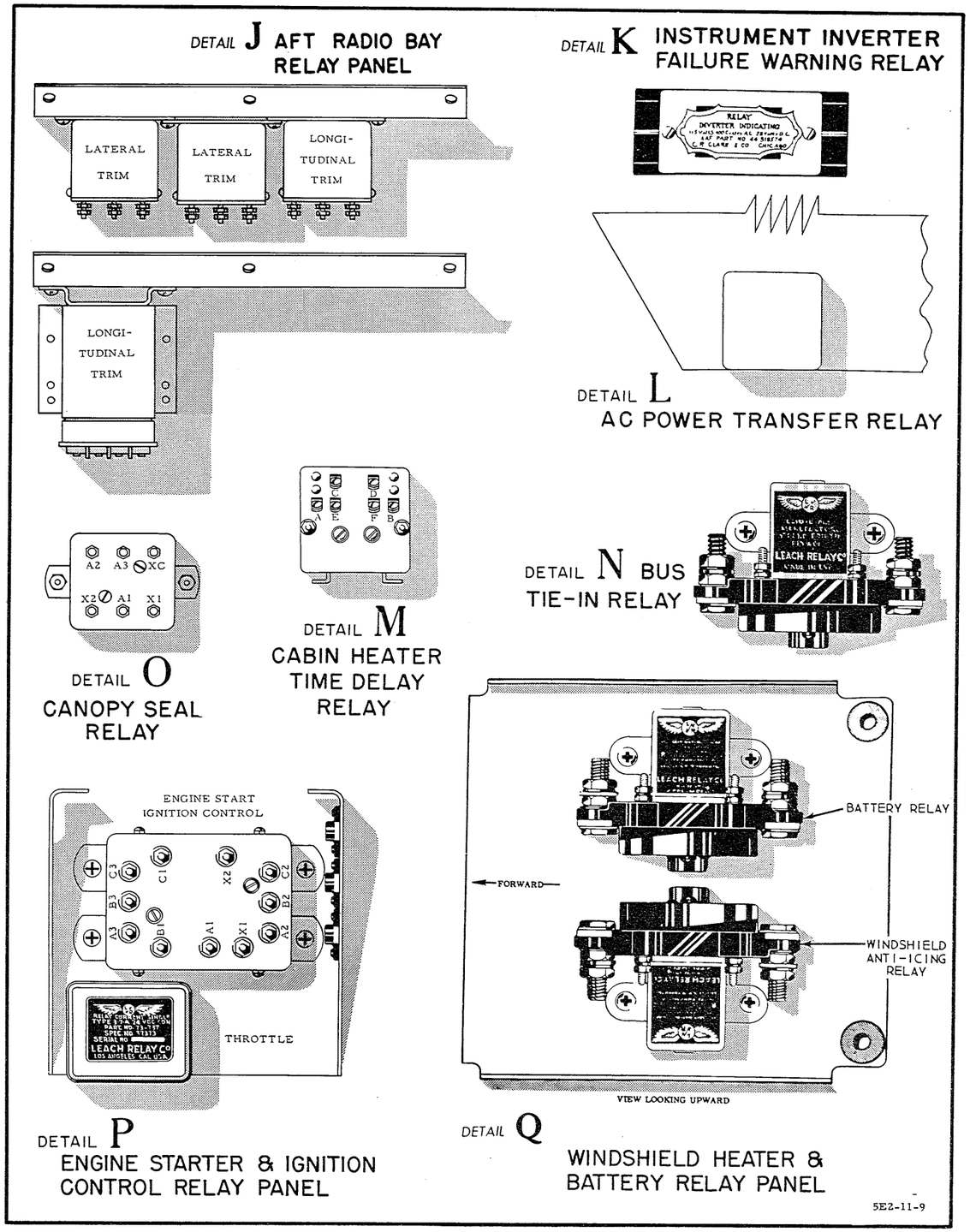


Figure 11-3 (Sheet 6 of 7) Relay Location Chart

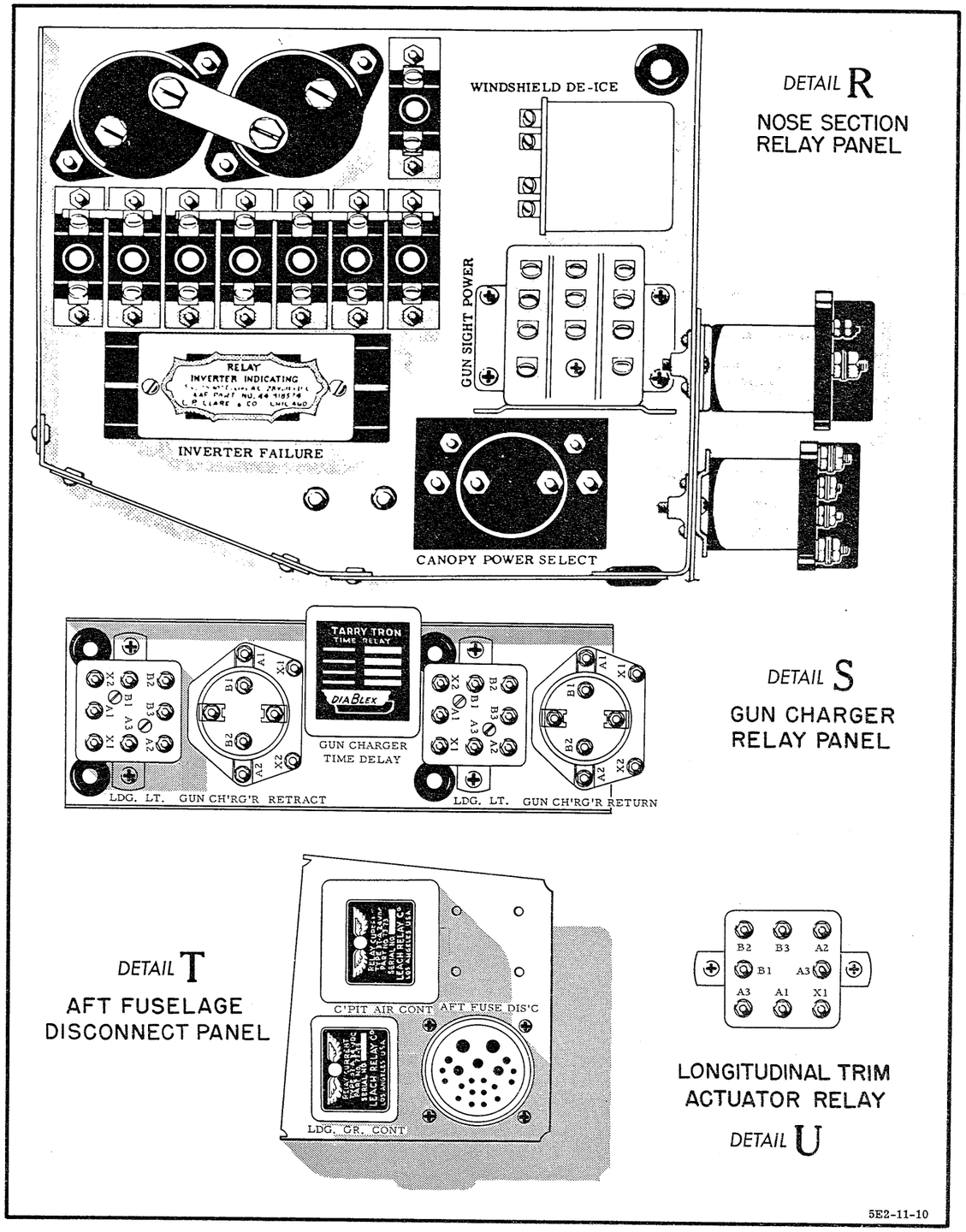
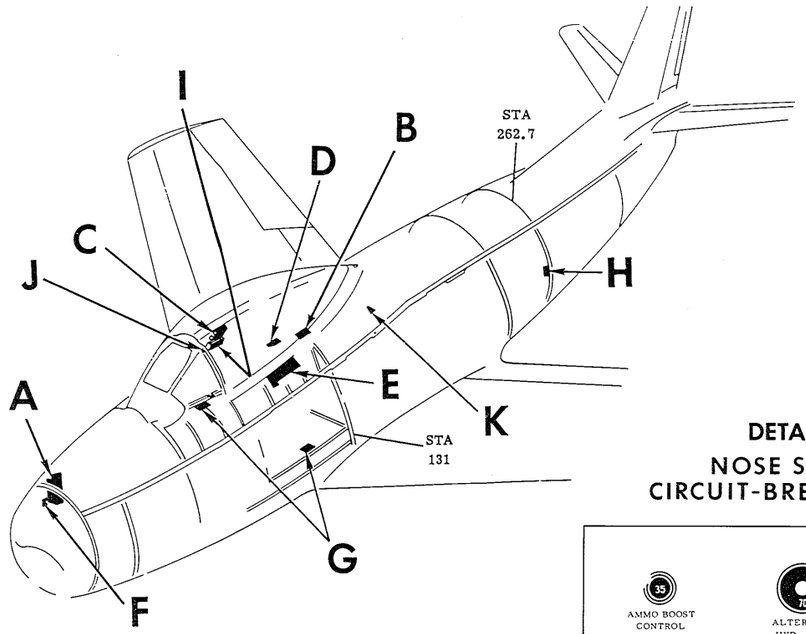
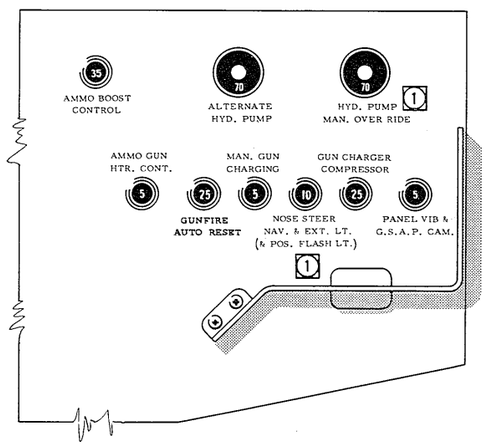
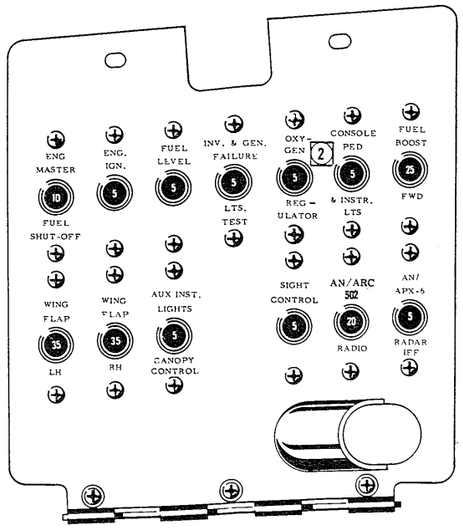


Figure 11-3 (Sheet 7 of 7) Relay Location Chart

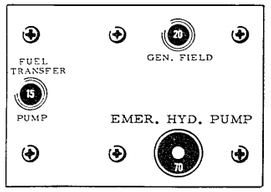


DETAIL A
NOSE SECTION
CIRCUIT-BREAKER PANEL





DETAIL C RH CIRCUIT-BREAKER PANEL



DETAIL B
ELECTRICAL RELAY
AND CONTROL PANEL

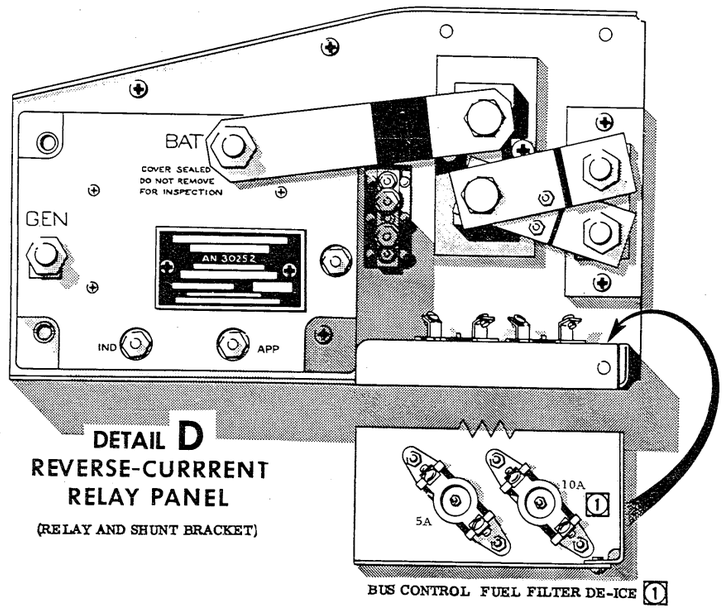
EFFECTIVITY

2 Aircraft 23001 to 23370 inclusive.

1 Aircraft 23001 to 23210 inclusive.

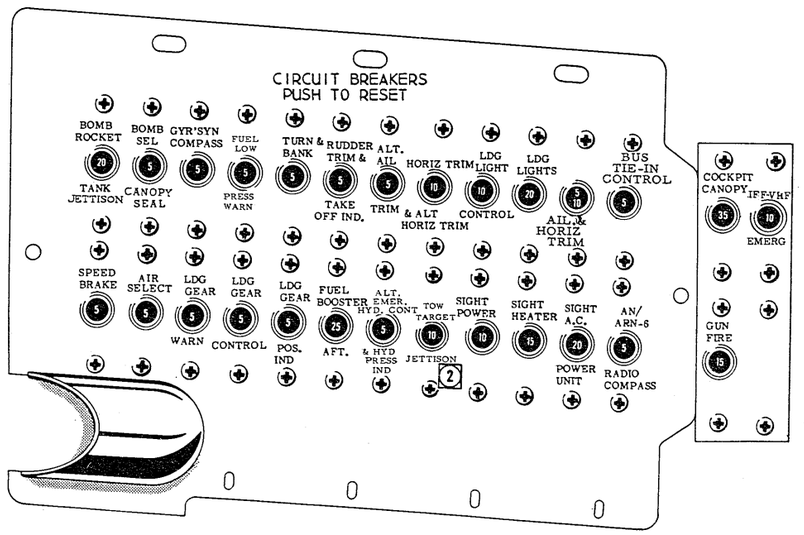
5E2-11-11D

Figure 11-4 (Sheet 1 of 3) (M) Circuit-breaker Location Chart



DETAIL D
REVERSE-CURRRENT RELAY PANEL
(RELAY AND SHUNT BRACKET)

BUS CONTROL FUEL FILTER DE-ICE [1]



DETAIL E
LH CIRCUIT-BREAKER PANEL

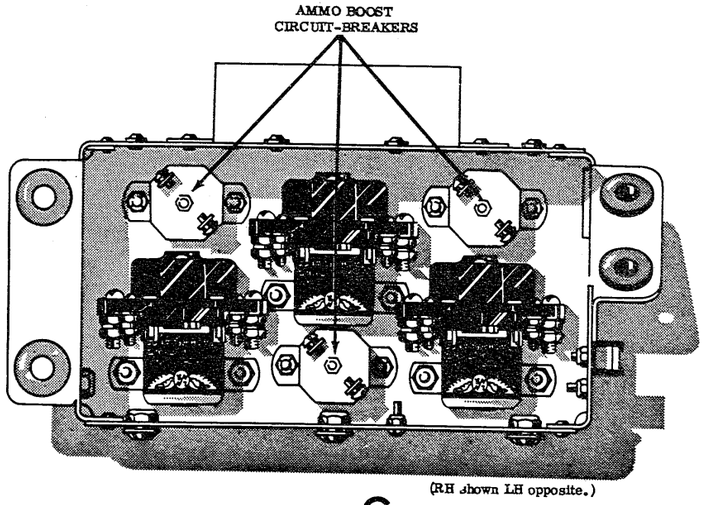
EFFECTIVITY

[2] Aircraft 23001 to 23210 inclusive.

[1] Aircraft 23001 to 23430 inclusive.

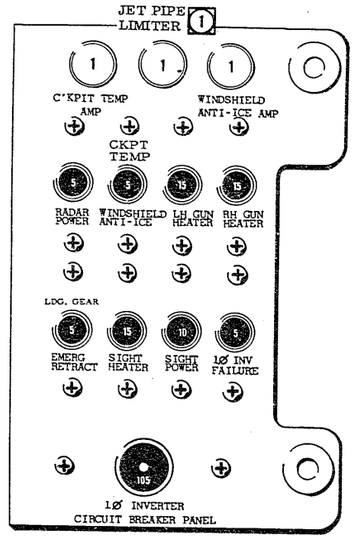
5E2-11-12C

Figure 11-4 (Sheet 2 of 3) (M) Circuit-breaker Location Chart

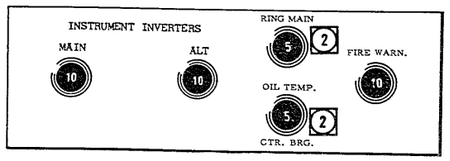


(RH shown LH opposite.)

DETAIL G
AMMUNITION BOOSTER RELAY AND CIRCUIT-BREAKER BOX



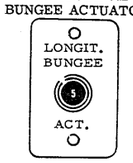
DETAIL F
1Ø INVERTER CIRCUIT-BREAKER



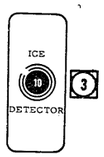
DETAIL I
RH CONSECONSOLE CIRCUIT-BREAKER PANEL

DETAIL H
EMERGENCY HYDRAULIC PUMP CIRCUIT-BREAKER

LONGITUDINAL BUNGEE ACTUATOR



DETAIL K



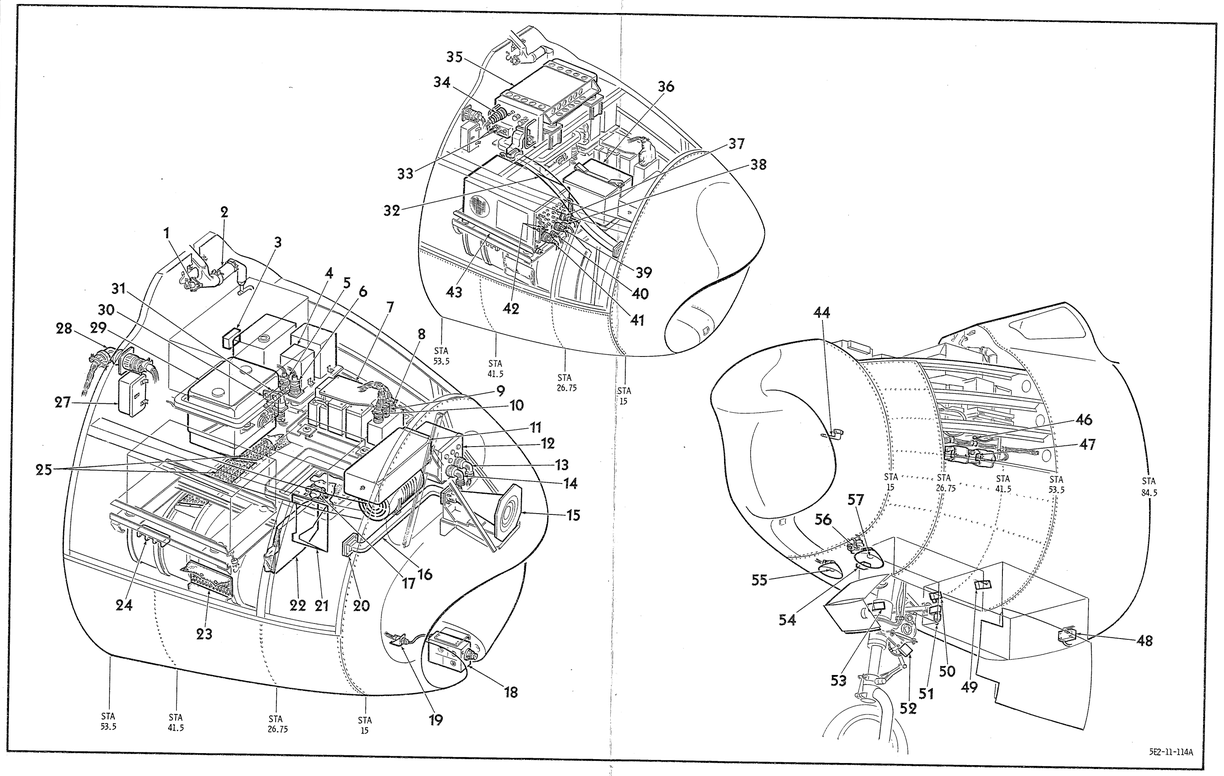
DETAIL J
RH CONSOLE CIRCUIT-BREAKER

EFFECTIVITY

3 Aircraft 23001 to 23490 inclusive.
2 Aircraft 23001 to 23370 inclusive.
1 Aircraft 23371 and subsequent.

5E2-11-13C

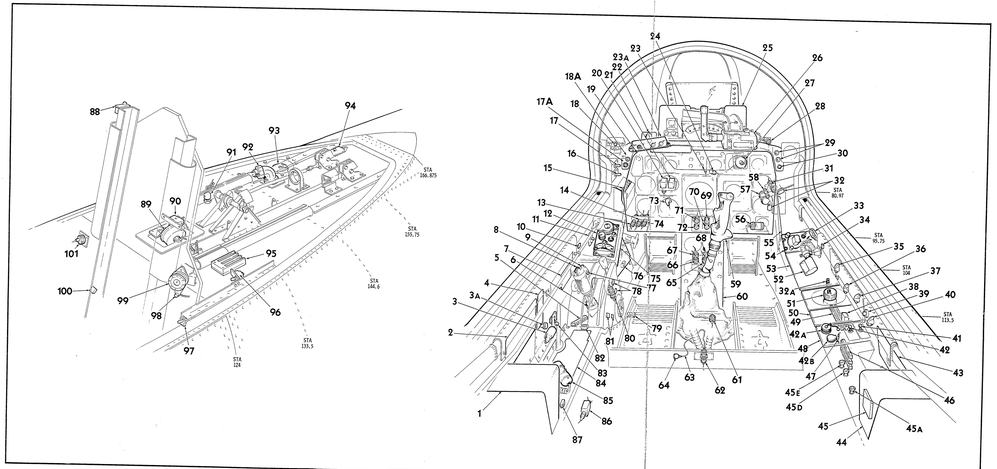
Figure 11-4 (Sheet 3 of 3) (M) Circuit-breaker Location Chart



REF	ITEM	NAME AND DESCRIPTION
1	711	Thermostat - Windshield anti-ice overheat
2	186	Heater - Windshield anti-ice - 2 kilowatt
3	152	Filter - Windshield anti-ice heater
4	E18	Unit - Range servo
5	E223	Plug - Range servo unit
6	E71	Plug - Range servo unit
7	E13	Amplifier - Sight
8	E82	Plug - Sight amplifier
9	E73	Plug - Sight amplifier
10	E83	Plug - Sight amplifier
11	206	Inverter - Single phase, 1500 volt-ampere, 400 cycle
12	E25	Regulator - Gunsight and radar voltage
13	E68	Plug - Voltage regulator
14	E66	Plug - Voltage regulator
15	E29	Antenna - Radar
16	E31	Waveguide - Radar - Rigid
17	271	Panel - Relay - Windshield anti-ice and battery
18	26	Camera - AN-N6 - GSAP
	27	Camera - AN-N9 - GSAP
19	2070	Harness assembly - AN-N6 camera - GSAP
	2434	Receptacle - GSAP camera
20	E33	Coupler - Waveguide
21	278	Panel - Circuit-breaker - Single phase inverter
22	267	Panel - Relay - Nose section
23	669	Terminal blocks - Nose junction box
24	675	Terminal blocks - Battery
25	670	Terminal blocks - Nose wiring
27	E11	Box - Voltage test - Gunsight and radar
28	E107	Receptacle - GBR sight - Field test disconnect
	E108	Plug - GBR sight - Field test disconnect
29	E12	Computor - Sight
30	E63	Plug - Sight computor
31	E70	Plug - Sight computor
32	E32	Waveguide - Radar - Flexible
33	E96	Plugs - Radar transmitter
34	E80	Plug - Radar transmitter
35	E14	Transmitter - Radar
36	20	Battery - 24-volt, 36 ampere-hour
37	E67	Plug - Range power unit
38	E69	Plug - Range power unit
39	E75	Plug - Range power unit
40	E61	Plug - Range power unit
41	E79	Plug - Range power unit
42	E96-1	Plugs - Range power unit
43	E16	Unit - Range power
44	2026	Heater - Duct pitot tube
	2034	Plug - Duct pitot tube heater
46	E19	Jack assembly - Range servo unit
47	266	Panel - Gun charger relay
48	613	Switch - Nose gear fairing door open sequence
49	612	Switch - Nose gear uplock
50	609	Switch - Nose gear fairing door locked
51	610	Switch - Nose gear fairing door closed
52	809	Switch - Nose gear steering safety
53	611	Switch - Nose gear downlock
54	154	Filter - Camera
55	244	Light assembly - Landing
	343	Plug - Landing light
56	746	Valve - Nose wheel steering hydraulic solenoid
57	242	Light assembly - Landing and taxi
	374	Plug - Landing and taxi light

Note: Prefix E denotes electronic item number.

Figure 11-5 (Sheet 1 of 7) Electrical Components Location - Nose Section

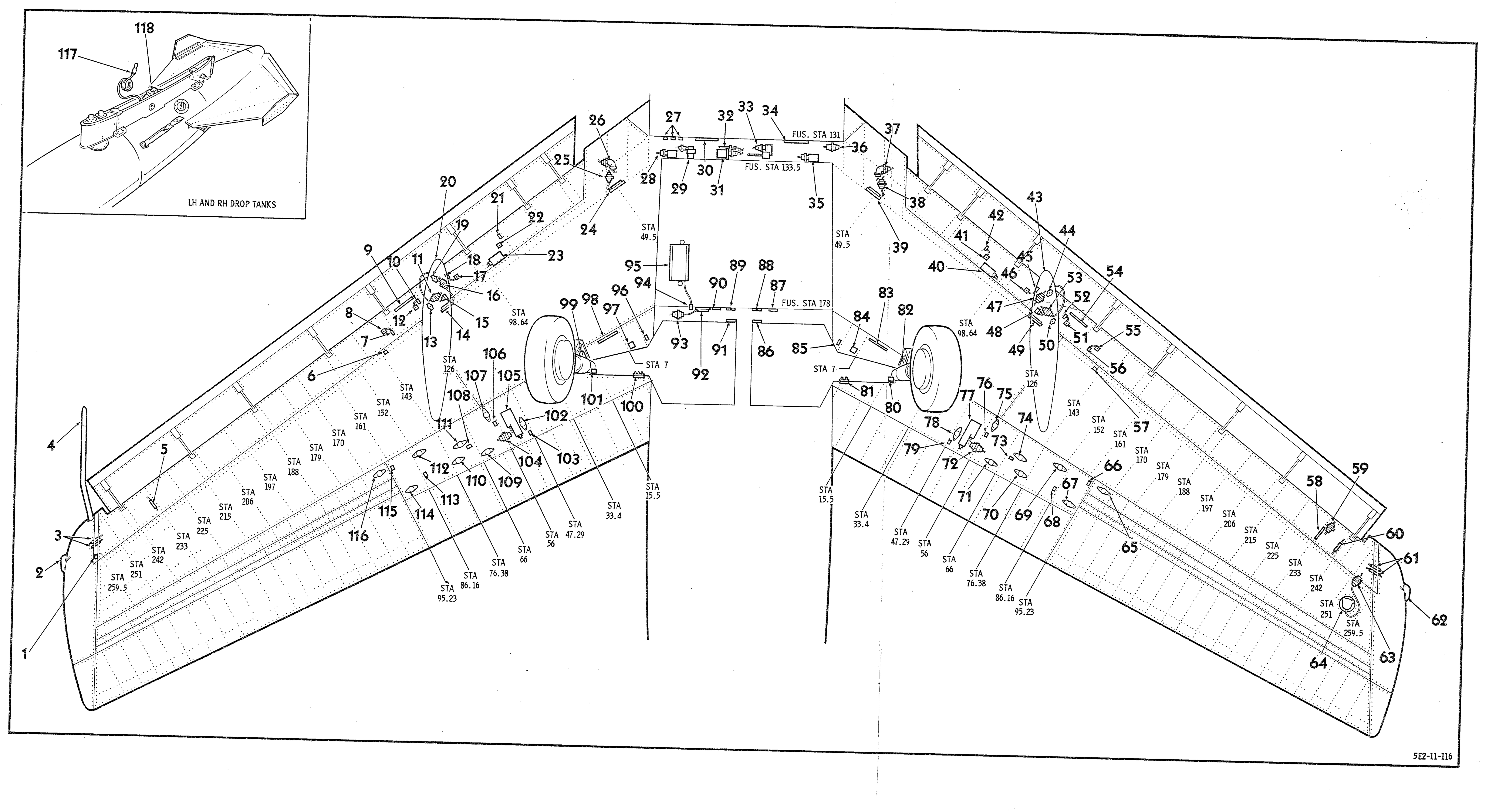


REF	ITEM	NAME AND DESCRIPTION
71	324	Plug - Centre pedestal disconnect
	443	Receptacle - Centre pedestal disconnect
72	289-1	Plug - Centre pedestal disconnect
	442-1	Receptacle - Centre pedestal disconnect
73	117	Connector - Pressure block - Forward
74	824	Receptacle - Instrument panel disconnect
	825	Plug - Instrument panel disconnect
75	273	Panel - Forward console - LH
76	353	Plug - Oxygen regulator
	515	Regulator - Oxygen
77	E139	Switch - Microphone
78	636	Switches - Wing flaps up
79	E134	Terminal block - Microphone-telephone
80	372	Plug - Throttle disconnect
	428	Receptacle - Throttle disconnect
81	636	Switches - Wing flaps down
82	632	Switch - Engine throttle control
83	633	Switch - Windshield anti-ice heater
84	274	Panel - Aft console - LH
85	230	Light assembly - Cockpit utility
86	155	Filter - Heat and vent radio noise
	379	Plug - Heat and vent radio noise filter
87	689	Terminal block - Cockpit utility light
88	E144	Switch - VHF and IFF emergency
89	326	Plug - Cockpit heater pressure switch
	619	Switch - Cockpit heater pressure
90	970	Switch - Canopy seal
91	E202	Feed-through connector - Sense antenna
	E203	Adapter - Sense antenna
92	285	Plug - Canopy deck disconnect
	400	Receptacle - Canopy deck disconnect
	2400	Connector - Canopy deck disconnect
	2401	Receptacle - Canopy deck disconnect
93	376	Plug - Cockpit pressure dump valve
	736	Valve - Cockpit pressure dump
94	566	Switch - Canopy open limit
95	E210	Contactor strip - Loop antenna
	E211	Receptacle - Loop antenna contactor strip
96	642	Switch - Defrost
97	117-1	Connector - Pressure block - Aft
98	2206	Fuse - Landing gear warning horn
99	190	Horn - Landing gear warning
100	571	Switch - Canopy seal dump
101	2064	Plug - Thermocouple disconnect
	2065	Receptacle - Thermocouple disconnect

Note: Prefix E denotes electronic item number.

REF	ITEM	NAME AND DESCRIPTION
39	E146	Switch - VHF and IFF emergency ground test
40	2609	Switch - Camera lens selector
41	2101	Circuit-breaker - Duct pitot heater
42	2110	Circuit-breaker - Drop tank empty warning
42A	E84	Plug - VHF rapid test
42B	E123	Jack - VHF rapid test
43	264	Panel - Circuit-breaker - RH
44	145	Disconnect - Pressure - RH
45	265	Panel - Fuel level adjustment
45A	48	Circuit-breaker - Fire warning
45B	2009	Deleted
45C	2009	Deleted
45D	93	Circuit-breaker - Instrument inverter - Alternate
45F	92	Circuit-breaker - Instrument inverter - Main
46	E217	Terminal block - Radio compass
47	532	Resistor - Console floodlights
48	E147	Panel - VHF rapid test
49	674	Terminal blocks - Radio
50	E181	Deleted
	E182	Deleted
51	E76	Plug - GBR sight field test
	E92	Receptacles - GBR sight field test
52	237	Light assembly - Auxiliary light - RH
53	E218	Panel - Control - AKN-6 radio compass
54	E181	Panel - Control APX-6 IFF
55	275	Panel - RH forward console
56	110	Condenser - Liquidensitometer
57	109	Condenser - Fuel level indicator
58	529	Deleted
59	179	Grip - Control stick
60	268	Panel - Centre pedestal
61	296	Plug - Control stick grip disconnect
	404	Receptacle - Control stick grip disconnect
62	E135	Socket assembly - Seat disconnect - Microphone-telephone
	E136	Plug - Assembly - Seat disconnect - Microphone-telephone
63	E137	Cord - Microphone-telephone
64	E138	Jack - Microphone-telephone
65	E78	Plug - Forward pressure disconnect - Aft RH
	E91	Receptacle - Forward pressure disconnect - Aft RH
66	318	Plug - Forward pressure disconnect - Aft LH
	413	Receptacle - Forward pressure disconnect - Aft LH
67	317	Plug - Forward pressure disconnect - Forward LH
	412	Receptacle - Forward pressure disconnect - Forward LH
68	E77	Plug - Forward pressure disconnect - Forward RH
	E90	Receptacle - Forward pressure disconnect - Forward RH
69	2324	Plug - Centre pedestal disconnect
	3443	Receptacle - Centre pedestal disconnect
70	289	Plug - Centre pedestal disconnect
	442	Receptacle - Centre pedestal disconnect

REF	ITEM	NAME AND DESCRIPTION
1	144	Disconnect - Pressure - LH
2	263	Panel - Circuit-breaker - LH
3	243	Light assembly - Console floodlight - LH
3A	252	Light assembly - Windshield overheat warning
4	276	Panel - Circuit-breaker - LH forward
5	2080	Terminal block - Throttle disconnect
6	E8	Control unit - Manual ranging
7	127	Control box - Rocket projectile release
8	628	Switch - Speed brake control
9	E9	Switch - Caging
10	694	Terminal block - Auxiliary instrument light - LH
11	556	Switch - Alternate longitudinal trim
12	E145	Panel - Control VHF ARC-502
13	339	Plug - Instrument panel indicator lights disconnect
	416	Receptacle - Instrument panel indicator lights disconnect
14	822	Receptacle - Instrument panel disconnect
	2054	Plug - Instrument panel disconnect
15	690	Terminal block - Landing gear control disconnect
16	1799	Switch - Low target jettison
17	569	Switch - Canopy operating - Pitot
17A	577	Switch - Fuel filter de-ice
18	365	Plug - Standby compass light
18A	232	Light assembly - Fuel filter de-ice
19	272	Panel - Instrument
20	426	Receptacle - Throttle relay
	491	Relay - Throttle
21	460	Relay - Engine start ignition control
22	E6	Potentiometer - Range sweep
23	E74	Plug - Gunsight head
23A	E174	Nacis light
24	E81	Plug - Gunsight head
25	E1	Head - Gunsight
26	26	Camera - Gunsight - AN-N6
	27	Camera - Gunsight - AN-N9
27	E2	Control - Reticle dimmer
	E62	Plug - Reticle dimmer control
28	2142	Receptacle - Gunsight camera
29	231	Light assembly - Fire detector warning
30	576	Switch - Fire detector test
31	338	Plug - Instrument panel shroud disconnect
	417	Receptacle - Instrument panel shroud disconnect
32	2699	Terminal block - Gunsight camera disconnect
32A	681	Terminal block - VHF rapid test
33	243	Light assembly - Console floodlight - RH
34	694	Terminal block - Auxiliary light - RH
35	541	Rheostat - Instrument panel ringlights
36	538	Rheostat - Auxiliary instrument lights
37	537	Rheostat - Console and pedestal lights
38	E147	Relay - VHF emergency control

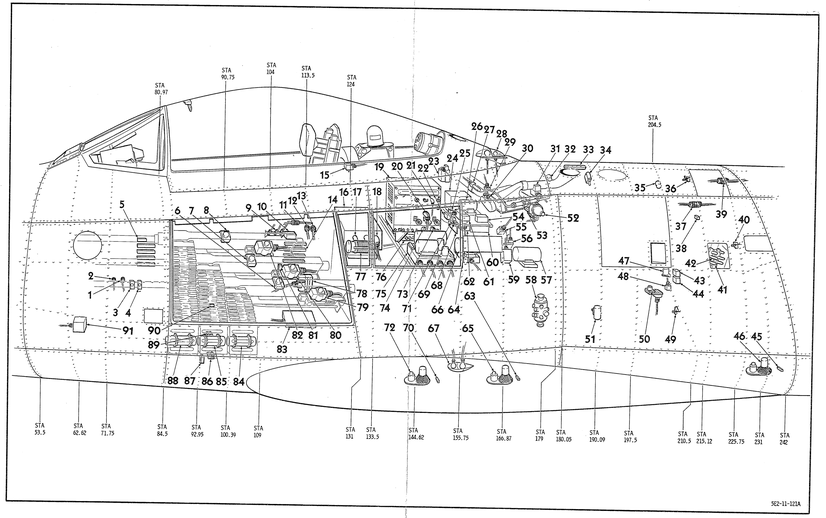


REF	ITEM	NAME AND DESCRIPTION
1	672	Terminal block - Pitot heater
2	249	Light assembly - RH wing position - Green
3	370	Plugs - RH wing position light and pitot heater disconnects
4	185	Heater - Pitot
	2150	Assembly - Pitot
5	2147	Quick-disconnects - RH wing position light and pitot heater
6	655	Terminal block - Bomb salvo - RH
7	423-1	Receptacle - Rocket pod - RH forward
8	686-1	Terminal block - Rocket pod - RH forward
9	658	Terminal block - Wing leading edge - RH
	2076	Terminal block - Wing leading edge - RH
10	423-2	Receptacle - Rocket pod - RH forward
11	399	Receptacle - Bomb rack - S-2 - RH
12	686-2	Terminal block - Rocket pod - RH forward
13	434	Receptacle - Drop tank disconnect - RH
14	725	Transmitter - Fuel level - RH outboard
15	349	Plug - Parachute fragmentation bomb rack - RH
16	410	Receptacle - Fuel level transmitter - RH outboard
17	686-3	Terminal block - Rocket pod - RH forward
18	423-3	Receptacle - Rocket pod - RH forward
19	114	Connector - Chemical tank - RH
20	283	Plug - Bomb rack - S-2 - RH
	392	Rack - Bomb release - S-2 - RH
	395	Rack - Parachute fragmentation bomb release - R-3 - RH
21	423-4	Receptacle - Rocket pod - RH forward
22	686-4	Terminal block - Rocket pod - RH forward
23	2075	Switch - Drop tank empty warning - RH
24	724	Transmitter - Fuel level - RH inboard
25	410	Receptacle - Fuel level transmitter - RH inboard
26	371	Plug - Wing forward disconnect - RH
	427	Receptacle - Wing forward disconnect - RH
27	680	Terminal block - Wing RH centre
28	589	Switch - Normal hydraulic pressure
29	745	Valve - Normal hydraulic by-pass
30	E133	Terminal block - VHF
31	334	Plug - Normal hydraulic pressure transmitter
	727	Transmitter - Normal hydraulic pressure
32	335	Plug - Utility hydraulic pressure transmitter
	728	Transmitter - Utility hydraulic pressure
33	3	Actuator - Lateral bungee trim
	344	Plug - Lateral bungee trim actuator
34	2144	Terminal block - Centre wing disconnect
35	593	Switch - Normal hydraulic pressure
36	288	Plug - Centre wing disconnect
	402	Receptacle - Centre wing disconnect
	2100	Plug - Centre wing disconnect
37	371-1	Plug - Wing forward disconnect - LH

REF	ITEM	NAME AND DESCRIPTION
37	427-1	Receptacle - Wing forward disconnect - LH
38	410	Receptacle - Fuel level transmitter - LH inboard
39	724	Transmitter - Fuel level - LH inboard
40	2075	Switch - Drop tank empty warning - LH
41	686-5	Terminal block - Rocket pod - LH forward
42	423-5	Receptacle - Rocket pod - LH forward
43	283	Plug - Bomb rack - S-2 - LH
	393	Rack - Bomb release - S-2 - LH
	394	Rack - Parachute fragmentation bomb release - R-3 - LH
44	114	Connector - Chemical tank - LH
45	423-6	Receptacle - Rocket pod - LH forward
46	686-6	Terminal block - Rocket pod - LH forward
47	410	Receptacle - Fuel level transmitter - LH outboard
48	349	Plug - Parachute fragmentation bomb rack - LH
49	725	Transmitter - Fuel level transmitter - LH outboard
50	434	Receptacle - Drop tank disconnect - LH
51	686-7	Terminal block - Rocket pod - LH forward
52	423-7	Receptacle - Rocket pod - LH forward
53	399	Receptacle - Bomb rack - S-2 - LH
54	688	Terminal block - Wing leading edge - LH
54	2097	Terminal block - Wing leading edge - LH
55	686-8	Terminal block - Forward rocket pod - LH
56	423-8	Receptacle -,Forward rocket pod - LH
57	655	Terminal block - Bomb salvo - LH
58	c657	Terminal block - Gyrosyn compass
59	2149	Plug - Gyrosyn compass flux valve
	2146	Receptacle - Gyrosyn compass flux valve
60	2147	Quick-disconnect - Wing position light - LH
61	370	Plug - Wing position light disconnect - LH
62	250	Light assembly - LH wing position - Red
63	294	Plug - Gyrosyn compass flux valve
	2077	Connector - Gyrosyn compass flux valve
	2078	Connector - Gyrosyn compass flux valve
64	161	Flux valve - Gyrosyn compass
65	422	Receptacle - Rocket firing No. 1
66	707	Terminal block - Rocket firing receptacles Nos 1 and 3
67	422	Receptacle - Rocket firing No. 3
68	708	Terminal block - Rocket firing receptacle No. 5
69	422	Receptacle - Rocket firing No. 5
70	422	Receptacle - Rocket firing No. 7
71	422	Receptacle - Rocket firing No. 11
72	429	Receptacle - Wing flap actuator - LH
73	707	Terminal block - Rocket firing receptacles nos. 7 and 9
74	422	Receptacle - Rocket firing No. 9
75	422	Receptacle - Rocket firing No. 13
76	707	Terminal block - Rocket firing receptacles Nos 11 and 13
77	8	Actuator - Wing flap - LH

REF	ITEM	NAME AND DESCRIPTION
78	422	Receptacle - Rocket firing No. 15
79	708	Terminal block - Rocket firing receptacle No. 15
80	602	Switch - Main gear downlock - LH
81	580	Switches - Booster pumps test - Forward and aft
	644	Switch - Ground door control
82	583	Switch - Landing gear ground safety
83	677	Terminal block - Wing - LH aft
84	601	Switch - Main gear uplock - LH
85	682	Terminal block - Wing flap actuator - LH
86	575	Switch - Main gear door open sequence - LH
87	608	Switch - Main gear fairing door closed - LH
88	607	Switch - Main gear fairing door locked - LH
89	607	Switch - Main gear fairing door locked - RH
90	608	Switch - Main gear fairing door closed - RH
91	575	Switch - Main gear door open sequence - RH
92	723	Transmitter - Fuel level - Centre wing
93	411	Receptacle - Fuel level transmitter - Centre wing
94	346	Plug - Liquidensitometer
95	256	Liquidensitometer
96	682	Terminal block - Wing flap actuator - RH
97	601	Switch - Main gear uplock - RH
98	678	Terminal block - Wing RH aft
99	623	Switch - Rocket jettison safety
	808	Switch - Rocket jettison safety
100	580-1	Switch - Fuel transfer pump test
	624	Switch - Rocket jettison test
	638	Switch - Manual jettison arming safety
101	602	Switch - Main gear downlock - RH
102	422	Receptacle - Rocket firing No. 14
103	708	Terminal block - Rocket firing receptacle No. 14
104	429	Receptacle - Wing flap actuator - RH
105	8	Actuator - Wing flap - RH
106	707	Terminal block - Rocket firing receptacles Nos 10 and 16
107	422	Receptacle - Rocket firing Nos. 16
108	707	Terminal block - Rocket firing receptacles Nos 6 and 12
109	422	Receptacle - Rocket firing No. 10
110	422	Receptacle - Rocket firing No. 6
111	422	Receptacle - Rocket firing No. 12
112	422	Receptacle - Rocket firing No. 8
113	708	Terminal block - Rocket firing receptacle No. 8
114	422	Receptacle - Rocket firing No. 2
115	707	Terminal block - Rocket firing receptacles Nos 2 and 4
116	422	Receptacle - Rocket firing No. 4
117	382	Plug - Drop tank disconnect
118	548	Solenoid - Drop tank jettison
	435	Receptacle - Drop tank jettison

Note: Prefix E denotes electronic item number.



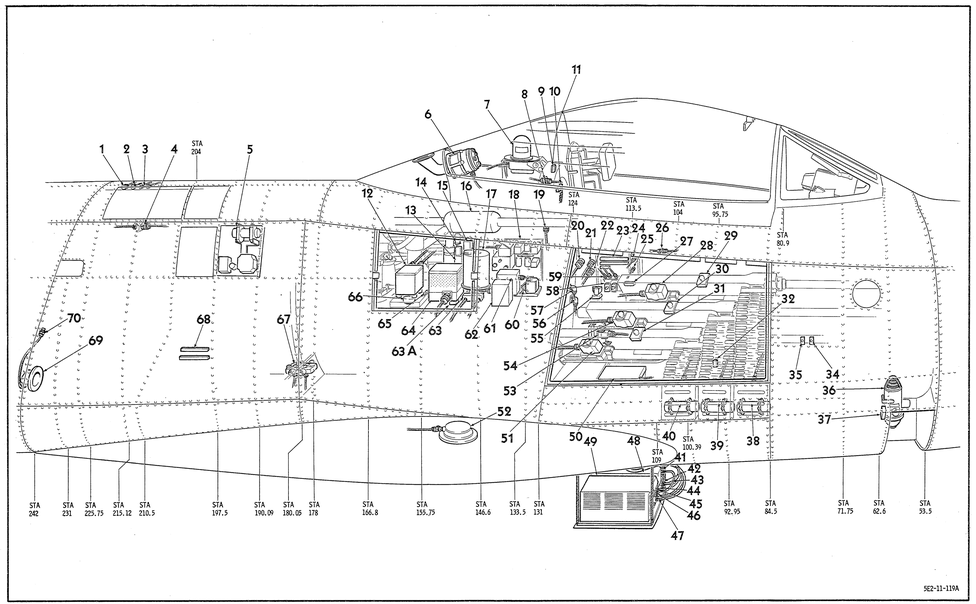
REF	ITEM	NAME AND DESCRIPTION
68	167	Fuse - Fuel and oil pressure indicators
	168	Fuse - Gyrosyn compass
	169	Fuse - Hydraulic pressure indicator
	2081	Fuse - Inverter failure warning
69	2102	Circuit-breaker - Longitudinal trim bungee actuator
70	659	Terminal block - Forward fuel booster pump
71	715	Transformer - Autosyn
72	388	Pump - Forward fuel booster
73	E184	Plug - APX-6 transmitter-receiver - Power
74	E185	Plug - APX-6 transmitter-receiver - Control
75	E127	Plug - VHF power junction box - Transmitter
	E128	Plug - VHF power junction box - Receiver
	E129	Plug - VHF power junction box - Battery
	E130	Plug - VHF power junction box - Control box
	E143	Box - VHF power junction - ARC-502
76	E178	Panel - Indicator light and fuse - APX-6
77	516	Regulator - Generator voltage
78	2135	Plug - Pneumatic valve - Gun charger - LH
	2141	Valve - Pneumatic - Gun charger - LH
79	172	Gun charger - Gun No. 3 - LH
	2139	Gun charger - Gun No. 3 - LH
80	172	Gun charger - Gun No. 2 - LH
	2139	Gun charger - Gun No. 2 - LH
81	661	Terminal block - Gun bay - LH
82	172	Gun charger - Gun No. 1 - LH
	2139	Gun charger - Gun No. 1 - LH
83	277	Panel - Relay - Ammunition Booster - LH
84	258	Motor - Ammunition booster - Gun No. 3 - LH
	280	Plug - Ammunition booster motor No. 3 - LH
85	258	Motor - Ammunition booster - Gun No. 2 - LH
86	710	Thermostat - Ammunition overheat warning
87	654	Terminal block - Ammunition compartment
88	258	Motor - Ammunition booster - Gun No. 1 - LH
	280	Plug - Ammunition booster motor No. 1 - LH
89	709	Thermostat - Ammunition low heat limit
90	653	Terminal block - Ammunition booster - LH
91	158	Flasher unit - Position lights
	352	Plug - Position lights flasher unit

Note: Prefix E denotes electronic item number.

REF	ITEM	NAME AND DESCRIPTION
36	704-14	Thermocouple - Fire detector
37	279	Plug - Aft fuselage disconnect
	397	Receptacle - Aft fuselage disconnect
38	664	Terminal block - Hydraulic pump - Emergency
39	E154	Plug - VHF antenna
	E155	Connector - VHF antenna
	E156	Coaxial cable - VHF antenna
	E172	Plug - VHF antenna
	E173	Connector - VHF antenna
40	704-15	Thermocouple - Fire detector
41	418	Receptacle - External power No. 2
42	408	Receptacle - External power No. 1
43	433	Receptacle - Cockpit air control relay
	499	Relay - Cockpit air control
44	432	Receptacle - Landing gear retract control relay
	497	Relay - Landing gear retract control
45	659	Terminal block - Fuel transfer pump
46	387	Pump - Fuel transfer
47	307	Plug - Fuel filter de-ice pressure switch
	578	Switch - Fuel filter de-ice pressure
48	308	Plug - Fuel filter de-ice valve
	740	Valve - Fuel filter de-ice solenoid
49	704-16	Thermocouple - Fire detector
50	316	Plug - Fuel shut-off solenoid valve
	743	Valve - Fuel shut-off solenoid
51	386	Pump - Fuel filter de-ice
52	738	Valve - Canopy seal
53	676	Terminal block - Wing flap - LH
54	501	Relay - Inverter failure warning
55	151	Filter - Ammunition heat actuator
	281	Plug - Ammunition heat actuator filter
56	1	Actuator - Ammunition heat
57	207	Inverter - Three-phase, 100 volt-ampere 115 volt A.C., 400 cycle - Alternate
	341	Plug - Three phase inverter - Alternate
58	361	Plug - Speed brake solenoid valve
	749	Valve - Speed brake solenoid
59	E2179	Switch - APX-6 inertia destructor
60	E40	Panel - Gunsight fuse
61	419	Receptacle - Instrument power transfer relay
	500	Relay - Instrument power transfer
62	E27	Relay - Sight power - D.C.
63	659	Terminal block - Aft fuel booster pump
64	269	Panel - Relay - Aft LH radio bay
65	388	Pump - Aft fuel booster
66	208	Inverter - Three phase, 100 volt-ampere, 115-volt A.C., 400 cycle - Main
	342	Plug - Three phase inverter - Main
67	235	Light assembly - Fuselage - Lower
68	164	Fuse - Attitude gyro
	165	Fuse - Autosyn transformer

REF	ITEM	NAME AND DESCRIPTION
1	304	Plug - Flasher pressure disconnect
	409	Receptacle - Flasher pressure disconnect
2	323	Plug - Gun bay pressure disconnect
	437	Receptacle - Gun bay pressure disconnect
3	568	Switch - Canopy close - External - LH
4	567	Switch - Canopy open - External - LH
5	691	Terminal blocks - Gun bay pressure disconnect
6	184	Heater - Gun No. 1 - LH
7	184	Heater - Gun No. 2 - LH
8	184	Heater - Gun No. 3 - LH
9	415	Receptacles - Gun heaters - LH
10	457	Relay - Canopy seal
11	430	Receptacle - Gun charger - Gun No. 1 - LH
12	430	Receptacle - Gun charger - Gun No. 2 - LH
13	430	Receptacle - Gun charger - Gun No. 3 - LH
14	679	Terminal block - Gun bay - LH
15	E207	Cable assembly - Loop antenna
	E208	Receptacle - Loop antenna
	E209	Brush holder assembly - Loop antenna
16	E213	Receiver - ARN-6 radio compass
	E214	Mounting - Radio compass receiver
17	E212	Cable assembly - Loop antenna
18	E204	Cable - Sense antenna
	E205	Adapter - Sense antenna
19	E180	Transmitter-receiver - APX-6
20	E189	Adapter - APX-6 antenna
	E190	Plug - APX-6 antenna
	E191	Coaxial cable - APX-6 antenna
21	E186	Plug - APX-6 transmitter-receiver - Destructor
22	459	Relay - Cockpit heater time delay
23	2	Actuator - Canopy
	286	Plug - Canopy actuator
24	E21	Static convertor
25	656	Terminal block - Radio compass
26	E22	Unit - Sight A.C. power
	E72	Plug - Sight A.C. power unit
27	377	Plug - Cockpit hot air by-pass valve
	737	Valve - Cockpit hot air by-pass
28	234	Light assembly - Fuselage - Upper
29	292	Plug - Cockpit air shut-off valve
	735	Valve - Cockpit air shut-off
30	129	Control - Windshield air pick-up
	381	Plug - Windshield air pick-up control
31	378	Plug - Heat exchanger modulating valve
	750	Valve - Heat exchanger modulating
32	464	Relay - Fuel booster pump - Forward
33	668	Terminal block - Landing gear connector - Upper
	2183	Resistor - Fire detector overheat warning
34	598	Switch - Throttle warning
35	463	Relay - Fuel booster pump - Aft

Figure 11-5 (Sheet 4 of 7) (M) Electrical Components Location - Forward Fuselage - Left Side



REF	ITEM	NAME AND DESCRIPTION
41	E168	Plug - VHF antenna - Receiver
	E169	Adapter - VHF antenna - Receiver
42	E125	Plug - VHF receiver
43	E167	Coaxial cable - VHF transmitter-receiver
44	E163	Plug - VHF antenna - Transmitter
	E164	Adapter - VHF antenna - Transmitter
45	E165	Plug - VHF antenna - Transmitter
	E166	Adapter - VHF antenna - Transmitter
46	E126	Plug - VHF transmitter
47	E140	Plug - VHF transmitter
48	E142	Receiver - VHF - ARC-502
49	E141	Transmitter - VHF - ARC-502
50	277	Panel - Relay - RH ammunition booster
	2093	Panel - Relay - Ammunition
51	172	Gun charger - Gun No. 3 - RH
	2139	Gun charger - Gun No. 3 - RH
52	E196	Plug - APX-6 antenna
	E197	Antenna - APX-6
53	2135	Plug - Pneumatic valve - Gun charger - RH
	2141	Valve - Pneumatic - Gun charger - RH
54	172	Gun charger - Gun No. 2 - RH
	2139	Gun charger - Gun No. 2 - RH
55	452	Relay - Bus tie-in
56	E157	Adapter - VHF antenna
	E158	Plug - VHF antenna
	E159	Feed-through connector - VHF antenna
	E160	Adapter - VHF antenna
	E161	Plug - VHF antenna
	E162	Coaxial cable - VHF antenna
57	E192	Plug - APX-6 antenna
	E193	Adapter - APX-6 antenna
	E194	Plug - APX-6 antenna
	E195	Coaxial cable - APX-6 antenna
58	673	Terminal block - Pressure
59	415	Receptacle - Gun heaters - RH
60	22	Bracket - Relay and shunt
61	18	Amplifier - Windshield anti-ice control
	380	Plug - Windshield anti-ice control amplifier
62	15	Amplifier - Cockpit temperature control
	291	Plug - Cockpit temperature control amplifier
63	2066	Resistor - Exhaust temperature - Adjustable
63A	153	Filter - Generator bus
64	17	Amplifier - Gyrosyn compass
	293	Plug - Gyrosyn compass amplifier
65	535	Resistor - Fire detector system
66	510	Receptacle - Forward fuselage fuel level transmitter
	722	Transmitter - Forward fuselage fuel level
	2085	Transmitter - Forward fuselage fuel level
	2088	Receptacle - Forward fuselage fuel level transmitter
67	297	Plug - Landing gear door solenoid valve
	297	Plug - Landing gear solenoid valve
	739	Valve - Landing gear and door solenoid valve
68	667	Terminal block - Landing gear connector lower
69	2027	Transmitter - Aft fuselage fuel level
	2087	Transmitter - Aft fuselage fuel level
70	410	Receptacle - Aft fuselage fuel level transmitter

Note: Prefix E denotes electronic item number.

REF	ITEM	NAME AND DESCRIPTION
1	2062	Plug - Thermocouple disconnect
	2062	Receptacle - Thermocouple disconnect
2	1802	Receptacle - Tow target jettison
	1803	Plug - Tow target jettison
3	301	Plug - Engine fire detectors
	407	Receptacle - Engine fire detectors
4	327	Plug - Hydraulic pump override - Manual
	436	Receptacle - Hydraulic pump override - Manual
5	270	Panel - Starter controller relay
6	290	Plug - Cockpit pressure regulator
	514	Regulator - Cockpit pressure
7	E206	Loop antenna - ARN-6 radio compass
	E221	Plug - Loop antenna
8	287	Plug - Canopy pull-away
	401	Receptacle - Canopy pull-away
9	E199	Terminal block - Sense antenna
10	E200	Terminal block - Sense antenna
11	E198	Sense antenna - ARN-6 radio compass
12	305	Plug - Fire detector relay
	306	Plug - Fire detector relay
	488	Relay - Fire detector
13	354	Plug - Ram-air shut-off valve
	748	Valve - Ram-air shut-off
14	458	Relay - Cockpit heater power
15	141	Current limiter - Cockpit heater - 150Ampere
16	183	Heater - Cockpit - 4 Kilowatt
17	162	Unit - Gyrosyn compass slaved gyro
	360	Plug - Gyrosyn compass slaved gyro unit
18	261	Panel - Aft radio compartment relay
19	126	Control - Cockpit air pick-up
	375	Plug - Cockpit air pick-up control
20	E131	Plug - VHF pressure disconnect
	E132	Receptacle - VHF pressure disconnect
21	E215	Plug - ARN-6 pressure disconnect
	E216	Receptacle - ARN-6 pressure disconnect
22	E187	Receptacle - APX-6 pressure disconnect
	E188	Plug - APX-6 pressure disconnect
23	663	Terminal block - Gun bay - RH
24	430	Receptacle - Gun charger - Gun No. 1 - RH
25	430	Receptacle - Gun charger - Gun No. 3 - RH
26	430	Receptacle - Gun charger - Gun No. 2 - RH
27	666	Terminal block - Hydraulic pump emergency override
28	172	Gun charger - Gun No. 1 - RH
	2139	Gun charger - Gun No. 1 - RH
29	184	Heater - Gun No. 1 - RH
30	184	Heater - Gun No. 2 - RH
31	184	Heater - Gun No. 3 - RH
32	653	Terminal block - Ammunition booster - RH
34	568	Switch - Canopy close - External - RH
34	567	Switch - Canopy open - External - RH
36	107	Compressor - Gun charger air
	322	Plug - Gun charger air compressor
37	157	Filter - Gun charger compressor
38	258	Motor - Ammunition booster - Gun No. 1 - RH
38	280	Plug - Ammunition booster motor No. 1 - RH
39	258	Motor - Ammunition booster - Gun No. 2 - RH
39	280	Plug - Ammunition booster motor No. 2 - RH
40	258	Motor - Ammunition booster - Gun No. 3 - RH
40	280	Plug - Ammunition booster motor No. 3 - RH

Figure 11-5 (Sheet 5 of 7) (M) Electrical Components Location - Forward Fuselage - Right Side

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS			
1	Actuator - Ammunition heat	WE-443-10DM	4	56
2	Actuator - Canopy	151-541.76	4	23
3	Actuator - Lateral bungee trim	396-G	3	33
4				
5				
6	Actuator - Rudder trim tab	31296	6	26
7				
8	Actuator - LH wing flap	M3320	3	77
8	Actuator - RH wing flap	M3320	3	105
9	Actuator - Longitudinal bungee trim	29656-6	6	20
10				
11				
12				
13				
14	Loadmeter - 50-millivolt	32529	2	19
15	Amplifier - Cockpit temperature control	30058	5	62
16				
17	Amplifier - Gyrosyn compass	21125	5	64
18	Amplifier - Windshield anti-ice control	30058	4	61
19				
20	Battery - 24-volt, 36 ampere-hours	AN3150-2	1	36
21				
22	Bracket - Relay and shunt	151-54099	5	60
23				
24				
25				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
26	Camera - GSAP - AN-N6	AN-N6	1	18
26	Camera - Gunsight - AN-N6	AN-N6	2	26
27	Camera - Gunsight - AN-N9	S51D18071	2	26
27	Camera - GSAP - AN-N9	S51D18071	1	18
28				
	CIRCUIT-BREAKERS			
29	Alternate hydraulic control - Emergency	AN3161-P5	2	2
30	Alternate aileron trim	AN3161-P5	2	2
31	Aileron, horizontal stabilizer trim and alternate horizontal stabilizer trim	AN3161-P10	2	2
32	Gun heat control - Ammunition heat	AN3161-P5	1	22
33	Ammunition boosters - LH	PDA-35	4	83
33	Ammunition boosters - RH	PDA-35	5	50
34	AN/ARN-6	AN3161-P5	2	2
35	ARC-502	AN3161-P20	2	43
36	APX/6 destructor	AN3161-P10	2	4
37	APX/6 IFF	AN3161-P5	2	43
38	Turn and slip indicator	AN3161-P5	2	2
39	Bomb rocket and tank salvo	AN3161-P20	2	2
40	Bomb select and canopy seal	AN3161-P5	2	2
41	Bus control relay	PSA-5	5	60
42	Bus tie-in	AN3161-P5	2	2
43	Cockpit canopy	AN3161-P35	2	4
44	Cockpit temperature and windshield anti-ice	AN3161-P5	1	21
45	Console, pedestal and instrument lights and stabilizer rate damper	AN3161-P5	2	43
46	Engine ignition	AN3161-P10	2	43
47	Engine master and fuel shut-off	AN3161-P10	2	43

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	CIRCUIT-BREAKERS (Continued)			
48	Fire warning	AN3161-P5	2	45A
49	Canopy control and auxiliary instrument lights	AN3161-P5	2	43
50	Air select	AN3161-P5	2	2
51	Fuel booster - Forward	AN3161-P25	2	43
52	Fuel booster - Aft	AN3161-P25	2	2
53	Fuel filter de-ice	PSA-10	5	40
54	Fuel level system	AN3161-P5	2	43
55	Fuel transfer pump	AN3161-P15	5	18
56				
57	Gunfire	AN3161-P15	2	4
58	Gun heaters	AN3161-P15	1	21
59	Gun fire - Auto reset	PSA-25	1	22
60				
61	Gun charger compressor	AN3161-P25	1	22
62	Gyrosyn compass	AN3161-P5	2	2
63	Emergency hydraulic pump motor control	AN3161-P10	6	42
64	Hydraulic pump - Emergency	PDLM-70	5	18
65				
66	Inverter single phase	POLM-105	1	21
67	Inverter and generator failure test light	AN3161-P5	2	43
68	Landing gear control	AN3161-P5	2	2
69	Landing light	AN3161-P20	2	2
70	Landing light control	AN3161-P10	2	2
71	Landing gear position indicator	AN3161-P5	2	2
72	Landing gear warning	AN3161-P5	2	2
73	Generator field	AN3161-P20	5	18
74				
75	Nose wheel steering, navigation, utility and flasher lights	AN3161-P10	1	22
76	Pitot heater	AN3160-10	2	75

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	CIRCUIT-BREAKERS (Continued)			
77	Radar power	AN3161-P5	1	21
78	Rudder trim and take-off indicator	AN3161-P5	2	2
79	Speed brake	AN3161-P5	2	2
80	Sight power unit - A. C.	AN3161-P20	2	2
81	Sight control	AN3161-P5	2	43
82	Sight heater	AN3161-P25	2	2
83	Sight power	AN3161-P10	2	2
84	Sight power	AN3161-P15	1	21
85	Vibrator - Panel and GSAP camera	AN3161-P5	1	22
86	LH wing flap	AN3161-P35	2	43
87	RH wing flap	AN3161-P35	2	43
88	Landing gear emergency retract	AN3161-P5	1	21
89	Ammunition booster control	AN3161-P5	1	22
90	Emergency hydraulic pump manual override	PDLM-70	1	22
91	Sight heater	AN3161-15	1	21
92	Instrument inverter - Main	AN3161-P10	2	45E
93	Instrument inverter - Alternate	AN3161-P10	2	45D
94	Single phase inverter failure	AN3161-P5	1	21
95	Oxygen regulator	AN3161-P5	2	43
96				
97				
98				
99				
100				
101				
102				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	CIRCUIT-BREAKERS (Continued)			
103				
104				
105				
106				
	MISCELLANEOUS			
107	Compressor - Gun charger air	32R-500-3	5	36
108				
109	Condenser - Fuel level indicator	HC1560	2	57
110	Condenser - Liquidensitometer	HC1560	2	56
111				
112				
113				
114	Connector - RH chemical tank	117-54241	3	19
114	Connector - LH chemical tank	117-54241	3	44
115				
116				
117	Connector - Pressure block	140-54008	2	73
117-1	Connector - Pressure block	140-54008	2	97
118				
119				
120				
121				
122				
123				
124				
125				
126	Control - Cockpit air pick-up	33500-05	5	19
127	Control box - Rocket projectile release	24775	2	7
128				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
129	Control - Windshield air pick-up	33500-05	4	30
130				
131				
132				
133				
134	Controller - Starter	AN3391-1	5	5
135				
136				
137				
138				
139				
140	Current limiter - Windshield anti-ice heater - 80 ampere	FLLB	1	47
141	Current limiter - Cockpit heater - 150 ampere	FLLE	5	15
142				
143				
144	Disconnect - Pressure - LH	YHS-100S-1	2	44
145	Disconnect - Pressure - RH	YHS-100S-1	2	44
146				
147				
148				
149				
150				
151	Filter - Ammunition heater actuator	C-330-L	4	55
152	Filter - Cabin and windshield heater	CP53B2EB40SK	1	3
153	Filter - Generator bus	CP53B2EB40SK	5	63A
154	Filter - Camera	EA125	1	54
155	Filter - Heat and vent radio noise	12288	2	86
156	Filter - Emergency hydraulic pump motor	CP53B2EB40SK	6	6

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
157	Filter - Gun charger compressor	CP53B2EB40SK	5	37
158	Flasher unit - Position lights	32660	4	91
159				
160				
161	Flux valve - Gyrosyn compass	SPEC 27635	3	64
162	Unit - Gyrosyn compass slaved gyro	SPEC 21098	5	17
163				
164	Fuse - Attitude gyro	AGC1/2	4	68
165	Fuse - Autosyn transformer	AGC1	4	68
166	Fuse - Fuel flowmeter	AGC1	1	21
167	Fuse - Fuel and oil pressure indicator	AGC1/2	4	68
168	Fuse - Gyrosyn compass	AGC1-1/2	4	68
169	Fuse - Hydraulic pressure indicator	AGC1	4	68
170	Fuse - Cockpit temperature control amplifier	AGC1	1	21
171	Fuse - Windshield anti-ice control amplifier	AGC1	1	21
172				
173				
174				
175	Starter-generator - Orenda 10	32550	7	4
175	Starter-generator - Orenda 14	32550	7	30
176				
177				
178				
179	Grip - Control stick	AFX50C4064	2	59
180				
181				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
182				
183	Heater - Cockpit - 4 kilowatt	C885	5	16
184	Heater - Gun No. 1 - LH	24946	4	6
184	Heater - Gun No. 2 - LH	24946	4	7
184	Heater - Gun No. 3 - LH	24946	4	8
184	Heater - Gun No. 1 - RH	24946	5	29
184	Heater - Gun No. 2 - RH	24946	5	30
184	Heater - Gun No. 3 - RH	24946	5	31
185	Heater - Pitot	AN5816-2	3	4
186	Heater - Windshield anti-ice - 2 kilowatt	G883	1	2
187				
188				
189				
190	Horn - Landing gear warning	32462	2	99
191				
192	Indicator - Turn and bank	21106	2	19
193				
194				
195				
196	Indicator - Gyrosyn compass	MIL-1-5126A	2	19
197	Indicator - Hydraulic pressure	21311	2	19
198	Indicator - Liquidensitometer	EA-721-6-1	2	19
199				
200				
201	Indicator - Tachometer	27144	2	19
202	Indicator (3) - Landing gear position	21250A	2	75

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
203				
204				
205				
206	Inverter - Single phase, 1500 volt-ampere 115 volt, 400 cycle	AN31515-1-F-137	1	11
207	Inverter - Three phase, 100 volt-ampere 115 volt, 400 cycle - Alternate	AN3499-1	4	57
208	Inverter - Three phase, 100 volt-ampere 115 volt, 400 cycle - Main	AN3499-1	4	66
209				
	LAMPS			
210	Cockpit utility light	AN3121-313	2	85
211	Fuselage position	AN3133-311	4	28
211	Fuselage position	AN3133-311	4	67
212	Fuselage position	AN3131-303	4	28
212	Fuselage position	AN3131-303	4	67
213	Indirect light panel	GE-327	Typical	
214	Landing	AN3129-4523	1	55
214	Landing and taxi	AN3129-4523	1	57
215				
216	Console floodlight	AN3121R313	2	3
216	Console floodlight	AN3121R313	2	33
217	Ringlights - Instrument panel	AN3140-327	2	19
218	Instrument floodlights - Auxiliary	AN3131-303	2	12
218	Instrument floodlights - Auxiliary	AN3131-303	2	52
219	Tail position	AN3124-307	6	27
219	Tail position	AN3124-307	6	28
220	Warning	AN3121-313	Typical	
221	Wing position	AN3122-1523	3	2

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	LAMPS (Continued)			
221	Wing position	AN3122-1523	3	62
222	Standby compass	AN3136-323	2	18
223	Landing gear unsafe	AN3140-327	2	75
224	Warning inverter failure	AN3121-313	2	19
225				
226				
	LIGHT ASSEMBLY			
227	Oxygen warning	T-1270	2	75
228	Deleted			
229	Console and pedestal	A4350	2	60
229	Console and pedestal	A4350	2	75
230	Cockpit utility	94-322940	2	85
231	Fire detection warning	AN3157-6	2	29
232	Fuel filter de-ice	AN3157-4	2	18A
233	Fragmentation bomb indicator	AN3157-4	2	60
234	Fuselage - Upper	AN3177-9	4	28
235	Fuselage - Lower	AN3177-9	4	67
236				
237	Auxiliary instrument light - LH	A4244A5	2	12
237	Deleted			
238	Flight control indicator - Alternate	AN3157-4	2	19
239	Single phase inverter failure warning	AN3157-4	2	19
240	Indirect panel illumination	AN3502-2A	2	55
240	Indirect panel illumination	AN3503-2A	2	75
240	Indirect panel illumination	AN3502-2A	2	84
241	Main instrument inverter failure warning	AN3157-4	2	19

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	LIGHT ASSEMBLY			
242	Landing and taxi	G-4710A	1	57
243	Console floodlight - LH	AN3034-1	2	3
243	Console floodlight - RH	AN3034-1	2	33
244	Landing	D5530	1	55
245	Ringlight assembly - Instrument panel	13A51005	2	19
246	Tail position - White	AN3158-1	6	28
247	Tail position - Yellow	AN3158-2	6	27
248	Take-off indicator	AN3157-4	2	19
249	RH wing position - Green	AN3033-8	3	2
250	LH wing position - Red	AN3033-7	3	62
251				
252	Windshield overheat warning	AN3157-4	2	3A
253	Both instrument inverters failure warning	AN3157-6	2	19
254				
255				
	MISCELLANEOUS			
256	Liquidensitometer	EA-900-C-1	3	95
257				
258	Motor - Ammunition booster - Gun No. 1 - LH	29492	4	88
258	Motor - Ammunition booster - Gun No. 2 - LH	29492	4	85
258	Motor - Ammunition booster - Gun No. 3 - LH	29492	4	84
258	Motor - Ammunition booster - Gun No. 1 - RH	29292	5	38
258	Motor - Ammunition booster - Gun No. 2 - RH	29292	5	39
258	Motor - Ammunition booster - Gun No. 3 - RH	29492	5	40
259				
260				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	PANELS			
261	Relay - Aft radio compartment	151-54122-40	5	18
262	Bus generator power	140-54035	5	60
263	Circuit-breaker - LH	170-54068	2	2
264	Circuit-breaker - RH	172-54040	2	43
265	Fuel level adjustment	AC134A5-3	2	45
266	Relay - Gun charger	172-54034	1	47
267	Relay - Nose section	170-54055	1	22
268	Centre pedestal	170-54104	2	60
269	Relay - Aft LH radio bay	172-54065	4	64
270	Relay starter controller	172-54079	5	5
271	Relay - Windshield anti-ice and battery	170-54085	1	17
272	Instrument	13A-51005	2	19
273	LH forward console	172-54028	2	75
274	LH aft console	172-54095	2	84
275	RH forward console	172-54094	2	55
276	Circuit-breaker - Forward LH	151-53377	2	4
277	Ammunition booster relay - LH	161-54037	4	83
277	Ammunition booster relay - RH	161-54037	5	50
278	Circuit-breaker - Single phase inverter	172-54166	1	21
	PLUGS			
279	Aft fuselage disconnect	AN3106B-32-6P	4	37
280	Motor - Ammunition booster - Gun No. 1 - LH	AN3106B-14S-2S	4	85
280	Motor - Ammunition booster - Gun No. 2 - LH	AN3106B-14S-2S	4	85
280	Motor - Ammunition booster - Gun No. 3 - LH	AN3106B-14S-2S	4	84
280	Motor - Ammunition booster - Gun No. 1 - RH	AN3106B-14S-2S	5	38
280	Motor - Ammunition booster - Gun No. 2 - RH	AN3106B-14S-2S	5	39

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	PLUGS (Continued)			
280	Motor - Ammunition booster - Gun No. 3 - RH	AN3106B-14S-2S	5	40
281	Ammunition heat filter	AN3106B-14S-5S	4	55
282				
283	RH bomb rack - S-2	AN3106B-18-1P	3	20
283	LH bomb rack - S-2	AN3106B-18-1P	3	43
285	Canopy deck disconnect	AN3108B-20-29S	2	92
286	Canopy actuator	AN3106B-14S-7S	4	23
287	Canopy pullaway	AN3107B-20-29S	5	8
288	Centre wing disconnect	AN3106E-22-14S	3	36
289	Centre pedestal disconnect	AN3106B-32-7S	2	70
289-1	Centre pedestal disconnect	AN3106B-32-7S	2	72
290	Cockpit pressure regulator	AN3106B-10SL-4S	5	6
291	Cockpit temperature control amplifier	AN3106B-20-27S	5	62
292	Cockpit air shut-off valve	AN3106B-14S-5S	4	29
293	Gyrosyn compass amplifier	AN3106B-20-27S	5	64
294	Gyrosyn compass flux valve	AN3106B-18-12S	3	63
295	Gyrosyn compass indicator	AN3106B-14S-5S	2	19
296	Control stick grip disconnect	AN3108B-20-27P	2	61
297	Landing gear door solenoid valve	AN3106B-14S-2S	5	67
298				
299				
300				
301	Engine fire detector	AN3106B-14S-2P	5	3
302	Emergency hydraulic supply and return valve	AN3108B-10SL-4S	6	35
303	Fuel shut-off control valve	AN3106B-10SL-4S		
304	Flasher pressure disconnect	AN3106B-28-12S	4	1

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	PLUGS (Continued)			
305	Fire detector relay	AN3106B-14S-5S	5	12
306	Fire detector relay	AN3106B-16S-1S	5	12
307	Fuel filter de-ice pressure switch	AN3106B-14S-9S	4	47
308	Fuel filter de-ice valve	AN3106B-12S-3S	4	48
309				
310				
311				
312				
313				
314				
315				
316	Fuel shut-off solenoid valve	AN3106B-14S-5S	4	50
317	Forward pressure disconnect - Forward LH	AN3106A-32-75	2	67
318	Forward pressure disconnect - Aft LH	AN3106B-28-11S	2	66
320	Generator field control relay	AN3106B-24-7S	5	18
322	Gun charger air compressor	AN3106B-16-11S	5	36
323	Gun-bay pressure	AN3106B-24-28S	4	2
324	Centre pedestal disconnect	AN3106B-28-11S	2	71
325	GSAP camera	102		
326	Cockpit heater pressure switch	AN3106B-18-10S	2	89
327	Hydraulic pump override - Manual	AN3106B-16-12P	5	4
329	Hydraulic by-pass valve - Normal system	AN3106B-10SL-4S	3	29
330	Hydraulic pressure indicator	AN3106B-14S-2S	2	19
331	Alternate hydraulic pressure switch - LH	AN3106B-12S-3S	6	37
331	Alternate hydraulic pressure switch - LH	AN3106B-12S-3S	6	38
331	Alternate hydraulic pressure switch - RH	AN3106B-12S-3S	6	46

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	PLUGS (Continued)			
331	Alternate hydraulic pressure switch - RH	AN3106B-12S-3S	6	48
332	Hydraulic pressure switch - Normal	AN3106B-12S-3S	3	28
332	Hydraulic pressure switch - Normal	AN3106B-12S-3S	3	35
333	Hydraulic pressure transmitter - Emergency	AN3106B-14S-2S	6	9
334	Hydraulic pressure transmitter - Normal	AN3106B-14S-2S	3	31
335	Hydraulic pressure transmitter - Utility	AN3106B-14S-2S	3	32
336	Motor - Emergency hydraulic pump	AN3106B-20-19S	6	44
337				
338	Instrument panel shroud disconnect	AN3106B-20-27P	2	31
339	Instrument panel indicator light disconnect	AN3106B-18-1P	2	13
340	Instrument panel - Jettison switch disconnect	AN3106B-16-9S	2	19
341	Inverter three-phase - Alternate	AN3108B-14S-7S	4	57
342	Inverter three-phase - Main	AN3108B-14S-7S	4	66
343	Landing light	AN3106B-18-5S	1	55
344	Lateral bungee trim actuator	AN3106B-14S-7S	3	33
345	Liquidensitometer indicator	AN3106B-14S-2S	2	19
346	Liquidensitometer	AN412266F	3	94
349	Parachute fragmentation bomb rack - LH	AN3107B-18-12S	3	48
349	Parachute fragmentation bomb rack - RH	AN3107B-18-12S	3	15
352	Position light flasher unit	AN3106B-16S-8S	4	91
353	Oxygen regulator	AN3106-10SL-3S	2	76
354	Ram-air shut-off valve	AN3106B-14S-5S	5	13
356	Rocket firing (16)	PL68		
357	Rocket arming and jettison	PL68	Attached to each rocket	
358	Rudder disconnect	AN3106A-14S-5P	6	29
360	Gyrosyn compass - Slaved gyro unit	AN3106B-14S-5S	5	17

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	PLUGS (Continued)			
361	Speed brake solenoid valve	AN3106B-14S-2S	4	58
362				
363	Speed brake well - LH	AN3108B-14S-6P	6	39
363	Speed brake well - RH	AN3108B-14S-6P	6	47
364	Speed brake well - LH	AN3108B-14S-6P	6	36
365	Stand-by compass light	279-8	2	18
366	Tachometer indicator	AN3106A-10SL-3S	2	19
367				
368	Turn and slip indicator	AN3106A-10SL-3S	2	19
369				
370	Disconnects - LH wing position light	1071	3	61
370	Disconnects - RH wing position light and pitot heater	1071	3	3
371	Disconnect - Forward - RH wing	AN3108B-32-8S	3	26
371-1	Disconnect - Forward - LH wing	AN3108B-32-8S	3	37
372	Disconnect - Throttle	AN3106B-16S-1P	2	80
373	Landing gear position indicator	AN3106B-10SL-3S	2	75
374	Landing and taxi light	AN3107B-18-9S	1	57
375	Cockpit air pick-up control	AN3106B-10SL-3S	5	19
376	Cockpit pressure dump valve	AN3108B-10SL-4S	2	93
377	Cockpit hot air by-pass valve	AN3106B-14S-5S	4	27
378	Heat exchanger modulating valve	AN3106B-14S-5S	4	31
379	Heat and vent radio noise filter	AN3106B-12S-3P	2	86
380	Windshield anti-ice amplifier	AN3106B-20-27SX	5	61
381	Windshield air pick-up control	AN3106B-10SL-3S	4	30
382	Drop tank disconnect	172-54022	3	117
383				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	PLUGS (Continued)			
384				
385				
	MISCELLANEOUS			
386	Pump - Fuel filter de-ice	20386-2	4	51
387	Pump - Fuel transfer	TFD31400-3	4	46
388	Pump - Aft fuel booster	TFD31400-3	4	65
388	Pump - Forward fuel booster	TFD31400-3	4	72
389	Motor - Emergency hydraulic pump	D-1000	4	44
392	Rack - Bomb release - RH	24993	3	20
393	Rack - Bomb release - LH	24993	3	43
394	Rack - Parachute fragmentation release - LH	24938	3	43
395	Rack - Parachute fragmentation release - RH	24938	3	20
396				
	RECEPTACLES			
397	Aft fuselage disconnect	AN3100A-32-6S	4	37
398	Ammunition booster	AN3102A-14S-2P	Booster Assembly	
399	RH bomb rack - S-2	AN3101A-18-15	3	11
399	LH bomb rack - S-2	AN3101A-18-15	3	53
400	Canopy deck disconnect	AN3106-20-29P	2	92
401	Canopy pullaway	AN3100A-20-29P	5	8
402	Centre wing disconnect	AN3101B-22-14P	3	36
403				
404	Control stick grip disconnect	AN3102A-20-27S	2	61
405				
406				
407	Engine fire detector	AN3101A-14S-2S	5	3

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	RECEPTACLES (Continued)			
408	External power - No. 1	AN2552-A3	4	42
408	External power - No. 2	AN2552-A3	3	41
409	Flasher pressure disconnect	AN3100C028-12P	4	1
410	Outboard fuel level transmitter - RH	AN3101A-14S-2S	3	16
410	Outboard fuel level transmitter - LH	AN3101A-14S-2S	3	47
410	Inboard fuel level transmitter - RH	AN3101A-14S-2S	3	25
410	Inboard fuel level transmitter - LH	AN3101A-14S-2S	3	38
410	Fuselage fuel level transmitter - Forward	AN3101A-14S-2S	5	66
410	Fuselage fuel level transmitter - Aft	AN3101A-14S-2S	5	70
411	Wing fuel level transmitter - Centre	AN3101A-14S-5S	3	93
412	Forward pressure disconnect - Forward LH	AN3100C-32-7P	2	67
413	Forward pressure disconnect - Aft LH	AN3100C-28-11P	2	66
414				
415	Gun heaters - LH (3)	AN3102A-12S-3S	4	9
415	Gun heaters - RH (3)	AN3102A-12S-3S	5	59
416	Instrument panel indicator light disconnect	AN3100A-18-1S	2	13
417	Instrument panel shroud disconnect	AN3100A-20-27S	2	31
418	Instrument panel - Jettison disconnect	AN3100A-16-9P	2	19
419	Instrument power transfer relay	2044-84	4	61
420				
421				
422	Rocket firing - No. 1	140-54110	3	65
422	Rocket firing - No. 2	140-54110	3	114
422	Rocket firing - No. 3	140-54110	3	67
422	Rocket firing - No. 4	140-54110	3	116
422	Rocket firing - No. 5	140-54110	3	69

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	RECEPTACLES (Continued)			
422	Rocket firing - No. 6	140-54110	3	110
422	Rocket firing - No. 7	140-54110	3	70
422	Rocket firing - No. 8	140-54110	3	112
422	Rocket firing - No. 9	140-54110	3	74
422	Rocket firing - No. 10	140-54110	3	109
422	Rocket firing - No. 11	140-54110	3	71
422	Rocket firing - No. 12	140-54110	3	111
422	Rocket firing - No. 13	140-54110	3	75
422	Rocket firing - No. 14	140-54110	3	102
422	Rocket firing - No. 15	140-54110	3	78
422	Rocket firing - No. 16	140-54110	3	107
423-1	Forward rocket pod - RH	JK-33A	3	7
423-2	Forward rocket pod - RH	JK-33A	3	10
423-3	Forward rocket pod - RH	JK-33A	3	18
423-4	Forward rocket pod - RH	JK-33A	3	21
423-5	Forward rocket pod - LH	JK-33A	3	42
423-6	Forward rocket pod - LH	JK-33A	3	45
423-7	Forward rocket pod - LH	JK-33A	3	52
423-8	Forward rocket pod - LH	JK-33A	3	56
424	Rudder disconnect	AN3101A-14S-5S	6	29
425				
426	Throttle relay	AN3102A-22-19S	2	20
427	Wing forward disconnect - RH	AN3100A-32-3P	3	26
427-1	Wing forward disconnect - LH	AN3100A-32-3P	3	37
428	Throttle disconnect	AN3101B-16S-1S	2	80
429	Wing flap actuator - LH	AN3100-18-10S	3	72

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	RECEPTACLES (Continued)			
429	Wing flap actuator - RH	AN3100-18-10S	3	104
430	Gun charger - Gun No. 1 - LH	AN3101A-14S-2S	4	11
430	Gun charger - Gun No. 2 - LH	AN3101A-14S-2S	4	12
430	Gun charger - Gun No. 3 - LH	AN3101A-14S-2S	4	13
430	Gun charger - Gun No. 1 - RH	AN3101A-14S-2S	5	24
430	Gun charger - Gun No. 2 - RH	AN3101A-14S-2S	5	26
430	Gun charger - Gun No. 3 - RH	AN3101A-14S-2S	5	25
431				
432	Landing gear retract control relay	2044-84	4	44
433	Cockpit air control relay	AN3102A-22-19S	4	43
434	Drop tank disconnect - LH	336	3	50
434	Drop tank disconnect - RH	336	3	13
435	Drop tank jettison	336	3	118
436	Hydraulic pump manual override	AN3100A-16-12S	5	4
437	Gun bay pressure	AN3100C-24-28P	4	
438	Speed brake well - LH	AN3100A-14S-6S	6	36
438-1	Speed brake well - LH	AN3100A-14S-6S	6	39
438-2	Speed brake well - RH	AN3100A-14S-6S	6	47
439				
440				
441				
442	Centre pedestal disconnect	AN3102A-32-7P		
442-1	Centre pedestal disconnect	AN3102A-32-7P	2	72
443	Centre pedestal disconnect	AN3102A-28-11P	2	11
444				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	RELAYS			
445	Ammunition boosters - LH	AN3350-2	4	83
445	Ammunition boosters - RH	AN3350-2	5	50
446	Ammunition heat control	AN3316-1	5	18
447	All bombs	237 EAS	5	18
448	Battery bus tie-in	AN3370-1	1	18
449	Bomb release control	237-EAU	2	60
450	Bomb release power	AN3350-2	2	60
451	Bomb salvo	237EAU	2	60
452	Bus tie-in	AN3370-1	5	55
453				
454	Bus tie-in control	237 EAU	2	60
455	Canopy actuator	AN3350-1	5	18
456	Canopy alternate power	AN3353-1	1	22
457	Canopy seal	239-51A	4	10
458	Cockpit heater power	AN3370-1	5	14
459	Cockpit heater time delay	32439	4	22
460	Engine start ignition control	9048-26F	2	21
461	External power	AN3380-1	5	5
462	Fragmentation bomb select	237EAU	2	60
463	Fuel booster pump - Aft	AN3350-1	4	35
464	Fuel booster pump - Forward	AN3350-1	4	32
465	Fuel transfer pump control	1264-938	5	5
466				
467	GSAP camera	1251-937	2	60
468				
469	Gunfiring	AN3350-1	1	22

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	RELAYS (Continued)			
470	Gun heater	AN3352-1	1	22
471				
472	Generator field control	32603	5	18
473	Gun charger retract	AN3353-1	1	47
474				
475				
476	Emergency hydraulic pump motor	AN3370-1	6	45
477				
478				
479	Inverter failure warning	44B18754	1	22
480	Lateral trim	237EAU	4	64
481	Longitudinal trim	237EAU4	4	64
482				
483	Landing gear warning horn	237EAU	2	60
484	Landing lights	1227-893	2	60
485	Landing and taxi light control	237EAU	1	47
486				
487	Overvoltage	32591	5	18
488	Fire detector	161-54116	5	12
489	Reverse -current	AN3025-2	5	60
490	Rocket jettison	6042H39	5	18
491	Throttle	AN3310-1	2	20
492				
493	Windshield anti-ice time delay	AN3370-1	1	18
494	Windshield anti-ice power	32439	1	22
495				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	RELAYS (Continued)			
496	Rocket arming control	6-54226	5	18
497	Landing gear retract control	AN3308-1	4	44
498	Landing light control	237EAU	1	47
499	Cockpit air control	AN3310-1	4	43
500	Instrument power transfer	AN3308-1	4	61
501	Inverter failure warning	44B18574	4	54
502				
503	Alternate hydraulic power control	AN3311-1	2	60
504	Hydraulic tie-in control - Emergency	AN3312-1	2	60
505	Gunsight power	AN3212-1	1	22
506				
507				
508	Bus tie-in control	237EAU	2	60
509				
510				
511				
512				
513				
	MISCELLANEOUS			
514	Regulator - Cockpit pressure	12. 5-5.00-5.75	5	6
515	Regulator - Oxygen	2870-5B-B2	2	76
516	Regulator - Voltage generator	Spec. 17R21	4	77
517				
518				
519				
520				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
521				
522				
523				
524				
525				
526				
527	Resistor - Transfer relay	B10F50	5	5
528	Resistor - Oxygen warning light dimmer	RW-31E800	2	75
529	Deleted			
530	Resistor - Tail position light dimmer	B20L25	2	55
531	Resistor - Wing position light dimmer	A25K10	2	55
532	Resistor - Console floodlights	B10F30	2	47
533				
534				
535	Resistor - Fire detector system	RW30J3RO	5	65
536				
537	Rheostat - Console and pedestal lights	AN3155-50-100	2	37
538	Rheostat - Auxiliary instrument lights	AN3155-50-100	2	36
539				
540	Rheostat - Cockpit temperature	30088	2	84
541	Rheostat - Instrument panel ringlights	31873-A	2	35
542				
543	Shunt - Loadmeter	130814	5	60
544				
545				
546	Solenoid - Rocket arming	X50C26144	Rocket Pods	

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
547	Solenoid - Rocket jettison	C-8001-3	Rocket Pods	
548	Solenoid - Drop tank jettison	151-48320	3	118
549				
550				
551				
552				
553				
554				
	SWITCHES			
555	Alternate lateral trim	8749K11	2	84
556	Alternate longitudinal trim	8749K11	2	11
557				
558				
559	Battery and starter	AN3027-8	2	55
560	Bomb arming	AN3021-1	2	60
561	Bomb release selector	AN3021-3	2	60
562	Bomb selector - Fragmentation	AN3226-1	2	60
563	Bomb train selector	AN3021-2	2	60
564				
565	Cockpit temperature control	45A7400-2	2	84
566	Canopy open limit	AN3210-1	2	94
567	Canopy open external - LH	BZ-3YST	4	4
567	Canopy open external - RH	BZ-3YST	5	35
568	Canopy close external - LH	BZ-3YST	4	3
568	Canopy close external - RH	BZ-3YST	5	34
569	Canopy operating - Pilot	AN3022-5	2	17

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	SWITCHES (Continued)			
570	Canopy seal	AN3215-1	2	90
571	Canopy seal dump	BZ-7RQIT	2	100
572	Chemical tank selector - M-10	AN3021-1	2	60
573				
574	Engine master	AN3027-3	2	55
575	Main gear door open sequence - LH	B2-7RQIT	3	86
575	Main gear door open sequence - RH	B2-7RQIT	3	91
576	Fire detector test	138187	2	30
577	Fuel filter de-ice	C-100	2	17A
578	Fuel filter de-ice pressure	G20AX11	4	47
579				
580	Booster pump test (2) - Forward and aft	AN3022-8	3	81
580-1	Fuel transfer pump test	AN3022-8	3	100
581				
582	Generator control	AN3027-8	2	55
583	Landing gear and ground safety	1HA1	3	82
584	Gun heaters	AN3027-3	2	60
585				
586	Gun safety	AN3226-1	2	60
587	Alternate flight control	1AT5	2	84
588				
589	Hydraulic pressure - Normal	170-58615	3	28
590	Gyrosyn compass fast slave	172-58624-3	2	19
591	Alternate hydraulic pressure - LH	172-58624-5	6	37
591-1	Alternate hydraulic pressure - RH	172-58624-5	6	46
592	Alternate hydraulic pressure - LH	172-58624-5	6	38

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	SWITCHES (Continued)			
592-1	Alternate hydraulic pressure - RH	172-58624-5	6	48
593	Hydraulic pressure - Normal	172-58615	3	35
594	Ignition - Emergency	AN3021-2	2	55
595	Instrument power	AN3027-3	2	60
596	Lateral trim neutral	AN3234-1	3	33
597	Landing gear control	10491	2	19
598	Throttle warning	AN3216-1	4	34
599	Landing lights control	AN3022-158	2	75
600				
601	Main gear uplock - LH	152-54201	3	84
601	Main gear uplock - RH	152-54201	3	97
602	Main gear downlock - LH	152-54201	3	80
602	Main gear downlock - RH	152-54201	3	101
603				
604				
605				
606				
607	Main gear fairing door locked - LH	BZ7RQIT	3	88
607	Main gear fairing door locked - RH	BZ-7RQIT	3	89
608	Main gear fairing door closed - LH	BZ-7RQIT	3	87
608	Main gear fairing door closed - RH	BZ-7RQIT	3	90
609	Nose gear fairing door locked	BZ-7RQIT	1	50
610	Nose gear fairing door closed	BZ-7RQIT	1	51
611	Nose gear downlock	152-54201	1	53
612	Nose gear uplock	152-54201	1	49
613	Nose gear fairing door open sequence	AN3215-1	1	48

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	SWITCHES (Continued)			
614	Nose gear steering safety	1HA1	1	52
615	Rocket jettison ready	AN3021-3	2	60
616	Landing gear emergency retract	C8100	2	19
617	Position and fuselage lights	AN3227-1	2	55
618	Position and fuselage lights dimmer	AN3227-3	2	55
619	Cockpit heater pressure	P6208AS2	2	89
620	Ram pressure selector	AN3227-3	2	84
621	Rocket arming	AN3021-1	2	60
622				
623	Rocket jettison safety	AN32436-4-13	3	99
624	Rocket jettison test	AN3021-8	3	100
625	Rocket selector	AN3027-1	2	60
626	Rudder trim tab control	AN3021-7	2	84
627	Rudder trim neutral	AN3234-1	6	25
628	Speed brake control	AN3021-1	2	8
629				
630	Standby compass light	AN3021-2	2	55
631	Stop start	D-800	2	55
632	Engine throttle control	BZ3YQT	2	82
633				
634				
635	Warning horn cut-out	A-401B2	2	75
636	Wing flaps down	WA-3SBTI	2	81
636	Wing flaps up	WA-3SBTI	2	78
637	Fuel density correction	AN3021-2	2	55
638	Manual jettison arming safety	AN3210-1	3	100

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	SWITCHES (Continued)			
639	Cockpit heater	AN3234-1	2	84
640	Cockpit heater cut-out	AN3234-1	2	84
641	Cockpit pressure regulator	AN3021-2	2	84
642	Canopy defrost	BZ7RQIT	2	96
643	Emergency hydraulic pump manual override	S-23-3B-1	6	7
644	Ground door control	AN3237-3	3	81
645	Hydraulic pressure indicator	4AT3	2	19
646				
647				
648				
	TERMINAL BLOCKS			
649	Longitudinal bungee trim actuator	AN3435-2-3	6	18
650				
651				
652	Loadmeter	AN3436-2-2	5	60
653	Ammunition booster - LH	AN3436-2-1	4	90
653	Ammunition booster - RH	AN3436-2-1	5	32
654	Ammunition compartment	AN3436-2-3	4	87
655	Bomb salvo - RH	AN3436-2-3	3	6
655	Bomb salvo - LH	AN3436-2-3	3	57
656	Radio compass	AN3436-2-9	4	25
657	Gyrosyn compass	AN3436-2-7	3	58
658	Wing leading edge - RH	AN3436-2-10	3	9
659	Fuel transfer pump	AN3436-2-1	4	45
659	Fuel booster pump - Aft	AN3436-2-1	4	63
659	Fuel booster pump - Forward	AN3436-2-1	4	70

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	TERMINAL BLOCKS (Continued)			
660				
661	Gun bay - LH	AN3436-6-2	4	81
662				
663	Gun bay - RH	AN3436-3-10	5	23
664	Hydraulic pump - Emergency	AN3436-6-3	4	38
665	Hydraulic system - Emergency	NAS45-6-9	6	43
666	Hydraulic pump emergency override	NAS45-416-2	5	27
667	Landing gear connector - Lower	AN3436-2-8	5	68
668	Landing gear connector - Upper	AN3436-2-17	4	33
669	Nose junction box	AN3436-2-11	1	23
670	Nose wiring	AN3436-4-13	1	25
671	Overvoltage relay	AN3436-2-8	5	18
672	Pitot heater	AN3436-2-1	3	1
673	Pressure	151-54037	5	58
674	Radio RH Web	NAS45-6-16	2	49
675	Battery	NAS45-416-1	1	24
676	Wing flap - LH	NAS45-8-2	4	53
677	Wing - LH aft	40095	3	83
678	Wing - RH aft	40095	3	98
679	Gun bay - LH	AN3436-2-10	4	14
680	Wing - RH centre	AN3436	3	27
681	Rapid VHF test - RH web	AN3436-2-6	2	32A
682	Wing flap actuator - LH	NAS45-8-2	3	85
682	Wing flap actuator - RH	NAS45-8-2	3	96
683				
684				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	TERMINAL BLOCKS (Continued)			
685				
686-1	Rocket pod - Forward RH	AN3436-22	3	8
686-2	Rocket pod - Forward RH	AN3436-2-2	3	12
686-3	Rocket pod - Forward RH	AN3436-2-2	3	17
686-4	Rocket pod - Forward RH	AN3436-2-2	3	22
686-5	Rocket pod - Forward LH	AN3436-2-2	3	41
686-6	Rocket pod - Forward LH	AN3436-2-2	3	46
686-7	Rocket pod - Forward LH	AN3436-2-2	3	51
686-8	Rocket pod - Forward LH	AN3436-2-2	3	55
687	Instrument panel ringlights	AN3436-2-6	2	19
688	Wing leading edge - LH	AN3436-2-12	3	54
689	Cockpit utility light	AN3436-2-1	2	87
690	Landing gear control disconnect	AN3436-2-10	2	15
691	Gun bay pressure disconnect	AN3436-2-7	4	5
692	Speed brake well	AN3436-2-2	6	13
693				
694	Auxiliary instrument light - LH	AN3436-2-1	2	10
694	Auxiliary instrument light - RH	AN3436-2-1	2	34
695				
696				
697				
698				
699				
700				
701				
702				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	TERMINAL BLOCKS (Continued)			
703				
	THERMOCOUPLES			
704	Fire detector - Engine - Orenda 10	AN35534-2	7	14
704	Fire detector - Engine - Orenda 14	AN35534-2	7	16
704-1	Fire detector	AN35534-2	6	1
704-2	Fire detector	AN35534-2	6	4
704-3	Fire detector	AN35534-2	6	5
704-4	Fire detector	AN35534-2	6	10
704-5	Fire detector	AN35534-2	6	11
704-6	Fire detector	AN35534-2	6	12
704-7	Fire detector	AN35534-2	6	17
704-8	Fire detector	AN35534-2	6	30
704-9	Fire detector	AN35534-2	6	31
704-10	Fire detector	AN35534-2	6	32
704-11	Fire detector	AN35534-2	6	33
704-12	Fire detector	AN35534-2	6	40
704-13	Fire detector	AN35534-2	6	41
704-14	Fire detector	AN35534-2	4	36
704-15	Fire detector	AN35534-2	4	40
704-16	Fire detector	AN35534-2	4	49
705				
706				
	TERMINAL BLOCKS			
707	Rocket firing receptacles - Nos 1 and 3	AN3436-2-2	3	66
707	Rocket firing receptacles - Nos 2 and 4	AN3436-2-2	3	115
707	Rocket firing receptacles - Nos 7 and 9	AN3436-2-2	3	73

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	TERMINAL BLOCKS (Continued)			
707	Rocket firing receptacles - Nos 6 and 12	AN3436-2-2	3	108
707	Rocket firing receptacles - Nos 10 and 16	AN3436-2-2	3	106
707	Rocket firing receptacles - Nos 11 and 13	AN3436-2-2	3	76
708	Rocket firing receptacles - No. 5	AN3436-2-1	3	68
708	Rocket firing receptacles - No. 8	AN3436-2-1	3	113
708	Rocket firing receptacle - No. 14	AN3436-2-1	3	103
708	Rocket firing receptacle - No. 15	AN3436-2-1	3	79
	MISCELLANEOUS			
709	Thermostat - Low heat limit	18420-45	4	89
710	Thermostat - Ammunition overheat warning	18423-260	4	86
711	Thermostat - Windshield anti-icing overheat	18423-275	1	1
712				
713				
714				
715	Transformer - Autosyn	C-124	4	71
716				
717				
718				
719				
720				
721				
722	Transmitter - Fuel level - Forward fuselage	EA-380-548	5	66
723	Transmitter - Fuel level - Centre wing	EA279AC-547	3	92
724	Tramsitter - Fuel level - LH inboard	EA378A-546	3	39
724	Transmitter - Fuel level - RH inboard	EA278A-546	3	24
725	Transmitter - Fuel level - LH outboard	EA378A-545	3	49

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
725	Transmitter - Fuel level - RH outboard	EA378A-545	3	14
726	Transmitter - Hydraulic pressure - Emergency	21323	6	9
727	Transmitter - Hydraulic pressure - Normal	21323	3	31
728	Transmitter - Hydraulic pressure - Utility	21323	3	32
729				
730				
731				
732				
733				
734				
735	Valve - Cockpit air shut-off	WB008-12	4	29
736	Valve - Cockpit pressure dump	35020-5, 25	2	93
737	Valve - Cockpit hot air by-pass	93750-1	4	27
738	Valve - Canopy seal	10211	4	52
739	Valve - Landing gear and door solenoid	9610	5	67
740	Valve - Fuel filter de-ice solenoid	40R855C	4	48
741				
742				
743	Valve - Fuel shut-off solenoid	3224	4	50
744	Valve - Emergency hydraulic supply and return	172-58625	6	35
745	Valve - Hydraulic by-pass - Normal	170-58616	3	29
746	Valve - Nose wheel steering hydraulic solenoid	20697-3	1	56
747				
748	Valve - Ram-air shut-off	W7946-20	5	13
749	Valve - Speed brake solenoid	9600	4	58
750	Valve - Heat exchanger - Modulating	94510	4	31

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
751				
752				
753				
754				
755				
756				
757				
758				
759				
760				
761	Voltmeter - 0-30 volt d.c.	94-32172-B	2	19
762				
763				
764				
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771				
772				
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776				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
803				
804				
805				
806	Switch - Landing gear safety	1HA1	3	82
807				
808	Switch - Rocket jettison safety	1HA1	3	99
809	Switch - Nose gear steering safety	1HA1RH	1	52
810				
811				
812				
813				
814				
815				
816				
817				
818				
819				
820				
821				
822	Receptacle - Instrument panel disconnect	AN3100A20-27S	2	14
823				
824	Receptacle - Instrument panel disconnect	AN3100A-22-14S	2	74
825	Plug - Instrument panel disconnect	AN3100A-22-14P	2	74
826				
827				
828				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
1793				
1794				
1795				
1796				
1797				
1798				
1799	Switch - Tow target jettison	AN3022-7	2	16
1800	Circuit-breaker - Tow target jettison	AN3161-P10	2	2
1801	Solenoid - Tow target jettison	C8001-1	6	30A
1801	Solenoid - Tow target jettison	C8001-1	6	30B
1802	Receptacle - Tow target jettison	AN3101B-14S-1S	5	2
1803	Plug - Tow target jettison	AN3106B-14S-1P	5	2
1804	Relay - Tow target jettison	237EAU	2	60
1805				
1806				
1807				
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1812				
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1815				
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1817				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
1999				
2000	Deleted			
2001	Deleted			
2002	Deleted			
2003	Deleted			
2004	Plug - Engine flange disconnect	AN31-6M-20-16S	7	19
2005	Receptacle - Engine flange disconnect	AN3100M-20-16S	7	19
2006	Plug - Engine disconnect	AN3106M-28-11S	7	7
2007	Plug - Ring main oil temperature bulb	AN3108M-12S-3S	7	5
2008	Temperature bulb - Ring main oil	74N900	7	5
2009	Deleted			
2009	Deleted			
2010	Light assembly - Low fuel pressure warning	AN3157-2	2	19
2011	Lamp - Low fuel pressure warning light	AN3121-313	2	19
2012	Circuit-breaker - Fuel pressure warning	AN3161-P5	2	43
2013	Switch - Low fuel pressure warning - Orenda 10	3135-13-C-30	7	9
2013	Switch - Low fuel pressure warning - Orenda 14	3135-13-C-30	7	15
2014	Plug - Low fuel pressure warning switch	AN3108M-12S-3S	7	9
2014	Plug - Low fuel pressure warning switch	AN3108M-12S-3S	7	15
2015				
2016	Plug - High energy ignition unit	AN3108M-16S-3S	7	12
2016	Plug - High energy ignition unit	AN3108M-16S-3S	7	22
2017				
2018	Deleted			
2019	Valve - Fuel pump solenoid	Furnished with Engine		
2020				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
2021	Switch - Emergency fuel system	AN3021-2	2	19
2022	Plug - Engine flange disconnect	AN3106M-20-27S	7	18
2023	Receptacle - Engine flange disconnect	AN3100M-20-27P	7	18
2024	Transmitter - Oil pressure - Orenda 10	MIL-T-5882A	7	13
2024	Transmitter - Oil pressure - Orenda 14	MIL-T-5882A	7	17
2025	Plug - Oil pressure transmitter	AN3108M-14S-2S	7	13
2025	Plug - Oil pressure transmitter	AN3108M-14S-2S	7	17
2026	Heater - Duct pitot tube	AN5812-1	1	44
2027	Transmitter - Fuel level - Aft fuselage	EA-881A-788A	5	69
2028	Connector - Generator	Furnished with Engine	7	11
2029	Connector - Starter	Furnished with Engine	7	3
2030	Plug - Engine disconnect	AN3106M-24-28S	7	6
2031	Plug - Torch igniter reducing valve	AN3108M-10SL-4S	7	10
2032	Valve - Torch igniter reducing	RV6/6C	7	10
2033	Terminal strip - Engine junction box	Furnished with Engine		
2034	Plug - Duct pitot tube heater	AN3115-1	1	44
2035				
2036	Indicator - Oil pressure	MS-28010-1	2	19
2037	Unit - High energy ignition - Orenda 10	3850-3	7	12
2037	Unit - High energy ignition - Orenda 14	3850-3	7	22
2038	Plug - Oil pressure indicator	AN3106B-14S-2S	2	19
2039	Temperature bulb - Centre bearing oil scavenger	174N900	7	1
2040	Generator - Tachometer - Orenda 10	2CM9AAC	7	8
2040	Generator - Tachometer - Orenda 14	2CM9AAC	7	23
2041	Plug - Tachometer generator	AN3108M-12S-3S	7	8
2041	Plug - Tachometer generator	AN3108M-12S-3S	7	23

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
2042				
2043				
2044	Plug - Engine junction box	AN3108M-22-14P	7	6
2045				
2046	Receptacle - Engine junction box	AN3102M-24-28S	7	6
2047	Receptacle - Engine junction box	AN3102M-28-11P	7	7
2048				
2049				
2050				
2051				
2052				
2053				
2054	Plug - Instrument panel disconnect	AN3106B-20-27P	2	14
2055				
2056	Lamp - Emergency and take-off fuel switch	AN3121-313	2	19
2057	Light assembly - Emergency and take-off fuel switch	AN3157-2	2	19
2058	Light - Airstart	AN3157-4	2	19
2059	Switch - Airstart	AN3021-10	2	19
2060	Thermocouple and harness	GE989215-G14G2 GE9890473-G3	6	34
2061	Receptacle - Thermocouple and harness	GE9892306	6	14
2062	Plug - Thermocouple disconnect	AN5537-4-1	5	1
2063	Connector - Thermocouple disconnect	AN5537-4	5	1
2064	Plug - Thermocouple disconnect	CE3106B-16-135-CA	2	101
2065	Receptacle - Thermocouple disconnect	97-3100PR-16-420R	2	101
2066	Resistor - Adjustable - Exhaust temperature	AN5534-1	4	63
2067				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
2068				
2069				
2070	Harness assembly - GSAP camera - AN-N-6	13-51049	1	19
2071	Switch - Bomb salvo	MBH1731	2	75
2072	Relay - Salvo	237EAU	2	60
2073	Light assembly - Drop tank empty warning	AN3157-6	2	19
2074	Switch assembly - Drop tank empty warning	AN3021-2	2	19
2075	Switch - Drop tank empty warning - RH	F7097	3	23
2075	Switch - Drop tank empty warning - LH	F7097	3	40
2076	Terminal block - Wing leading edge - RH	AN3436-2-12	3	9
2077	Connector - Gyrosyn compass flux valve	TBF-18-12-PS	3	63
2078	Connector - Gyrosyn compass flux valve	AN3106B-18-12P	3	63
2079				
2080	Terminal block - Throttle disconnect	AN3436-2-5	2	5
2081	Fuse - Inverter failure warning	AGC1/2BUSS	4	68
2082	Switch - Attitude gyro fast erection	BZ-7ROIT	2	19
2083	Plug - Artificial horizon indicator	AN3108B-16S-1S	2	19
2084	Indicator - Artificial horizon	64/30002C	2	19
2085	Transmitter - Fuel level - Forward fuselage	EA370C-1057	5	66
2086	Terminal block - Empennage equipment	AN3436-2-9	6	15
2087	Transmitter - Fuel level - Aft fuselage	EA370A-1056	5	69
2088	Receptacle - Fuel level transmitter - Forward fuselage	AN3101A-16S-1S	5	66
2089	Dimmer switch - Position lights	AN3033-1	2	55
2090	Relay - Ammunition booster motors	AN3370-1	5	50
2091	Switch - Last round - Ammunition	WA35T	Booster Assembly	
2092	Switch - Ammunition overfeed	DR-201	Booster Assembly	

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
2093	Panel - Ammunition boost relay	13A-50023	5	50
2094	Terminal block - Emergency hydraulic system	AN3436-6-2	6	8
2095	Receptacle - Aft fuselage disconnect	AN3100A-32-6P	6	3
2096	Plug - Aft fuselage disconnect	AN3108A-32-6S	6	3
2097	Terminal block - Wing leading edge - LH	AN-N6	1	54
2098				
2099				
2100	Plug - Centre wing disconnect	AN3106M-22-14S	3	36
2101	Circuit-breaker - Duct pitot heater	AN3160-5	2	41
2102	Circuit-breaker - Longitudinal trim bungee actuator	AN3161-P5	4	69
2103	Relay - Longitudinal trim bungee actuator	Leach 237EAU	6	19
2104	Terminal block - Empennage equipment	AN3436-2-12	6	15
2105	Plug - Flight controls aft disconnect	AN3108A-16S-1S	6	2
2106	Receptacle - Flight controls aft disconnect	AN3100A-16S-1P	6	2
2107	Terminal block - Longitudinal trim actuator	AN3436-2-1	6	18
2108	Circuit-breaker - Longitudinal and lateral trim	AN3161-P10	2	2
2109	Light assembly - Drop tank empty warning	AN3157-6	2	19
2110	Circuit-breaker - Drop tank empty warning	AN3160-5	2	42
2111	Fuse - Jet pipe limiter	AGC-1	1	21
2112	Switch - Emergency fuel system	AN3027-3	2	19
2113				
2114	Actuator - Emergency fuel flow control	Supplied with Engine	7	24
2115	Plug - Emergency fuel flow control actuator	Supplied with Engine	7	24
2116	Quick-disconnect - Starter	83736	7	29
2117	Quick-disconnect - Generator	83750	7	21
2118	Quick-disconnect - Generator - Field	83805	7	20

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
2119	Quick-disconnect - Starter	83737	7	27
2120				
2121				
2122	Electronic control - JPT limiter	10-35900-201	7	28
2123				
2124				
2125	Plug - Flow control microswitch	AN3108M-10SL-4P	7	25
2126	Microswitch - Flow control	Part of Engine	7	25
2127	Plug - Temperature limiter servo valve	AN3106M-14S-7S	7	26
2128	Servo valve - Temperature limiter	Part of Engine	7	26
2129				
2130				
2131				
2132				
2133				
2134	Switch - Gun charger	AN3027-3	2	30
2135	Plug - Pneumatic valve - Gun charger - LH	AN3106-10SL-4S		78
2135	Plug - Pneumatic valve - Gun charger - RH	AN3106B-10SL-4S	5	53
2136				
2137	Circuit-breaker - Gunfire	AN3161-P-25	2	4
2138	Circuit-breaker - Manual gun charger	AN3161-P5	1	22
2139	Gun charger - Gun No. 1 - LH	871209-S4	4	82
2139	Gun charger - Gun No. 2 - LH	871209-S4	4	80
2139	Gun charger - Gun No. 3 - LH	871209-S4	4	79
2139	Gun charger - Gun No. 1 - RH	871209-S4	5	28
2139	Gun charger - Gun No. 2 - RH	871209-S4	5	54

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
2139	Gun charger - Gun No. 3 - RH	871209-S4	5	51
2140	Light - Generator failure warning	AN3157-6	2	19
2141	Valve - Pneumatic - Gun charger - LH	871357	4	78
2141	Valve - Pneumatic - Gun charger - RH	871357	5	53
2142	Receptacle - Gunsight camera	AN3106-16S-1S	2	28
2143	Harness assembly - AN-N6 gunsight camera	13B-53013	2	28
2144	Terminal block - Centre wing disconnect	AN3436-2-7	3	34
2145	Thermocouple assembly - Dual probes	13B50500	6	34
2146	Receptacle - Gyrosyn compass flux valve	AN3100A-18-12P	3	59
2147	Quick-disconnect - Wing position lights and pitot heater - RH	181-54217	3	5
2147	Quick-disconnect - Wing position lights - LH	181-54217	3	60
2148				
2149	Plug - Gyrosyn compass flux valve	AN3106B-18-12S	3	59
2150	Assembly - Pitot	187-51098	3	4
2151				
2152				
2153				
2154				
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2156				
2157				
2158				
2159				
2160				
2161				
2162				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
2163				
2164				
2165				
2166				
2167				
2168				
2169				
2170				
2171				
2172				
2173				
2174				
2175				
2176				
2177				
2178	Standby compass	AN5766-4C	2	18
2179	Lamp - Standby compass	AN3140-327	2	18
2180				
2181				
2182	Switch - Longitudinal trim neutral	AN3234-1	6	21
2183	Resistor - Fire detector overheat warning	RW30G3RO	4	33
2184				
2185				
2186				
2187				
2188				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
2189				
2190				
2191				
2192				
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2195				
2196				
2197				
2198				
2199				
2200				
2201				
2202				
2203				
2204				
2205				
2206	Fuse - Landing gear warning horn	AGC-1-1/2	2	98
2207	Relay - Emergency landing gear retract hold-in	237EAU	2	19
2208				
2209				
2210				
2211				
2212				
2213				
2214				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
2319				
2320				
2321				
2322				
2323				
2324	Plug - Centre pedestal disconnect	AN3106B-28-11S	2	69
2325				
2326				
2327				
2328				
2329				
2330				
2331				
2332				
2333				
2334				
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Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
2398				
2399				
2400	Connector - Canopy deck disconnect	TPF20-29-PS	2	92
2401	Plug - Canopy deck disconnect	AN3106B-20-29P	2	92
2402				
2403				
2404				
2405				
2406				
2407				
2408				
2409				
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Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
2424				
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2427				
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2429				
2430				
2431				
2432				
2433				
2434	Receptacle - GSAP camera	AN3100A-16S-1S	1	19
2435				
2436				
2437				
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Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
2606				
2607				
2608				
2609	Switch - Camera lens selector	AN3211-2	2	40
2610				
2611				
2612				
2613				
2614				
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Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
2684				
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2691				
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2693				
2694				
2695				
2696				
2697				
2698				
2699	Terminal block - Gunsight camera disconnect	AN3436-2-3	2	32
2700				
2701				
2702				
2703				
2704				
2705				
2706				
2707				
2708				
2709				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	MISCELLANEOUS (Continued)			
3438				
3439				
3440				
3441				
3442				
3443	Receptacle - Centre pedestal disconnect	AN3102A-28-11P	2	69
	ELECTRONIC ITEM LIST			
E1	Head - Gunsight	667499	2	25
E2	Control - Reticle dimmer	667498	2	27
E3	Selector unit - Sight	672636	2	60
E4				
E5	Switch - Reticle filaments	AN3021-2	2	60
E6	Potentiometer - Range sweep	JA7531FS3056-3	2	22
E7	Switch - Radar out	Part of Stick Grip	2	59
E8	Control unit - Manual ranging	170-43059	2	6
E9	Switch - Caging	138106	2	9
E10				
E11	Box Voltage test - Gunsight and radar	151-74083	1	27
E12	Computer - Sight	66-7494	1	29
E13	Amplifier - Sight	667502	1	7
E14	Transmitter - Radar Transmitter - Radar	RT-181-APG-30 RT-5005-APG-501	1	35
E15				
E16	Unit - Range power Unit - Range power	PP-493-APG-30 PP-5041-APG-501	1	15
E17				
E18	Unit - Range servo	104451	1	4
E19	Jack assembly - Range servo unit	13B-52033	1	46

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
ELECTRONIC ITEM LIST (Continued)				
E20				
E21	Static converter	8EB/1216 8EB/1621	4	24
E22	Unit - Sight power - A.C.	172-74025-10	4	26
E23				
E24				
E25	Regulator - Voltage - Gunsight and radar	CN-112/APG-30	1	12
E26				
E27	Relay - Sight power - D.C.	AN3312-1	4	62
E28				
E29	Antenna - Radar Antenna - Radar	AT223/APG-30 AT561/APG-501	1	15
E30				
E31	Wave guide - Radar - Rigid Wave guide - Radar - Rigid	LC19288 60418	1	16
E32	Wave guide - Radar - Flexible Wave guide - Radar - Flexible	CG801/U (2'0") 34094	1	32
E33	Coupler - Wave guide Coupler - Wave guide	LC19287 60417	1	20
E34				
E35				
E36				
E37				
E38				
E39				
E40	Panel - Gunsight fuse	170-74014-3	4	60
E41	Fuse - Power - 300-volt D.C.	AGC-1/8	4	60
E42	Fuse - Amplifier power - 300-volt D.C.	AGC-1/2	4	60
E43	Fuse - Amplifier and servo power - A.C.	AGC-2	4	60
E44	Fuse - Amplifier power unit A.C.	MTH-4	5	60
E45	Fuse - Voltage regulator - 115-volt D.C.	MTH-5	4	60

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	ELECTRONIC ITEM LIST (Continued)			
E46				
E47				
E48				
E49				
E50				
E51				
E52				
E53				
E54				
E55				
E56				
E57				
E58				
E59				
E60				
E61	Plug - Range power unit	AN3106B-14S-2P	1	40
E62	Plug - Reticle dimmer control	AN3106B-10SL-4S	2	27
E63	Plug - Sight computer	AN3106B-14S-5P	1	30
E64	Plug - Sight selector unit	AN3106B-22-14S	2	60
E65				
E66	Plug - Voltage regulator	AN3106B-20-15S	1	14
E67	Plug - Range power unit	AN3106B-20-18S	1	37
E68	Plug - Voltage regulator	AN3106B-20-18D	1	13
E69	Plug - Range power unit	AN3106B-20-27P	1	38
E70	Plug - Sight computer	AN3106B-24-28S	1	31
E71	Plug - Range servo unit	AN3106B-22-19S	1	6

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	ELECTRONIC ITEM LIST (Continued)			
E72	Plug - A.C. power unit	AN3106B-22-24S	4	26
E73	Plug - Sight amplifier	AN3106B-24-28P	1	9
E74	Plug - Gunsight head	AN3106B-22-14S	2	23
E75	Plug - Range power unit	AN3106B-28-17P	1	39
E76	Plug - GBR sight field test	AN3106B-24-28P	2	51
E77	Plug - Forward pressure disconnect - Forward RH	AN3106M-28-12P	2	68
E78	Plug - Forward pressure disconnect - Aft RH	AN3106M-28-12P	2	65
E79	Plug - Range power unit	AN3108B-32-13P	1	41
E80	Plug - Radar transmitter	AN3106B-32-13S	1	34
E81	Plug - Gunsight head	AN3108B-22-14SW	2	24
E82	Plug - Sight amplifier	AN3106B-36-8S	1	8
E83	Plug - Sight amplifier	AN3106B-36-8P	1	10
E84	Plug - Rapid VHF test	SO-166	2	42A
E85	Cover - Rapid VHF test	23559	2	42A
E86				
E87				
E88	Cable assembly - Range power unit - Radar transmitter	170-74013	1	33
E89	Cable assembly - Range power unit - Radar transmitter	170-74013	1	33
E90	Receptacle - Forward pressure disconnect - Forward RH	AN3100M-28-12S	2	68
E91	Receptacle - Forward pressure disconnect - Aft RH			
E92	Receptacle - GBR sight field test	AN3100A-24-28S	2	51
E93				
E94				
E95				
E96-1	Plugs - Range power unit	UG-260/U	1	42
E96	Plugs - Radar transmitter	UG-260/U	1	33

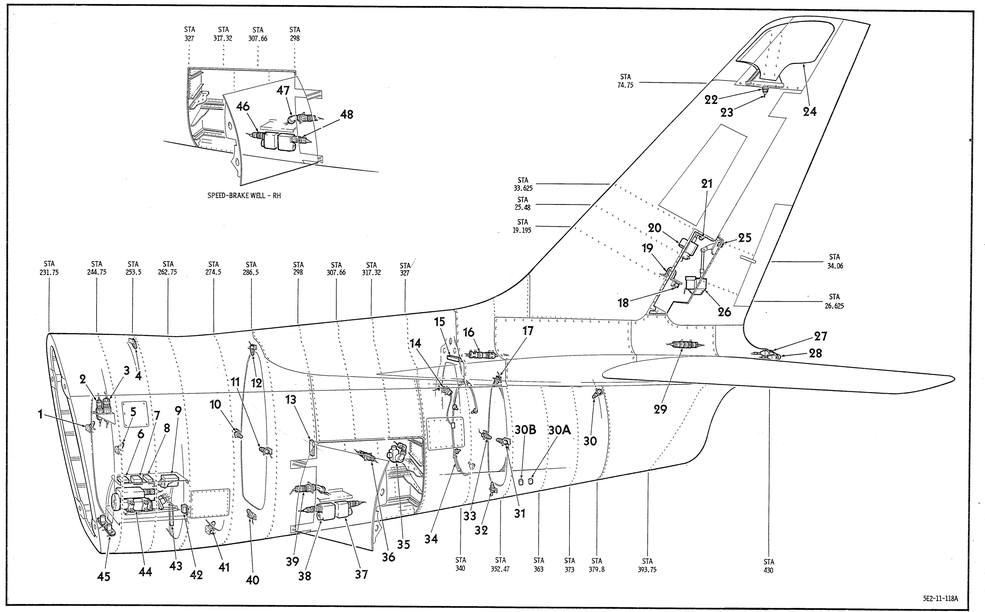
Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	ELECTRONIC ITEM LIST (Continued)			
E97	Connector	35206		
E98	Connector	35203		
E99	Plug - VHF control panel harness	MS3100B-22-14P	2	12
E100	Receptacle - VHF control panel harness	MS3101B-22-14S	2	12
E101				
E102				
E103				
E104				
E105				
E106				
E107	Receptacle - GBR sight - Field test disconnect	AN3100C-24-28P	1	28
E108	Plug - GBR sight - Field test disconnect	AN3108B-24-28S	1	28
E109				
E110	Potentiometer - Manual ranging	A4509A	2	6
E111	Potentiometer - Manual ranging	19058	2	6
E112	Potentiometer - Manual ranging	S2222	2	6
E113	Switch - Manual ranging	AN3234-1	2	6
E114				
E115				
E116				
E117				
E118				
E119				
E120				
E121				
E122				

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	ELECTRONIC ITEM LIST (Continued)			
E123	Jack - Rapid VHF test	420-60-0054	2	42B
E124	Cover - Rapid VHF test	55620-1	2	42B
E125	Plug - VHF receiver	PI-153-/A	5	42
E126	Plug - VHF transmitter	U-15/U	5	46
E127	Plug - VHF power junction box - Transmitter	U-15/U	4	75
E128	Plug - VHF power junction box - Receiver	PI-153/A	4	75
E129	Plug - VHF power junction box - Battery	PI-148/A	4	75
E130	Plug - VHF power junction box - Control box	U-16/U	4	75
E131	Plug - VHF pressure disconnect	AN3108B-24-28S	5	20
E132	Receptacle - VHF pressure disconnect	AN3100PR-24-28P	5	20
E133	Terminal block - VHF	NAS45-6-13	3	30
E134	Terminal block - Microphone-telephone		2	79
E135	Socket assembly - Seat disconnect - Microphone-telephone	14S-2S	2	62
E136	Plug assembly - Seat disconnect - Miscrophone-telephone	14S-2P	2	62
E137	Cord - Microphone-telephone	WF-5/U	2	63
E138	Jack - Microphone-telephone	U-61/U	2	64
E139	Switch - Microphone	138106	2	77
E140	Plug - VHF transmitter	PI-151/A	5	47
E141	Transmitter - VHF - ARC-502	T5015/ARC-502	5	49
E142	Receiver - VHF - ARC-502	R5009/ARC-502	5	48
E143	Box - VHF power junction - ARC-502	J5007/ARC-502	4	75
E144	Switch - VHF and IFF emergency		2	88
E145	Panel - VHF control - ARC-502	C5037/ARC-502	2	54
E146	Switch - VHF and IFF emergency - Ground test	D204W3R-82R	2	39
E147	Panel - Rapid VHF test		2	48
E148	Antenna - VHF	151-71012-10	6	24

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	ELECTRONIC ITEM LIST (Continued)			
E149	Plug - VHF antenna	UG-21/U	6	22
E150	Coaxial cable - VHF antenna	RG-8/U	6	23
E151	Connector - VHF antenna	UG-23/U	6	16
E152	Plug - VHF antenna	UG-21B/U	6	16
E153	Coaxial cable - VHF antenna	Teflon Temp Res	6	16
E154	Plug - VHF antenna	UG-1185/U	4	39
E155	Connector - VHF antenna	UG-1186/U	4	39
E156	Coaxial cable - VHF antenna	Teflon Temp Res	4	39
E157	Adapter - VHF antenna	M359	5	56
E158	Plug - VHF antenna	PI-259A	5	56
E159	Feed-through connector - VHF antenna	PI-274	5	56
E160	Adapter - VHF antenna	M359	5	56
E161	Plug - VHF antenna	PI-259A	5	56
E162	Coaxial cable - VHF antenna	151-71044-18	5	56
E163	Plug - VHF antenna - Transmitter	PI-259A	5	44
E164	Adapter - VHF antenna - Transmitter	M359	5	44
E165	Plug - VHF antenna - Transmitter	PI-259A	5	45
E166	Adapter - VHF antenna - Transmitter	M359	5	45
E167	Coaxial cable - VHF transmitter-receiver	151-71044-16	5	43
E168	Plug - VHF antenna - Receiver	PI-259A	5	41
E169	Adapter - VHF antenna - Receiver	M359	5	41
E170	Plug - VHF antenna	UG-21B/U	6	16
E171	Connector - VHF antenna	UG-23B/U	6	16
E172	Plug - VHF antenna	UG-23B/U	4	39
E173	Connector - VHF antenna	UG-21B/U	4	39
E174	Nixie light		2	23A

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	ELECTRONIC ITEM LIST (Continued)			
E175	Terminal block - LH cockpit pressure web	13B-52052-12		
E176				
E177				
E178	Panel - Indicator lights and fuse - APX-6	161-74049	4	76
E179	Switch - Inertia destructor - APX-6	SA-3/8	4	59
E180	Transmitter-receiver - APX-6	RT-82/APX-6	4	19
E181	Panel - Control - APX-6	C629/APX-6 or C1158/APX-6	2	54
E182	Plug - Control panel - APX-6	AN3106B-20-27S	2	50
E183	Terminal Block - APX-6	NAS45-6-2		
E184	Plug - APX-6 transmitter-receiver - Power	AN3108B-14S-5S	4	73
E185	Plug - APX-6 transmitter-receiver - Control	AN3108B-18-1P	4	74
E186	Plug - APX-6 transmitter-receiver - Destructor	AN3108B-8S-1P	4	21
E187	Receptacle - Pressure disconnect - APX-6	AN3100PR-20-27P	5	22
E188	Plug - Pressure disconnect - APX-6	AN3108B-20-27S	5	22
E189	Adapter - Antenna - APX-6	UG-212/U	4	20
E190	Plug - Antenna - APX-6	UG59/U	4	20
E191	Coaxial cable - Antenna - APX-6	RG-8/U	4	20
E192	Plug - Antenna - APX-6	UG-61A/U	5	57
E193	Adapter - Antenna - APX-6	UG-212/U	5	57
E194	Plug - Antenna - APX-6	UG-59/U	5	57
E195	Coaxial cable - Antenna - APX-6	RG-8/U	5	57
E196	Plug - Antenna - APX-6	UG-59/U	5	52
E197	Antenna - APX-6	AT-234/APX-6	5	52
E198	Sense antenna - ARN-6 radio compass	151-71026	5	11
E199	Terminal block - Sense antenna		5	9
E200	Terminal block - Sense antenna		5	10

Item No.	Name and Description	Part No.	Figure 11-5 Sheet	Ref
	ELECTRONIC ITEM LIST (Continued)			
E201	Cord assembly - Sense antenna	151-71023	2	91
E202	Feed-through connector - Sense antenna	PI-274	2	91
E203	Adapter - Sense antenna	M359	2	91
E204	Cable - Sense antenna	CG-405/ARN-6	4	18
E205	Adapter - Sense antenna	M359	4	18
E206	Loop antenna - ARN-6 radio compass	AS-313A/ARN-6	5	7
E207	Cable assembly - Loop antenna	151-71068-11	4	15
E208	Receptacle - Loop antenna	AN3102-14S-1P	4	15
E209	Brush holder assembly - Loop antenna	151-71097-12	4	15
E210	Contactor strip - Loop antenna	151-71086	2	95
E211	Receptacle - Loop antenna contactor strip	AN3102PR-14S-1P	2	95
E212	Cable assembly - Loop antenna	151-71068-5	4	17
E213	Receiver - ARN-6 radio compass	R-101/ARN-6	4	16
E214	Mounting - ARN-6 radio compass receiver	MT-274-ARN-6	4	16
E215	Plug - Pressure disconnect - ARN-6	AN3108B-28-12S	5	21
E216	Receptacle - Pressure disconnect - ARN-6	AN3100PR-28-12P	5	21
E217	Terminal block - Radio compass	AN3436-2-9	2	46
E218	Panel control - ARN-6 radio compass	C-403-/A	2	53
E219	Indicator - ARN-6 radio compass	ID-90/ARN-6	2	19
E220	Plug - ARN-6 radio compass indicator	AN3106B-14S-2S	2	19
E221	Plug - Loop antenna	AN3107B-16S-1S	5	7
E222				
E223	Plug - Range servo unit	AN3106B-24-28S	1	5

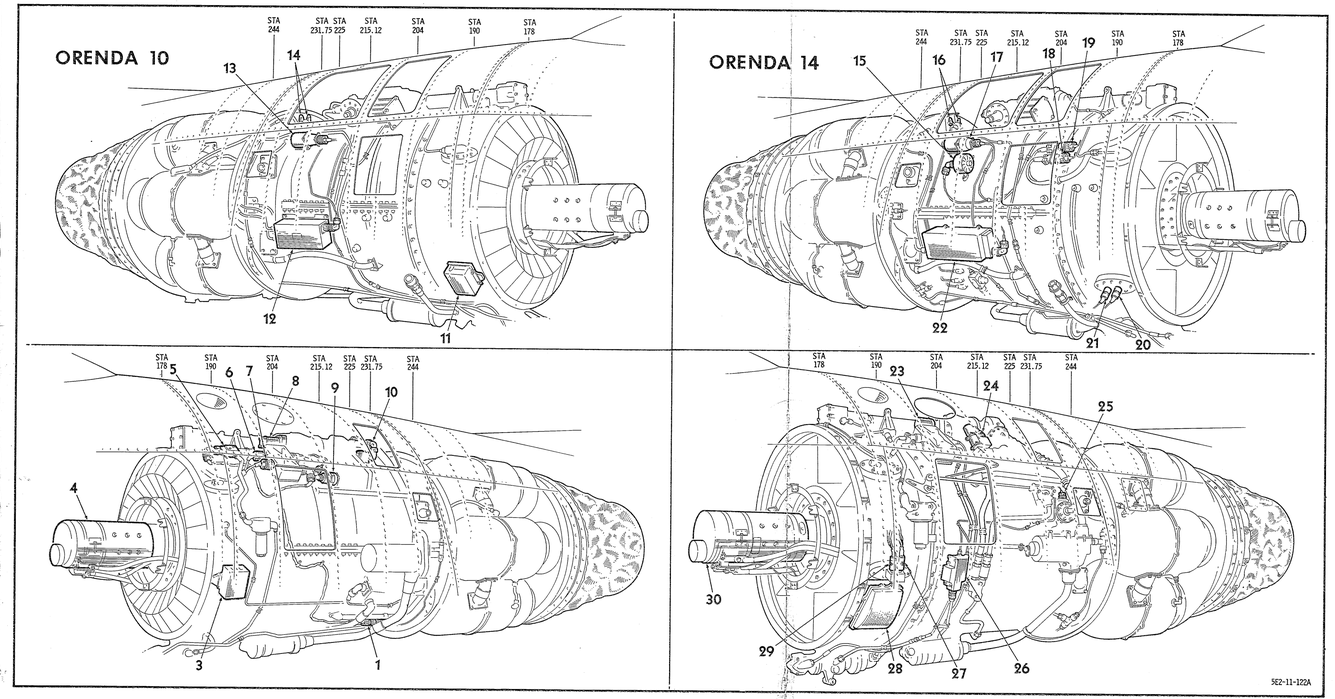


REF	ITEM	NAME AND DESCRIPTION
28	246	Light assembly - Tail position - White
29	358	Plug - Rudder disconnect
	424	Receptacle - Rudder disconnect
30	704-8	Thermocouple - Fire detector
30A	1801	Solenoid - Tow target jettison
30B	1801	Solenoid - Tow target jettison
31	704-9	Thermocouple - Fire detector
32	704-10	Thermocouple - Fire detector
33	704-11	Thermocouple - Fire detector
34	2060	Thermocouple and harness
	2145	Thermocouple assembly - Dual probes
35	302	Plug - Emergency hydraulic supply and return valve
	744	Valve - Emergency hydraulic supply and return
36	364	Plug - Speed brake well - LH
	438	Receptacle - Speed brake well - LH
37	591	Switch - Alternate hydraulic pressure - LH
	331	Plug - Alternate hydraulic pressure switch - LH
38	592	Switch - Alternate hydraulic pressure - LH
	331	Plug - Alternate hydraulic pressure switch - LH
39	363	Plug - Speed brake well - LH
	438-1	Receptacle - Speed brake well - LH
40	704-12	Thermocouple - Fire detector
41	704-13	Thermocouple - Fire detector
42	63	Circuit-breaker - Emergency hydraulic pump motor control
43	665	Terminal block - Emergency hydraulic system
44	336	Plug - Emergency hydraulic pump motor
	389	Motor - Emergency hydraulic pump
45	476	Relays - Emergency hydraulic pump motor
46	331	Plug - Alternate hydraulic pressure switch - RH
	591-1	Switch - Alternate hydraulic pressure - RH
47	363	Plug - Speed brake well - RH
	438-2	Receptacle - Speed brake well - RH
48	331	Plug - Alternate hydraulic pressure switch - RH
	592-1	Switch - Alternate hydraulic pressure - RH

Note: Prefix E denotes electronic item number.

REF	ITEM	NAME AND DESCRIPTION
1	704-1	Thermocouple - Fire detector
2	2105	Plug - Flight controls aft disconnect
	2106	Receptacle - Flight controls aft disconnect
3	2095	Receptacle - Aft fuselage disconnect
	2096	Plug - Aft fuselage disconnect
4	704-2	Thermocouple - Fire detector
5	704-3	Thermocouple - Fire detector
6	156	Filter - Emergency hydraulic pump motor
7	643	Switch - Emergency hydraulic pump manual override
8	2094	Terminal block - Emergency hydraulic system
9	333	Plug - Emergency hydraulic pressure transmitter
	726	Transmitter - Emergency hydraulic pressure
10	7044	Thermocouple - Fire detector
11	704-5	Thermocouple - Fire detector
12	704-6	Thermocouple - Fire detector
13	692	Terminal block - Speed brake well
14	2061	Receptacle - Thermocouple and harness
15	2086	Terminal block - Empennage equipment
	2104	Terminal block - Empennage equipment
16	E151	Connector - VHF antenna
	E152	Plug - VHF antenna
	E153	Coaxial cable - VHF antenna
	E170	Plug - VHF antenna
	E171	Connector - VHF antenna
17	704-7	Thermocouple - Fire detector
18	649	Terminal block - Longitudinal trim bungee actuator
	2107	Terminal block - Longitudinal trim bungee actuator
19	2103	Relay - Longitudinal trim bungee actuator
20	9	Actuator - Longitudinal trim bungee
21	2182	Switch - Longitudinal trim neutral
22	E149	Plug - VHF antenna
23	E150	Coaxial cable - VHF antenna
24	E148	Antenna - VHF
25	627	Switch - Rudder trim neutral
26	6	Actuator - Rudder trim tab
27	247	Light assembly - Tail position - Yellow

Figure 11-5 (Sheet 6 of 7) Electrical Components Location - Aft Fuselage and Tail Section



REF	ITEM	NAME AND DESCRIPTION
1	2018	Plug - Centre bearing oil scavenger temperature bulb
	2039	Temperature bulb - Centre bearing oil scavenger
3	2029	Connector - Starter
4	175	Starter - Generator
5	2007	Plug - Ring main oil temperature bulb
	2008	Temperature bulb - Ring main oil
6	2030	Plug - Engine junction box
7	2006	Plug - Engine junction box
8	2040	Generator - Tachometer
	2041	Plug - Tachometer generator
9	2013	Switch - Low fuel pressure warning
	2014	Plug - Low fuel pressure warning switch
10	2013	Plug - Torch igniter reducing valve
	2032	Valve - Torch igniter reducing
11	2028	Connector - Generator
12	2016	Plug - High energy ignition unit
	2037	Unit - High energy ignition
13	2024	Transmitter - Oil pressure
	2025	Plug - Oil pressure transmitter
14	704	Thermocouple - Fire detector
15	2013	Switch - Low fuel pressure warning
	2014	Plug - Low fuel pressure warning switch
16	704	Thermocouple - Fire detectors
17	2024	Transmitter - Oil pressure
	2025	Plug - Oil pressure transmitter
18	2022	Plug - Engine flange disconnect
19	2004	Plug - Engine flange disconnect
20	2118	Quick-disconnect - Generator field
21	2117	Quick-disconnect - Generator
22	2016	Plug - High energy ignition unit
	2037	Unit - High energy ignition
23	2040	Generator - Tachometer
	2041	Plug - Tachometer generator
24	2114	Actuator - Emergency fuel flow control
	2115	Plug - Emergency fuel flow control actuator
25	2125	Plug - Flow control microswitch
	2126	Microswitch - Flow control
26	2127	Plug - Temperature limiter servo valve
	2128	Servo valve - Temperature limiter
27	2119	Quick-disconnect - Starter
28	2122	Electronic control - JPT limiter system
29	2116	Quick-disconnect - Starter
30	175	Starter - Generator

Figure 11-5 (Sheet 7 of 7) Electrical Components Location - Engine - Orenda 10 and 14

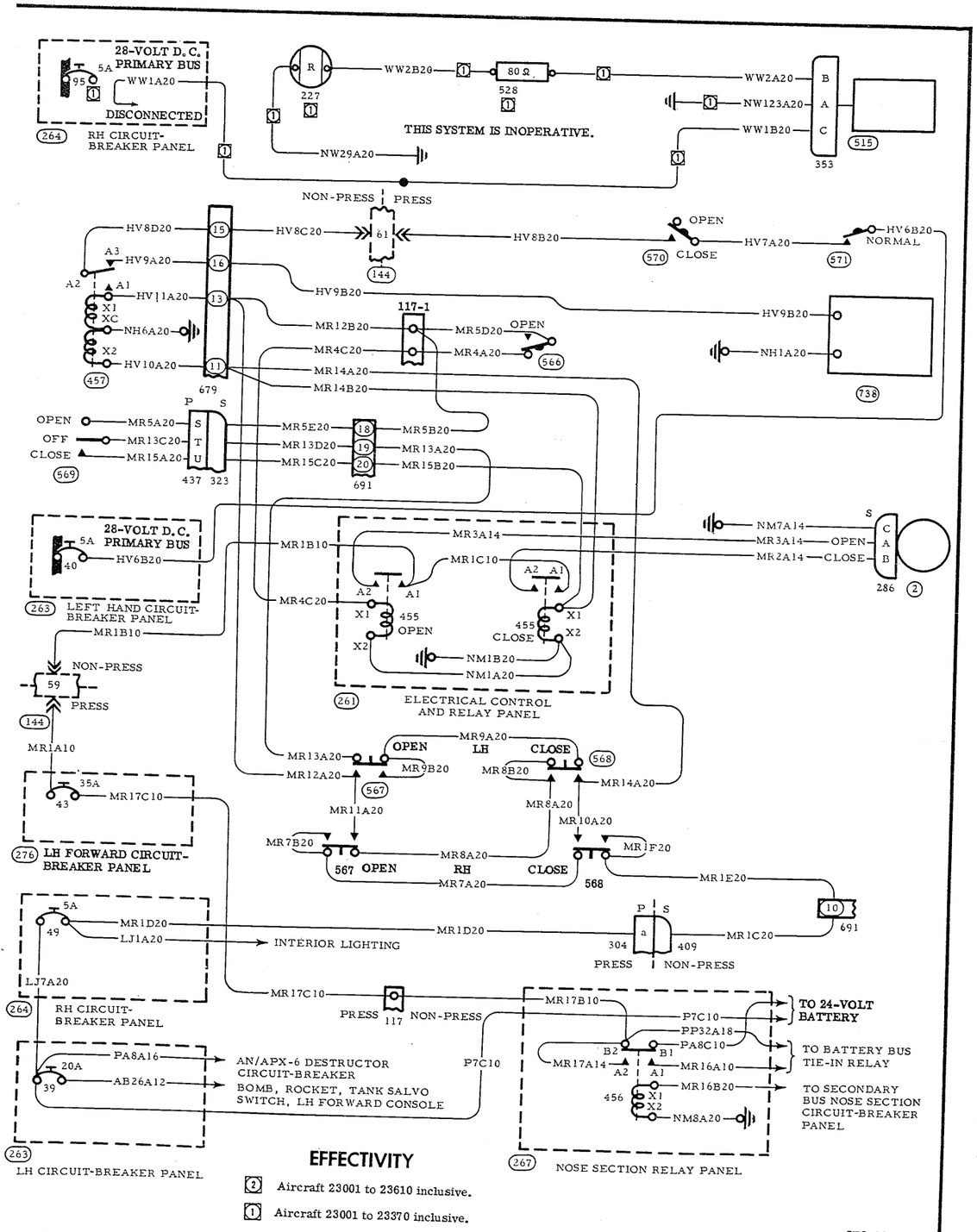


Figure 11-6 (M) Cockpit Pressure Seal, Canopy Actuator and Oxygen Warning Systems

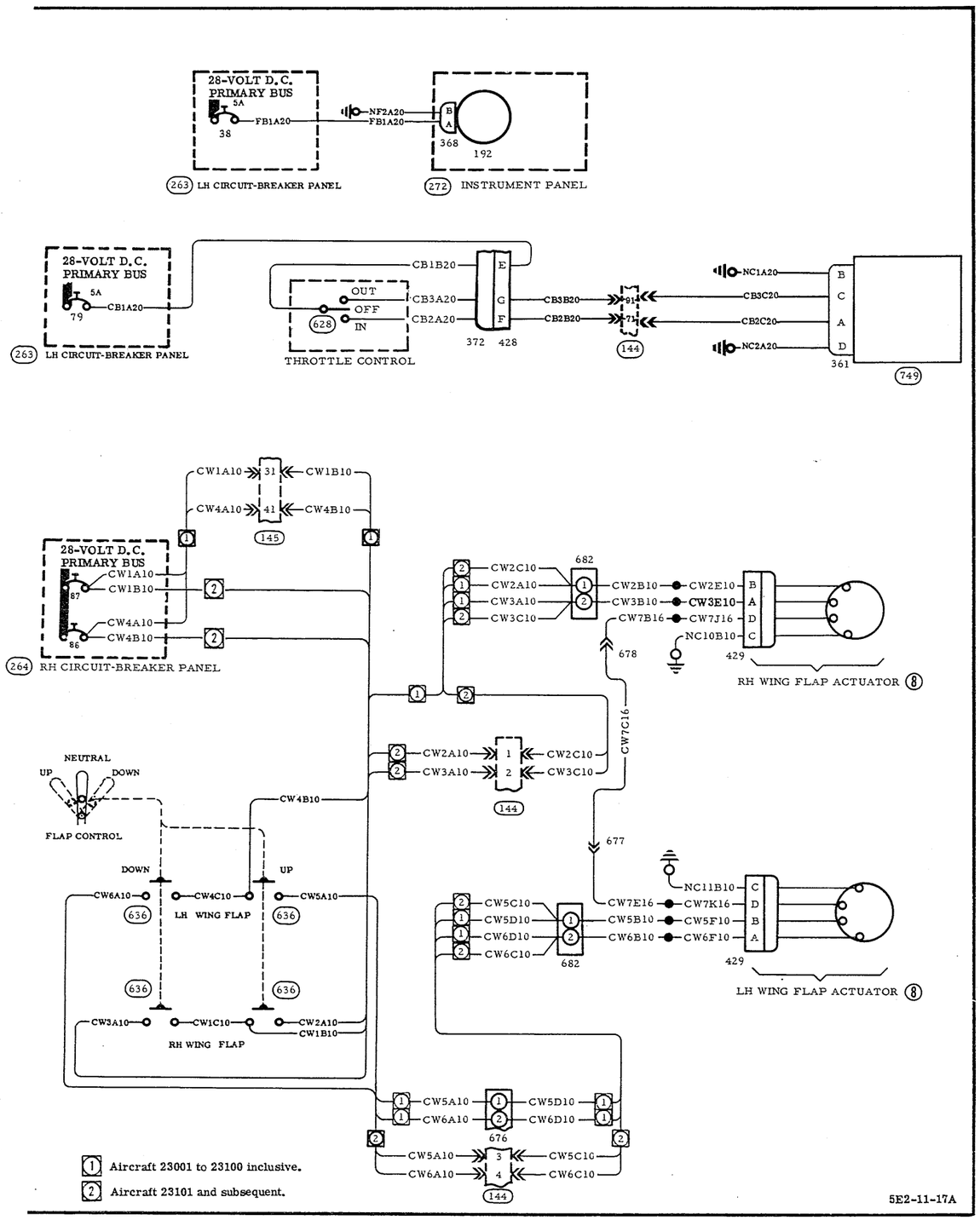


Figure 11-7 Turn and Slip, Wing Flap and Speed Brake Systems

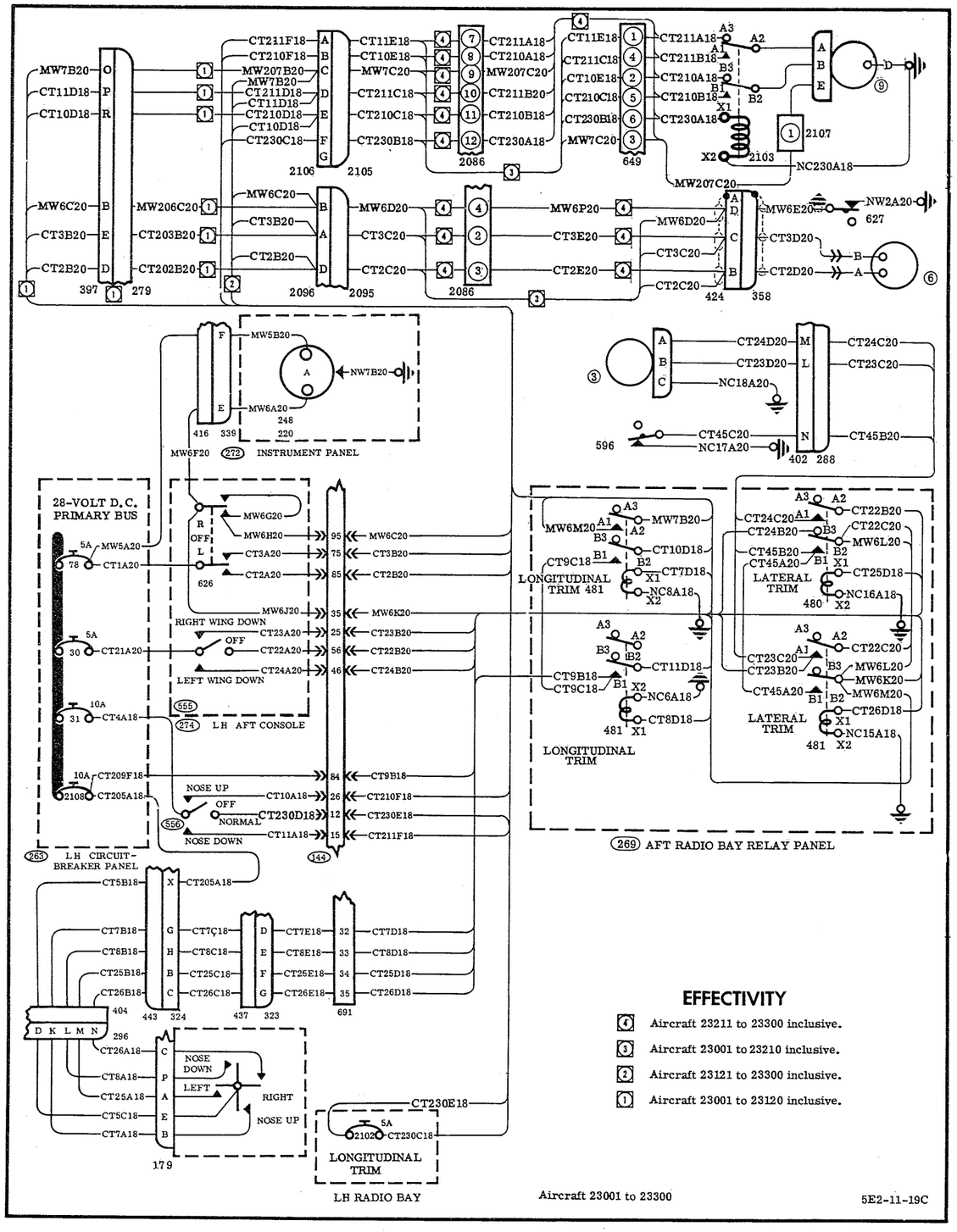


Figure 11-8 (Sheet 1 of 2) (M) Trim Tab and Horizontal Stabilizer Actuator Control Systems

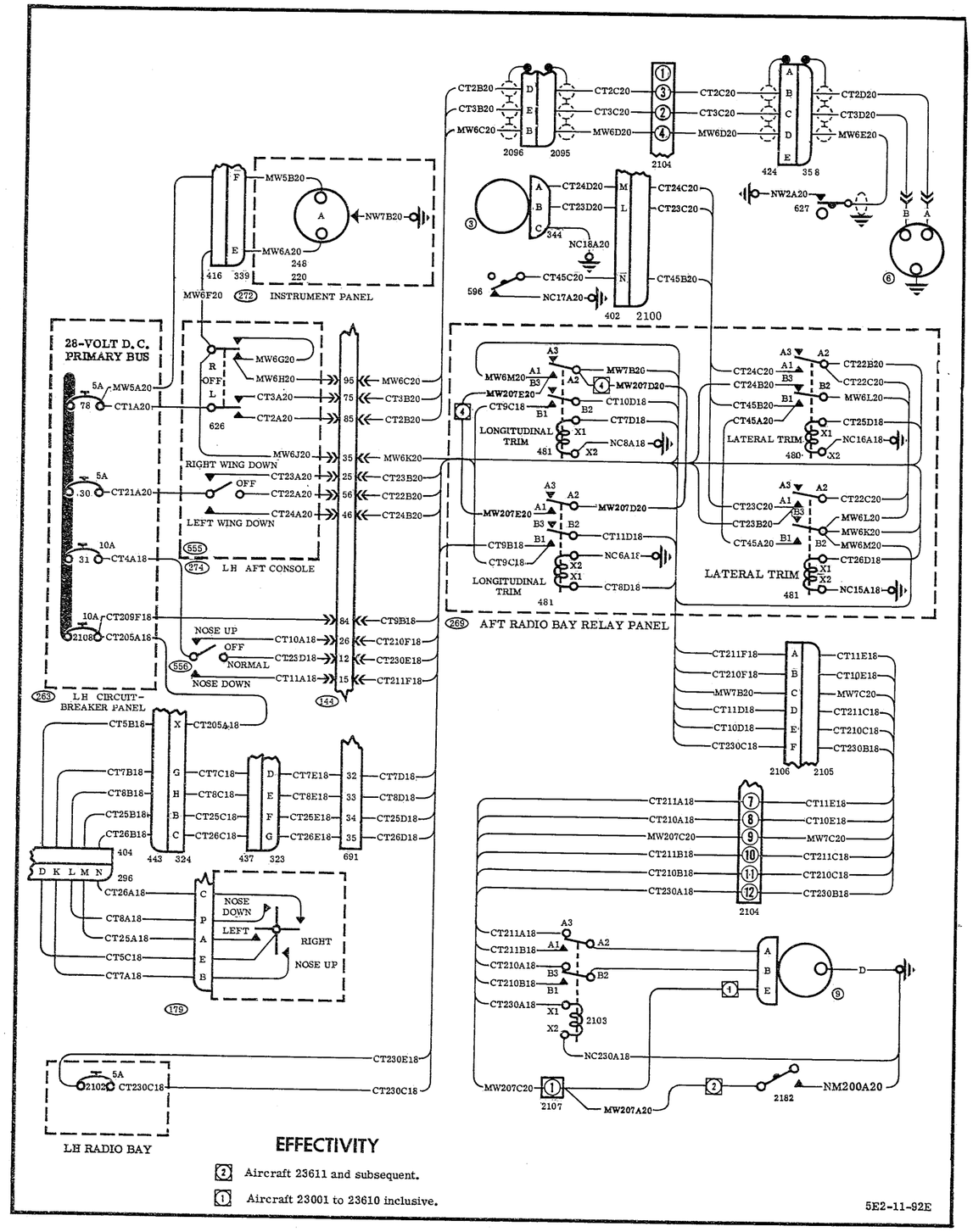


Figure 11-8 (Sheet 2 of 2) (M) Trim Tab and Horizontal Stabilizer Actuator Control Systems

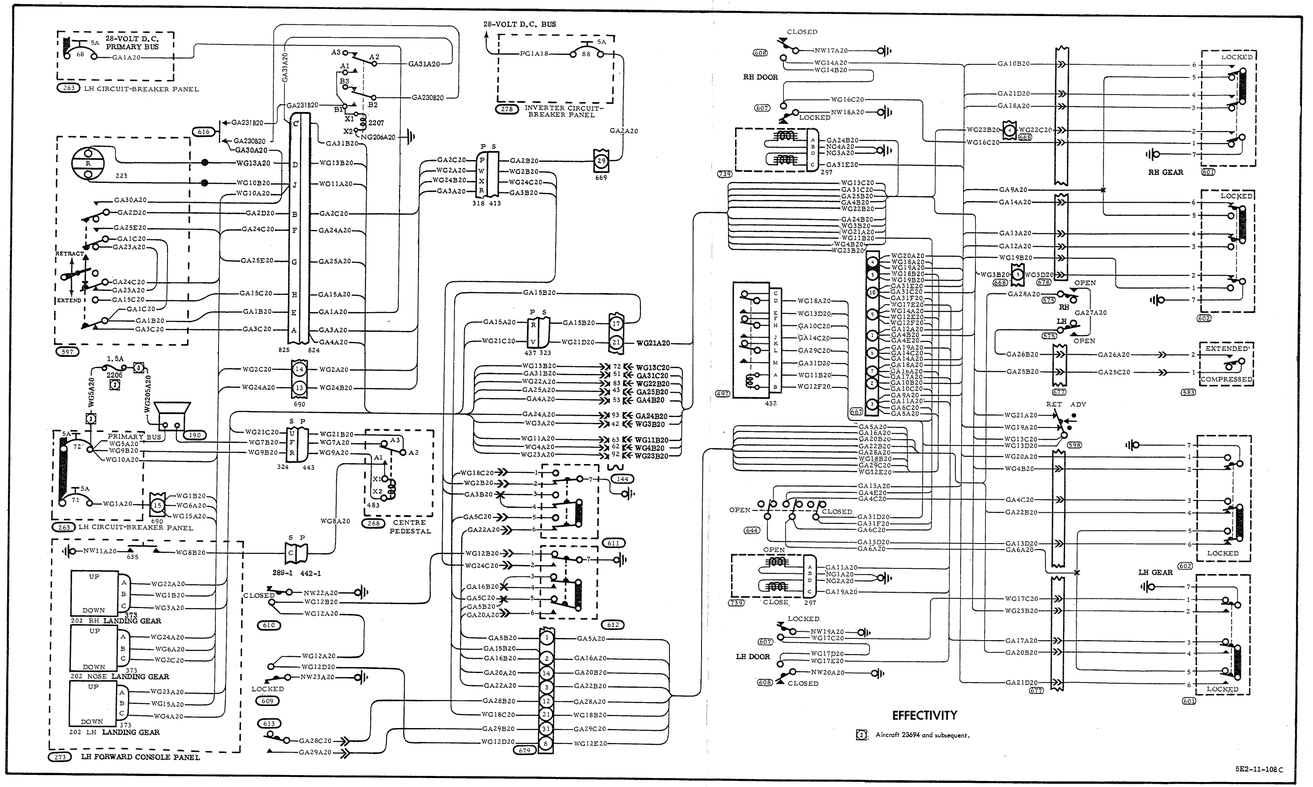


Figure 11-9(M) Landing Gear System

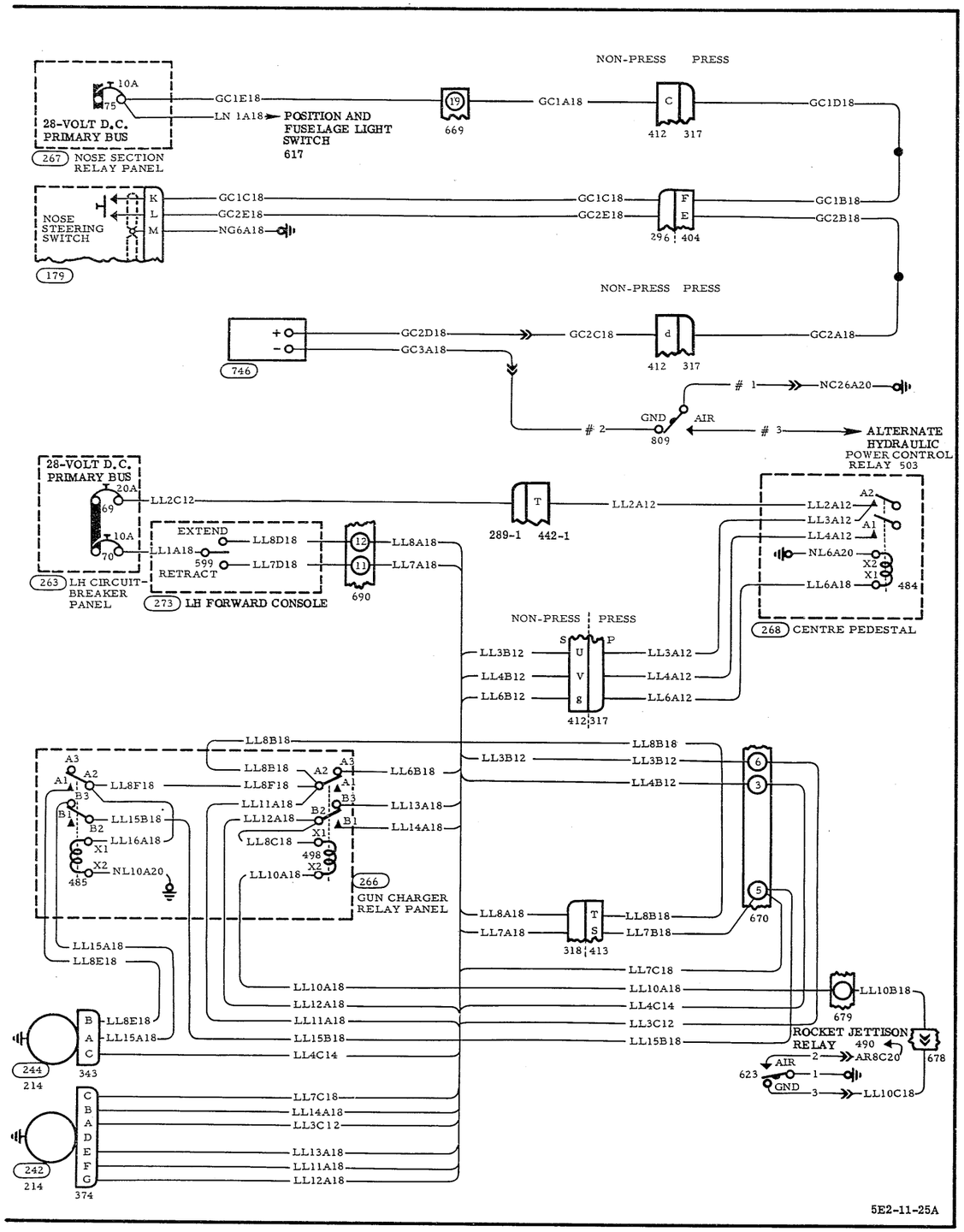


Figure 11-10 Nose Gear Steering and Landing Lights Systems

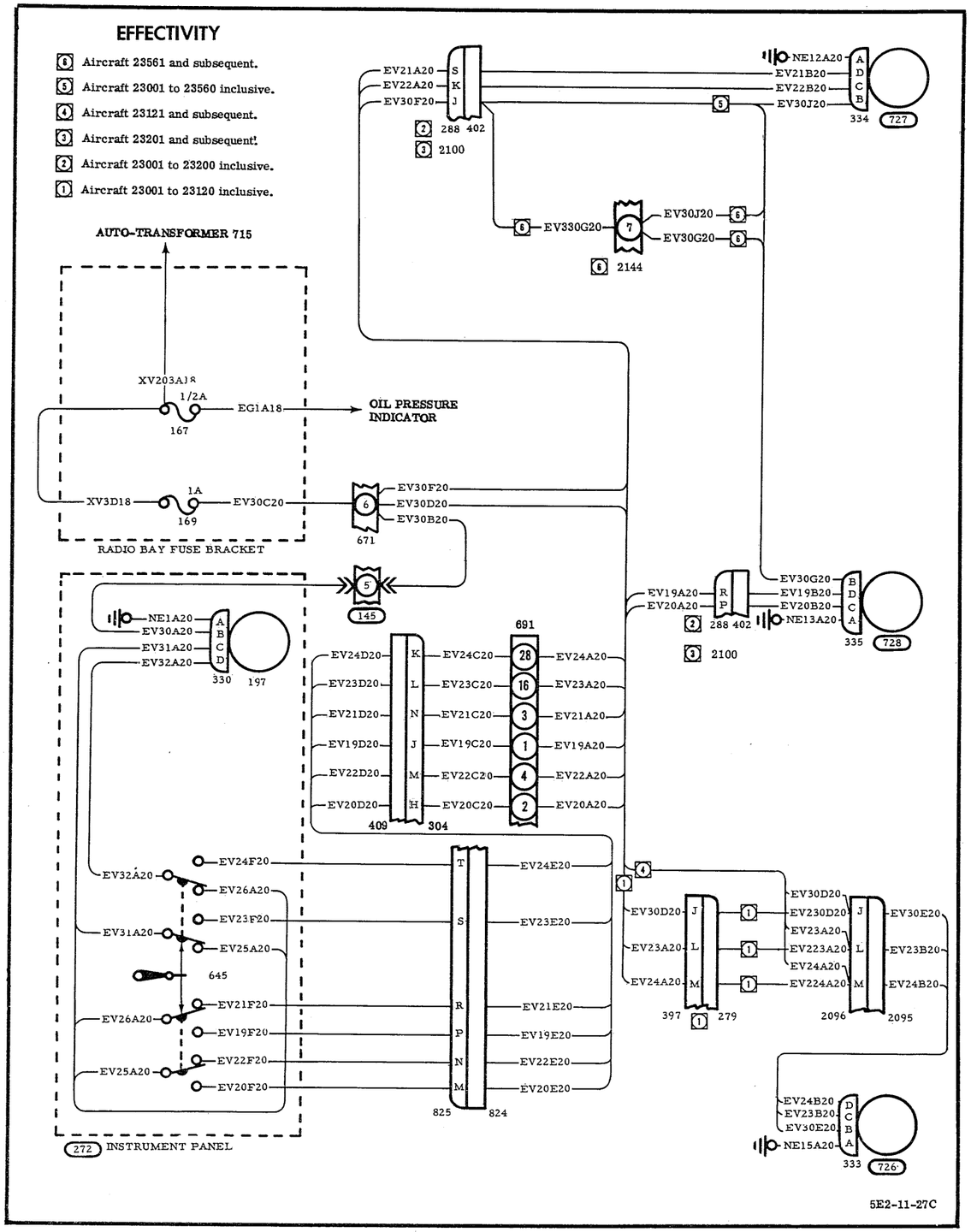


Figure 11-11 (M) Hydraulic Pressure Indicating System

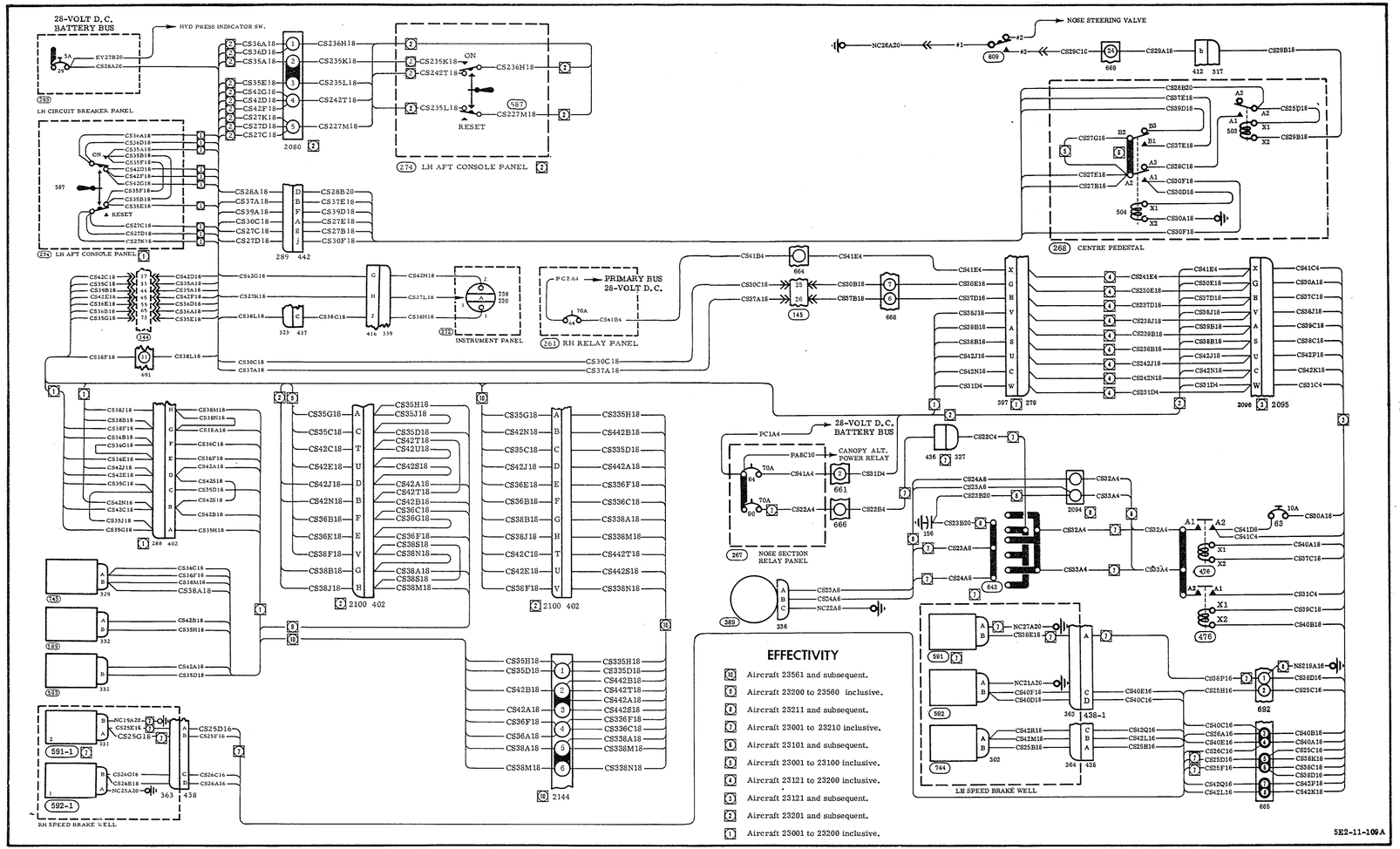


Figure 11-12 (M) Hydraulic Control - Alternate System

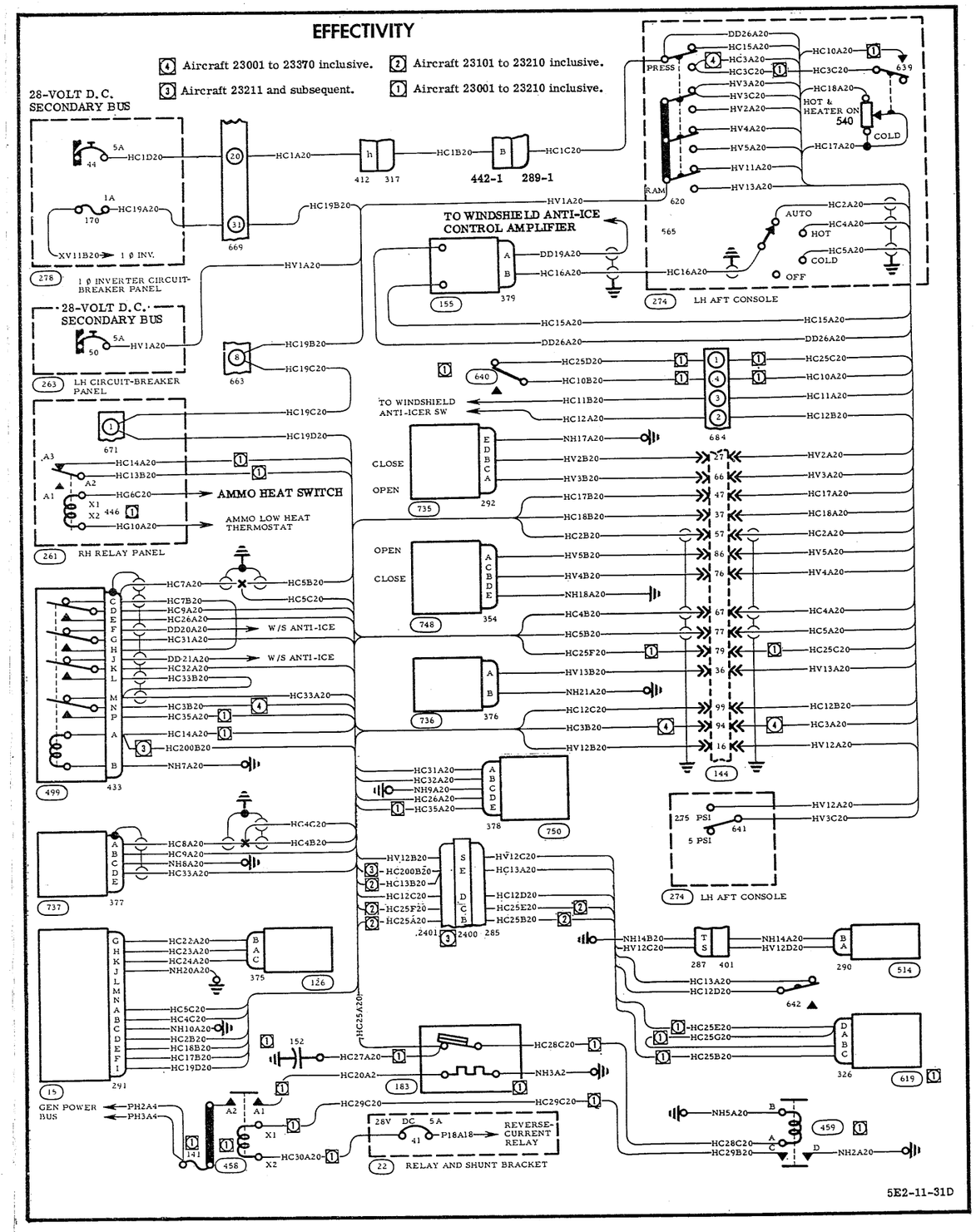


Figure 11-13 (M) Heating and Ventilating System

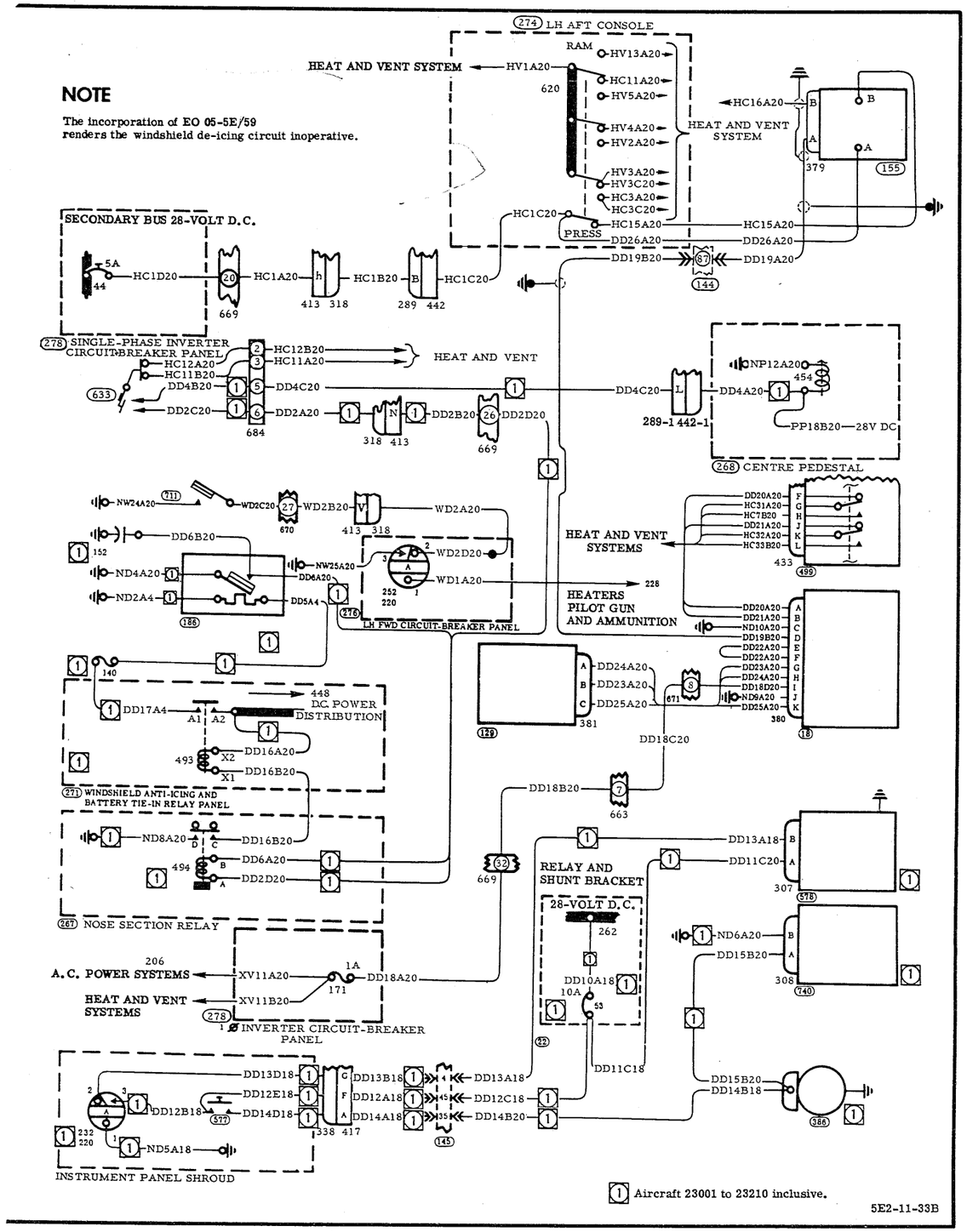


Figure 11-14 Fuel and Windshield De-icing System

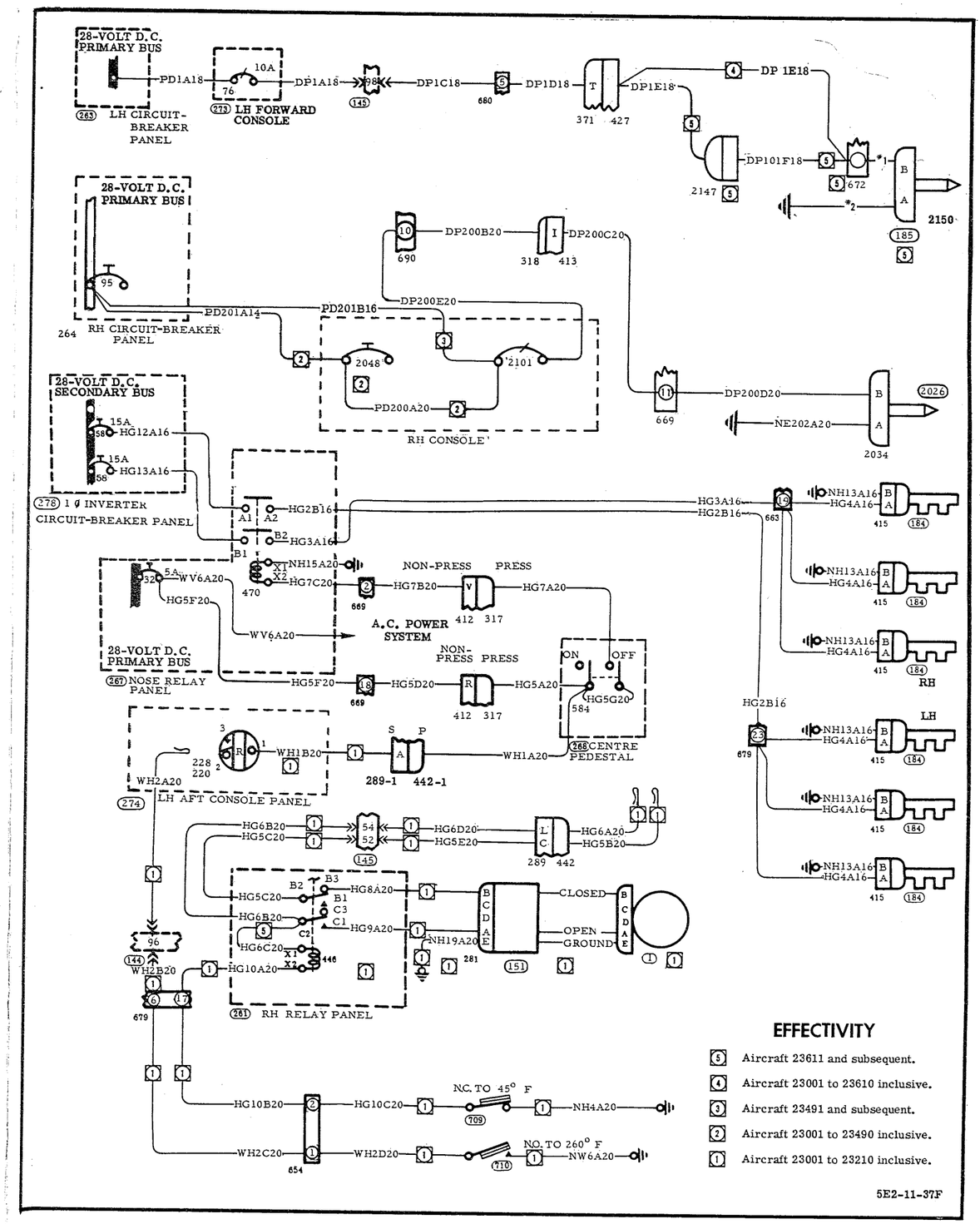
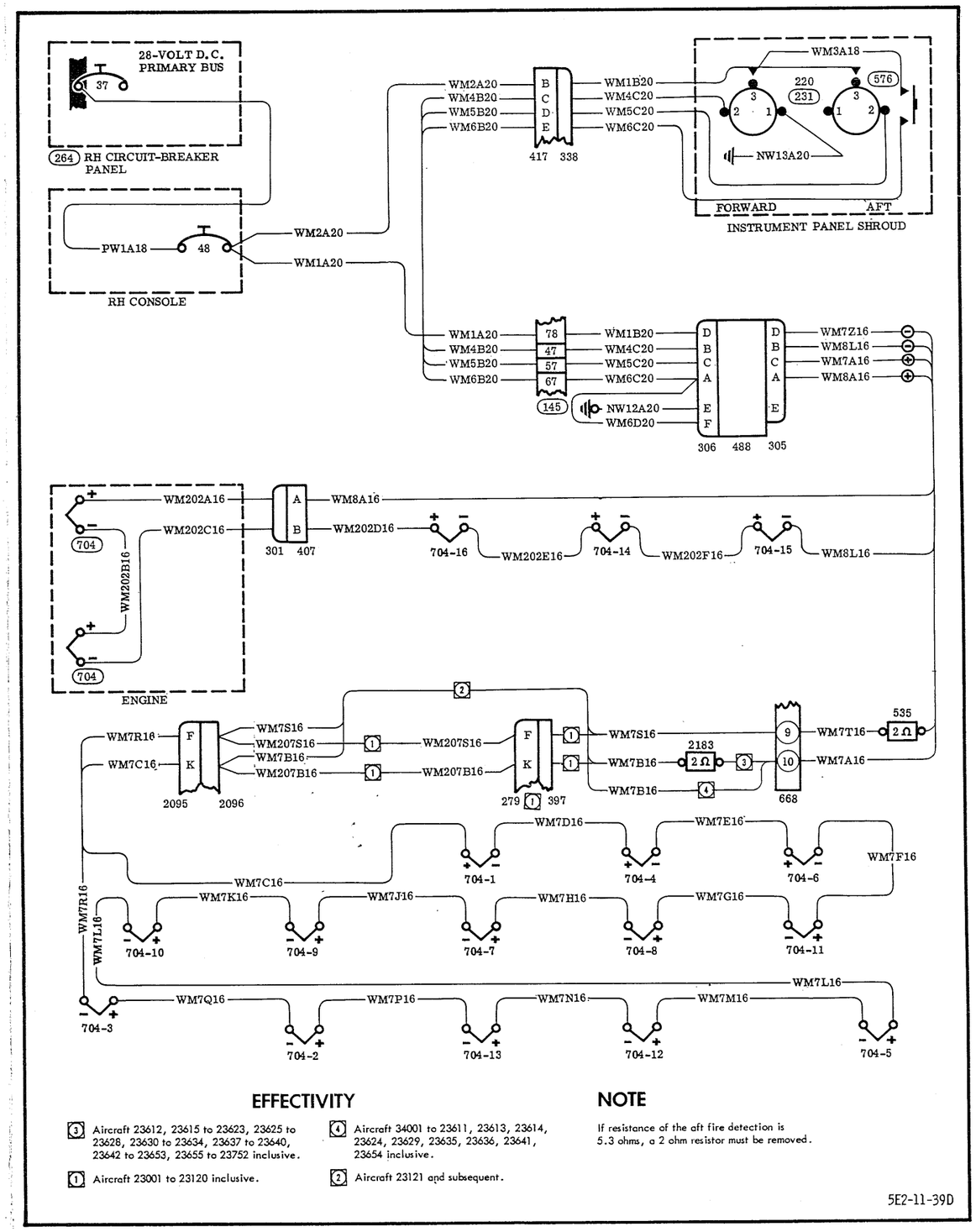


Figure 11-15 (M) Heaters - Pitot, Gun and Ammunition



EFFECTIVITY

[3] Aircraft 23612, 23615 to 23623, 23625 to 23628, 23630 to 23634, 23637 to 23640, 23642 to 23653, 23655 to 23752 inclusive.

[4] Aircraft 34001 to 23611, 23613, 23614, 23624, 23629, 23635, 23636, 23641, 23654 inclusive.

[1] Aircraft 23001 to 23120 inclusive.

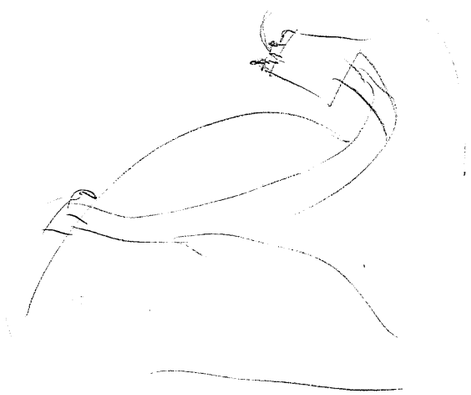
[2] Aircraft 23121 and subsequent.

NOTE

If resistance of the aft fire detection is 5.3 ohms, a 2 ohm resistor must be removed.

5E2-11-39D

Figure 11-16 (M) Fire Detection System



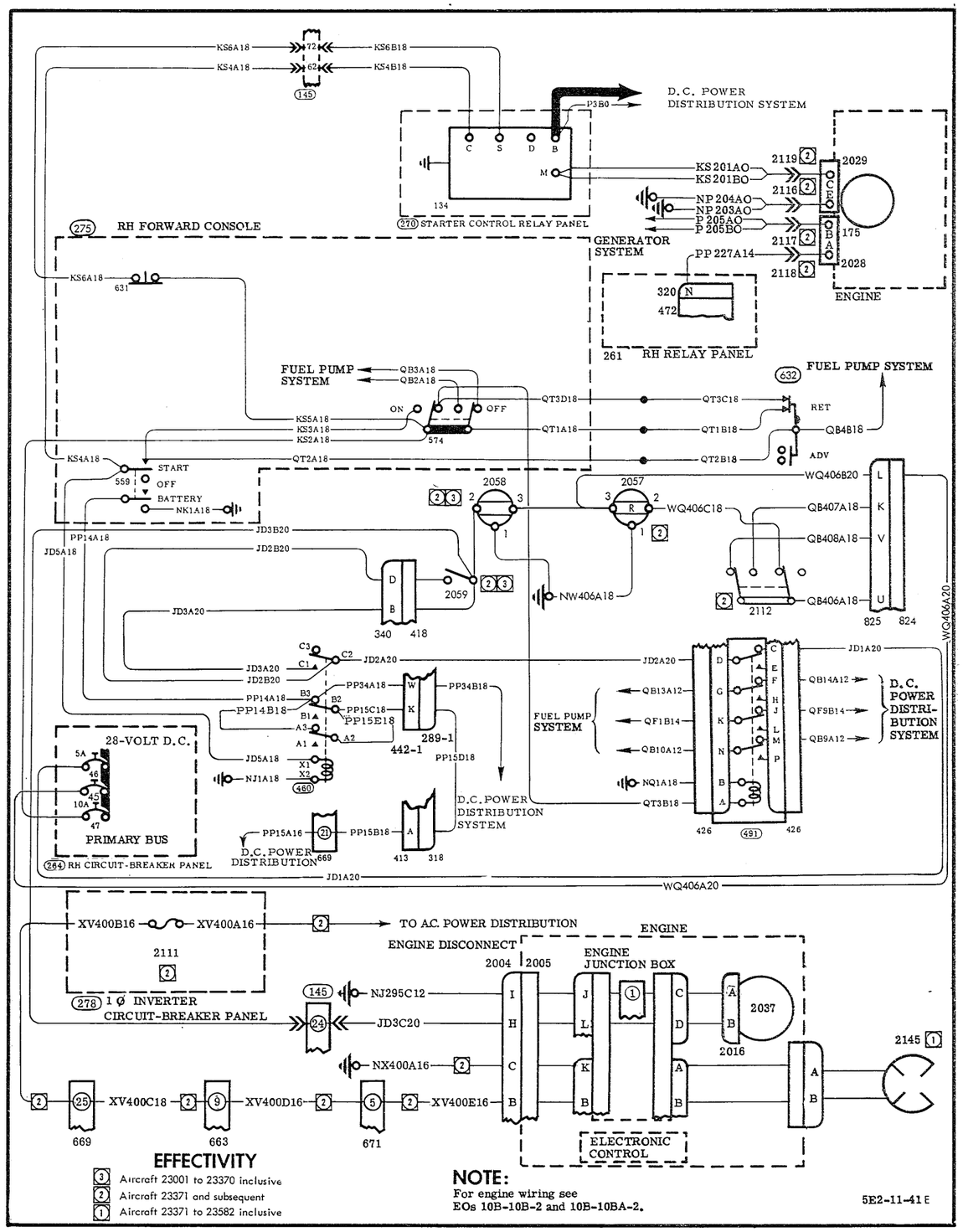


Figure 11-17 (M) Starter and Ignition System and Jet Pipe Limiter System

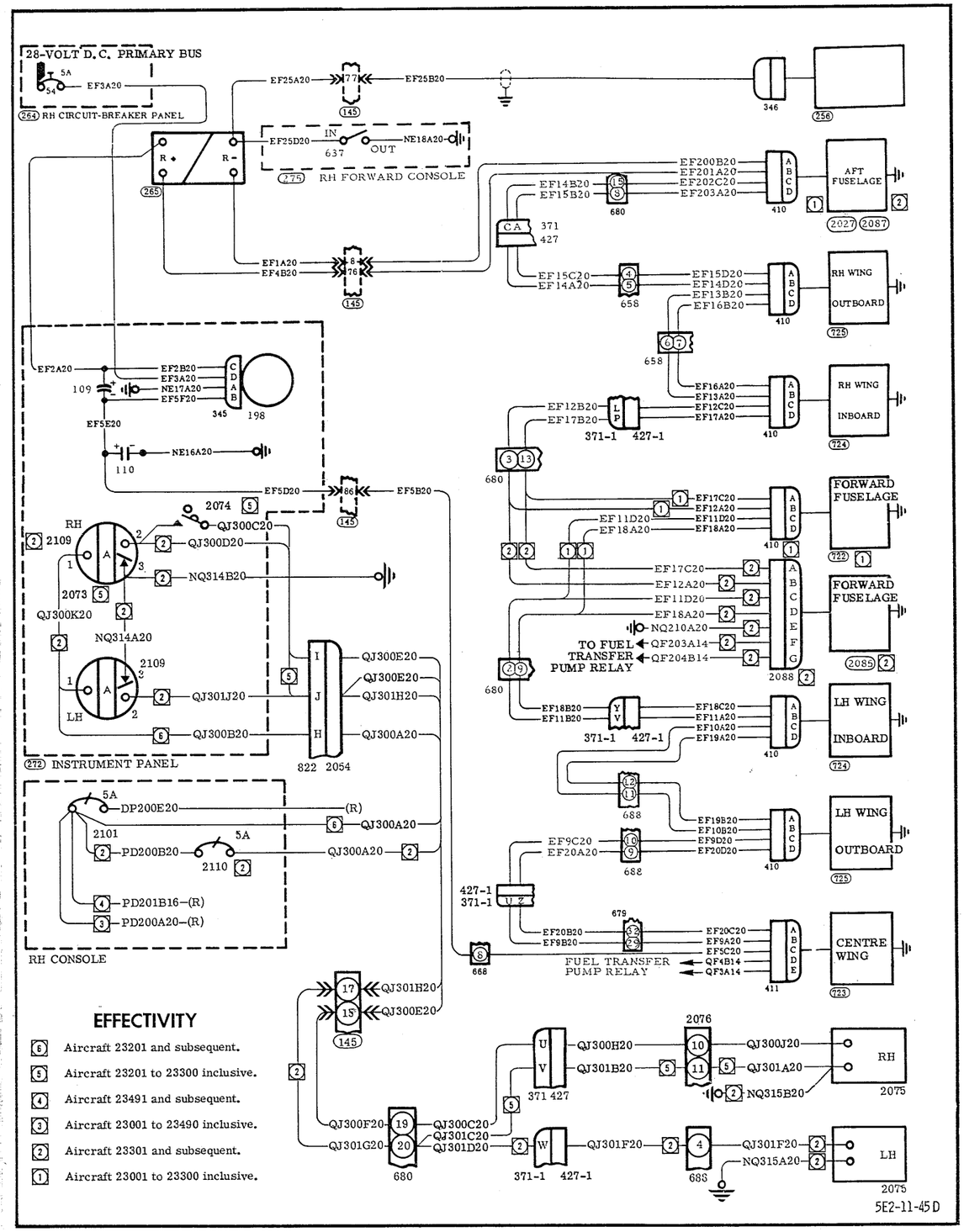


Figure 11-18 (M) Fuel Level Indicating and Drop Tank Warning Systems

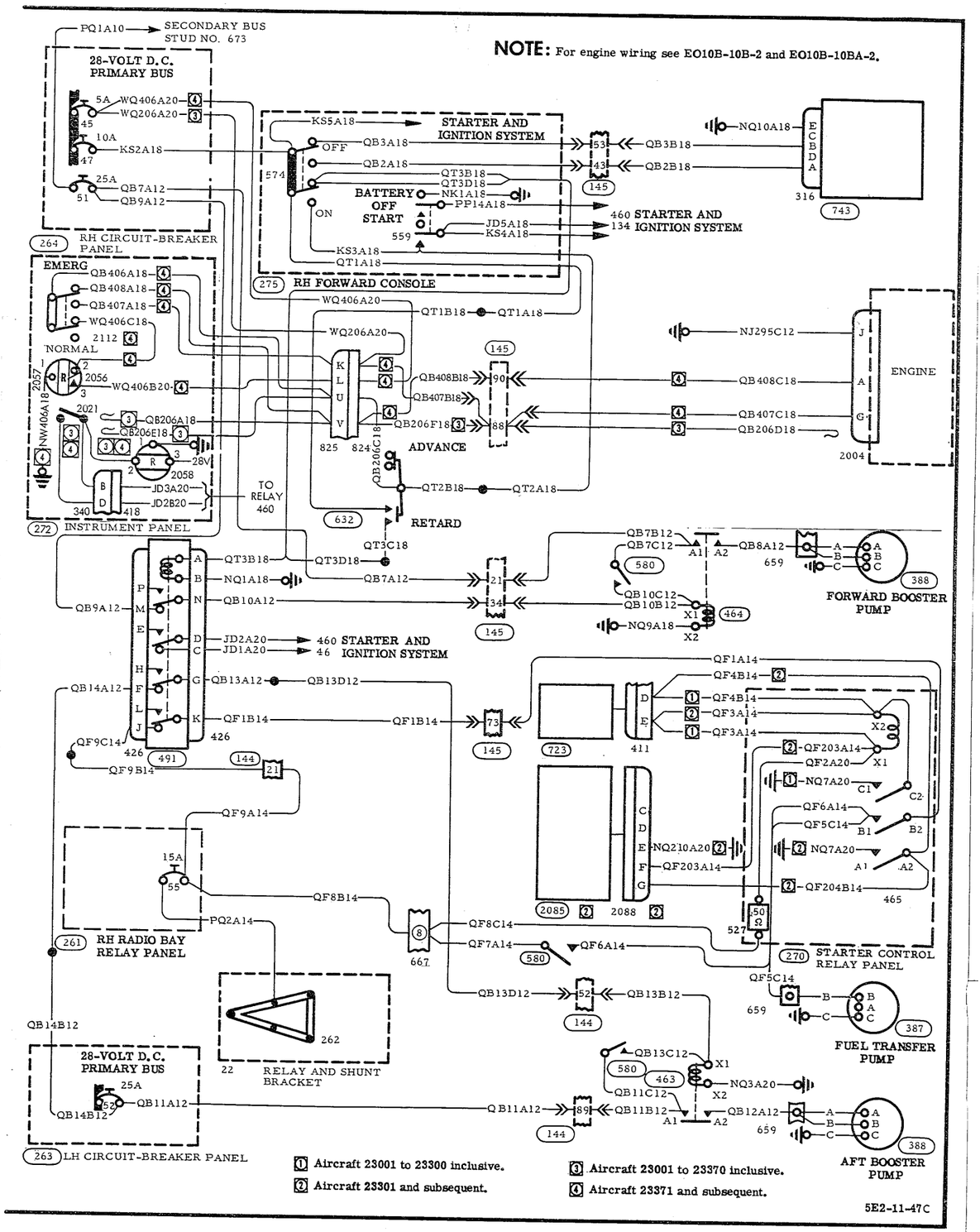
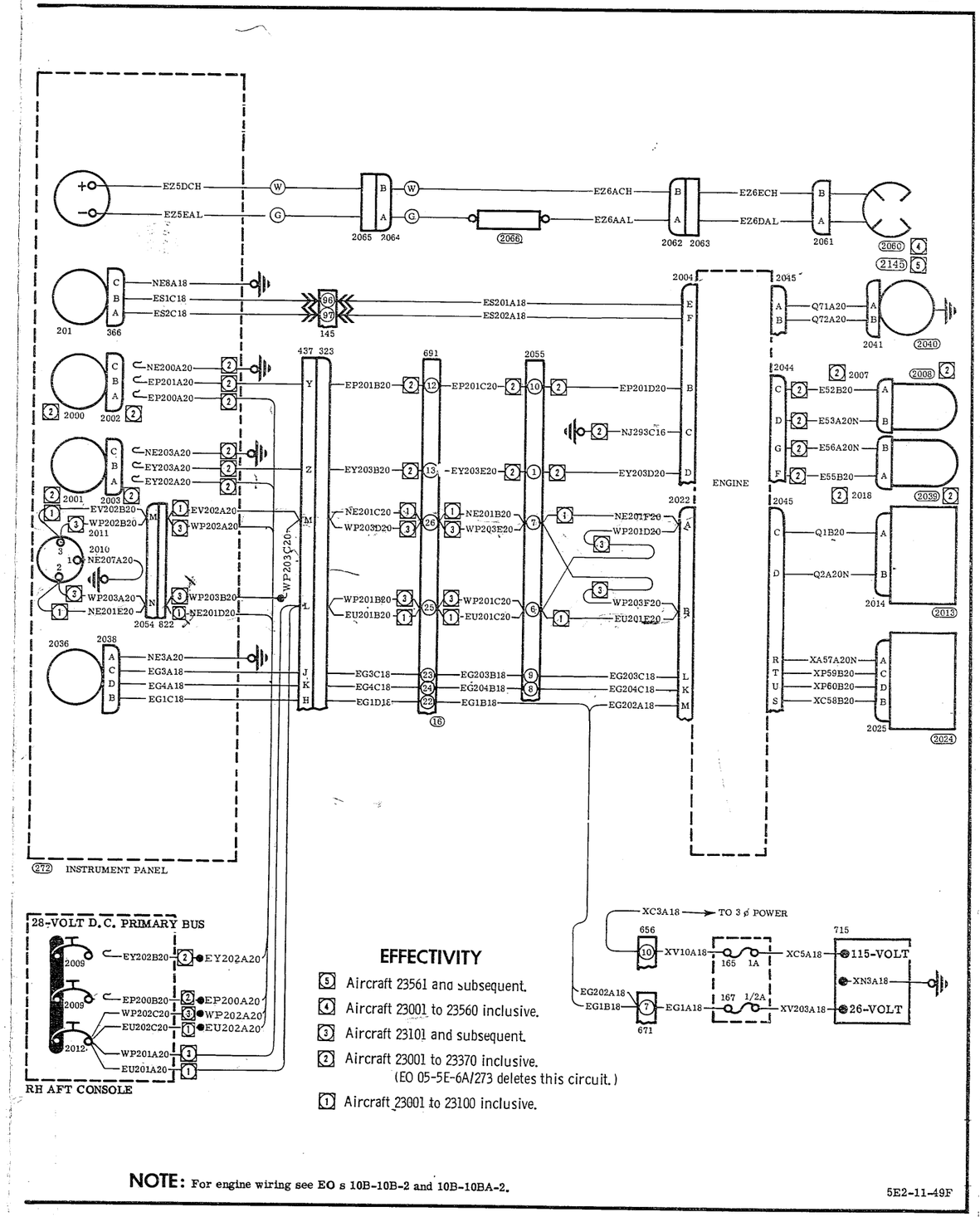


Figure 11-19(M) Fuel Pump System



EFFECTIVITY

5 Aircraft 23561 and subsequent.

4 Aircraft 23001 to 23560 inclusive.

3 Aircraft 23101 and subsequent.

2 Aircraft 23001 to 23370 inclusive.
(EO 05-5E-6A/273 deletes this circuit.)

1 Aircraft 23001 to 23100 inclusive.

NOTE: For engine wiring see EO s 10B-10B-2 and 10B-10BA-2.

5E2-11-49F

Figure 11-20 (M) Instrument System

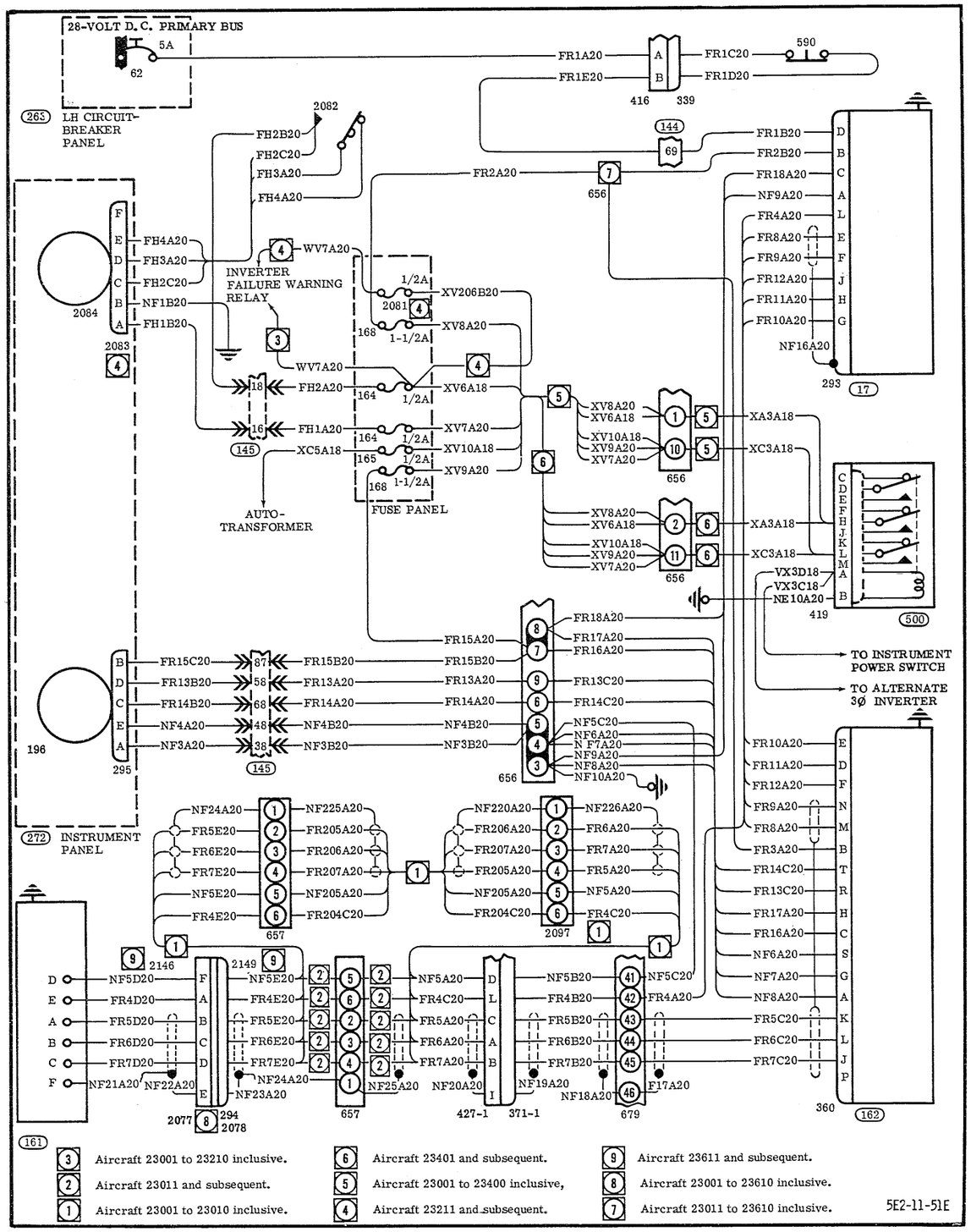


Figure 11-21 (M) Artificial Horizon and Gyrosyn Compass

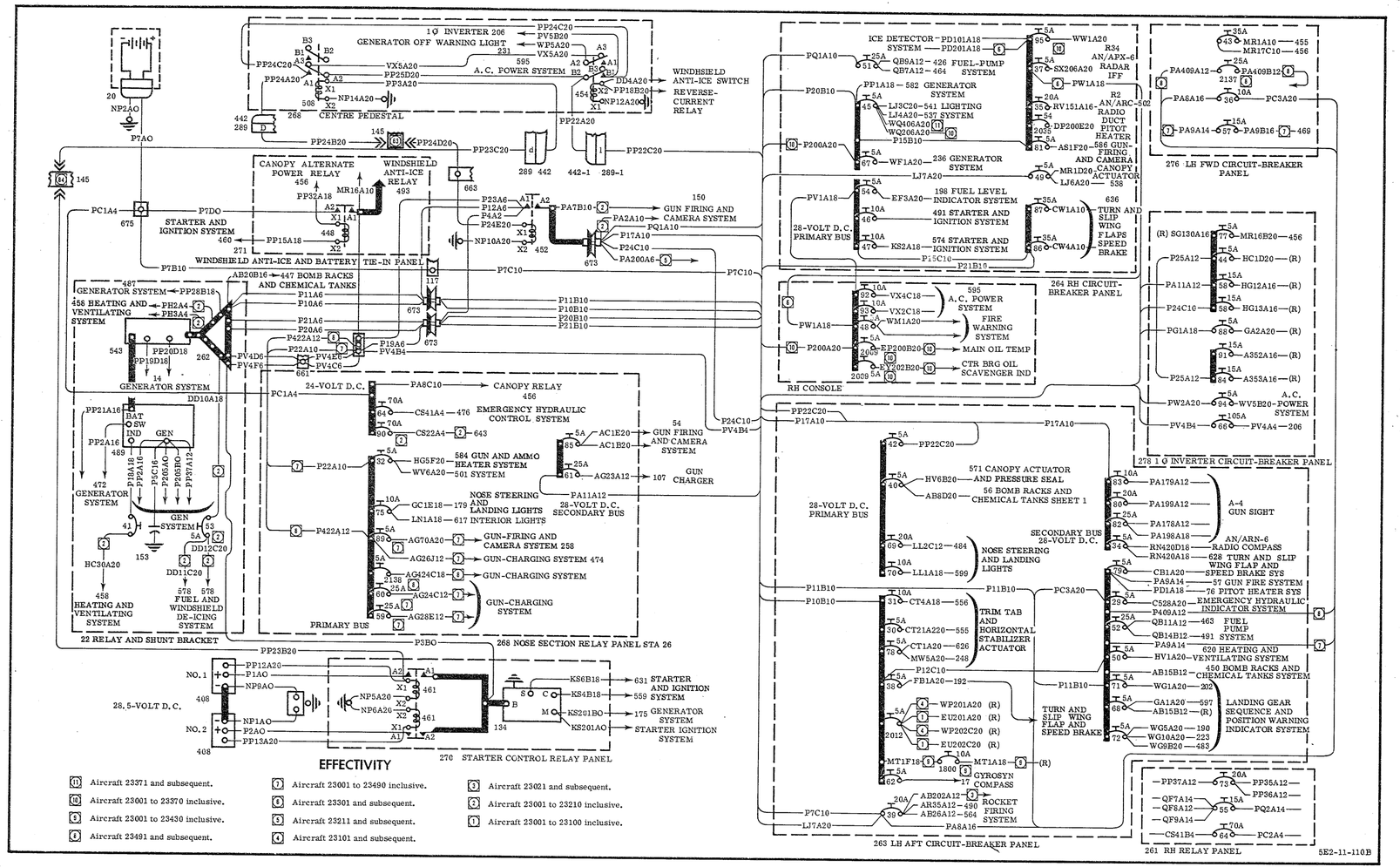


Figure 11-22 (M) D.C. Power Distribution

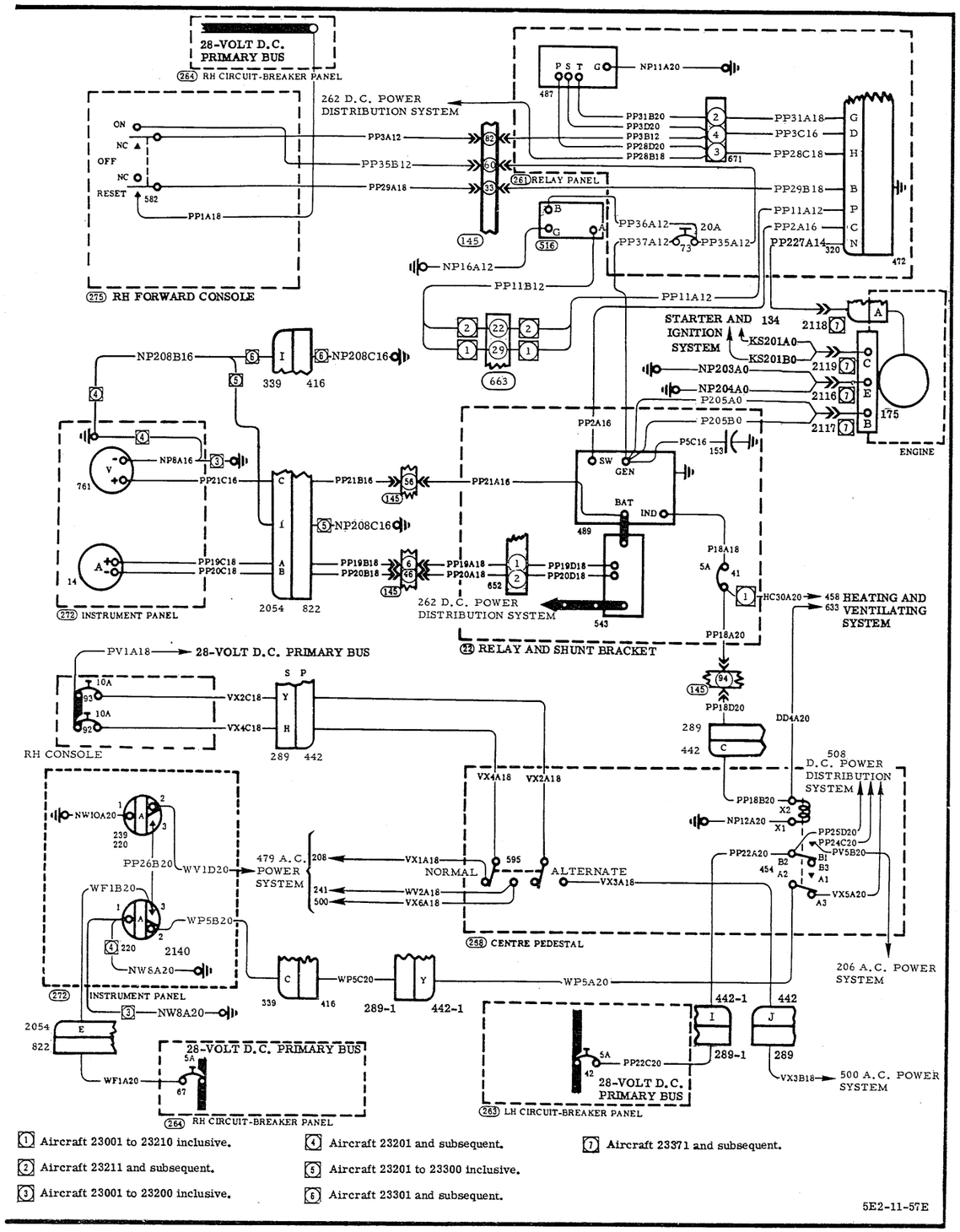
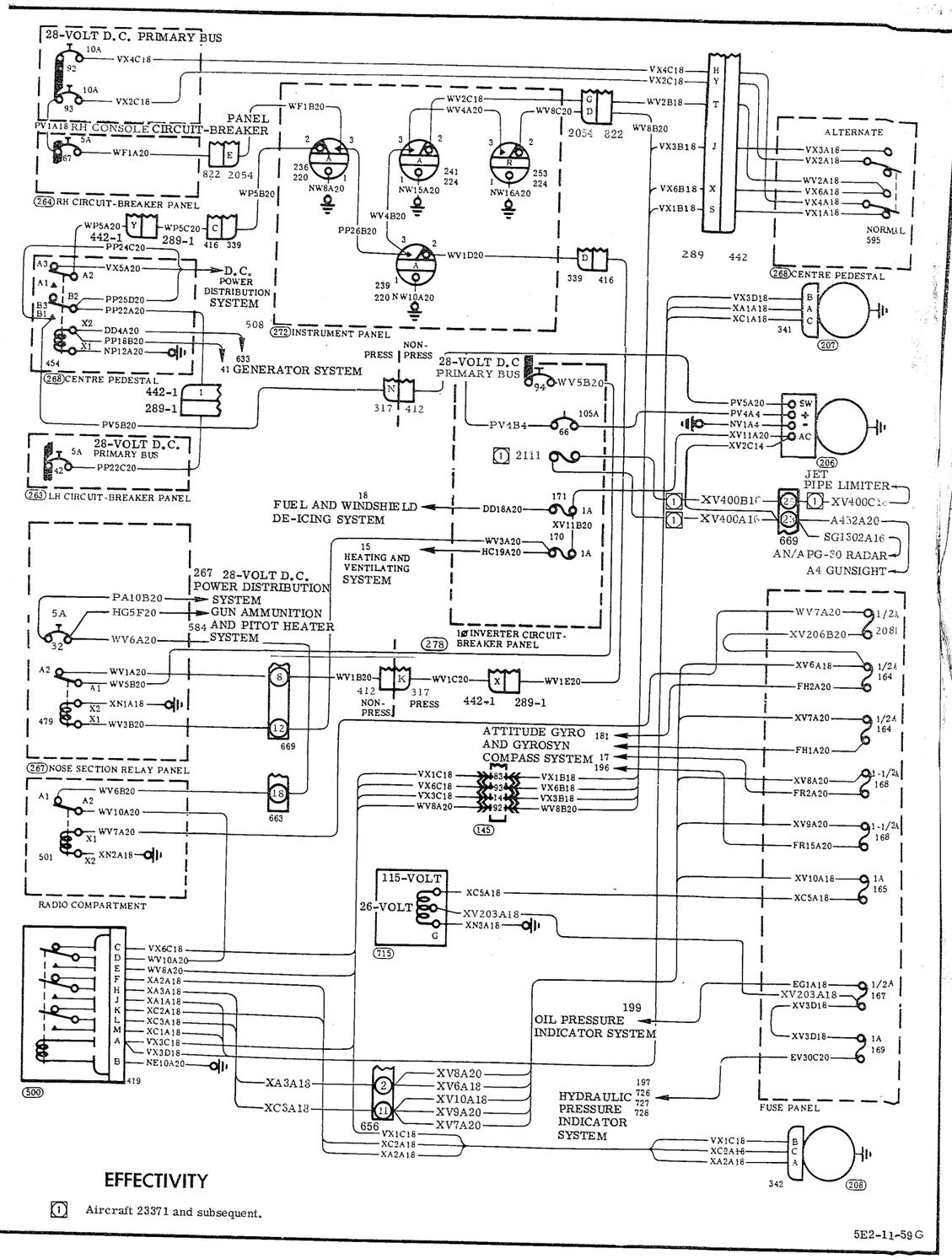


Figure 11-23 (M) Generator System



EFFECTIVITY

[1] Aircraft 23371 and subsequent.

5E2-11-59 G

Figure 11-24 (M) A.C. Power Distribution

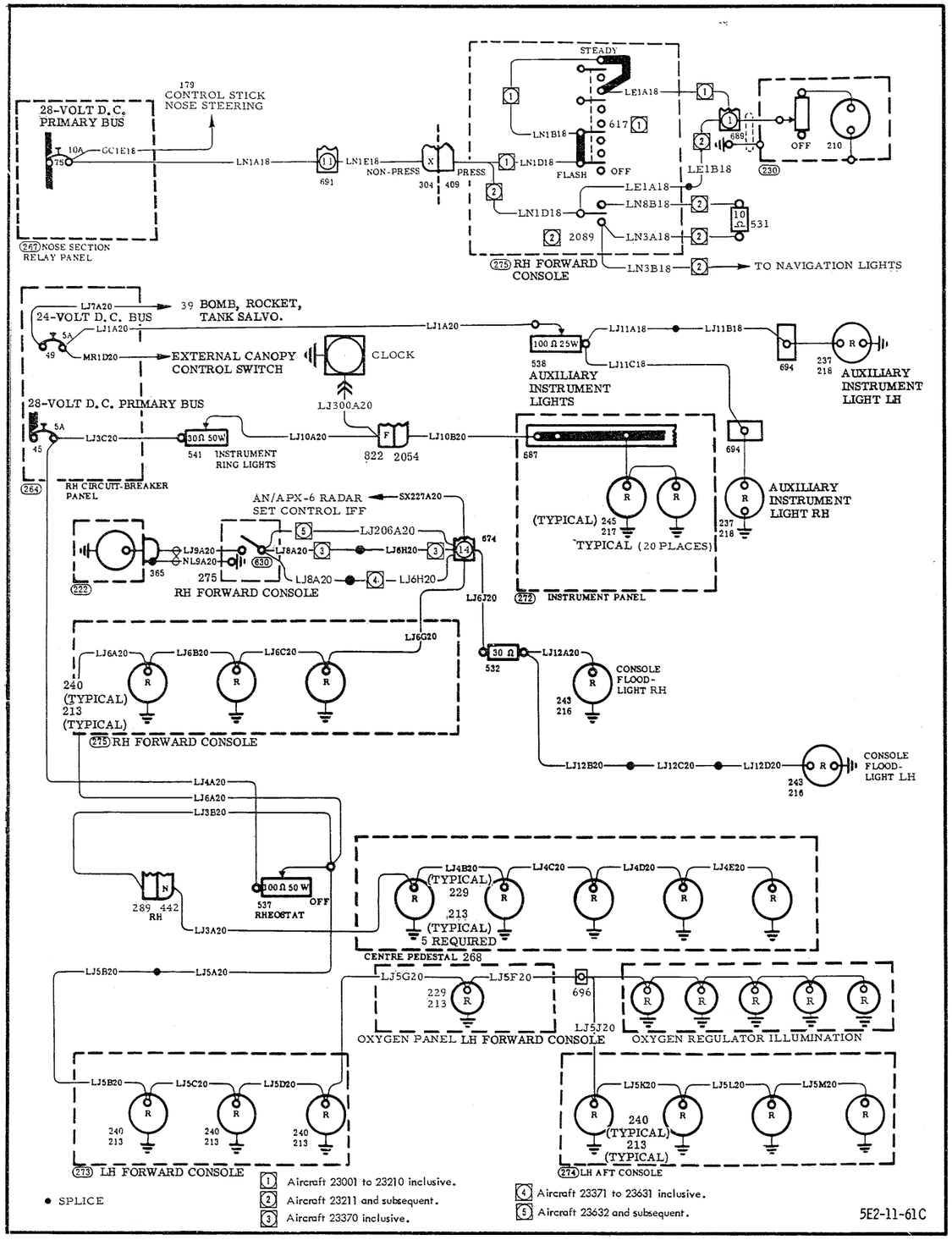


Figure 11-25 Lighting System - Interior

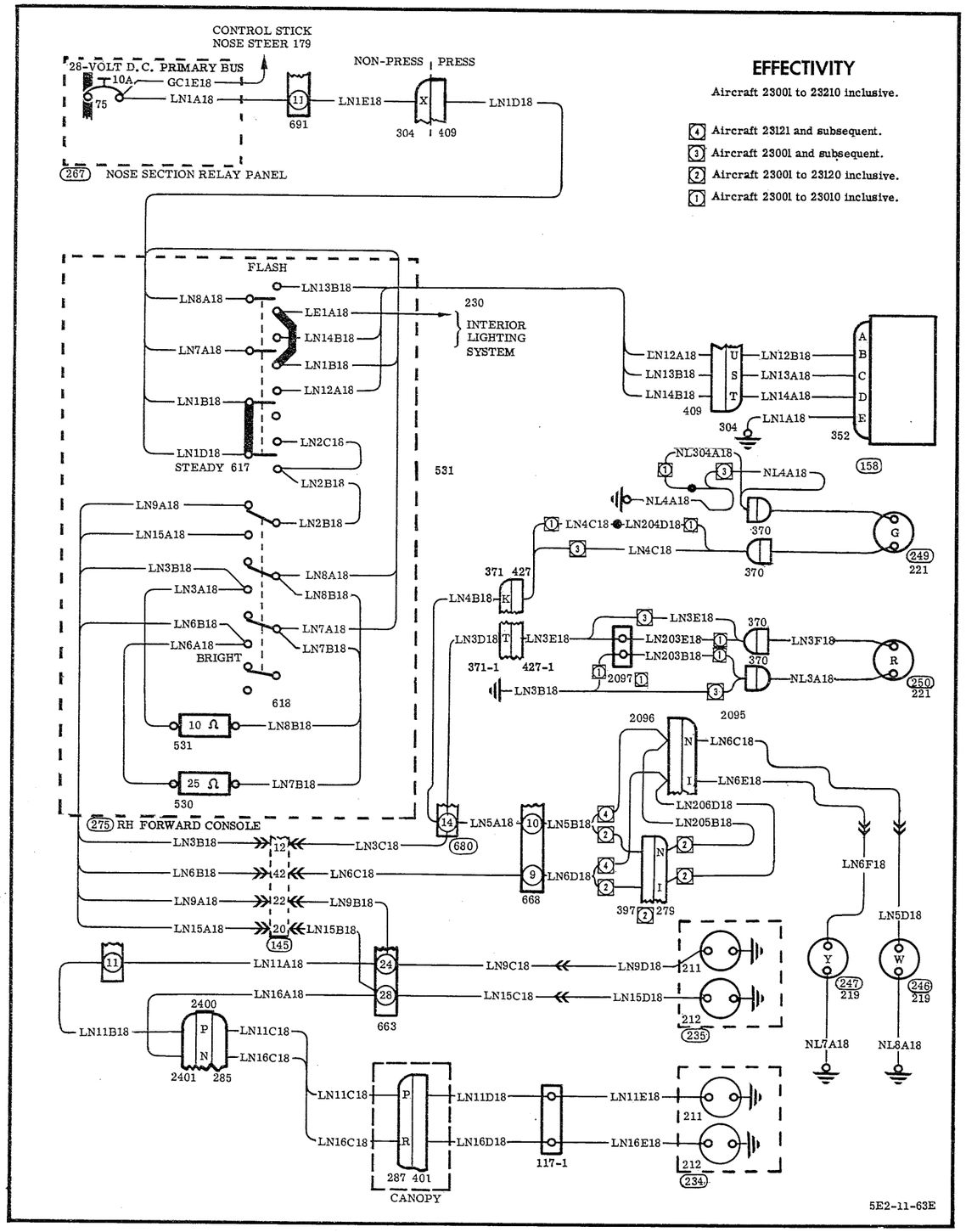
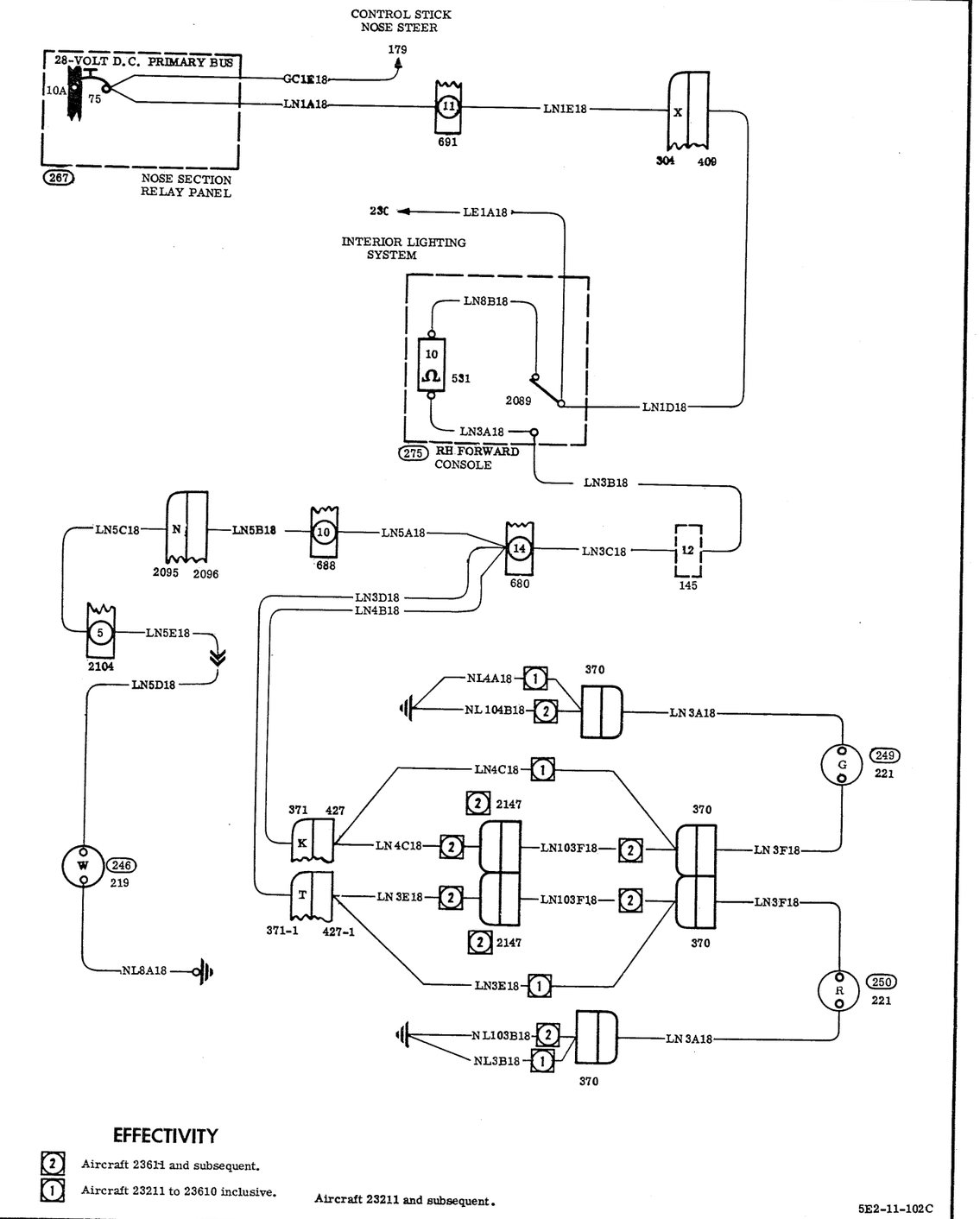


Figure 11-26 (Sheet 1 of 2) (M) Lighting System - Exterior



EFFECTIVITY

2 Aircraft 23611 and subsequent.

1 Aircraft 23211 to 23610 inclusive.

Aircraft 23211 and subsequent.

5E2-11-102C

Figure 11-26 (Sheet 2 of 2) Lighting System - Exterior

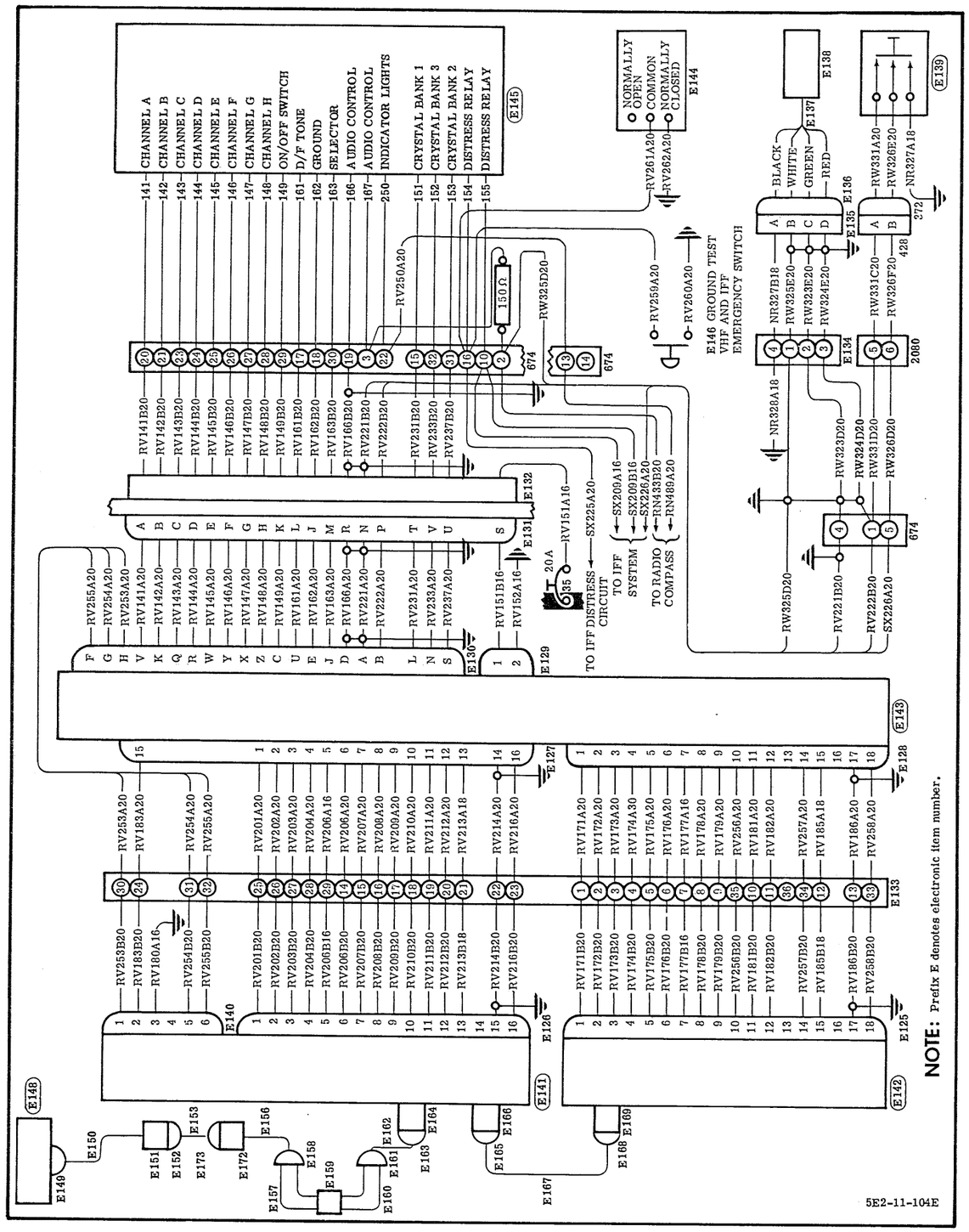


Figure 11-27 VHF Radio System - AN/ARC-502

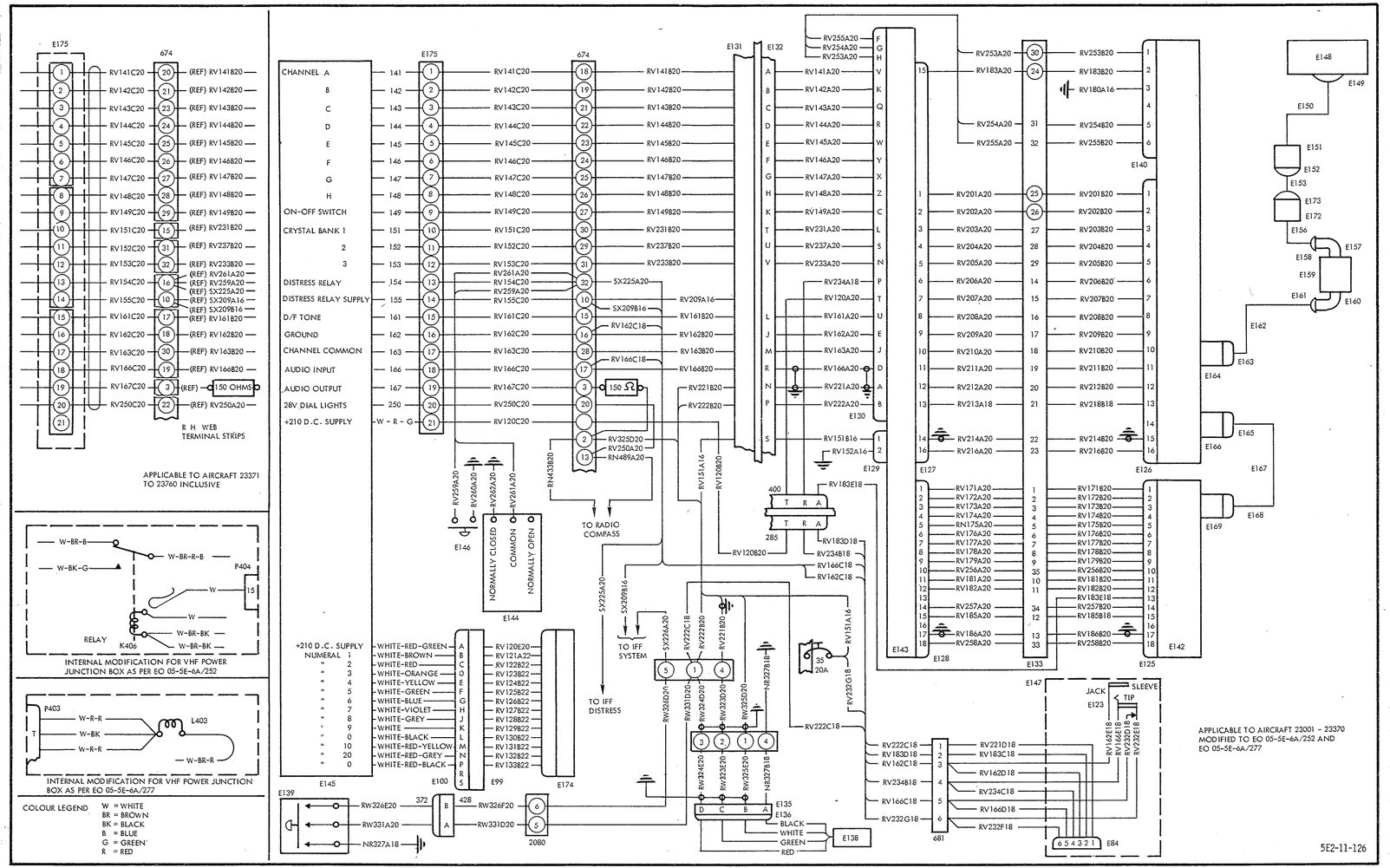


Figure 11-27A(M) VHF Radio System - AN/ARC-502

Figure 11-27B AN/ARC552 UHF System

Revised 12 Dec 62

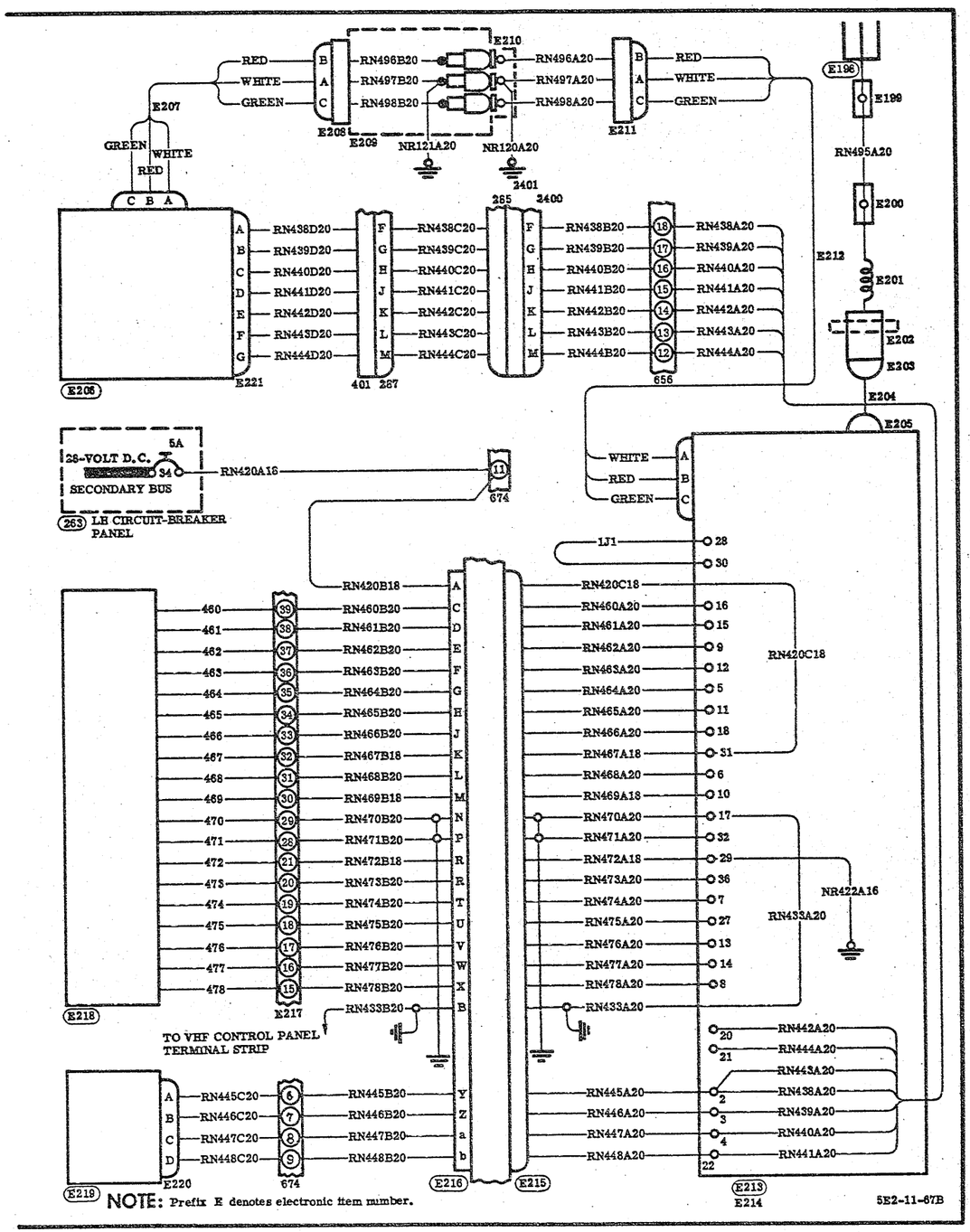


Figure 11-28 (M) (Issue 1) AN/ARN-6 Radio Compass System

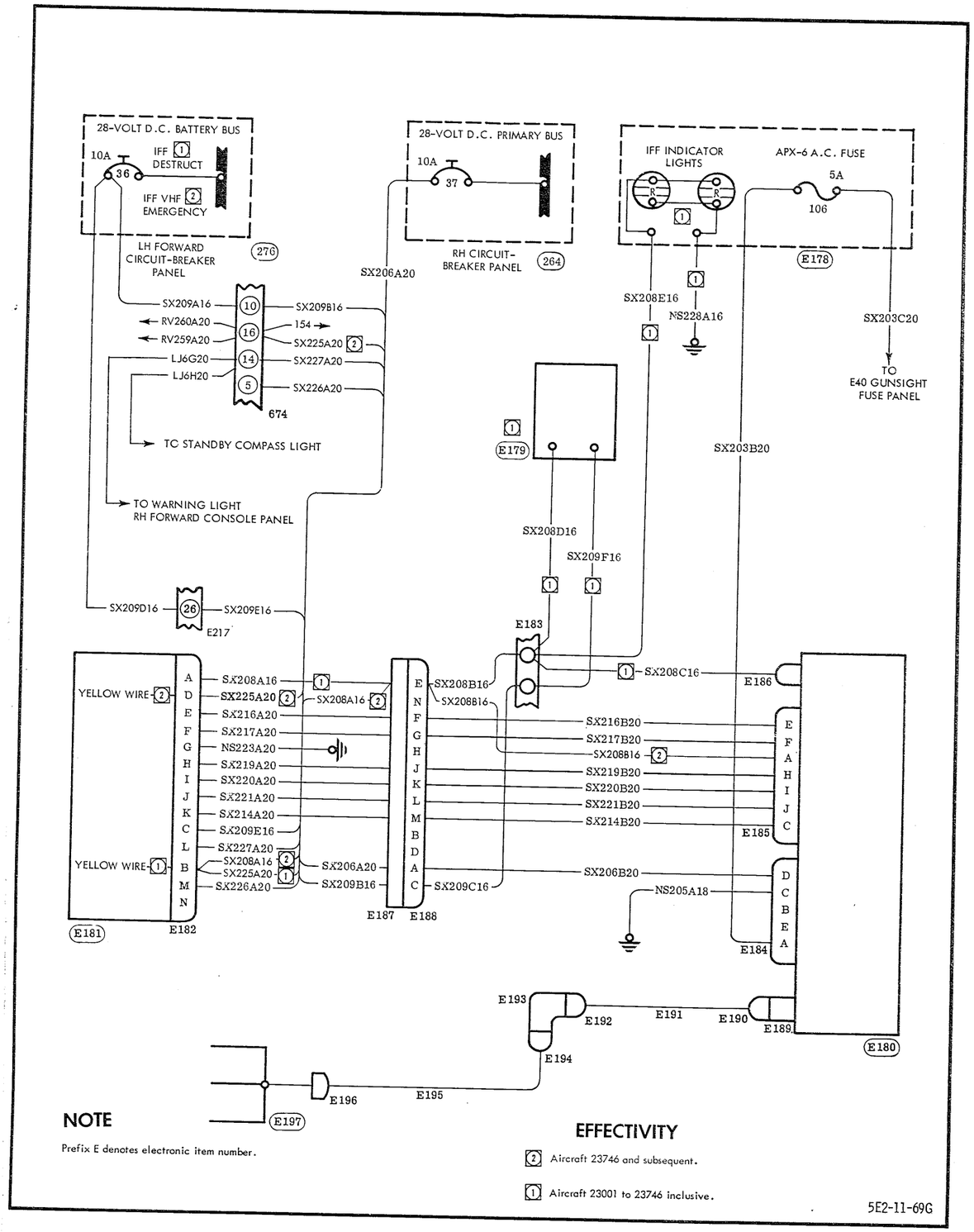


Figure 11-29 (M) APX-6 Radar Equipment

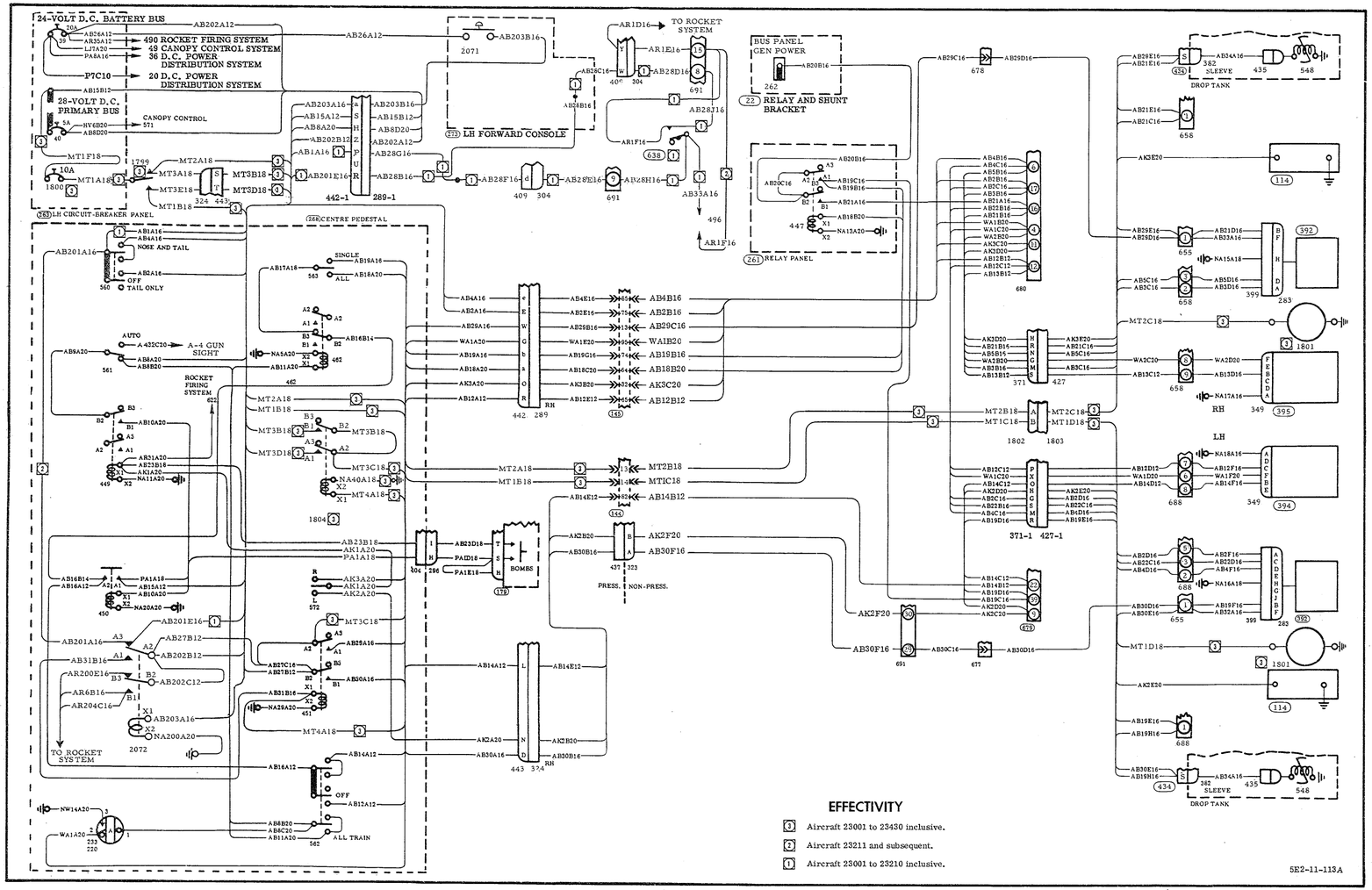


Figure 11-30 (M) Bomb Racks and Chemical Tanks System

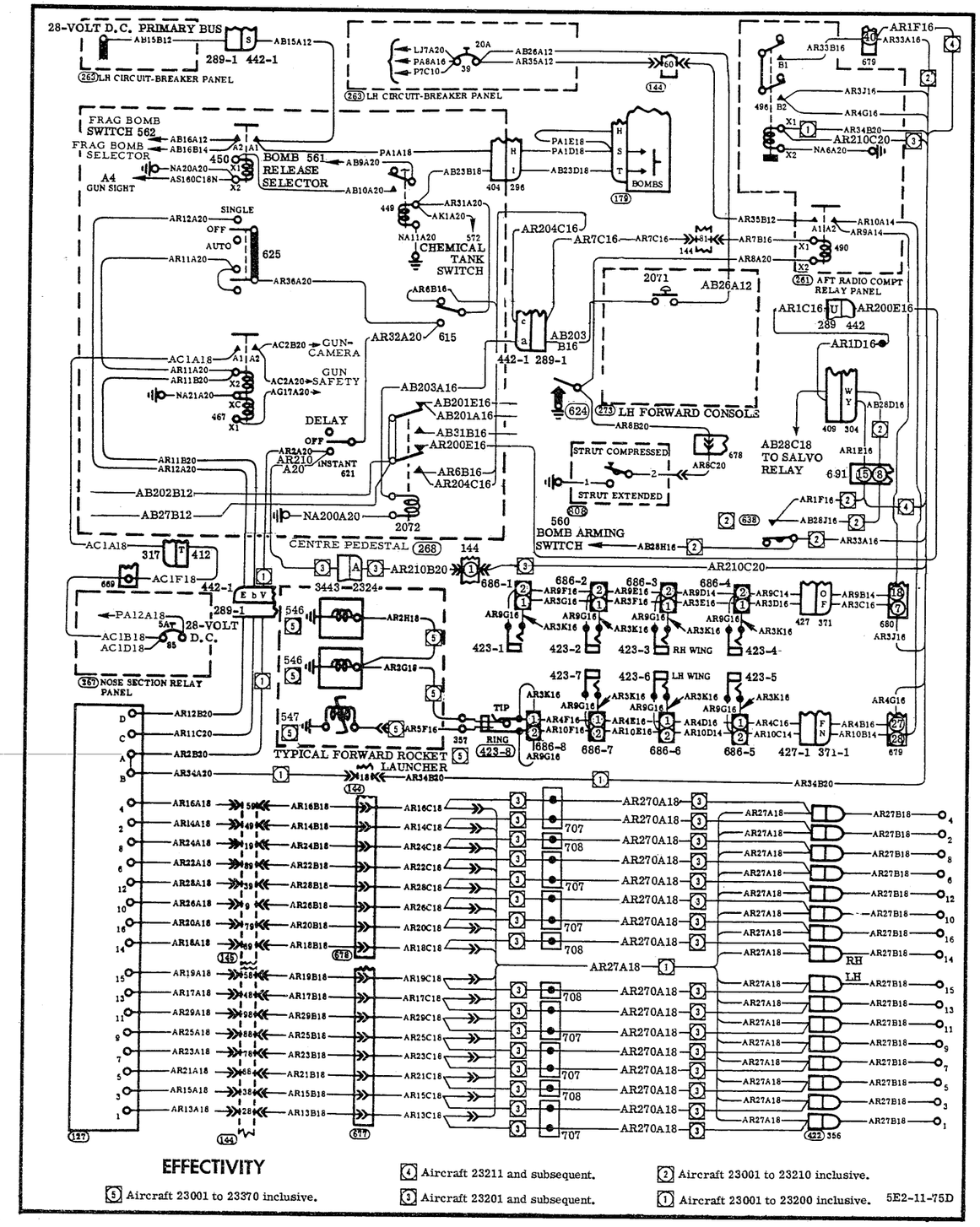


Figure 11-31 (M) Rocket Firing System

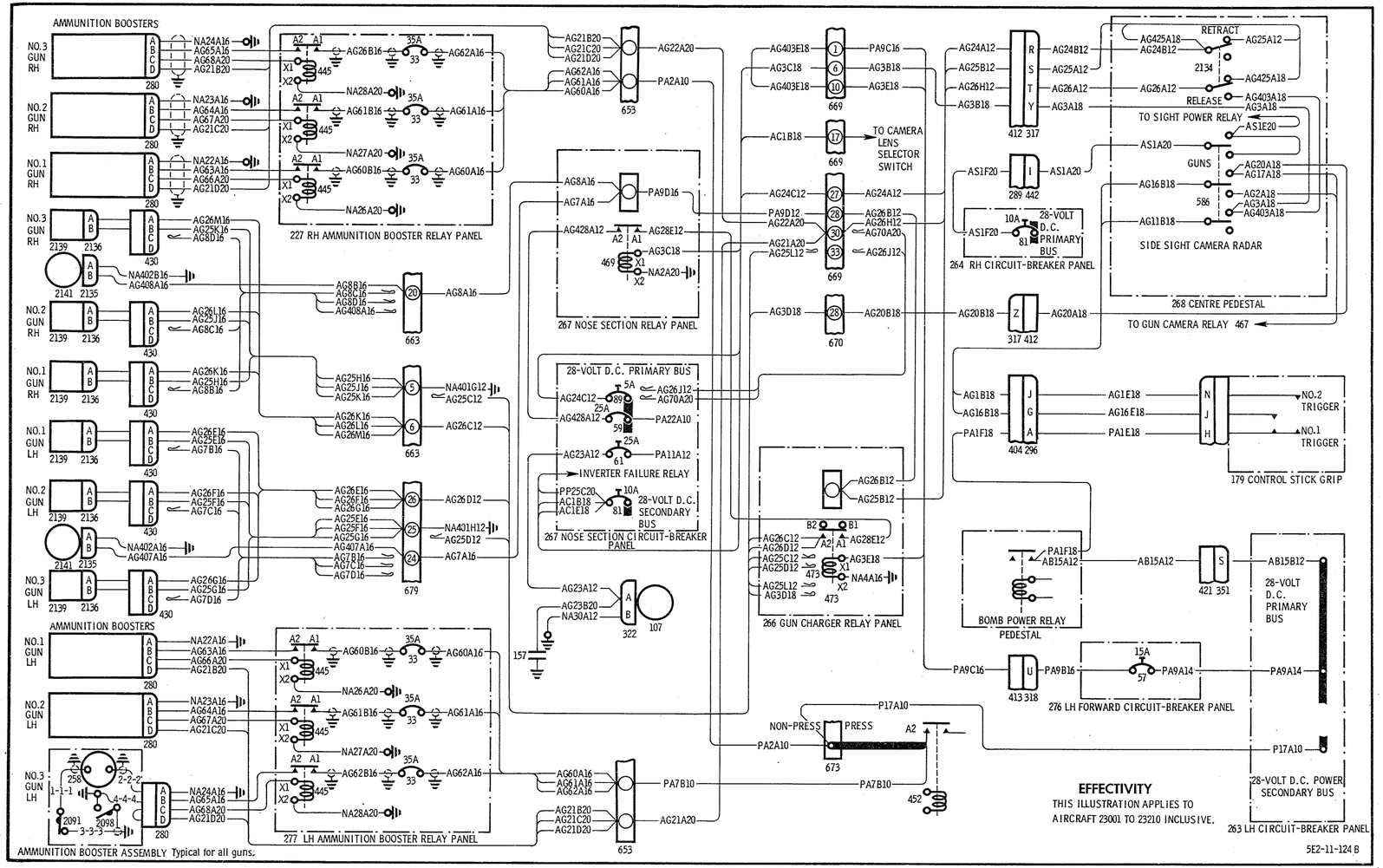


Figure 11-32 (Sheet 1 of 3)(M) Gunfiring System

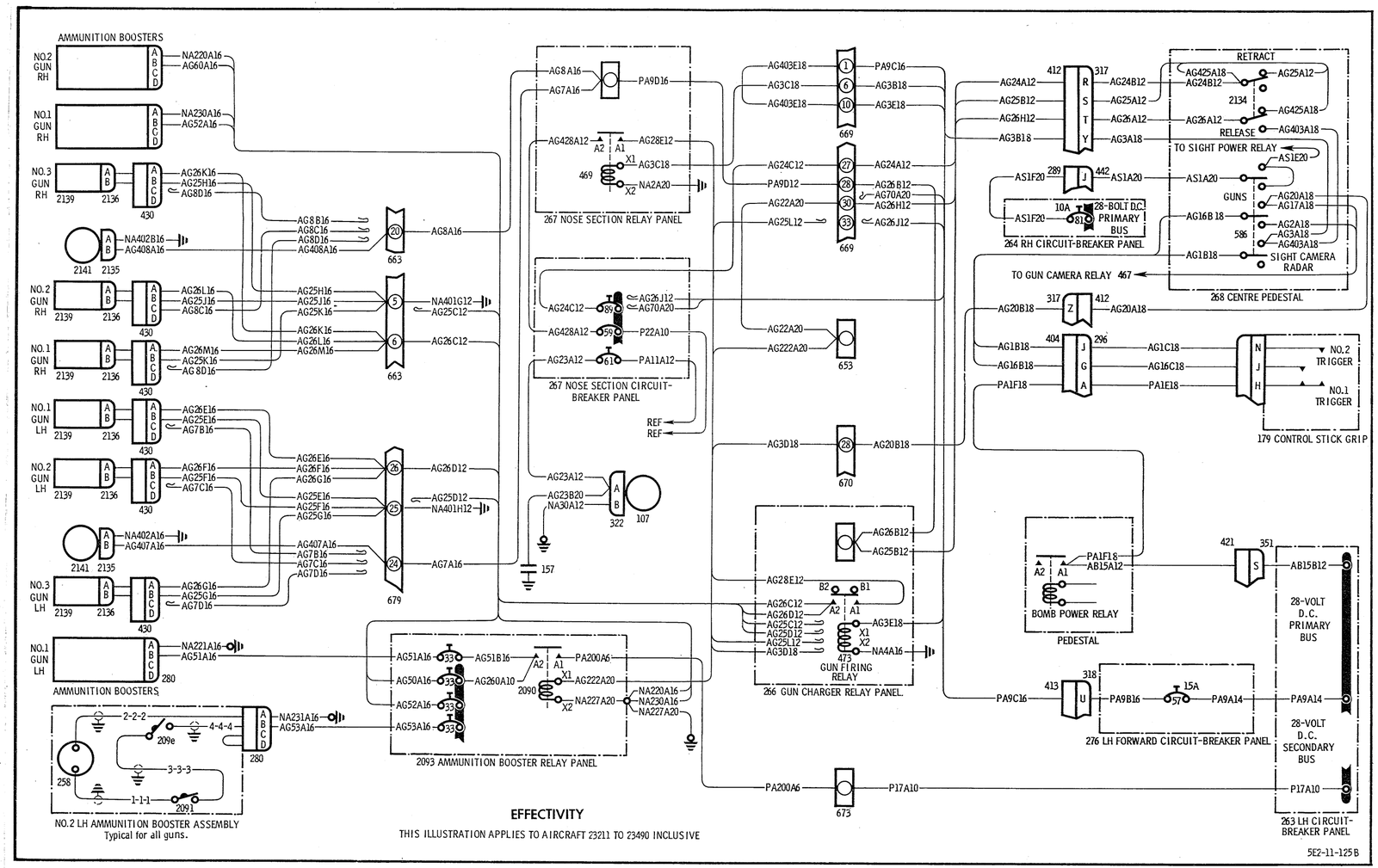


Figure 11-32 (Sheet 2 of 3)(M) Gunfiring System

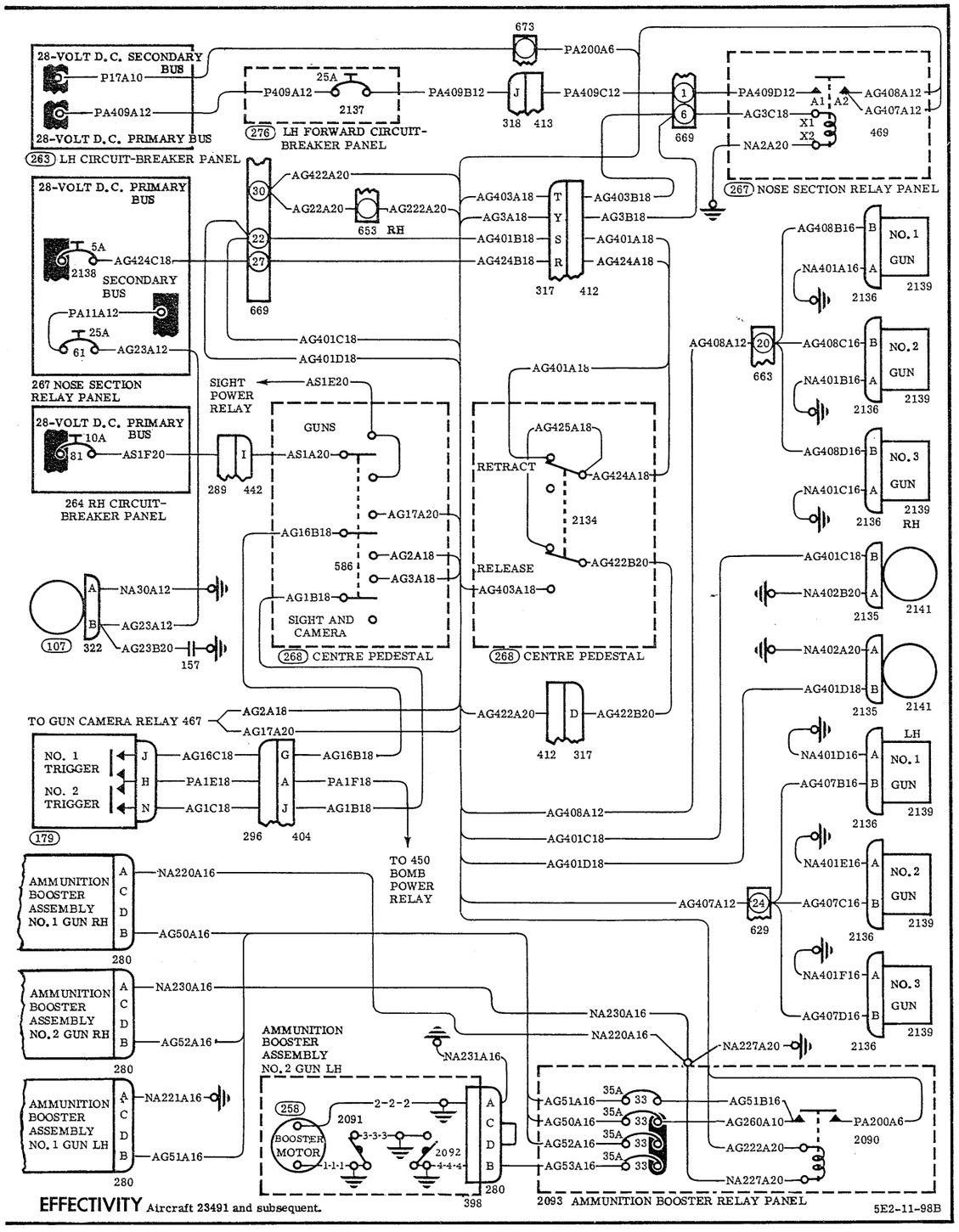
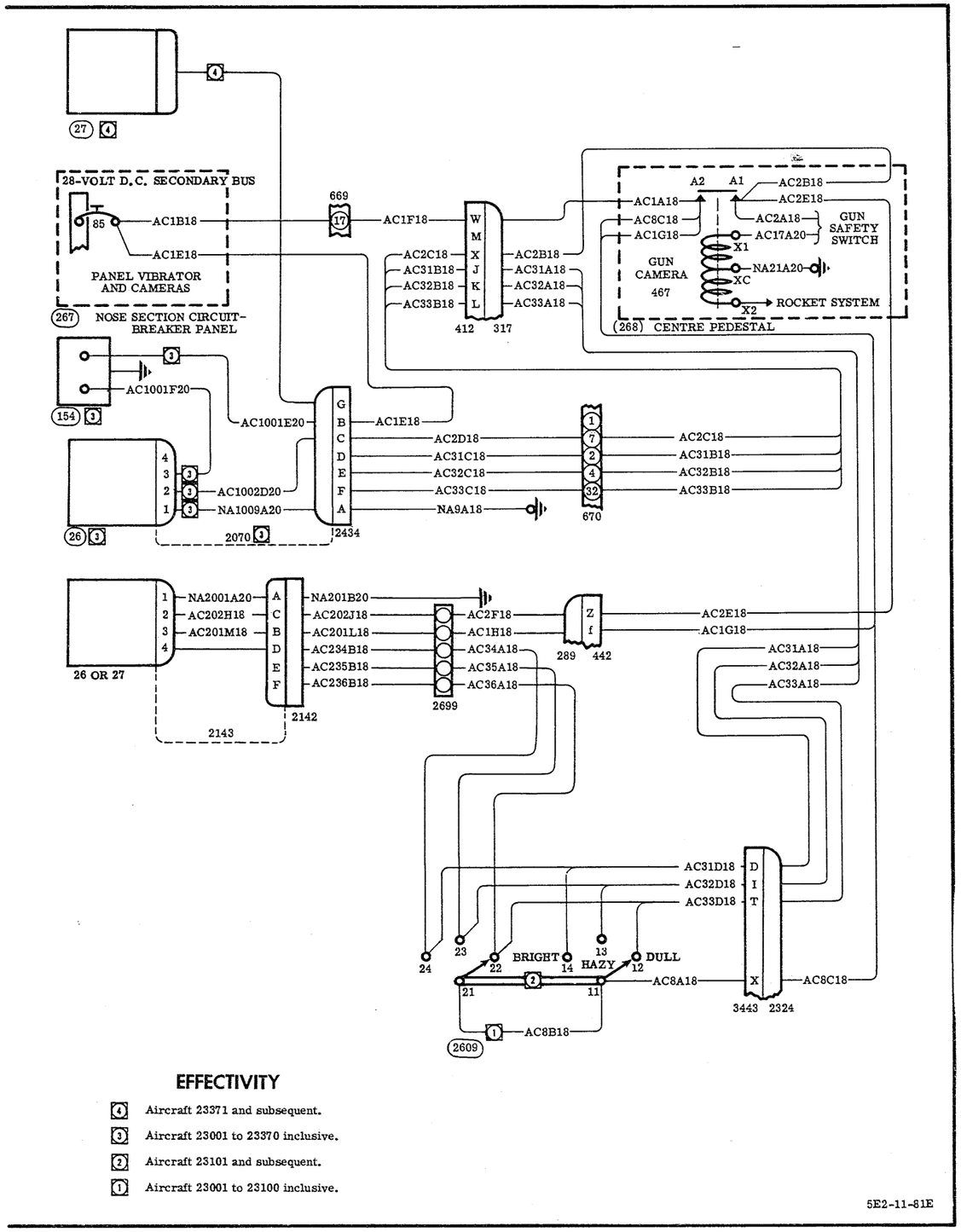


Figure 11-32 (Sheet 3 of 3) Gunfiring System



EFFECTIVITY

4 Aircraft 23371 and subsequent.

3 Aircraft 23001 to 23370 inclusive.

2 Aircraft 23101 and subsequent.

1 Aircraft 23001 to 23100 inclusive.

5E2-11-81E

Figure 11-33 (M) Camera System

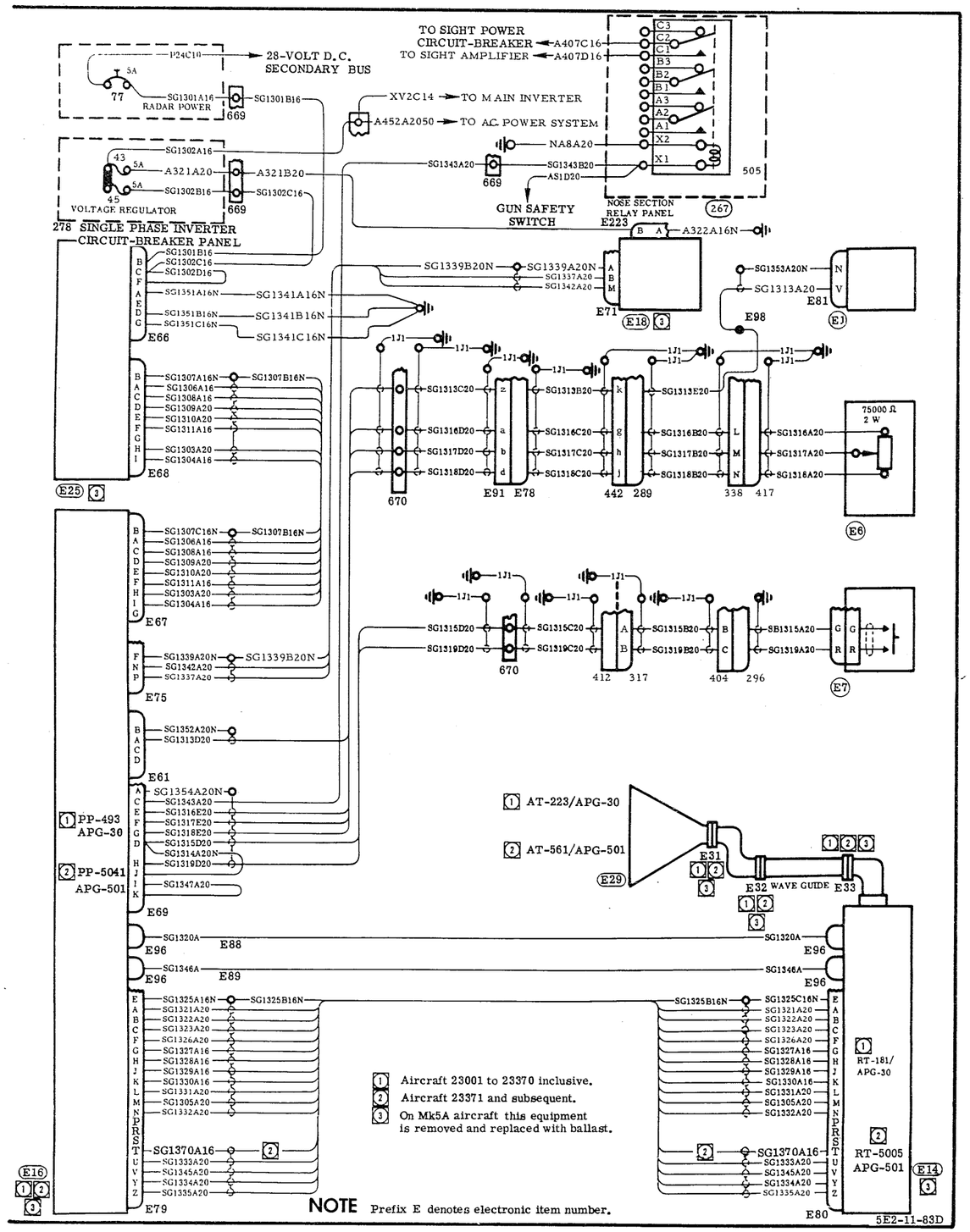


Figure 11-34 Radar System

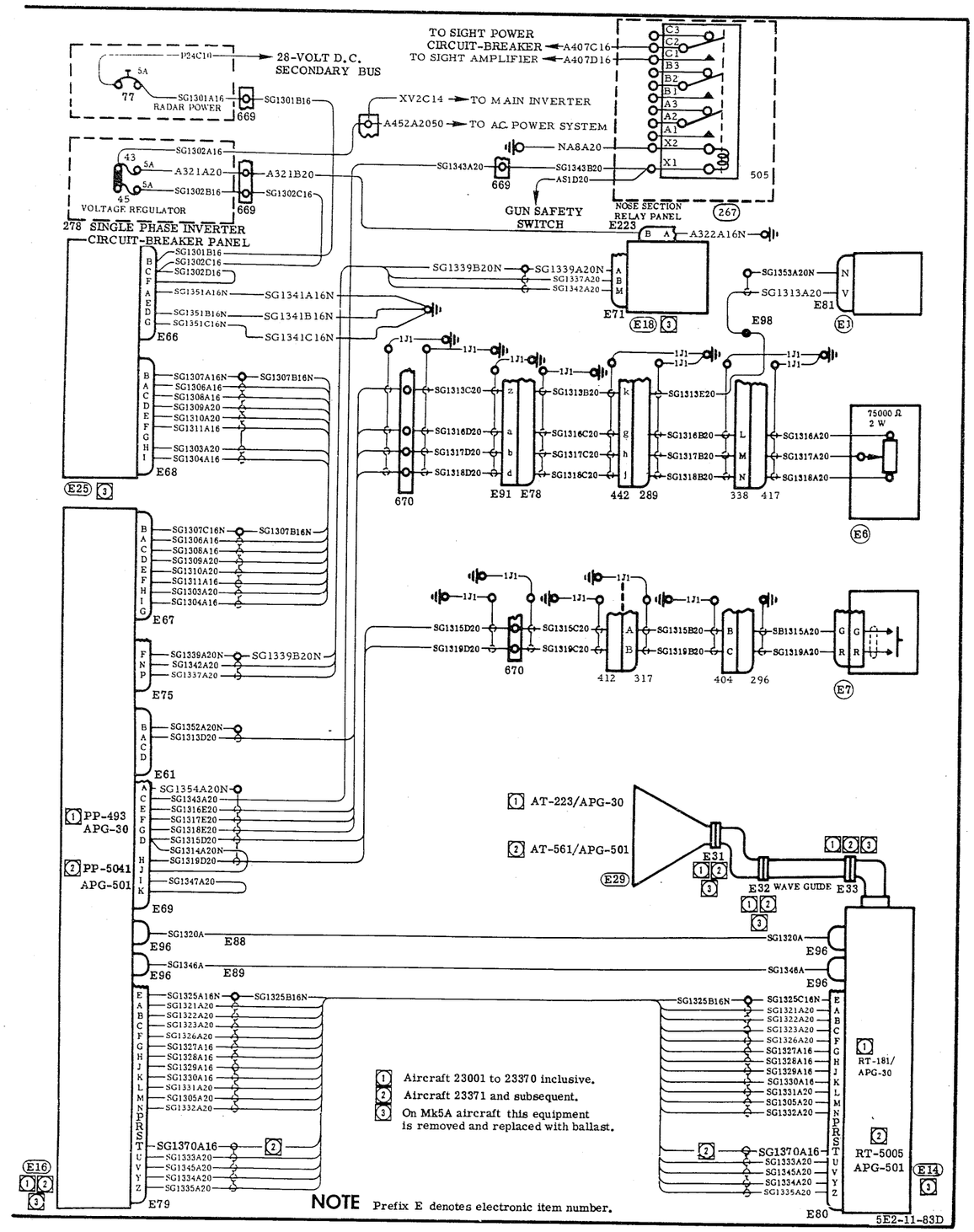


Figure 11-34 Radar System

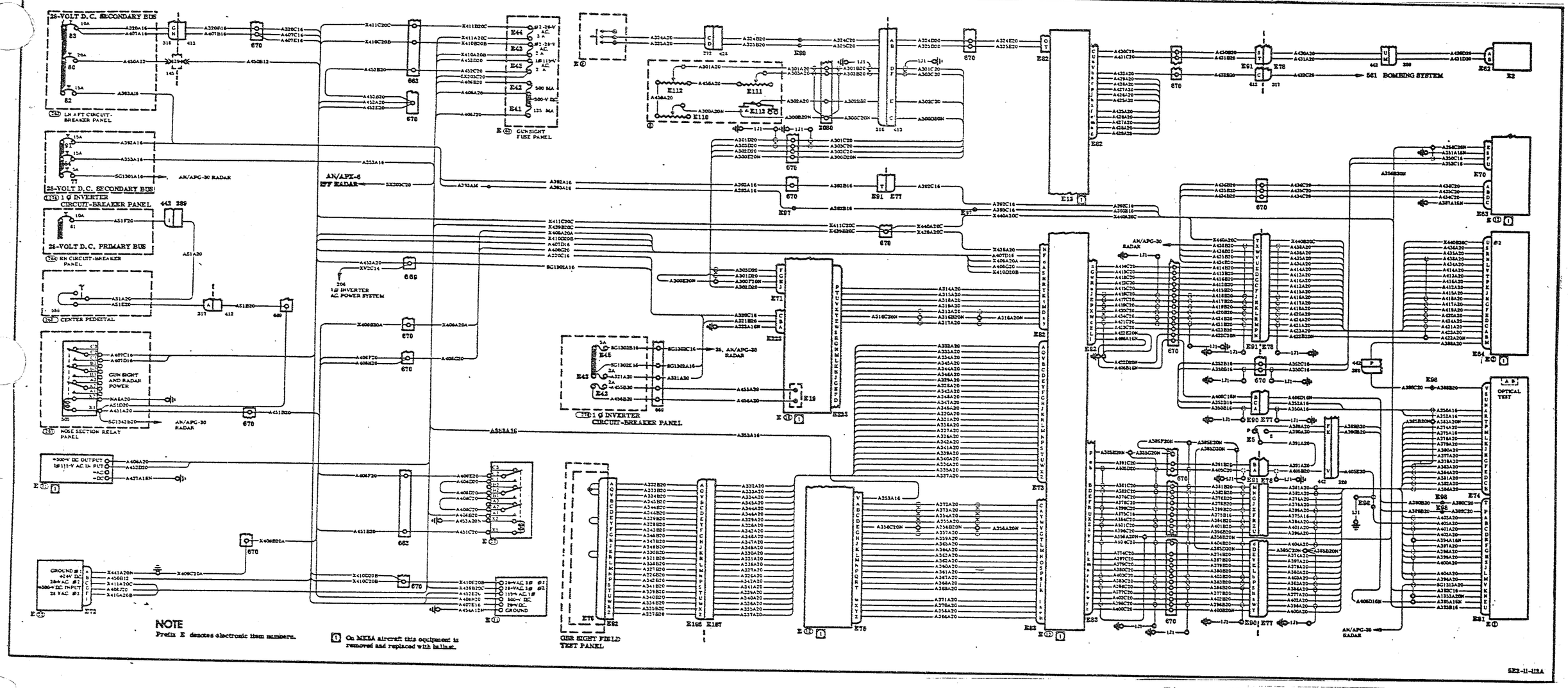


Figure 11-35 (Issue 1) A-4 Gunsight

Revised 22 Aug 60