SECTION 6

ELECTRICAL INSTALLATION

LIST OF CHAPTERS OVERLEAF

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ELECTRICAL INSTALLATION

LIST OF CHAPTERS

Note.– *A list of contents appears at the beginning of each chapter*

Chapter I GENERAL INFORMATION

◀PRE MOD. 5466 (SEE SUPPLEMENT FOR POST MOD. 5466)▶

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WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

Introduction

1. This section contains information relating to the electrical system. It is divided into a number of self-contained chapters consisting of descriptive and servicing matter, illustrations, and tables appropriate to the chapter heading. The General Information chapter covers the complete installation and describes the wiring system, cable identification, and location of equipment. The illustrations locate the main components. The combined theoretical/routeing diagrams for individual systems are contained in A.P.101B-0417-10 (Servicing Diagrams Manual).

DESCRIPTION

Power supplies

2. Two engine-driven Type P3 generators, operating in parallel, supply power at 28-volt d.c. for the main aircraft electrical system and also charge the 12-volt, 40 Ah batteries connected in series parallel. The special equipment, the wireless and radar installations and certain flight instruments operate from a.c. supplies obtained from two 30 kVA, 3-phase, 400 Hz, 200V turbine-driven alternators. In the event of failure of both alternators, two 115V, 3-phase, 400 Hz a.c. inverters provide a stand-by source of supply for operating the flight instruments.

Wiring system

3. The Plessey system of wiring, using cables and conduits with multi-pole plugs and sockets, is mainly used for making connections between equipment although in some instances, the Hellerman type of multi-pole plugs and sockets are used. In addition, certain cable assemblies pass through the pressure bulkhead by means of Helvin pressure bungs. Circuit distribution to the equipment is by the use of junction and distribution boxes dispersed throughout the aircraft. Each junction box is referenced by a number such as J.B.1, J.B.2, etc., which is marked on the box cover. Cable connections to the terminals and fuse blocks in the junction and distribution boxes are made by quick-release tags or ferrules.

Circuit identification

4. Each circuit has a code reference which is shown on the appropriate theoretical and routeing diagrams. The code consists of a basic alphabetical reference given to the circuit at the fuse or circuit breaker feed point and a suffix number which changes after each switch, relay or other item of operative equipment in the circuit. The changes, where possible, consist of incremental alterations to the numerical component, i.e. F1 to F11, F11 to F12, etc. Unipren cables are generally used for wiring the aircraft, the cable ratings being indicated on the routeing diagrams by a break in the cable line and the insertion of either 6, 12 or 24 as the case may be. Circuit identification in control units and panel assemblies is by rubber markers fitted at the cable terminations, those serving the d.c. circuits being yellow or pink and those in the 400 Hz, 3-phase circuits red, pale blue, or white, depending on the phase colour. In the a.c. circuits, the phase reference is the second letter of the circuit reference. For example, in the 400 Hz, 3-phase circuits, the second letter in reference TR, TB2 and EW denotes the red, blue, and white phases respectively.

Cable assemblies and junction boxes

5. All terminals in junction boxes and panel assemblies have identification tabs marked with their appropriate circuit reference. Conduits and cable assemblies are identified by a letter and number printed on rubber sleeves .....

fitted at each end of the assemblies. Where a cable terminates in tails, each lead is fitted with a marker bearing the circuit reference of the terminal to which it is connected. Conduits or cables with the initial letters N, F, C or T, are usually installed in the nose, front, centre or rear fuselage respectively. Cables feeding into a junction box are referenced as above but when leaving a junction box for an item of equipment the initial reference is changed to that of the box; for example, cables leaving J.B.3 and J.B.4 are shown as 3A, 3B, 4A, 4B and so on.

6. Each lead in a cable fitted with multi-pole plugs or sockets is identified by a rubber marker bearing the number or letter reference of the pin to which it should be connected. On the routeing diagrams, a cable referenced as N45-1 or N45-A would be identified as cable N45-pin 1 or N45-pin A, the contact pins being represented by heavy dots shown at the termination or inter-section of a lead with a bulkhead plug, panel assembly, or other item of equipment. Where Type S relays are illustrated on the diagrams, the letter 'a' shown near the solenoid coil denotes the side of the relay which carries the contacts marked Ca (the solenoid connection) and 1A, 2A, etc.

Plessey wiring system

7. Both standard and miniature types of Plessey plugs and sockets are employed for making connections between items of equipment. The standard type is more widely used for the general electrical services whilst the miniature types are retained for interconnection between the instruments, wireless and radar units, and some items of intercomm. equipment. The joints between plug pins, socket inserts, and conductors in all miniature plugs and sockets and in all standard sockets of and above 37 amp size are soldered. Those in standard type plugs and sockets of less than 37 amp sizes are crimped. The Plessey system of wiring together with the standard plugs and sockets is described in A.P.113D-1825-1 while the miniature plugs and sockets are dealt with in Chap.8. General information concerning aircraft wiring systems will be found in A.P.4343, Vol.1, Sect.12, Chap.5.

WARNING

Where earth connections from various equipments are taken to a common earth terminal group, the disconnecting of the main airframe earth connection from such terminal groups, whilst the electrical system is live, could cause back feeding to the live supply via other equipments to another connected airframe earth. This could result in explosive circuits being inadvertently discharged, or sensitive equipments having higher than normal or reversed voltage on them.

It is therefore essential, before disconnecting any grouped earth connections, that both the main and emergency batteries be disconnected at the battery terminals and that all electrical supplies be disconnected from the aircraft.

8. The crimping process is a solderless method of making electrical joints between cable conductors and plug pins, socket inserts, terminal tags, or ferrules. The contact pin or tag, after the insertion of the bared conductor, is swaged by a crimping tool. This operation imparts sufficient pressure to contract the pin or tag body round the conductor to make a sound mechanical and electrical joint. The crimping tool carries a detachable die which can be changed to accommodate the various sizes of plug pins, socket inserts, tags or ferrules. There is available a special crimping tool kit No.3 *(Ref.No. 5X/3186)* which comprises a hand tool and a range of dies suitable for crimping 4, 7 and 19 amp plug pins, socket inserts, and tags, etc.

9. To make a stronger joint when crimping the smaller size of cable, such as vin, cel, rubber 2.5 or Pren 4, the bared conductor should be doubled over before inserting it in the bore of the plug pin, insert or tag. After crimping the excess strands of wire should be carefully cut off before fitting a rubber sleeve over the joint.

10. In the standard type of Plessey socket, the contact inserts are secured in the moulding by spring clips which must be pressed down before the insert can be withdrawn. Special extractor tools for removing the inserts are available under the following Reference Numbers:-

Insert size	Ref.No.
7 amp	5X/2237
19 amp	5X/2238
37 amp	5X/2239
64 amp	5X/2240

11. The fitting of rubber sleeves, either as markers or for the protection of joints between cable conductors and

plug pins or socket inserts, requires the use of a special stretching tool. Two sizes of Hellerman 3-prong stretching tools are available, the Type A (Ref.No. 1C/5862) which is suitable for sleeves of sizes 0-4 and the Type B (Ref.No. 1C/5863) for sizes 5-10.

12. Servicing of Plessey plugs and sockets calls for special care during dismantling and reassembly. With the standard type, the socket coupling nut must always be slackened off first to allow the socket shell to be unscrewed independently of the inner moulding and cable leads. Pliers must never be used to unscrew tight socket shells - an adjustable strap wrench (Ref.No. 5X/1564) is available for this purpose. Before mating up multi-pole plugs and sockets it is essential to examine all contacts for the presence of metal swarf or other foreign matter which could cause shorting. The plug and socket threads must be kept clean and lightly lubricated with an approved low-temperature grease such as XG-287.

Pilot's station

13. All switches and instruments employed in the control of the aircraft are grouped on panels arranged round the cabin. The panels facing the pilot comprise three assemblies designated the main instrument panel: engine instrument panel, and starboard panel. Above these is a coaming panel on which are carried an E2B compass, certain wireless controls, an accelerometer and a number of cabin lamps and dimmer switches. Below the main instrument panel is the starter panel on which are the engine starting switches and the GM compass COMP-D/GYRO switch.

Pilot's console

14. The console structure at the port side of the pilot's seat carries on a detachable panel, switches associated with the control of all external lighting such as the navigation, taxying, landing, identification and anti-collision lamps. Also housed on this panel are switches which control the flying control trim circuits, the wing-tip tank/pod jettison circuits and certain cabin lighting lamps. At the aft end of the console under a detachable cover fitted with quick-release fasteners, are the fuses protecting the external lighting circuits. Spare fuses are carried in clips attached to the underside of the cover. Two 12-volt lead-acid batteries are housed behind the map stowage in the lower section of the console structure; these are provided for the emergency operation of the canopy and hatch jettison circuits and the turn-and-slip indicator. Connections to the equipment on the console are made by Plessey plugs and sockets on the underside of the detachable panel.

Take-off panel

15. Services which essentially must be in operation during take-off are controlled by switches grouped on a panel above and to port of the pilot's seat. These switches are associated with the control of battery isolation, canopy and hatch jettison, canopy demisting, fuel cocks, heating, alighting gear and No.1 and No.2 generator circuits.

Throttle box

16. The engine throttle box installed forward of the console panel carries the engine fuel pump isolation switches and, embodied in the handles of the H.P. fuel cock levers, the engine relight switches. Inside the box assembly is a microswitch which is connected into the alighting-gear circuit and operated when either throttle lever is less than one third open. Slow-speed running stops are fitted to the throttle quadrants to prevent under-frequency conditions occurring when running the a.c. generators on the ground.

Alighting-gear panel

17. This panel is located between the throttle box and the flight instrument panel. It carries the alighting-gear master switch, selector switch and position indicator together with the flaps control switch and indicator.

Flight instrument panel

18. The flight instrument panel, situated directly forward of the pilot's seat, embodies the flight instruments, navigational aid indicators, flying control trim indicators and instruments associated with ancillary services.

Engine instrument panel

19. This panel, positioned to starboard of the flight instrument panel, carries all engine instruments, fuel contents gauges and fuel pump switches. It also houses the d.c. generator failure warning lamps.

Starboard instrument panel

20. The starboard instrument panel is

fitted diagonally at the starboard side of the cabin between the engine instrument panel and frame 3. It carries the miscellaneous instruments, oxygen indicators, cooling fan switches, cabin air and fire extinguisher controls, a Tacan indicator and the pilot's U.H.F. control unit and U.H.F. installation control switches.

Starter panel

21. On this panel are mounted the engine MASTER STARTING and IGNITION switches START push-switch, and the GM COMPASS COMP-D/GYRO switch used in the GM4B compass circuit.

Control column

22. The right handgrip of the pilot's control column carries the tail plane control cut-in and trim switches and, in the crook of the handle, the V.H.F. radio press-to-transmit switch.

Electrical control panel (E.C.P.)

23. The E.C.P. is installed slightly aft and to starboard of the pilot's seat. Fitted to the forward face of the panel are the fuel pump test switches and ammeter socket, panel internal lighting switch, and No.1 and No.2 generator field circuit breakers. On the starboard side of the panel, under a cover secured with quick-release fasteners, is a further hinged panel on which is mounted the main assembly of fuses. This panel may be hinged down to give access to the heavy current fuses and relays inside the assembly. Two lamps, controlled by the switch on the forward face, provide illumination for servicing the fuse panel.

A.E.O.'s station

24. The equipment at the A.E.O.'s station mainly consists of the controls necessary to the operation of the special equipment. Also fitted at this station are wireless and radar controls, a pack bay fire warning lamp, a control switch and two indicator lamps associated with the pack-bay air inlet scoops circuit, a hatch jettison switch, the J.B.14, the GM4B compass control panel and amplifier, and the 400 Hz fusebox. The Davall recorder interface control unit is mounted beneath the A.R.I. 23166 control unit (port).

Navigator's station

25. The majority of the equipment at the navigator's station is fitted on the port wall and mounted on panels situated above the chart table. The equipment on the port wall consists mainly of wireless and radar controls and hatch jettison switches. Panels above the chart table house wireless and radar controls and indicators, navigation and flying instruments, lighting services and control switches, and a control panel associated with the turbine-driven alternators. Other controls and services mounted in panels at the starboard side of the chart table are, essentially, associated with the control of the special equipment and are considered as part of the A.E.O.'s station.

Pressure bulkhead

26. The pressurized and unpressurized sections of the aircraft are divided by the pressure bulkhead at the rear of the cabin. Two methods are employed to take the circuits through the bulkhead; in one of these the cable runs are broken by plugs and sockets and in the other the cables pass directly through it by way of Helvin rubber bungs. During servicing that involves the removal or refitting of equipment on the bulkhead it is essential that adequate sealing is ensured at the attachment points to prevent loss of pressure from the cabin.

Upper equipment compartment

27. This compartment, located above the nose-wheel well and aft of the pressure bulkhead, houses the No.2 distribution and relay box, the cabin pressure control valve, the instrument a.c. supplies step-down transformer and undervoltage and phase-sequence unit and the detonator resistor boxes for the hatch jettison circuit. Access to the equipment is gained through the roof of the compartment after the opening of a hinged panel.

Port equipment compartment

28. Situated on the port side of the nose-wheel bay, between the pressure bulkhead and frame 12, this compartment houses the contents and pressure gauges, and reducing valves for the nitrogen system, the contents gauge for the hydraulic wheel-brake system, the pack bay fire detector control unit, and the port inertia switch. Access to the equipment is by a hinged hatch forward of the battery bay.

Starboard equipment compartment

29. Situated at the starboard side of the nose-wheel bay, between the pressure bulkhead and frame 12, this compartment houses the main electrical panel assemblies, a.c. power supply inverters No.1 and No.2, the starboard inertia switch,

mounted below the inverters on the fuselage structure, and the ground services earth point. Access to the equipment is through a hinged door in the starboard side of the fuselage. Illumination of the equipment is provided by a floodlamp fitted above the access door.

Main electrical panel (M.E.P.)

30. Three sub-assemblies designated the forward, aft and busbar panels comprise the M.E.P. The forward and aft panels are installed on the starboard wall of the nose-wheel bay, whilst the busbar panel is mounted in an inverted position on the underside of the upper equipment compartment floor. The panel assemblies carry the generator control and test equipment, battery isolation relay, external power plugs, crash relays, and heavy current H.R.C. fuses used in the d.c. distribution.

Armament safety-break panel

31. This panel is situated just aft of the starboard equipment compartment access door. Removal of its detachable cover exposes the safety-break, comprised of a multi-pin fixed socket and free plug attached to a red warning pennant. Below the safety break is an armament test switch in which must be fitted a ground test key (Ref.No. 1E/5245) to permit ground functioning of the armament system.

Pack bay

32. Among the many items of equipment installed in the pack bay are the electrically-driven fuel pumps and cocks, J.B.1, 2, 3 and 5, and the electrically-operated hydraulic valves which control the alighting gear, air scoops, flaps and air brakes. On the forward and aft bulkhead is fitted a fire extinguisher to protect the special equipment mounted in the bay. A Firewire sensing element is positioned on either side of the roof down the entire length of the bay and operates in conjunction with a control unit to provide a fire warning. Three inlet scoops and two outlet ducts are provided for equipment cooling, operation of the scoops is controlled by an hydraulic valve, microswitches, positioned adjacent to the scoop at frame 21, provide an indicator circuit. No.1 distribution box, a contactor panel and a busbar switching logic unit are mounted on the roof of the bay and provide the control and distribution of the supplies from the alternators for the special equipment. Access to the equipment in the bay is obtained through the eight access panels positioned four on either side of the bay lower centre member.

Rear fuselage

33. The main items of electrical equipment installed in the rear fuselage are the fire extinguisher on frame 27A, J.B.6, rudder trim actuator, navigation lamps, the tail-plane actuator with its associated isolating relay and limit microswitches and the anti-collision lamps and flasher unit. Access to the rear fuselage is through a hinged hatch door on the underside of the structure, just aft of the pack bay.

Earth bonding data

34. There are three main earth bonding data.

(a) the generator earth terminal in the port and starboard wheel wells.

(b) the battery negative in the fuselage.

9000 series switches

35. Some of the 9000 series switches fitted on the aircraft, may incorporate a lever lock at the centre position only, or at the operated position, or at the operated positions and centre position. To operate any of these switches, the switch toggle must be pulled to unlock the toggle, before the next selection can be made.

TABLE 1

Fuse numbers, ratings and locations

SERVICE	FUSE No.	RATING (AMP)	CIRCUIT REF.	LOCATION
Battery isolating	1	5	P91	
Fire extinguishers (fuselage)	2	20	X1	
A.C. ground supply	3	5	VV1	
Fatigue meter	4	5	FF1	
Volt and ammeter test socket	5	5	P51	
Ammeter test socket	6	5	P71	
Ammeter test socket	7	5	P81	
Volt and ammeter test socket	8	5	P61	
Voltmeter	9	5	V +	
No.1 generator failure warning lamp	10	5	W1	M.E.P.
No.2 generator failure warning lamp	11	5	W2	
Equipment bay lamp	12	5	LL4	
No.2 U.H.F. supply	13	40	RR3	
Spare	14	–	–	
Canopy jettison	15	60	X5	
Hatch jettison	16	60	X6	
E.C.P. feeder	17	125	PP1	
E.C.P. feeder	18	125	PP2	
E.C.P. feeder	19	60	PP7	
E.C.P. feeder	20	60	PP8	
No.2 inverter supply	21	20	M2	
Spare	22	–	–	
Instrument supply and No.2 inverter	23	10	M8	
Fuel pump, No.1 port	24	20	Z1	
Fuel cock, No.1 port	25	5	Y1	E.C.P.
Oxygen warning, navigator and A.E.O.	26	5	W5	
Pilot's instrument lighting (red)	27	5	L5	
Rudder trim position indicator	28	5	C6	
Flap control actuator	29	5	C3	
Flap position indicator	30	5	C4	
Air thermometer	31	5	F2	
Aileron trim control	32	10	CC1	
Alleron position indicator	33	5	CC2	
◀ Exhaust gas temperature	34	5	Q5	▶
Rudder trim control	35	10	C5	
Fuel cock, No.2 port	36	5	Y3	
Fuel pump, No.3 port	37	20	Z5	
Fuel cock, No.3 port	38	5	Y5	
Undercarriage indicator	39	5	U2	
Undercarriage control	40	10	U1	
No.1 engine fuel pressure warning	41	5	W3	
No.2 engine fuel pressure warning	42	5	W4	E.C.P.
Fire extinguisher (No.1 engine)	43	5	X1-P	
Fire detector switches (No.1 engine)	44	5	X3	
Cabin air shut-off, No.1 engine	45	5	HH1	
Cabin air shut-off, No.2 engine	46	5	HH2	
Canopy de-misting	47	5	H7	
Cooling fans	48	5	HH5	
Pilot's instrument lights (U/V)	49	5	L6	
Fuel pump, No.2 port	50	20	Z3	
Pressure head heater	51	10	H4	
Vent valve heater (not used)	52	–	H5	
Windscreen heater	53	10	H6	

continued . . .

TABLE 1 Fuse numbers, ratings and locations – *continued*

SERVICE	FUSE No.	RATING (AMP)	CIRCUIT REF.	LOCATION
Periscope sextant heater	54	5	H8	
Tail-plane isolating	55	5	CC7	
Tail-plane incidence control	56	5	CC5	
Turn-and-slip indicator supply	57	5	F5	
Tail-plane position indicator	58	5	C7	
Window launcher control unit	59	5	A4	
Turn-and-slip indicator supply	60	5	F4	
Dive brake control	61	10	C9	
Fuel contents gauges	62	7.5	Q7	
Fuel pump, No.1 starboard	63	20	Z2	
Fuel cock, No.1 starboard	64	5	Y2	
Fuel pump, No.2 starboard	65	20	Z4	
Fuel cock, No.2 starboard	66	5	Y4	
E.C.P. lights	67	5	LL5	
Fuel cock, No.3 starboard	68	5	Y6	
Wing-tip pod/tank jettison	69	10	Y7	E.C.P.
Ignition master switch (No.1 engine)	70	10	J1	
No.1 engine ignition units	71	20	J5	
Fuel pump isolation (port)	72	5	J3	
Navigator's and A.E.O.'s lights	73	5	L9	
Console and deviation card lights	74	5	L7	
Fuel pump isolation (starboard)	75	5	J4	
◀ Fire extinguisher (No. 2 engine	76	5	X1-S ▶	
Fire detector switches (No.2 engine)	77	5	X4	
No.1 inverter supply	78	20	M1	
Oxygen warning, pilot's	79	5	W6	
Cabin air control	80	5	H1	
Cabin air control Indicator	81	5	H2	
Cabin air pressure warning	82	5	H3	
No.2 engine ignition units	83	20	J6	
Ignition master switch (No.2 engine)	84	10	J2	
Fuel pump, No.3 starboard	85	20	Z6	E.C.P.
UA.60 station box lights	86	5	LL7	
Control unit panel lights (pilot's radio)	87	5	LL8	
Tacan and H.F. control unit lights	88	5	LLL1	
Navigator's panel lights	89	5	LLL2	
No.1 inverter control	90	10	M7	
Alternator control (port)	91	5	V1	
Main alternator control	92	5	W9	
Spare	93	–	–	
Spare	94	–	–	
Landing lamp switch	95	5	L3	
Anti-collision lamps	96	10	L10	Pilot's console
Navigation lamps	97	5	L1	
Identification lamps	98	5	LL1	
Taxying lamps	99	10	L2	
Landing lamp filament	100	20	L4	
Oil pressure gauge (No.1 engine)	101	5	Q3	
Oil pressure gauge (No.2 engine)	102	5	Q4	No.2 dist. box
Radio supplies transformer, 26 V	103	5	TR6	
Spare	104	–	–	
Spare	105	–	–	

continued

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TABLE 1 Fuse numbers, rating and locations – *continued*

SERVICE	FUSE No.	RATING (AMP)	CIRCUIT REF.	LOCATION
Spare	106	–	–	No.2
Automatic height encoding	107	5	FFC2	dist.
Tacan single-phase a.c.	108	7.5	SA2	box
GM4B compass amplifier	109	5	FR3	
Spare	110	–	–	
Artificial horizon	111	5	FR6	
Spare	112	–	–	
GM4B compass amplifier	113	5	FB3	
Spare	114	–	–	
Artificial horizon	115	5	FB6	
Heater supply (windscreen)	116	5	HB6	
Spare	117	–	–	
Spare	118	–	–	400 Hz
G.P.I.	119	5	F8	fusebox
GM4B compass amplifier	120	5	F3	
Spare	121	–	–	
Spare	122	–	–	
Spare	123	–	–	
Spare	124	–	–	
Spare	125	–	–	
Spare	126	–	–	
Spare	127	–	–	
Spare	128	–	–	
Turn-and-slip emergency supply	129	5	FX4	Pilot's
Emergency lights (pilot's)	130	5	LL2	console
Spare	131	–	–	(lower)
Spare	132	–	–	
Spare	137	–	–	
Tail-plane control	138	60	C2	
Spare	139	–	–	M.E.P.
No.1 distribution box busbar	140	20	PP4	
No.1 distribution box busbar	141	20	PP5	
Scoop shutter indication	142	5	HH3	
Spare	143	–	–	
Spare	144	–	–	
Spare	145	–	–	
Cartridge discharge supply	146	D	A6	
Cartridge discharge control	147	D	A5	
Wander lamp socket (M.E.P.)	148	5	L8	M.E.P.
Spare	149	–	–	
Spare	150	–	–	
Spare	151	–	–	
No.1 stripper unit motor	152	40	A2	
No.2 stripper unit motor	153	40	A3	
High energy ignition unit (No.1 engine)	156	10	J51A	
High energy ignition unit (No.1 engine)	157	10	J51B	
High energy ignition unit (No.2 engine)	158	10	J61A	
High energy ignition unit (No.2 engine)	159	10	J61B	
Special equipment lighting	160	5	LL6	
Special equipment lighting	161	5	LL62	
Special equipment lighting	162	5	LL65	
Instrument a.c. selector switch	163	5	M6	E.C.P.
I.F.F. lamp check	164	5	S1	
TACAN supply	165	7.5	S2	
Green satin power switch	166	5	S3	
VOR/ILS supply	167	10	S4	
U.H.F aerial change over	168	5	R8	
H.F. radio supply	169	10	RR1	
A.R.I.23287	170	10	–	
Davall recorder	171	5	–	
V.H.F. supply	172	10	R1	
V.H.F. supply	173	5	R2	
Intercomm. UA60 supply	174	5	R4	

continued . . .

TABLE 1 Fuse numbers, ratings and locations – *continued*

SERVICE	FUSE No.	RATING (AMP)	CIRCUIT REF.	LOCATION
Radio compass supply	175	5	R5	
Ground crew I/comm. isolator switch	176	5	R9	
◀ Emergy. intercomm. supply	177	5	RR4	▶
Spare	178	–	–	
Spare	179	–	–	
Spare	180	–	–	
Spare	181	–	–	
Spare	182	–	–	
Spare	183	–	–	
A.R.I.23165 power supply (fwd.)	184	10	SS1	
Repeater forward	185	20	SS3	
Aerial selector forward	186	5	SS5	
Alternator control (starboard)	187	5	V4	
Fuselage fire warning (pack bay)	188	5	X8	E.C.P.
Fuselage fire extinguishers (pack bay)	189	20	X2	
Spare	190	–	–	
Spare	191	–	–	
Spare	192	–	–	
Spare	193	–	–	
Spare	194	–	–	
Spare	195	–	–	
Spare	196	–	–	
Spare	197	–	–	
Spare	198	–	–	
Spare	199	–	–	
A.R.I.23165 power supply (aft)	200	10	SS2	
Repeater aft	201	20	SS4	
Aerial selector aft	202	5	SS6	
Scoop shutter control	203	5	HH4	
Automatic height encoding	204	5	FF2	
28 volts d.c. test position	205	5	FF3	
28 volts d.c. test socket	206	5	FF4	
Spare	207	–	–	
Spare	208	–	–	
Spare	209	–	–	
Spare	210	–	–	
Spare	211	–	–	E.C.P.
Spare	212	–	–	
Spare	213	–	–	
Spare	214	–	–	
Spare	215	–	–	
Pilot's console busbar	216	40	PP3	
Spare	217	–	–	
No.1 U.H.F. supply	218	10	R6	
H.F. supply	219	30	R3	
Spare	220	–	–	
Spare	221	–	–	
R.M.I. compass card	223	5	RRR2	
Radio compass	224	5	RR5	
VOR/ILS	225	5	SR4	
Spare	226	–	–	
H.F. supply	227	5	RC3	
Spare	228	–	–	
Spare	229	–	–	Radio
Spare	230	–	–	fuse &
Spare	231	–	–	relay
Spare	232	–	–	box
Spare	233	–	–	
Spare	234	–	–	
A.R.I.23287	235	5	1XB2	
Spare	236	–	–	
Spare	237	–	–	
Spare	238	–	–	
A.R.I.23166 (starboard)	241	5	S5	No.1 dist. box

continued . . .

TABLE 1 Fuse numbers, ratings and locations – *continued*

SERVICE	FUSE No.	RATING (AMP)	CIRCUIT REF.	LOCATION
A.R.I.23166 (port) or A.R.I.23167	242	5	S7	No.1 dist. box
Alternator cooling fan control (starboard)	243	5	HH7	
I.F.F. aerial switch	244	5	SS7	
Logic unit	245	10	V7	
A.R.I.23166 (aft)	246	5	S6	
Busbar interconnected warning	247	5	W7	
Alternator cooling fan control (port)	248	5	HH6	
I.F.F. supply relay	249	5	SS8	
Radio altimeter	250	5	R7	
◀ No.2 U.H.F. supply	251	10	RR1 ▶	Upper equipment compartment
No.2 distribution box	261	10	1XA1	No.1 dist. box
Radio fuse and relay box	262	10	1XA2	
Instrument supplies transformer	263	10	TA4	
Green satin transformer supply	264	5	SA3	
A.R.I.23165 (fwd.) generator	265	5	SA8	
A.R.I.23165 (fwd.) power supply	266	15	SSA1	
A.R.I.23166 (starboard)	267	15	SA5	
Test socket ground load	268	10	1XA3	
Frequency meter	269	5	DA1	
Alternator cooling fan (port)	270	5	HHA6	
Spare	271	–	–	
Spare	272	–	–	
Spare	273	–	–	
Spare	274	–	–	
Alternator cooling fan (starboard)	275	5	HHA7	
Frequency meter	276	5	DA2	
A.R.I.23166 (aft)	277	15	SA6	
A.R.I.23165 power supply (aft)	278	15	SSA2	
A.R.I.23165 generator (aft)	279	5	SA9	No.1 dist. box
A.R.I.23166 (port) to A.R.I.23167 supply	280	20	SA7	
Spare	281	–	–	
Spare	282	–	–	
Spare	283	–	–	
Spare	284	–	–	
Spare	285	–	–	
No.2 distribution box	286	spare	1XB1	
Radio fuse and relay box	287	10	1XB2	
Instrument supplies transformer	288	10	TB4	
Green satin supply	289	5	SB3	
A.R.I.23165 generator (fwd.)	290	5	SB8	
A.R.I.23165 power supply (fwd.)	291	15	SSB1	
A.R.I.23166 (starboard)	292	15	SB5	
Test socket ground load	293	10	1XB3	
Alternator cooling fan (port)	294	5	HHB6	
Radio altimeter	295	5	RB7	
Spare	296	–	–	
Spare	297	–	–	
Spare	298	–	–	
Spare	299	–	–	
Alternator cooling fan (starboard)	300	5	HHB7	
Spare	301	–	–	
A.R.I.23166 (aft)	302	15	SB6	
A.R.I.23165 power supply (aft)	303	15	SSB2	
A.R.I.23165 generator (aft)	304	5	SB9	
A.R.I.23166 (port) or A.R.I.23167	305	20	SB7	

continued . . .

TABLE 1 Fuse numbers, ratings and locations – *continued*

SERVICE	FUSE No.	RATING (AMP)	CIRCUIT REF.	LOCATION
Spare	306	–	–	No.1 dist. box
Spare	307	–	–	
Spare	308	–	–	
Spare	309	–	–	
Spare	310	–	–	
No.2 distribution box	311	10	1XC1	
Radio fuse and relay box	312	10	1XC2	
Instrument supplies transformer	313	10	TC4	
Green satin supply	314	5	SC3	
A.R.I.23165 generator (fwd.)	315	5	SC8	
A.R.I.23165 power supply (fwd.)	316	15	SSC1	
A.R.I.23166 (starboard)	317	15	SC5	
Test socket ground load	318	10	1XC3	
Alternator cooling fan (port)	319	5	HHC6	
I.F.F. trans/rect.	320	5	SC1	
115 volts a.c. test socket	321	5	FFC3	
Spare	322	–	–	
Spare	323	–	–	
Spare	324	–	–	
Alternator cooling fan (starboard)	325	5	HHC7	
Spare	326	–	–	
A.R.I.23166 (aft)	327	15	SC6	
A.R.I.23165 power supply (aft)	328	15	SSC2	
A.R.I.23165 generator (aft)	329	5	SC9	
A.R.I.23166 (port) or A.R.I.23167 supply	330	20	SC7	
Hatch jettison relay test		0.25	X61	Pilot's port console
Canopy jettison relay test		0.25	X51	

TABLE 2

Lamp filaments, ratings and locations

SERVICE	LOCATION	REF.NO.	NO.OFF	VOLTAGE	WATTS
Fire warning	Starboard instrument panel	5L/9951273	3	28	3.5
Fire warning	A.E.O.'s station	5L/9959118	1	28	0.04
Scoop shutter position indicators	A.E.O.'s station	5L/9951273	2	28	3.5
Generator failure warning	E.C.P.	5L/9951273	2	28	3.5
Pilot's instrument lighting (U/V)	Port and starboard cabin	5L/9952261	4	12	7
Pilot's instrument lighting (red)	Port and starboard cabin	5L/9951263	10	24	2.8
Pilot's instrument lighting, emergency	Canopy coaming	5L/9951283	2	28	3.5
Downward identification	Underside of fuselage (frame 12)	5L/9952604	3	24	80
Navigation	Wing tips, port and starboard	5L/9952431	2	28	24
Navigation (when wing-tip tanks or pods are fitted)	Jettisonable tanks or pods	5L/9952431	2	28	24
Taxying	Wing tips, port and starboard	5L/9952511	2	24	60
Landing	Underside port wing	5L/9954717	1	26	240
Fuel pressure warning	Engine instrument panel	5L/9951110	2	6	0.24
Fuselage lighting	Cabin (port)	5L/9953271	1	28	7
Servicing	Starboard equipment bay	5L/9953271	1	28	7
Alighting-gear indicator	Pilot's port panel	5L/9951286	9	28	2.5
Console lighting (red)	Console	5L/9951263	2	24	2.8
E2 compass lighting	Pilot's cabin coaming	5L/9959211	1	24	2.4
No.3 fuel gauge lighting	Engine instrument panel	5L/9959211	1	24	2.4
Navigator's and A.E.O.'s adjustable lamps	Chart board lamp	5L/9953278	2	28	18
Inspection lamp	Cabin starboard side	5L/9952254	1	24	6
Upper anti-collision lamp	Upper side rear fuselage	5L/2641	2	28	40
Lower anti-collision lamp	Underside rear fuselage	5L/2641	2	28	40
	▶◀				
Navigation lamps tail	Above and below tail-plane	5L/9952276	2	24	10
Hatch jettison relay test	Pilot's port console	5L/9959182	1	28	1.1
Canopy jettison relay test	Pilot's port console	5L/9959182	1	28	1.1

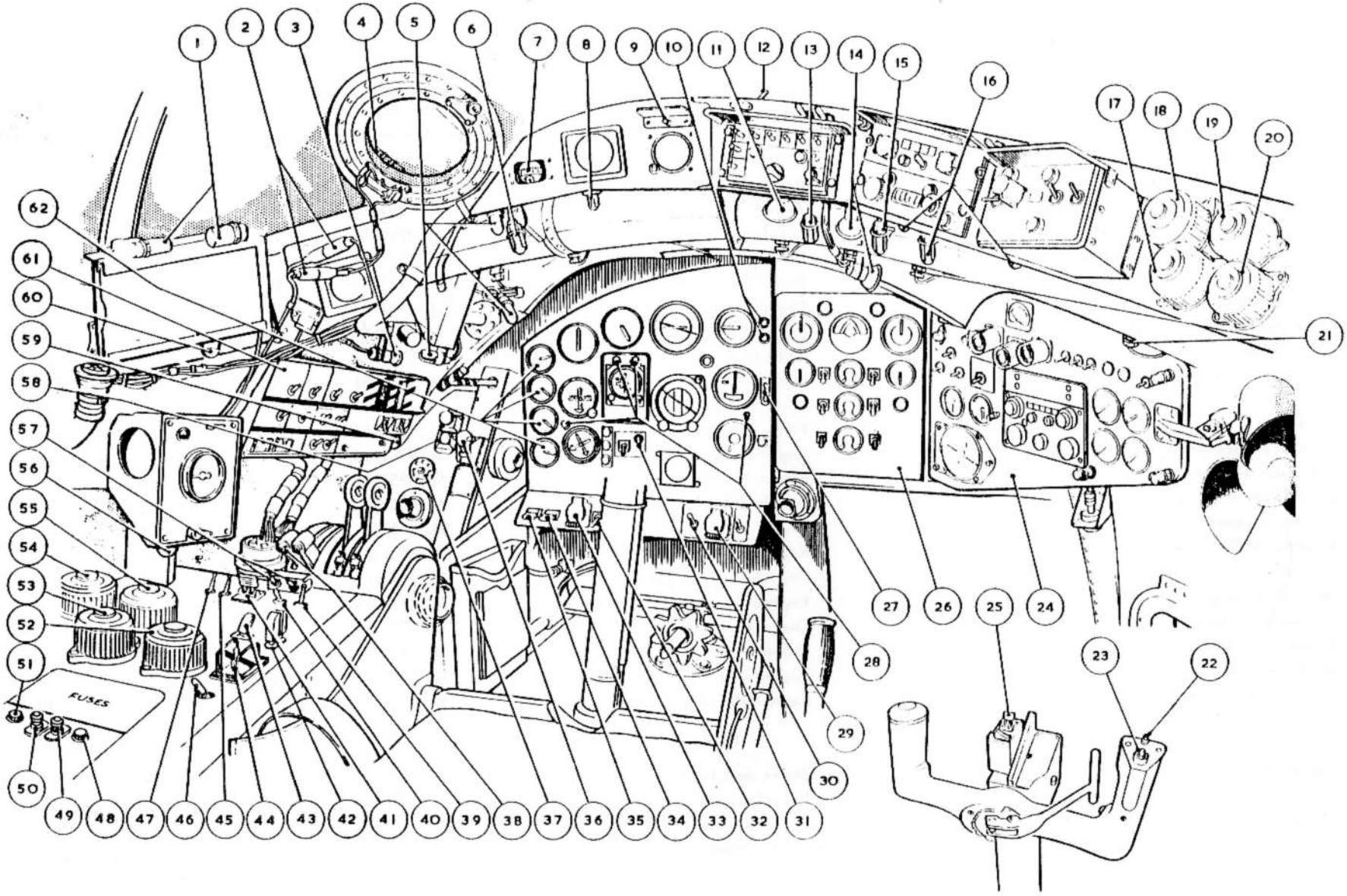
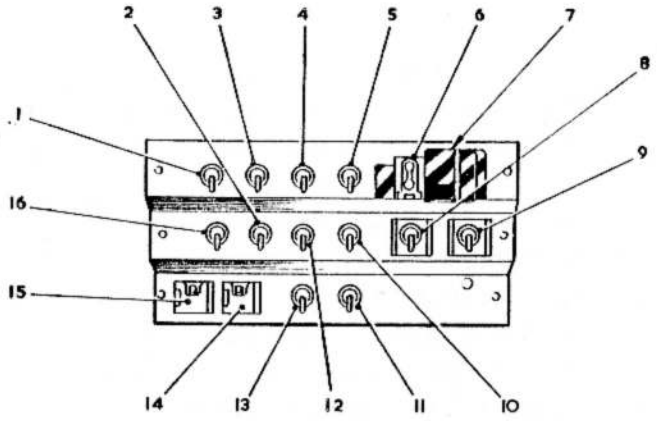


FIG. 1. ELECTRICAL INSTALLATION - PILOT'S STATION

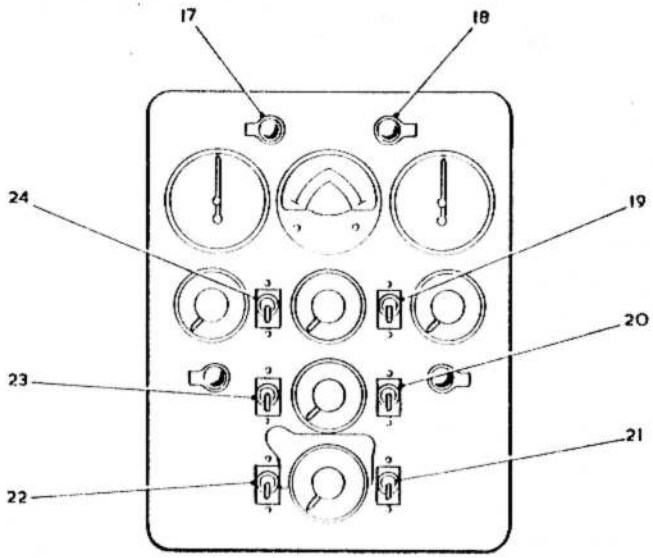
◄ MOD. 5428 EMBODIED ►

KEY TO FIG. 1 (PILOT'S STATION)

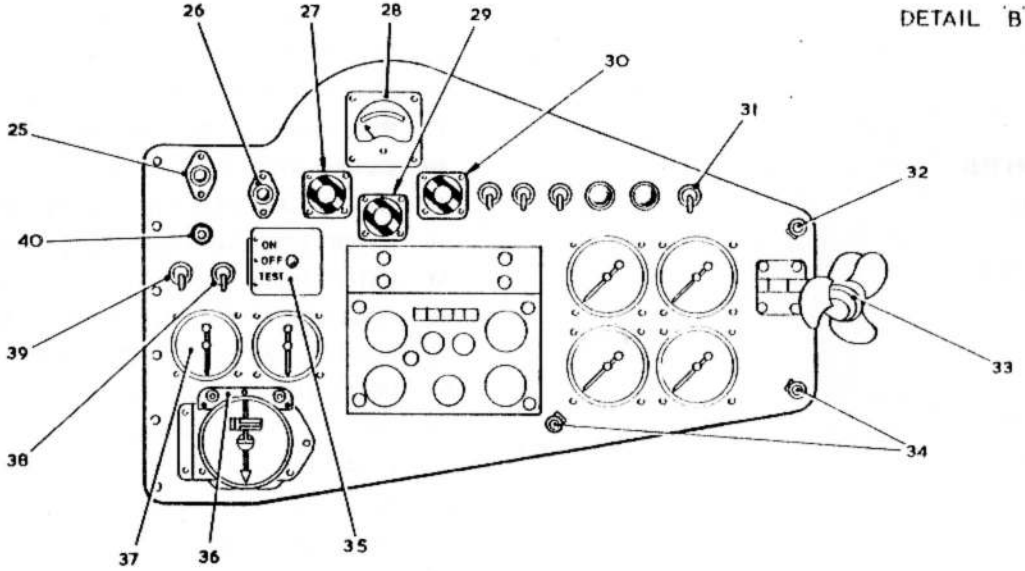
1 DEVIATION CARD LAMPS
2 D.V. WINDOW HEATER PLUGS AND SOCKETS
3 U/V LAMP (PORT)
4 D.V. WINDOW HEATER
5 PORT RED FLOODLAMPS (3)
6 EMERGENCY RED FLOODLAMP (PORT)
7 E2B COMPASS LAMP (INTEGRAL WITH COMPASS)
8 PORT RED FLOODLAMP
9 ACCELEROMETER LAMP
10 INSTRUMENT EMERGENCY A.C. SUPPLY INDICATORS (NO.1 AND 2 INVERTERS)
11 PORT U/V LAMP
12 EMERGENCY LIGHTS SWITCH
13 STARBOARD RED FLOODLAMP
14 STARBOARD U/V LAMPS (2)
15 EMERGENCY RED FLOODLAMP (STARBOARD)
16 STARBOARD RED FLOODLAMPS (3)
17 STARBOARD U/V LAMPS DIMMER SWITCH
18 RADIO CONTROL PANEL LAMPS DIMMER SWITCH
19 INTERCOMM. STATION BOX LAMPS DIMMER SWITCH
20 STARBOARD RED FLOODLAMPS DIMMER SWITCH
21 CANOPY DETONATORS
22 TAIL-PLANE TRIM CUT-IN SWITCH
23 TAIL-PLANE TRIM SWITCH
24 STARBOARD INSTRUMENT PANEL - REFER TO DETAIL C, FIG.1A
25 AIR-BRAKES CONTROL SWITCH
26 ENGINE INSTRUMENT PANEL - REFER TO DETAIL B, FIG.1A
27 TURN-AND-SLIP INDICATOR SUPPLIES SWITCH
28 ALTIMETER, I.L.S. INDICATOR AND RADIO COMPASS LAMPS
29 NO.2 ENGINE START PUSH-BUTTON
30 NO.2 ENGINE IGNITION SWITCH
31 INSTRUMENT A.C. SUPPLY SELECTOR SWITCH
32 NO.1 ENGINE IGNITION SWITCH
33 NO.1 ENGINE START PUSH-BUTTON
34 NO.2 ENGINE MASTER STARTING SWITCH
35 NO.1 ENGINE MASTER STARTING SWITCH
36 FLAP SELECTOR
37 ALIGHTING-GEAR POSITION INDICATOR
38 NO.1 AND NO.2 ENGINE RELIGHT BUTTONS
39 EXTERNAL LIGHTS MASTER SWITCH
40 IDENTIFICATION LAMPS SWITCH
41 LANDING LAMPS SWITCH
42 RUDDER TRIM SWITCH
43 AILERON TRIM SWITCH
44 WING-TIP PODS/TANKS JETTISON SWITCH
45 TAXYING LAMPS SWITCH
46 ANTI-COLLISION LAMPS SWITCH
47 NAVIGATION LAMPS SWITCH
48 CANOPY JETTISON RELAY TEST FUSE
49 CANOPY JETTISON RELAY TEST SWITCH
50 HATCH JETTISON RELAY TEST SWITCH
51 HATCH JETTISON RELAY TEST FUSE
52 PORT RED FLOODLAMPS DIMMER SWITCH
53 CONSOLE RED FLOODLAMPS DIMMER SWITCH
54 DEVIATION CARD HOLDER LAMPS DIMMER SWITCH
55 PORT U/V LAMPS DIMMER SWITCH
56 CONSOLE RED FLOODLAMP
57 FUEL PUMP ISOLATING SWITCHES
58 ALIGHTING-GEAR SELECTOR SWITCH
59 CONSOLE RED FLOODLAMP
60 OXYGEN REGULATOR RED FLOODLAMP
61 TAKE-OFF PANEL - REFER TO DETAIL A, FIG.1A
62 CONTROL SURFACE POSITION INDICATORS



DETAIL 'A'



DETAIL 'B'



DETAIL 'C'

FIG. 1A. ELECTRICAL INSTALLATION - PILOT'S PANEL DETAILS

◄ MOD 5428 EMBODIED ►

KEY TO FIG. 1A (PILOT'S PANEL DETAILS)

1 NO.1 TANK, PORT COCK SWITCH
2 NO.2 TANK, STARBOARD COCK SWITCH
3 NO.1 TANK, STARBOARD COCK SWITCH
4 ALIGHTING-GEAR MASTER SWITCH
5 BATTERY SWITCH
6 CANOPY/SNATCH MASTER SWITCH
7 CANOPY JETTISON SWITCH
8 NO.1 PORT GENERATOR SWITCH
9 NO.2 STARBOARD GENERATOR SWITCH
10 D.V. WINDOW HEATER SWITCH
11 VENT VALVE HEATER SWITCH
12 PRESSURE HEAD HEATER SWITCH
13 CANOPY DE-MIST SWITCH
14 NO.3 TANK, STARBOARD COCK SWITCH
15 NO.3 TANK, PORT COCK SWITCH
16 NO.2 TANK, PORT COCK SWITCH
17 NO.1 GENERATOR FAILURE WARNING LAMP
18 NO.2 GENERATOR FAILURE WARNING LAMP
19 NO.1 TANK, STARBOARD PUMP SWITCH
20 NO.2 TANK, STARBOARD PUMP SWITCH
21 NO.3 TANK, STARBOARD PUMP SWITCH
22 NO.3 TANK, PORT PUMP SWITCH
23 NO.2 TANK, PORT PUMP SWITCH
24 NO.1 TANK, PORT PUMP SWITCH
25 PACK BAY FIRE WARNING TEST SWITCH
26 ENGINE FIRE WARNING LAMPS TEST SWITCH
27 NO.1 ENGINE COMBINED PUSH-SWITCH AND FIRE WARNING LAMP
28 D.C. VOLTMETER
29 PACK BAY FIRE COMBINED PUSH-SWITCH AND FIRE WARNING LAMP
30 NO.2 ENGINE COMBINED PUSH-SWITCH AND FIRE WARNING LAMP
31 FAN SWITCH
32 OXYGEN CONTENTS GAUGE PILLAR LAMP
33 FAN
34 HYDRAULIC GAUGES PILLAR LAMPS
35 CABIN PRESSURE WARNING HORN SWITCH
36 TACAN INDICATOR BRIDGE LAMP
37 CABIN HEAT INDICATOR
38 NO.2 ENGINE, AIR-TO-CABIN VALVE SWITCH
39 NO.1 ENGINE, AIR-TO-CABIN VALVE SWITCH
40 CABIN AIR TEMPERATURE CONTROL SWITCH

UK RESTRICTED

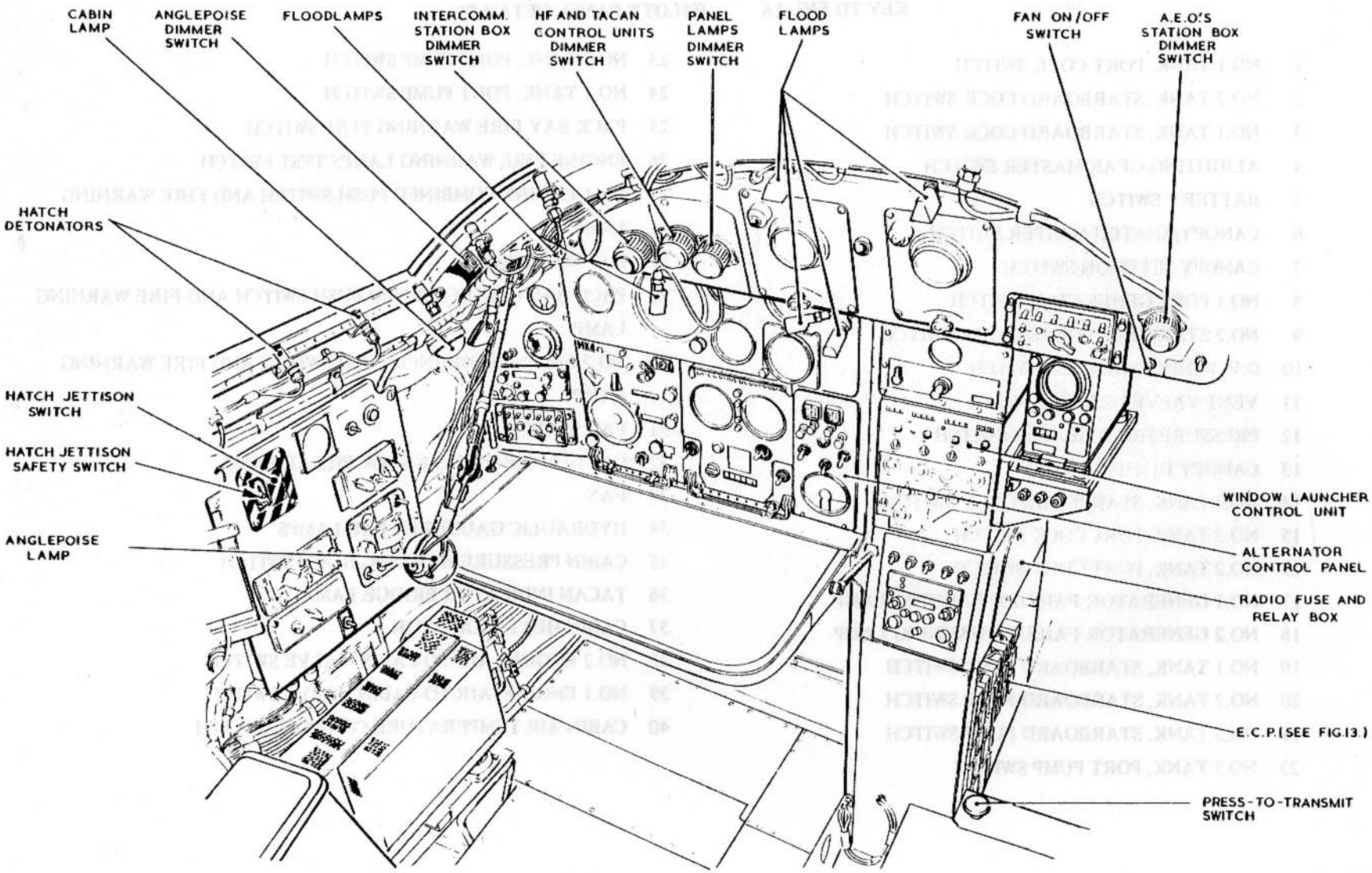


FIG. 2. ELECTRICAL INSTALLATION - NAVIGATOR'S STATION

◂MOD 5506 EMBODIED▸

UK RESTRICTED

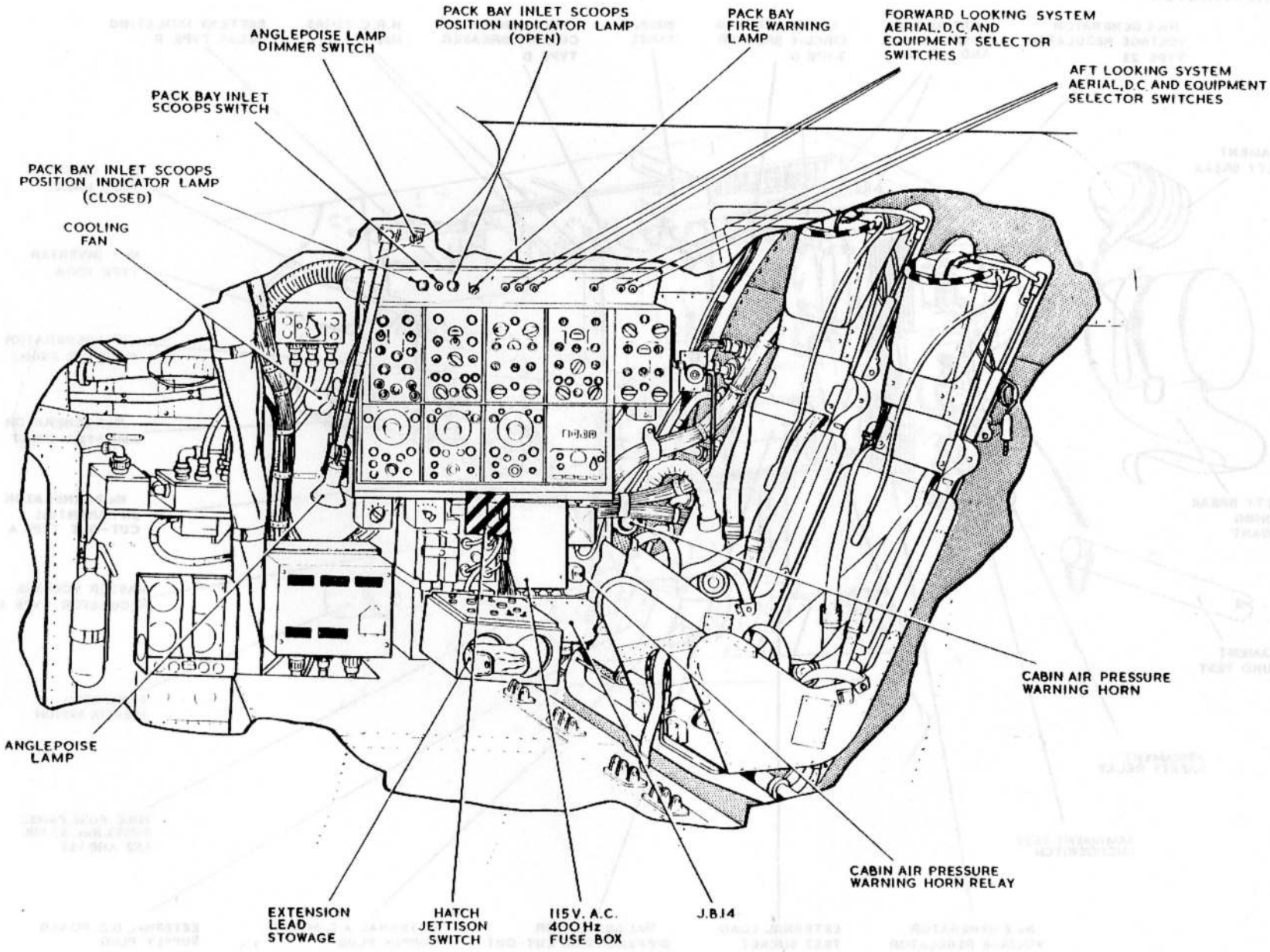


FIG. 3. ELECTRICAL INSTALLATION - A.E.O's. STATION

◂MOD 5506 EMBODIED▸

UK RESTRICTED

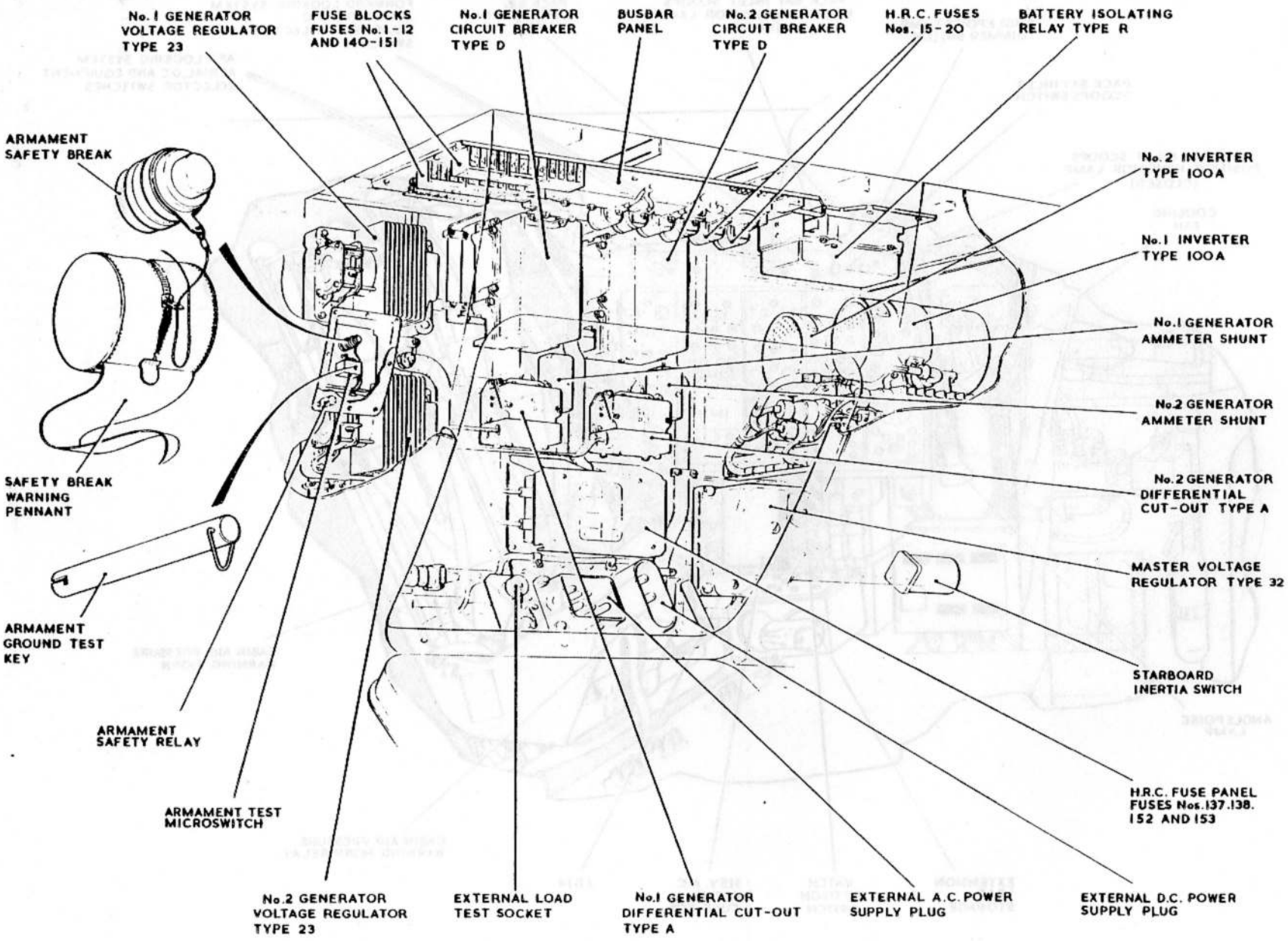


FIG. 4. ELECTRICAL INSTALLATION - STARBOARD EQUIPMENT COMPARTMENT

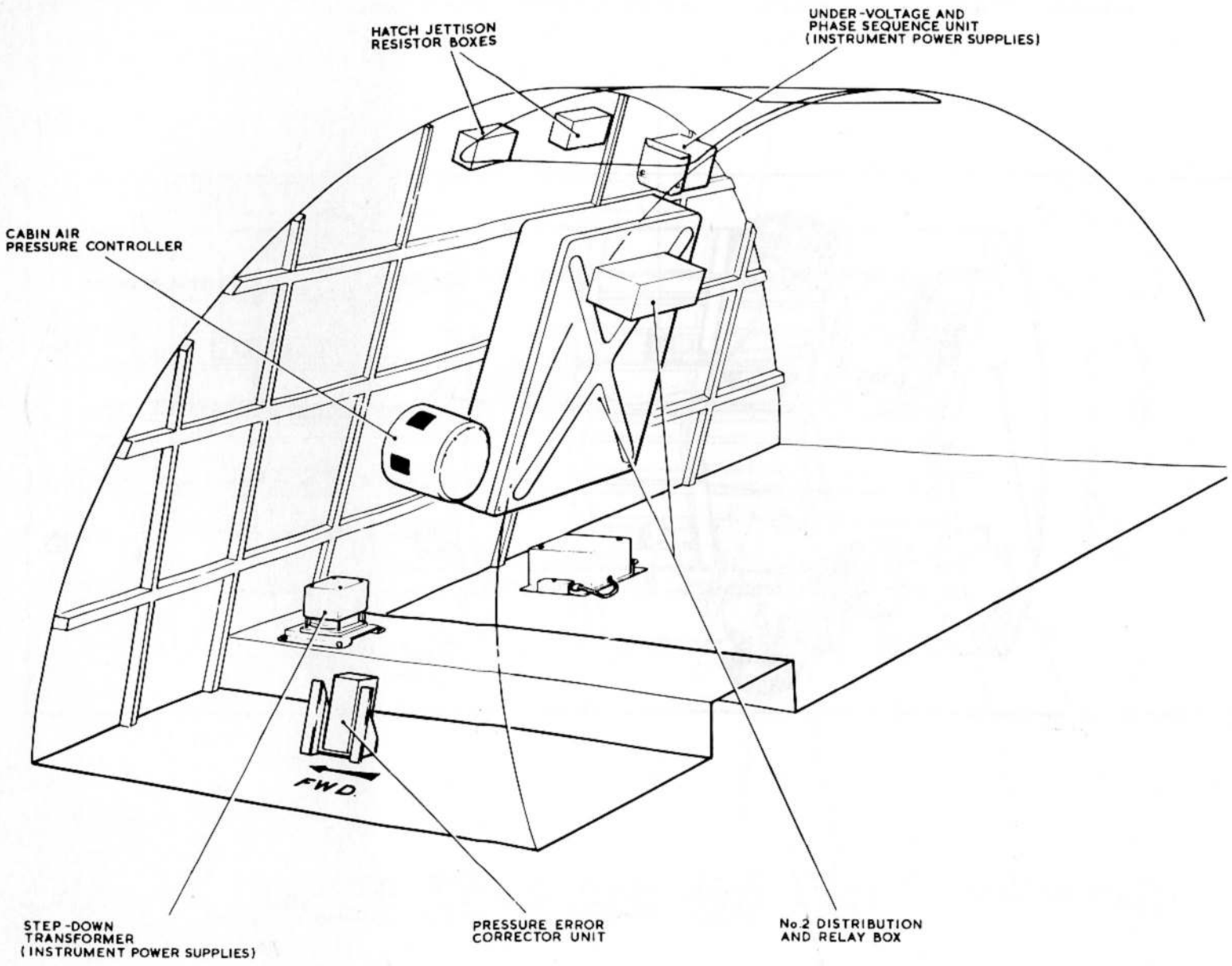


FIG. 5. ELECTRICAL INSTALLATION - UPPER EQUIPMENT COMPARTMENT

◀ MOD. 4865 EMBODIED ▶

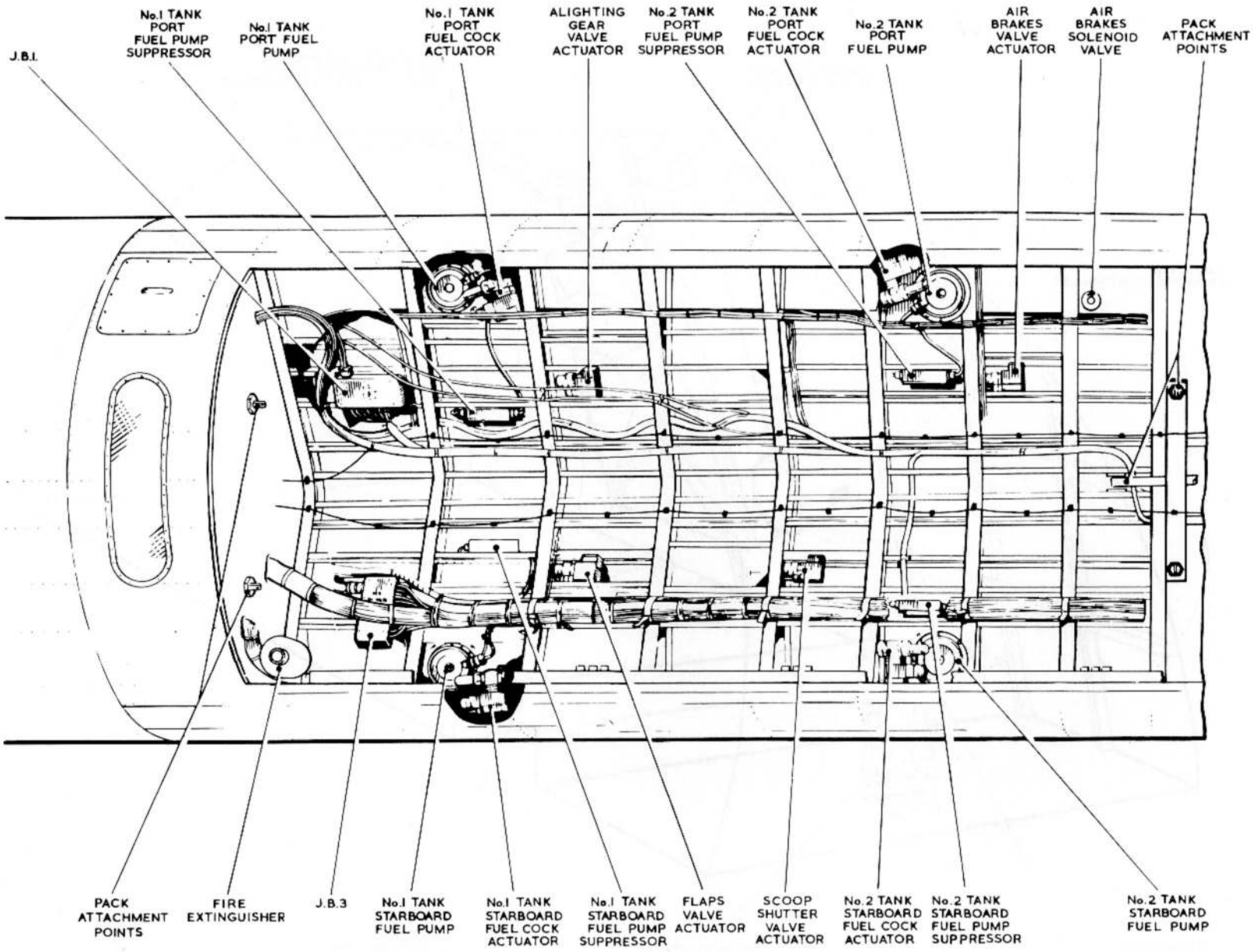


FIG. 6. ELECTRICAL INSTALLATION – PACK BAY

◀ MASTER KEY DELETED ▶

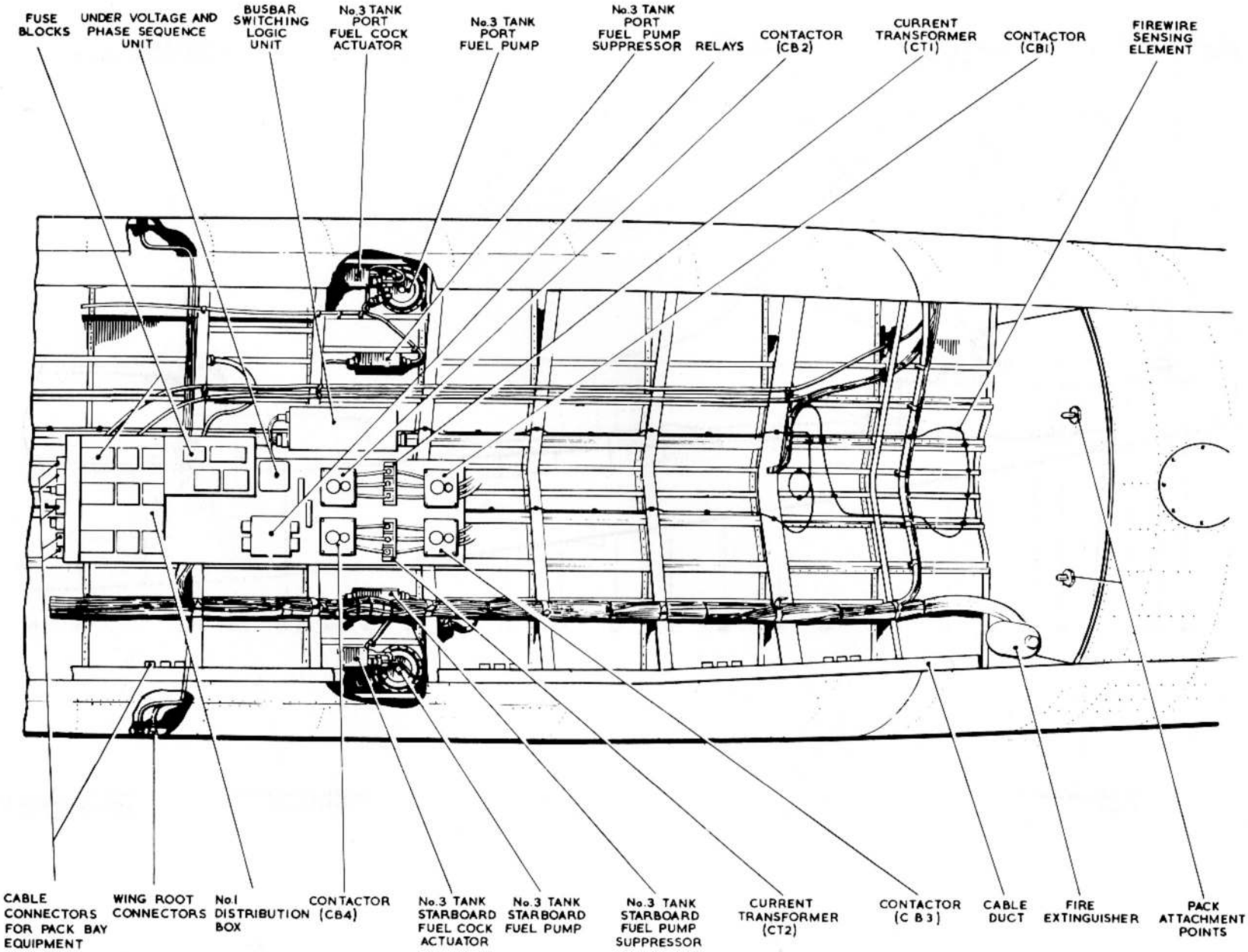


FIG. 6A. ELECTRICAL INSTALLATION – PACK BAY

◀ MASTER KEY DELETED ▶

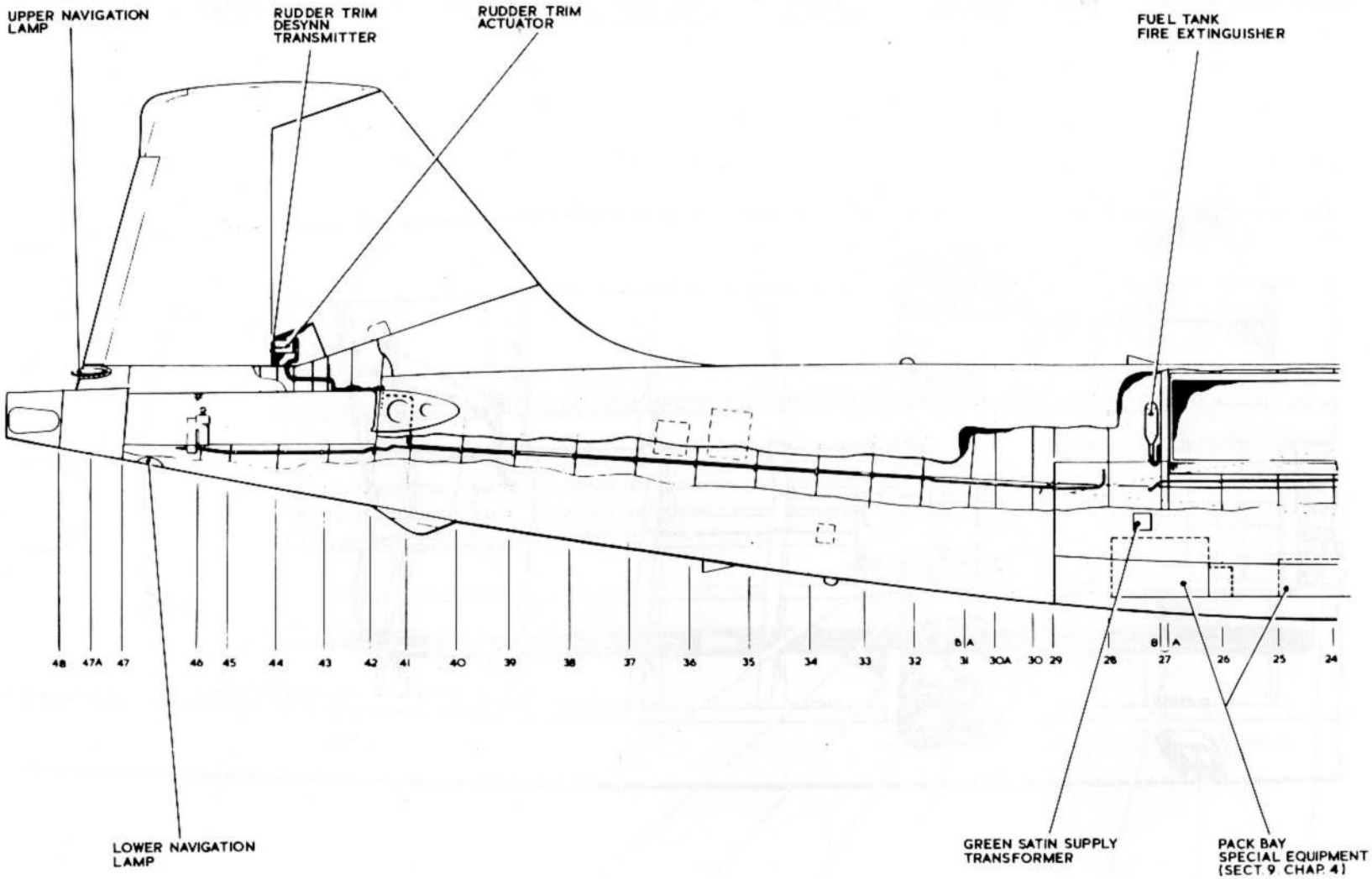


FIG. 7. ELECTRICAL INSTALLATION - PORT FUSELAGE

◀ MASTER KEY DELETED ▶

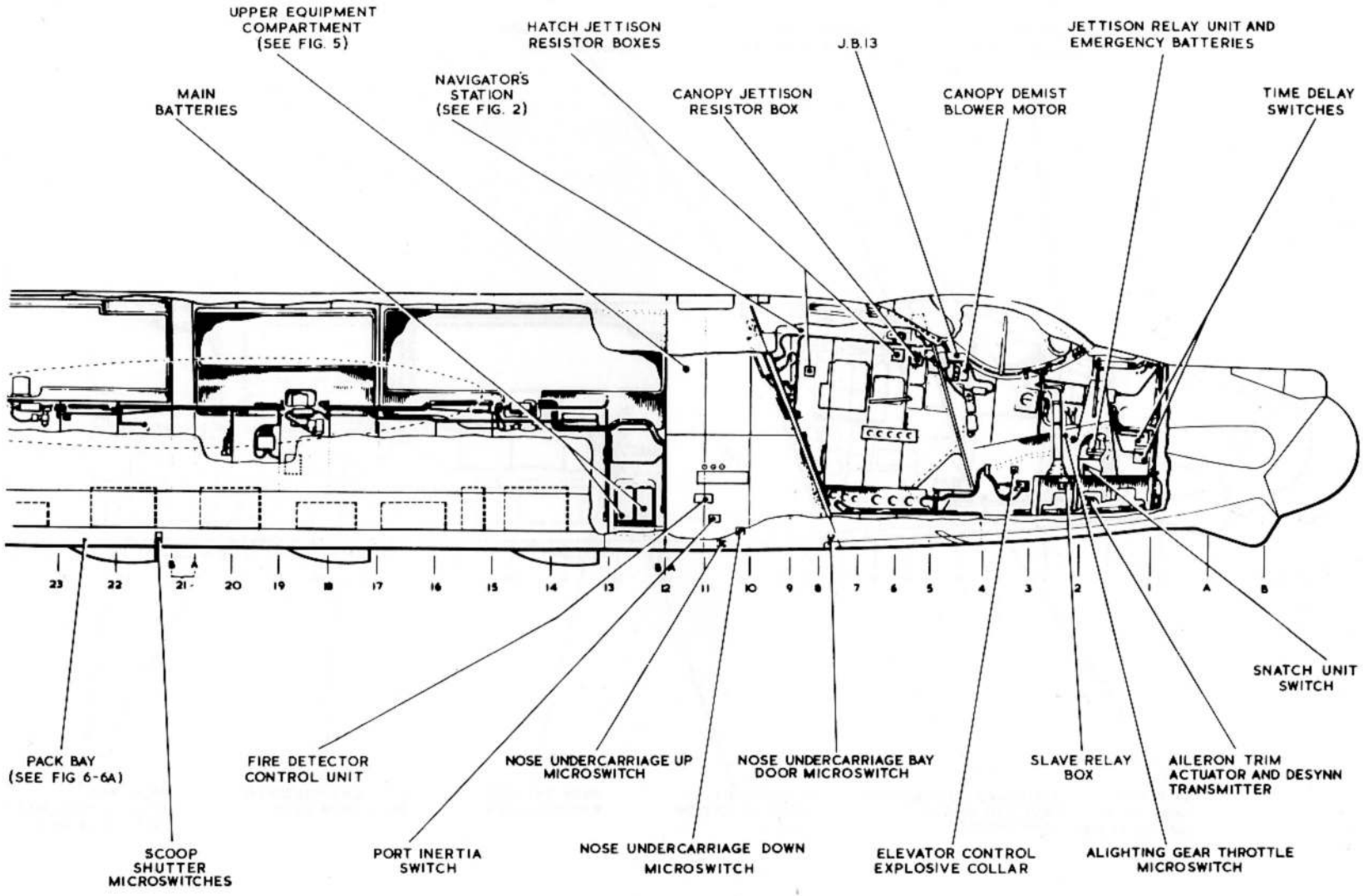


FIG. 7A. ELECTRICAL INSTALLATION – PORT FUSELAGE

◀ MASTER KEY DELETED ▶

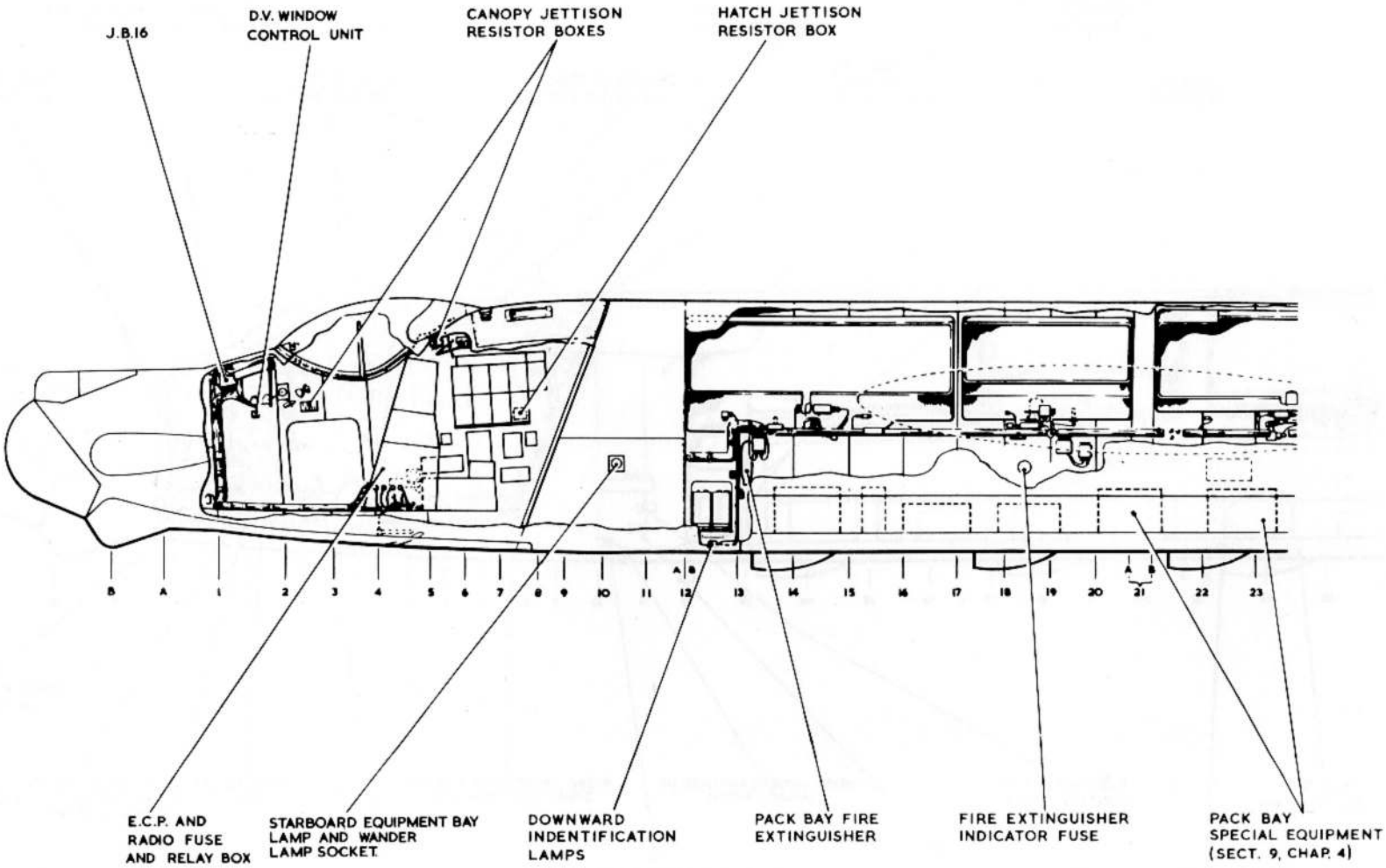


FIG. 8. ELECTRICAL INSTALLATION – STARBOARD FUSELAGE

◀ MASTER KEY DELETED ▶

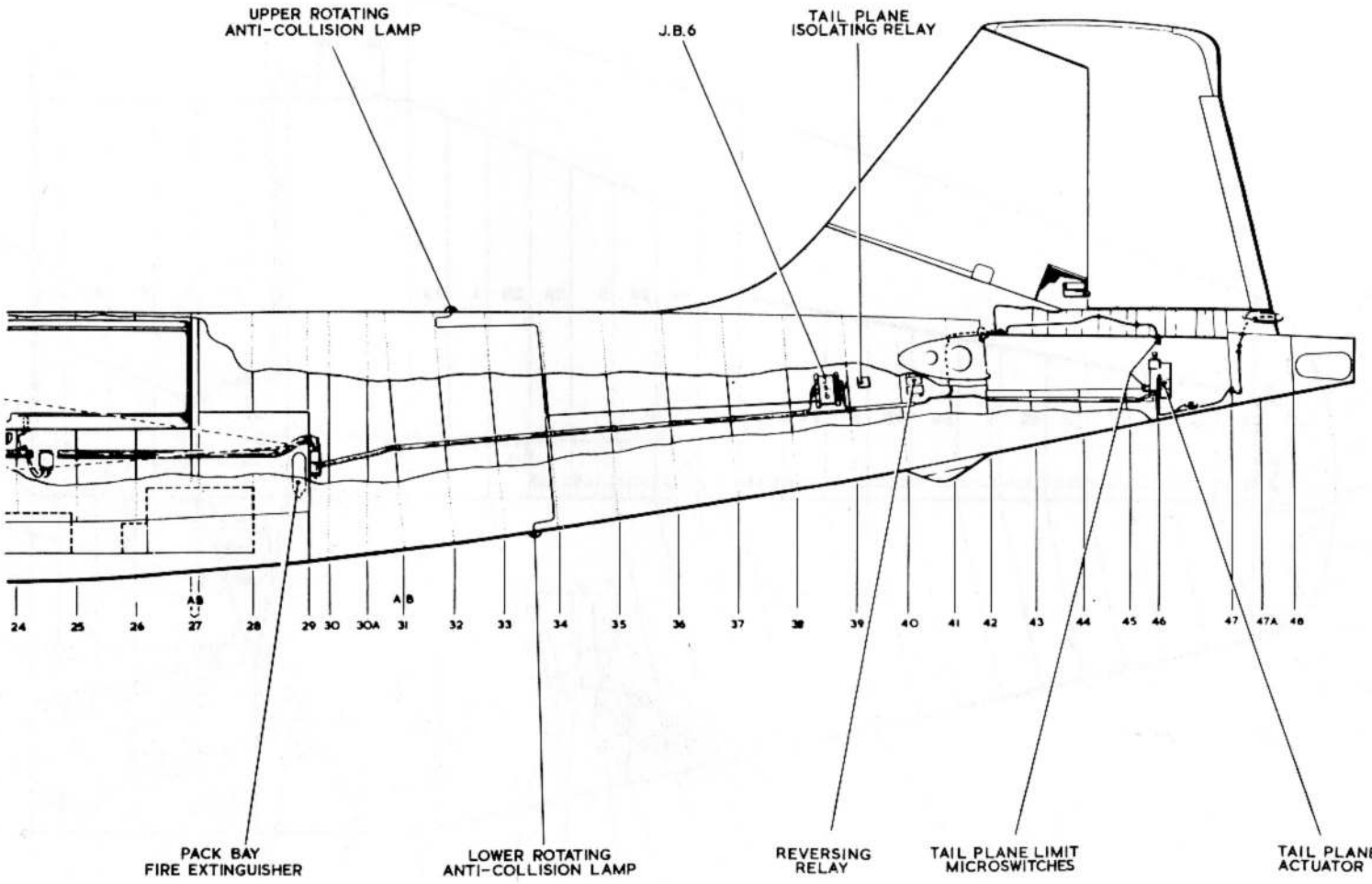


FIG. 8A. ELECTRICAL INSTALLATION – STARBOARD FUSELAGE

‹MOD. 4923 EMBODIED›

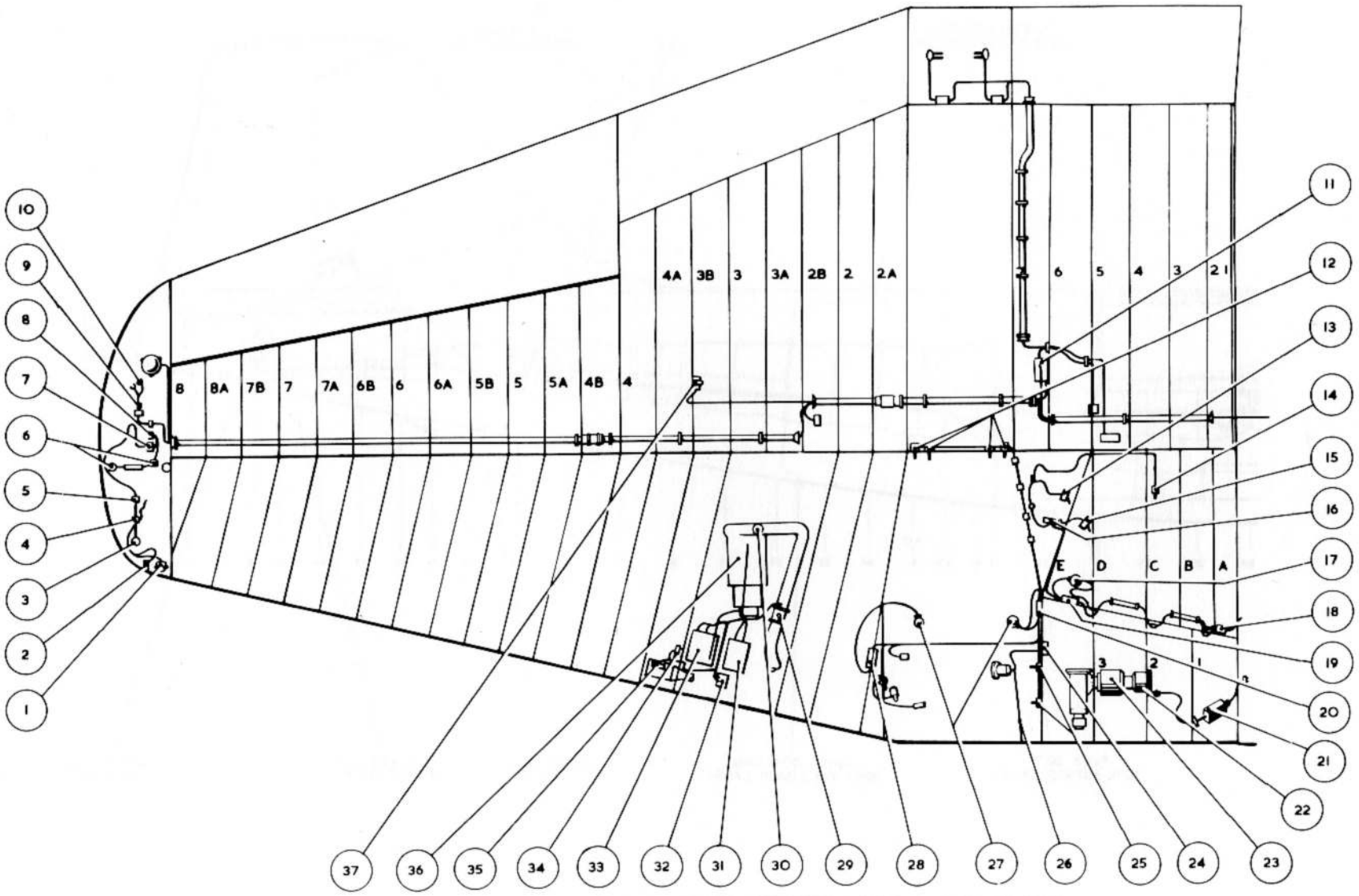


FIG. 9. ELECTRICAL INSTALLATION - STARBOARD MAIN PLANE

KEY TO FIG.9 (STARBOARD MAIN PLANE)

1 TAXYING LAMP
2 NAVIGATION LAMP
3 DETONATORS
4 5-WAY TERMINAL BLOCK
5 DETONATOR RESISTORS
6 DETONATORS
7 2-WAY TERMINAL BLOCK
8 WING POD NAVIGATION LAMP CONTACT BLOCK
9 TERMINAL BLOCK
10 DETONATOR RESISTORS
11 J.B.10 AND E10
12 RESETTING FIRE DETECTORS
13 ALIGHTING-GEAR 'UP' MICROSWITCH
14 ALIGHTING-GEAR 'DOWN' MICROSWITCH
15 OLEO LEG MICROSWITCH
16 ALIGHTING-GEAR TERMINAL BLOCK
17 FIRE EXTINGUISHER
18 J.B.8 AND E8
19 H.E. IGNITION UNIT (INBOARD)
20 J.B.12 AND E12
21 GENERATOR SUPPRESSOR
22 GENERATOR
23 TWO-SPEED GEARBOX
24 CABIN AIR VALVE ACTUATOR
25 RESETTING FIRE DETECTORS
26 CABLE TO STARTER CARTRIDGE
27 IGNITION PLUGS
28 H.E. IGNITION UNIT (OUTBOARD)
29 AIR SHUT-OFF VALVE
30 OVERSPEED TRIP VALVE AND RESET ACTUATOR
31 FREQUENCY CONTROL UNIT
32 ALTERNATOR TEST SOCKET
33 CONTROL AND PROTECTION UNIT
34 COOLING FAN THERMOSTAT
35 COOLING FAN
36 ALTERNATOR
37 AIR-BRAKE MICROSWITCHES

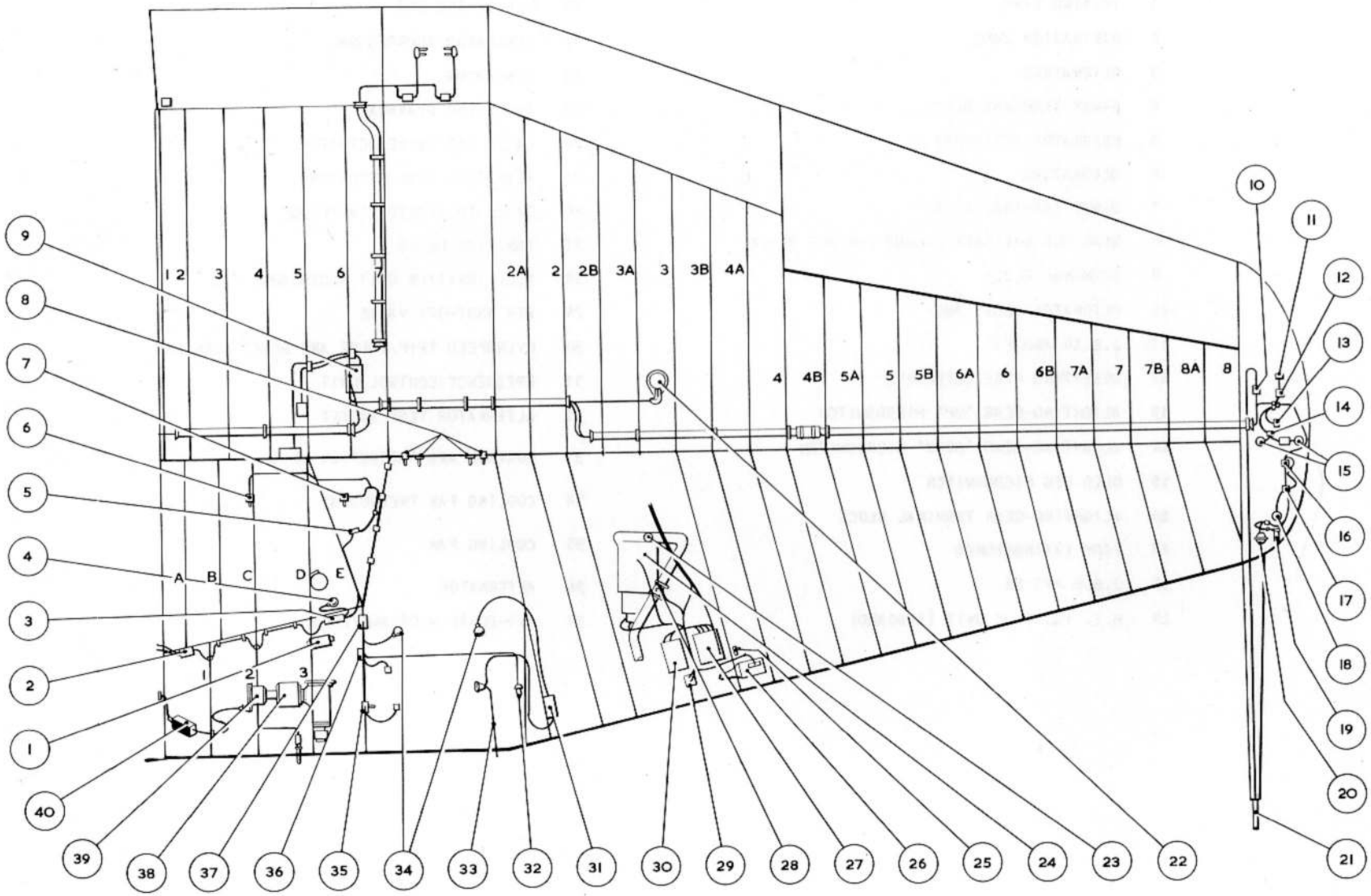


FIG. 10. ELECTRICAL INSTALLATION - PORT MAIN PLANE

KEY TO FIG. 10 (PORT MAIN PLANE)

1 MIXING VALVE ACTUATOR AND DESYNN TRANSMITTER
2 J.B.7 AND E7
3 H.E. IGNITION UNIT (INBOARD)
4 FIRE EXTINGUISHER
5 ALIGHTING-GEAR TERMINAL BLOCK
6 ALIGHTING GEAR 'DOWN' MICROSWITCH
7 ALIGHTING-GEAR 'UP' MICROSWITCH
8 RESETTING FIRE DETECTORS
9 J.B.9 AND E9
10 PRESSURE HEAD HEATER TERMINAL BLOCK
11 DETONATOR RESISTORS
12 TERMINAL BLOCK
13 WING TIP POD/TANK NAVIGATION LAMP CONTACT BLOCK
14 2-WAY TERMINAL BLOCK
15 DETONATORS
16 DETONATOR RESISTORS
17 5-WAY TERMINAL BLOCK
18 DETONATORS
19 NAVIGATION LAMP
20 TAXYING LAMP
21 PRESSURE HEAD HEATER
22 LANDING LAMP
23 OVERSPEED TRIP VALVE AND RESET ACTUATOR
24 ALTERNATOR
25 COOLING FAN THERMOSTAT
26 COOLING FAN
27 CONTROL AND PROTECTION UNIT
28 AIR SHUT-OFF VALVE
29 ALTERNATOR TEST SOCKET
30 FREQUENCY CONTROL UNIT
31 H.E. IGNITION UNIT (OUTBOARD)
32 RESETTING FIRE DETECTORS
33 CABLE TO STARTER CARTRIDGE
34 IGNITION PLUGS
35 RESETTING FIRE DETECTORS
36 CABIN AIR VALVE ACTUATOR
37 J.B.11 AND E11
38 TWO-SPEED GEARBOX
39 GENERATOR TYPE P3
40 GENERATOR SUPPRESSOR

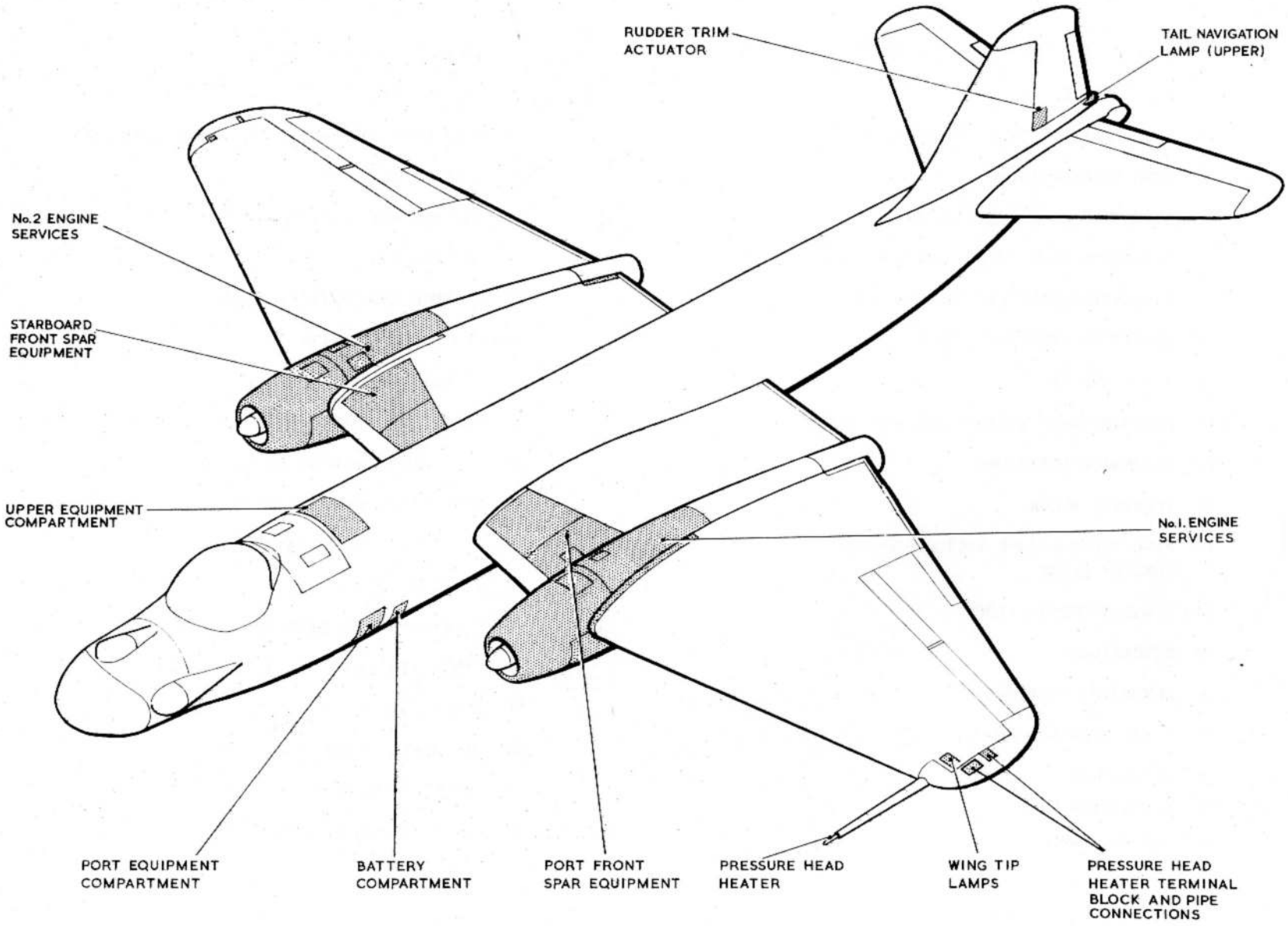


FIG. 11. ACCESS PANELS–UPPER SURFACE AND PORT SIDE

◀ MOD 5184 EMBODIED ▶

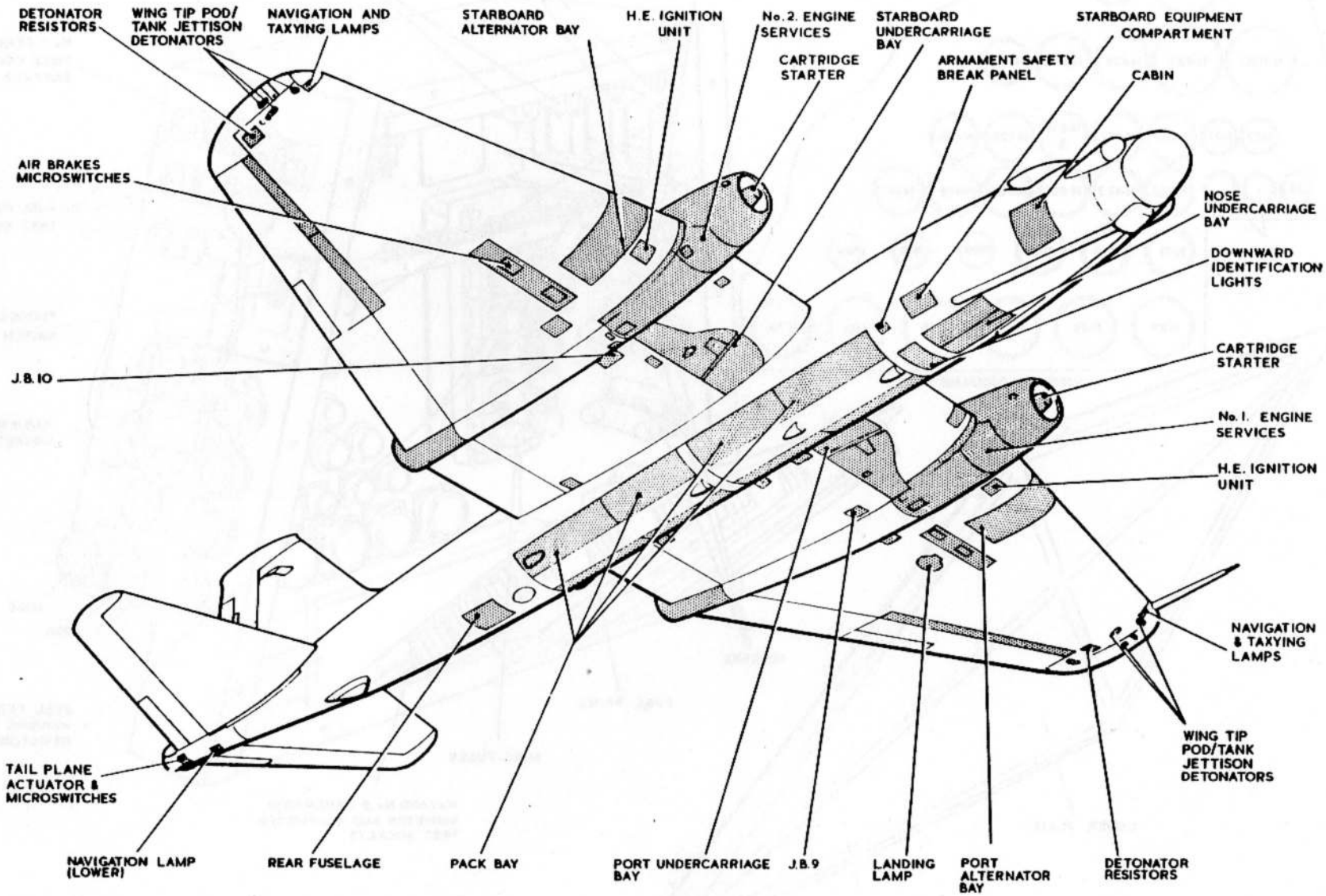


FIG. 12. ACCESS PANELS - LOWER SURFACE AND STARBOARD SIDE

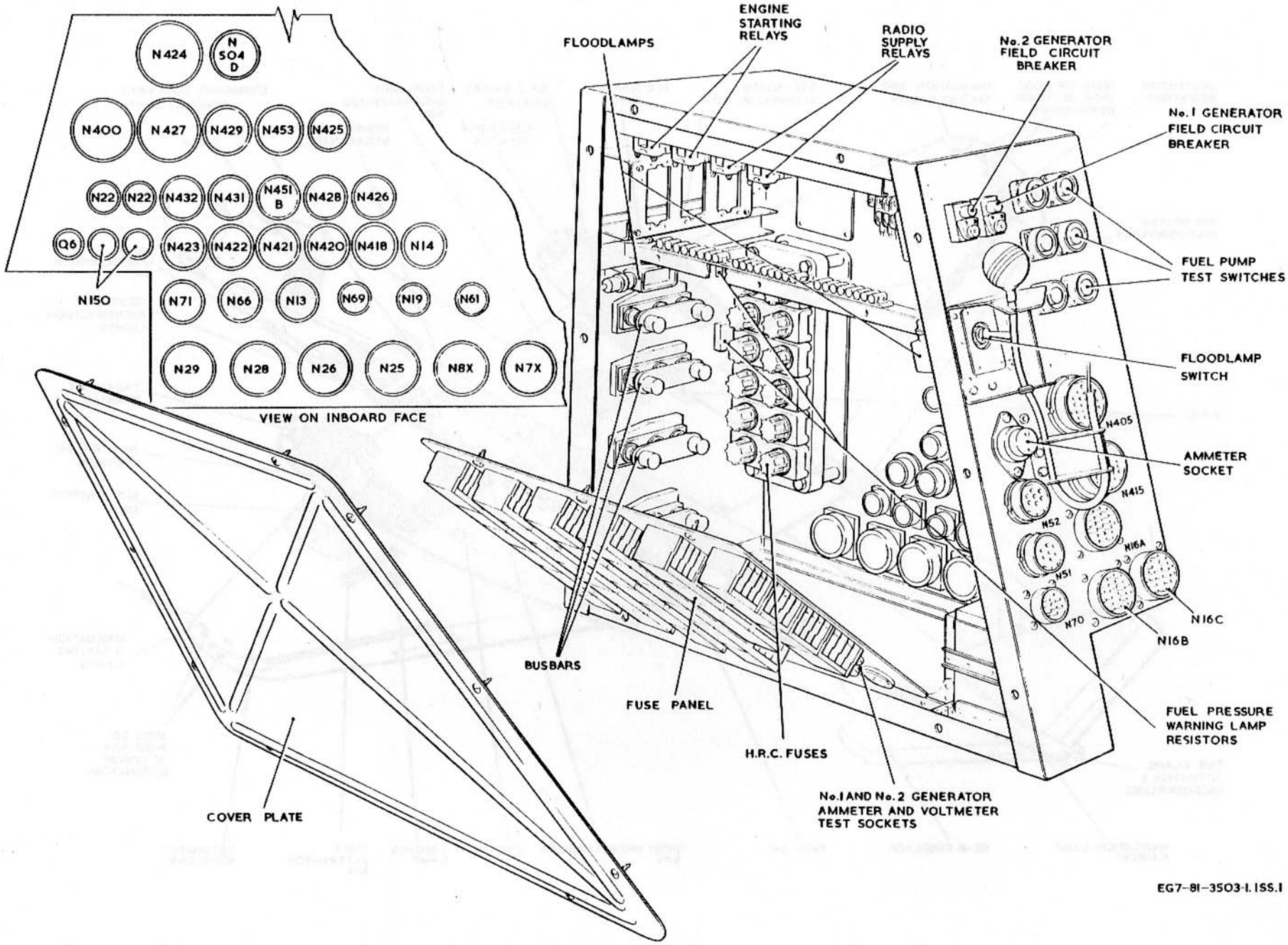


FIG. 13. ELECTRICAL CONTROL PANEL (E.C.P.)

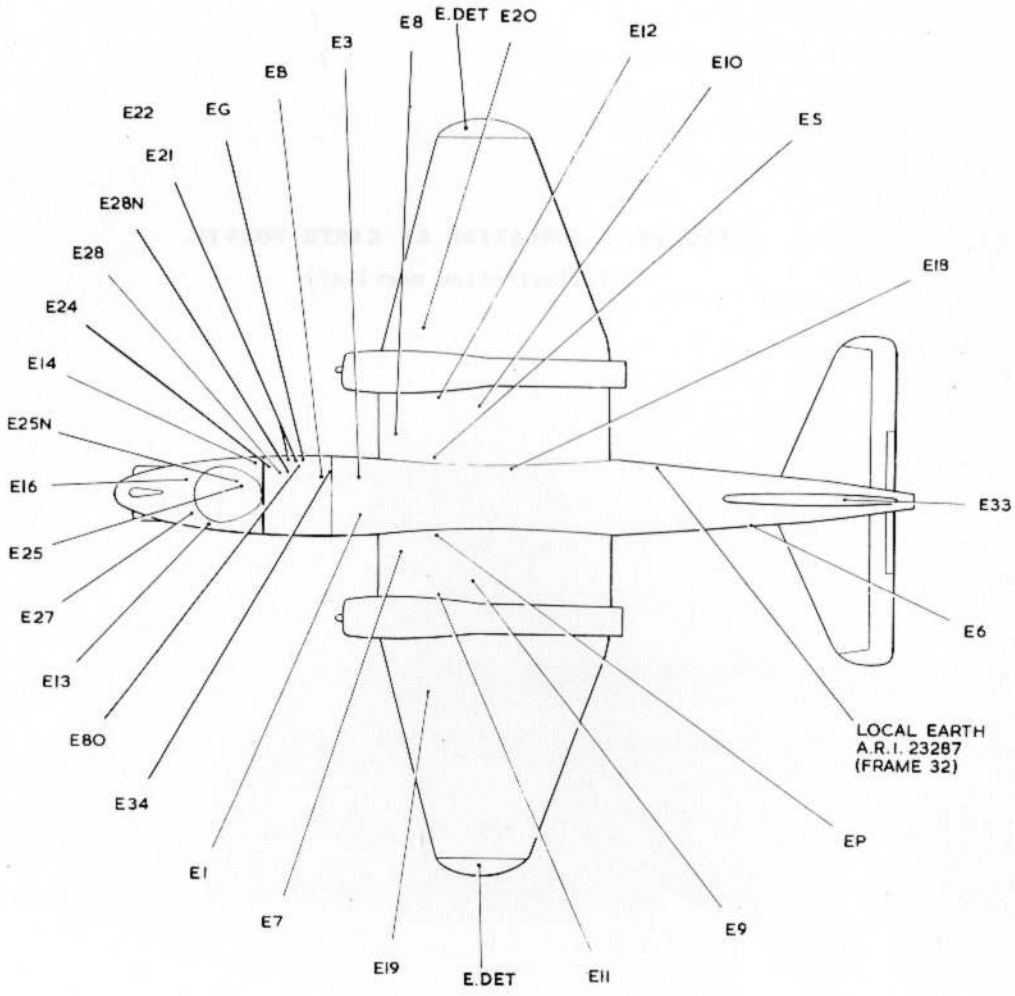


FIG. 14. LOCATION OF EARTH POINTS

◀ MOD 5176 EMBODIED ▶

KEY TO FIG. 14 (LOCATION OF EARTH POINTS)

EARTH POINT NO.	EQUIPMENT BONDED	EARTH POINT LOCATION
E1	J.B.1	CENTRE FUSELAGE (PORT)
E3	J.B.3	CENTRE FUSELAGE (STBD.)
E6	J.B.6	REAR FUSELAGE
E7	J.B.7	PORT WING LEADING EDGE
E8	J.B.8	STBD. WING LEADING EDGE
E9	J.B.9	PORT INNER WING
E10	J.B.10	STBD. INNER WING
E11	J.B.11	PORT WING LEADING EDGE
E12	J.B.12	STBD. WING LEADING EDGE
E13	J.B.13	STR.8, BETWEEN FRAMES 4 AND 5 PORT
E14	J.B.14 AND 400 Hz FUSE BOX	FRAME 8 STBD. SIDE
E16	J.B.16	NOSE FUSELAGE STBD. (FRAME 1)
E18	NO.1 DISTRIBUTION BOX	CENTRE FUSELAGE
E19	PORT ALTERNATOR	RIB 3 PORT OUTER WING
E20	STBD. ALTERNATOR	RIB 2 STBD. OUTER WING
E21	M.E.P. BUSBAR PANEL	MAIN ELECTRICAL PANEL
E22	M.E.P. BUSBAR PANEL	MAIN ELECTRICAL PANEL
E24	DETONATORS	FWD. FACE FRAME 8 PORT SIDE
E25	E.C.P.	NAVIGATOR'S TABLE STRUCTURE
E25N	RADIO FUSE AND RELAY BOX	ELECTRICAL CONTROL PANEL
E27	DETONATORS	FRAME 2 BELOW PILOT'S CONSOLE
E28	NO.2 DISTRIBUTION BOX	REAR OF PRESSURE BULKHEAD
E28N	NO.2 DISTRIBUTION BOX	REAR OF PRESSURE BULKHEAD
E33	TAIL-PLANE ACTUATOR	REAR FUSELAGE
E34	INVERTER NO.4 TYPE 200 (NOT FITTED)	EQUIPMENT BAY FRAME 12
EB	AIRCRAFT BATTERIES	FRAME 12A PORT
EG	GROUND SUPPLY SOCKET	MAIN ELECTRICAL PANEL
EP	NO.1 (PORT) GENERATOR	INBOARD SIDE OF PORT WHEEL WELL
ES	NO.2 (STBD.) GENERATOR	INBOARD SIDE OF STBD. WHEEL WELL
E80	GROUND SERVICES EARTH POINT	MAIN ELECTRICAL PANEL FRAME 10
E.DET	WING-TIP FUEL TANK JETTISON (PORT)	PORT WING OUTBOARD, RIB 8
E.DET	WING-TIP FUEL TANK JETTISON (STARBOARD)	STARBOARD WING OUTBOARD, RIB 8
—	LOCAL EARTH A.R.I.23287	FRAME 32 STARBOARD

Chapter 2 ARMAMENT

◀PRE MOD. 5466 (SEE SUPPLEMENT FOR POST MOD.5466)▶

General

Owing to the complexity of the window system and in order to present the information in a readily understandable form, this chapter has been divided into a number of sub-chapters. Each of the sub-chapters is complete in itself, dealing with one particular aspect of the window system. Descriptive text, location diagrams, circuit and routeing charts, servicing information and removal and assembly instructions, are all given in the associated sub-chapter. The various sub-chapters described are:-

◀2A - General information (pre Mod. 5466)
2B - Window launcher installation (pre Mod. 5466)▶
2C - Cartridge discharger installation (inoperative)

Chapter 2A GENERAL INFORMATION

◄PRE MOD. 5466 (SEE SUPPLEMENT FOR POST MOD. 5466)►

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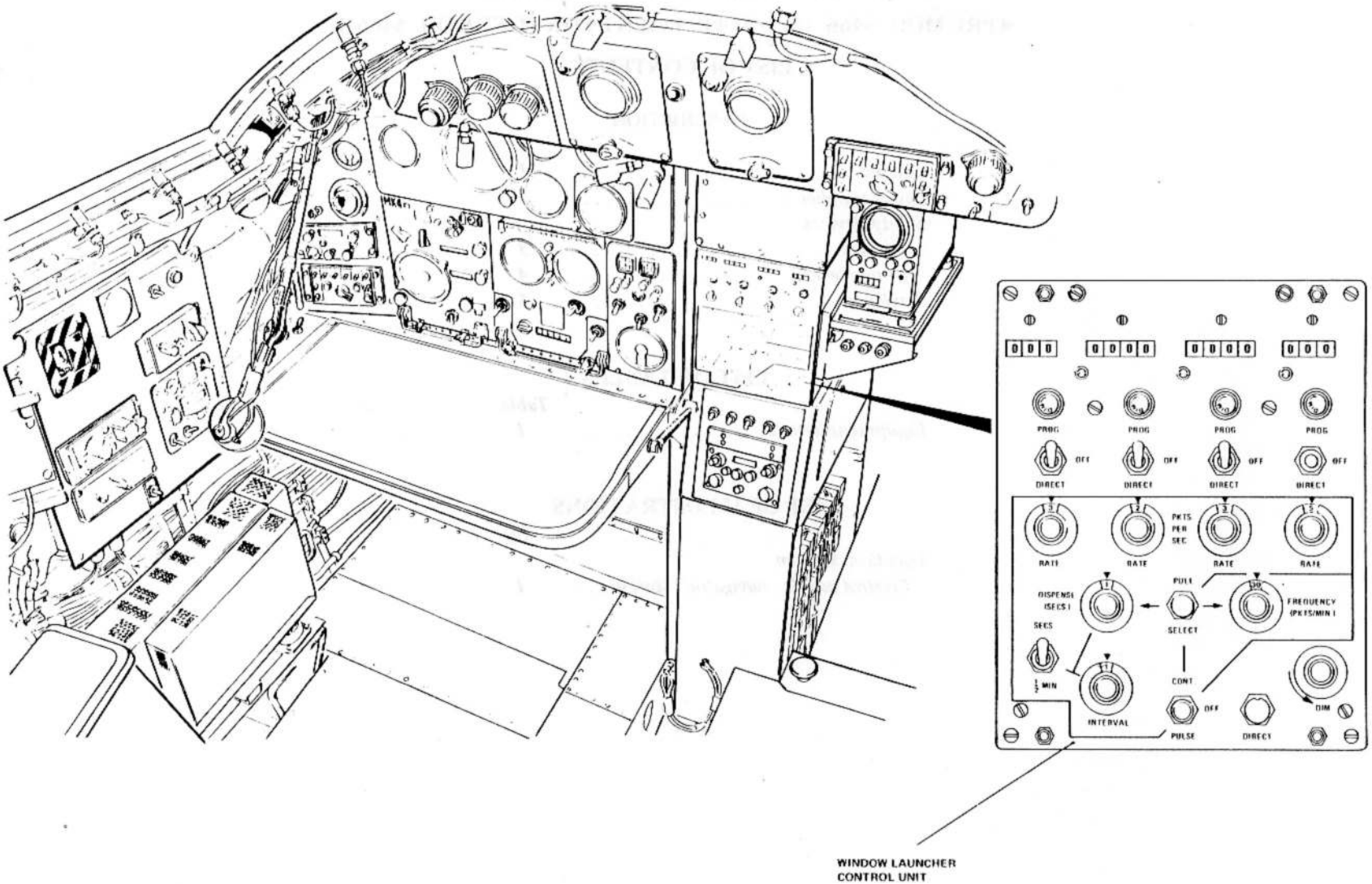

FIG. 1 CONTROL PANELS- NAVIGATOR'S STATION

DESCRIPTION

General

1. The window dispensing installation comprises two individual systems; the window launcher and the cartridge discharger. The window launcher installation comprises a control unit, located at the navigator's station, and a stripper unit located at the forward end of each of the port and starboard wing-tip pods. The cartridge discharger installation is rendered inoperative by the removal of the control unit, which was located at the navigator's station the wiring to the pressure bulkhead and the fitting of dummy fuses. Aft of the pressure bulkhead, and in the port and starboard wing-tip pods, the equipment, including the safety devices and wiring, are retained.

Power supplies

2. The supplies for window launcher installation are taken from the 28 volt d.c. busbars PP1 and P10 and are routed to the control unit and each wing-tip pod respectively.

Safety devices

General

3. The wiring to the ground arming link and the armament safety relay is retained in the aircraft but is inoperative due to the fitment of dummy fuses in the cartridge discharger installation supply lines.

Arming levers

4. As a further safety device, three arming levers are located on the inboard side of each wing-tip pod and are described in Chap.2C and Sect.5, Chap.6.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

5. General information on the equipment used in the window installation can be found in A.P.113F-1104-12 and in A.P.101B-0417-1A, Sect 5. In addition to a full description of the equipment used, the publications include operation, servicing and loading instructions.

TABLE 1

Equipment details

Equipment	Location	Access	Air.Pub.
Window control unit ▶◀	Navigator's station	Cabin	A.P.113F-1104-12
Stripper unit and magazine	Wing-tip pods (forward)	Hinged nose section	A P 113F-1104-12
Cartridge discharger (inoperative)	Wing-tip pods (rear)	Access panel (outboard)	
Arming levers	Wing-tip pods (inboard)		A.P.101B-0417-1A, Sect.5, Chap.1

Chapter 2B WINDOW LAUNCHER - PRE MOD. 5466
(See Supplement for post mod. 5466)
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Note ... *Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*

DESCRIPTION

Installation

1. The nose fairing of each wing-tip pod is hinged to provide access to the conventional window stripper unit and magazine, which is mounted in the forward section of the pod. The stripper unit is attached to the forward end of the magazine and the whole assembly is mounted on two rails. For more detailed information on the units of the window launcher installation refer to A.P.113F-1104-12.

Control unit

2. The control unit, which is mounted at the AEO's station, provides for the release of stores by the selected stripper or stripper units. Each stripper unit can be set by the control unit to a PROGRAMME or DIRECT mode of operation. In the PROGRAMME mode, the stripper unit can release stores in bursts of preset duration and at preset intervals, and in the DIRECT mode in one second bursts or at a continuously preset rate.

3. Control of the control unit logic circuitry is effected by various toggle and rotary switches mounted on the front panel. Also fitted on the front panel are four electro-mechanical subtracting counters, operated by pulses from the stripper units, four indicator lamps to show that the store is being dispensed and a potentiometer to control the intensity of general panel illumination.

4. Electrical connections are made via connectors on the rear of the control unit. In this installation the stripper units are connected to connectors PL1 and PL2.

5. The following paragraphs describe the functions of the various switches. It must be noted that whilst certain switches, indicators and lamps are for specific channels other switches are used in the overall operation of the system, therefore, not all switches will be used in this installation.

6. Four toggle switches annotated PROG-OFF-DIRECT provide for the mode of operation of the stripper units.

7. Four indicator lamps are illuminated whenever the stripper unit motor is running.

8. Four rotary switches annotated RATE-PKTS PER SEC control the dispensing rates for the four stripper unit channels and are operative

in the DISPENSE mode or in the DIRECT mode. The dispense rate can be varied between one and five packets per second, in steps of one packet.

9. A lever lock toggle switch annotated PULL SELECT selects either the rotary switch DISPENSE (SECS) or the rotary switch FREQUENCY (PKTS/MIN) functions.

10. The DISPENSE rotary switch controls the dispense period from 1 to 10 seconds.

11. The FREQUENCY rotary switch controls the pulse repetition rate which is 1, 2, 3, 4, 5, 6, 8, 10, 12, 20, 30 pulses per minute, the pulse width being fixed at one second.

12. A toggle switch annotated SECS - ½ MIN is an interval multiplier used to select either seconds or half minutes and is used in conjunction with the INTERVAL switch.

13. A rotary switch annotated INTERVAL selects the interval from 1 to 10 seconds in one second steps. When SECS is selected on the above switch the time interval is direct reading. When ½ MIN is selected the time interval is multiplied by 30 seconds.

14. A lever lock switch annotated CONT-OFF-PULSE selects the type of output from the control unit, either continuous (CONT) or pulse (PULSE). This control is only applicable to the PROGRAMME mode of operation. When set to PULSE, a single pulse of the selected width will be emitted i.e. a pulse width of one second in the FREQUENCY mode and 1 - 10 seconds in the DISPENSE mode. When set to CONT, trains of pulses of the preset timing sequence will be emitted.

15. A push button switch annotated DIRECT is used to dispense the store from the stripper unit set to the DIRECT mode of operation. If the switch is pressed for less than one second a single one-second pulse will be emitted. If the switch is pressed and held the store will be released at the preset rate until the switch is released.

16. The rotary potentiometer annotated DIM provides for setting the panel illumination to the desired level.

REMOVAL, ASSEMBLY AND SERVICING

Warning

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

General

17. The removal, assembly and servicing instructions for the Window Launcher installation are detailed in A.P.101B-0417-1A, Sect.5, Chap.5.

in the DISPENSE mode or in the DIRECT mode. The dispense rate can be varied between one and five packets per second, in steps of one packet.

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16. The rotary potentiometer annotated DIM provides for setting the panel illumination to the desired level.

REMOVAL, ASSEMBLY AND SERVICING

Warning

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

General

17. The removal, assembly and servicing instructions for the Window Launcher installation are detailed in A.P.101B-0417-1A, Sect.5, Chap.5.

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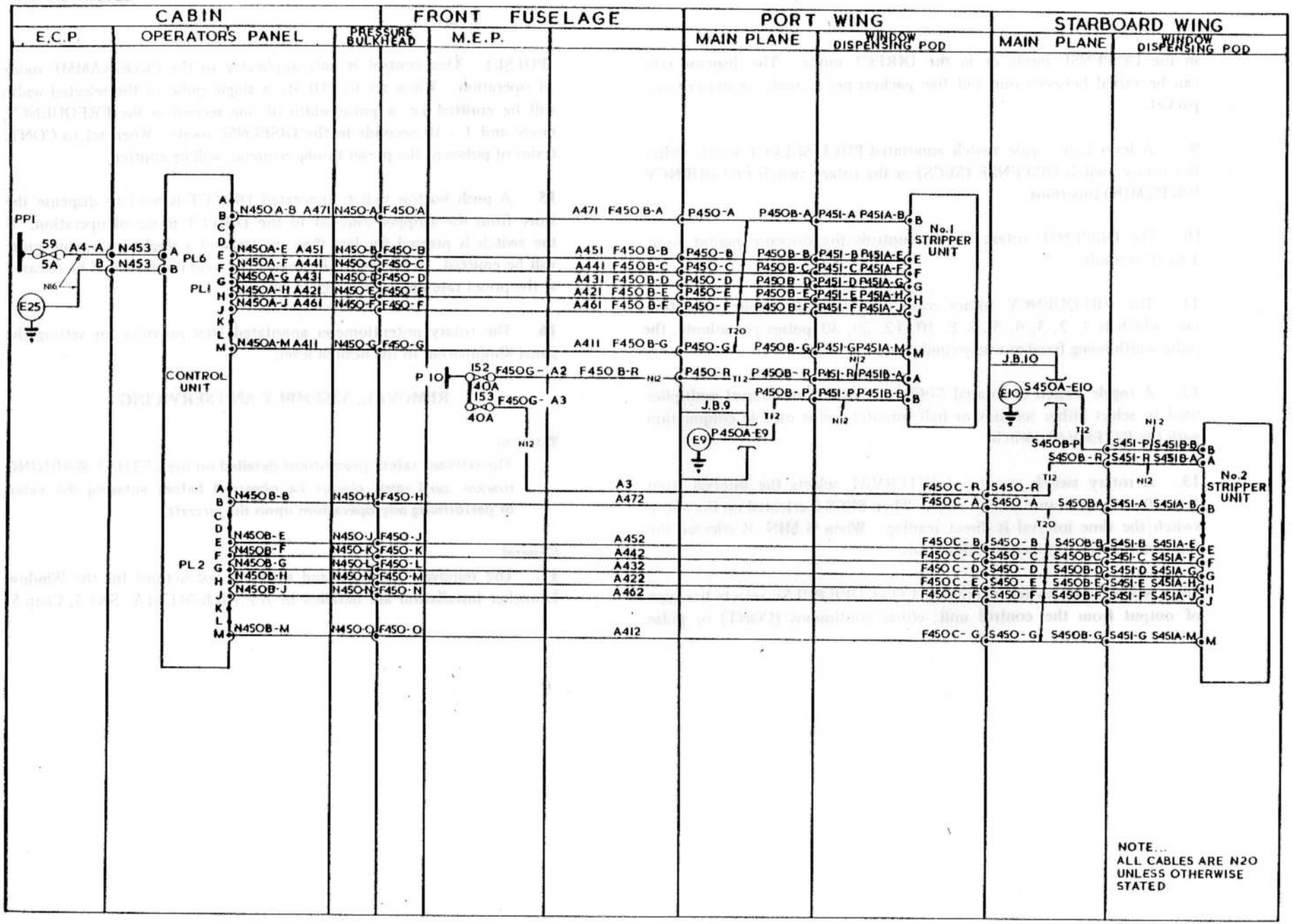

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FIG. 2 WINDOW LAUNCHER

Chapter 2C CARTRIDGE DISCHARGER INSTALLATION (INOPERATIVE)

◀ *(completely revised)* ▶

LIST OF CONTENTS

Note... *Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*

DESCRIPTION

General

1. As this system has been rendered inoperative by the removal of the control unit, wiring to the pressure bulkhead and the fitment of dummy fuses in the power supplies, this chapter only describes the equipment and safety devices which are retained in the aircraft.

Wing-tip pods

2. The cartridge discharger installation in each wing-tip pod comprises three fixed reaction plates each of which is attached to the upper surface of a rectangular matrix housing, a lever-and-linkage assembly which positively locates and locks each matrix in its housing, and the electrical distributor. Panels in the structure provide access to the matrices and their housings for the attachment of the levers and latch hooks and the electrical connections.

Arming lever assembly

3. Three spring-loaded, hinged arming levers situated on the inboard side of each wing-tip pod govern the arming, transit, or ejection positions of the matrices. Each lever has three positions and is positively locked in each:-

(1) TRANSIT position
The lever is held in the mid-open position and is locked by a spring-loaded latch.

(2) ARMED position
The lever is flush with the wing-tip pod skin and is locked by the action of the arming key.

(3) EJECT position
The spring-loaded latch is depressed, and the lever is moved to the full-open position. The matrix is freed from the retaining hooks and can be removed from the pod. The position of each arming lever can be seen from the cabin.

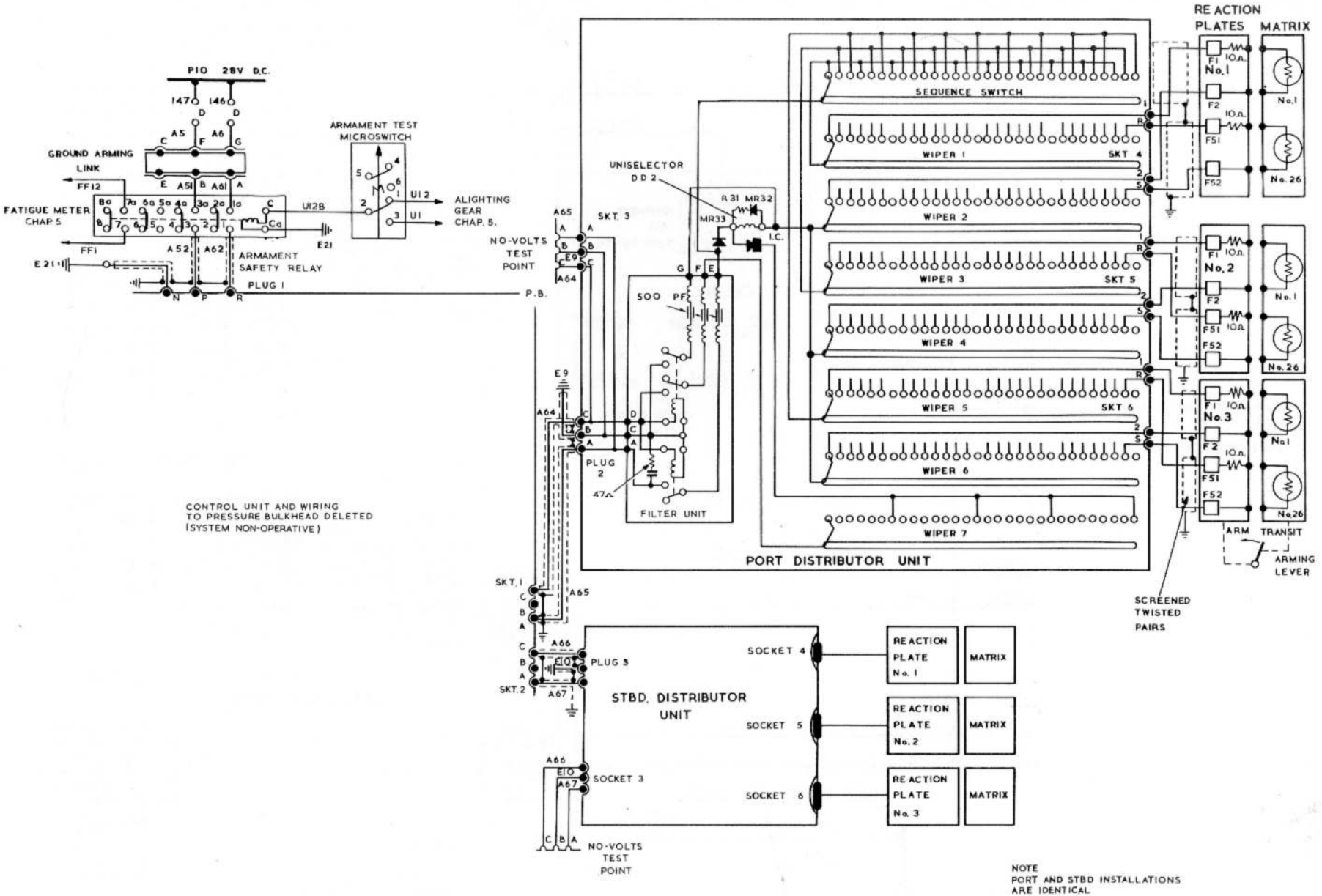

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FIG.1. CARTRIDGE DISCHARGER INSTALLATION

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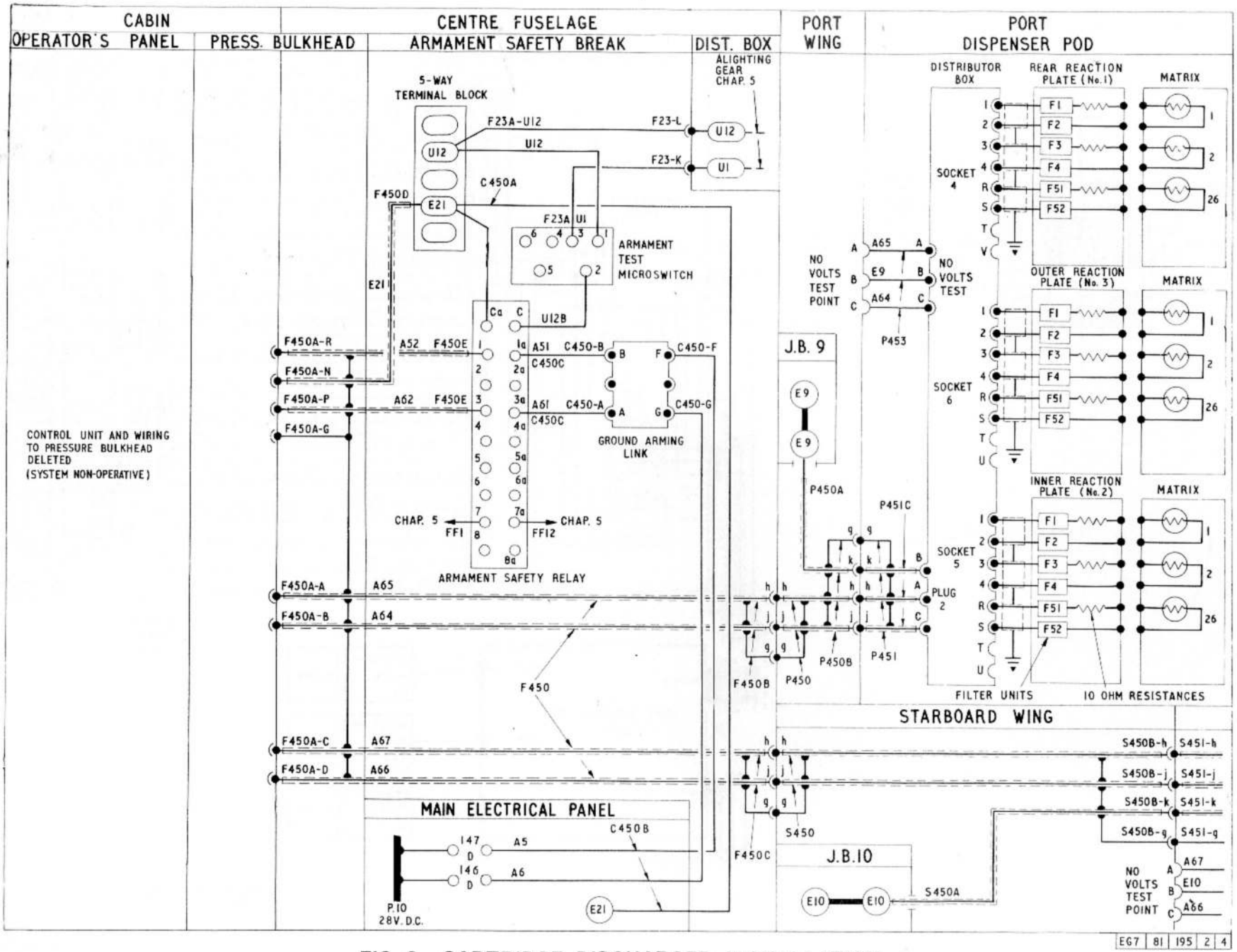

FIG. 2. CARTRIDGE DISCHARGER INSTALLATION

◀MOD 5184 EMBODIED▶

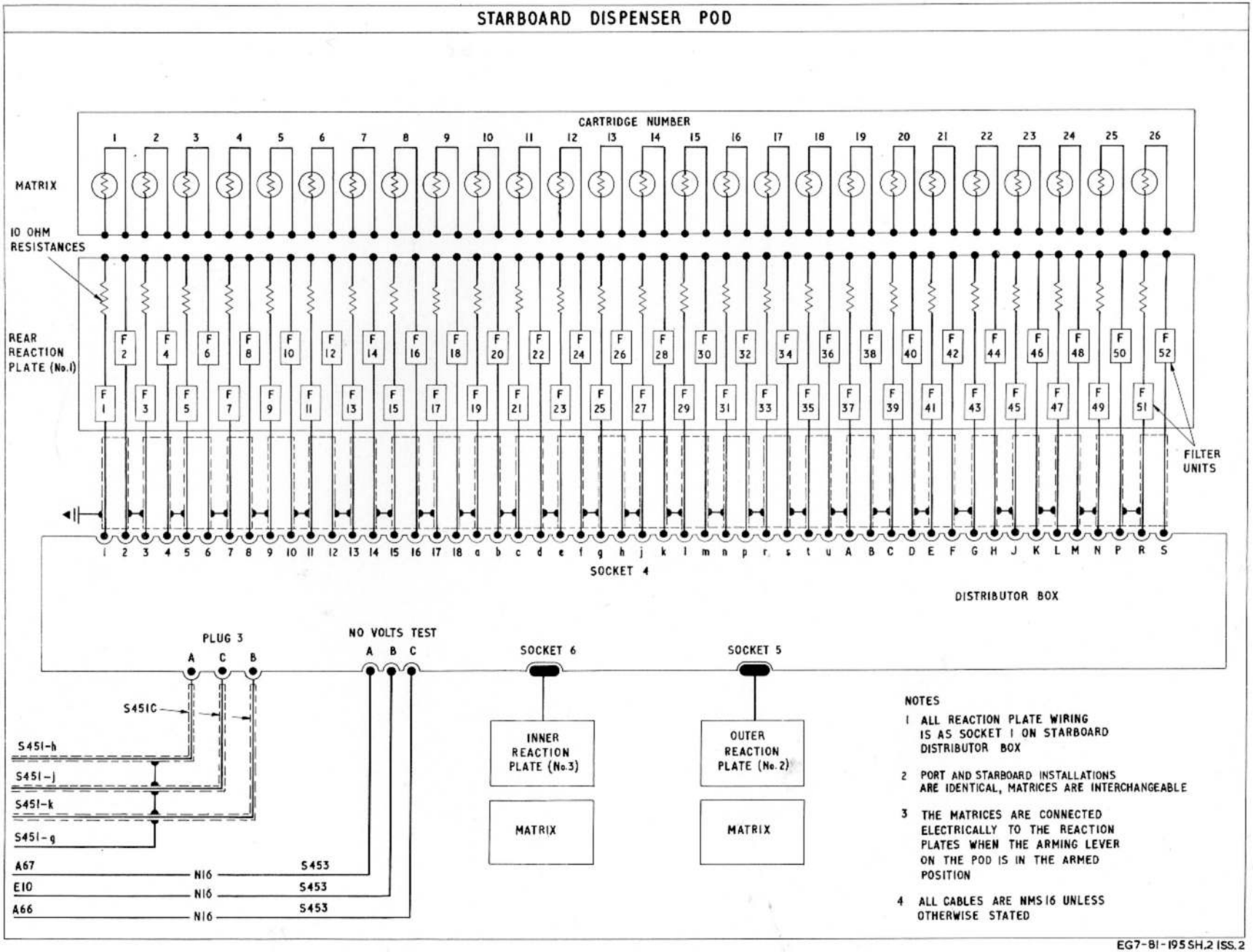

FIG. 2A. CARTRIDGE DISCHARGER INSTALLATION

Chapter 2B WINDOW LAUNCHER INSTALLATION

LIST OF CONTENTS

Note...*Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*

DESCRIPTION

Installation

1. The nose fairing of each wing-tip pod is hinged to provide access to the conventional window stripper unit and magazine, which is mounted in the forward section of the pod. The stripper unit is attached to the forward end of the magazine and the whole assembly is mounted on two rails. For more detailed information on the units of the window launcher installation refer to A.P. 113F-1104-12.

Control unit

2. The control unit, which is mounted on the starboard wall, outboard of the A.E.O.'s seat, provides for the release of stores by the selected stripper or stripper units. Operation of these units can also be achieved by a pair of switches mounted on the navigator's control panel, starboard end. Each stripper unit can be set by the control unit to a PROGRAMME or DIRECT mode of operation. In the PROGRAMME mode, the stripper unit can release stores in bursts of preset duration and at preset intervals, and in the DIRECT mode in one second bursts or at a continuously preset rate.

3. Control of the control unit logic circuitry is effected by various toggle and rotary switches mounted on the front panel. Also fitted on the front panel are four electro-mechanical subtracting counters, operated by pulses from the stripper units, four indicator lamps to show that the store is being dispensed and a potentiometer to control the intensity of general panel illumination.

4. Electrical connections are made via connectors on the rear of the control unit. In this installation the stripper units are connected to connectors PL1 and PL2.

5. The following paragraphs describe the functions of the various switches. It must be noted that whilst certain switches, indicators and lamps are for specific channels other switches are used in the overall operation of the system, therefore, not all switches will be used in this installation.

6. Four toggle switches annotated PROG-OFF-DIRECT provide for the mode of operation of the stripper units.

7. Four indicator lamps are illuminated whenever the stripper unit motor is running.

8. Four rotary switches annotated RATE-PKTS PER SEC control the dispensing rates for the four stripper unit channels and are operative in the DISPENSE mode or in the DIRECT mode. The dispense rate can be varied between one and five packets per second, in steps of one packet.

9. A lever lock toggle switch annotated PULL SELECT selects either the rotary switch DISPENSE (SECS) or the rotary switch FREQUENCY (PKTS/MIN) functions.

10. The DISPENSE rotary switch controls the dispense period from 1 to 10 seconds.

11. The FREQUENCY rotary switch controls the pulse repetition rate which is 1, 2, 3, 4, 5, 6, 8, 10, 12, 20, 30 pulses per minute, the pulse width being fixed at one second.

12. A toggle switch annotated SECS - ½ MIN is an interval multiplier used to select either seconds or half minutes and is used in conjunction with the INTERVAL switch.

13. A rotary switch annotated INTERVAL selects the interval from 1 to 10 seconds in one second steps. When SECS is selected on the above switch the time interval is direct reading. When ½ MIN is selected the time interval is multiplied by 30 seconds.

14. A lever lock switch annotated CONT-OFF-PULSE selects the type of output from the control unit, either continuous (CONT) or pulse (PULSE). This control is only applicable to the PROGRAMME mode of operation. When set to PULSE, a single pulse of the selected width will be emitted i.e. a pulse width of one second in the FREQUENCY mode and 1 - 10 seconds in the DISPENSE mode. When set to CONT, trains of pulses of the preset timing sequence will be emitted.

15. A push button switch annotated DIRECT is used to dispense the store from the stripper unit set to the DIRECT mode of operation. If the switch is pressed for less than one second a single one-second pulse

will be emitted. If the switch is pressed and held the store will be released at the preset rate until the switch is released.

16. The rotary potentiometer annotated DIM provides for setting the panel illumination to the desired level.

17. A pair of switches mounted on the navigator's control panel provide alternative control of the stripper units.

REMOVAL, ASSEMBLY AND SERVICING

Warning

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

General

18. The removal, assembly and servicing instructions for the Window ◀ Launcher installation are detailed in A.P. 101B-0417-1A, Sect. 5, Chap. 5A. ▶

Chapter 3 FLYING CONTROLS

◀ *(completely revised)* ▶

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LIST OF ILLUSTRATIONS

Note... *Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*

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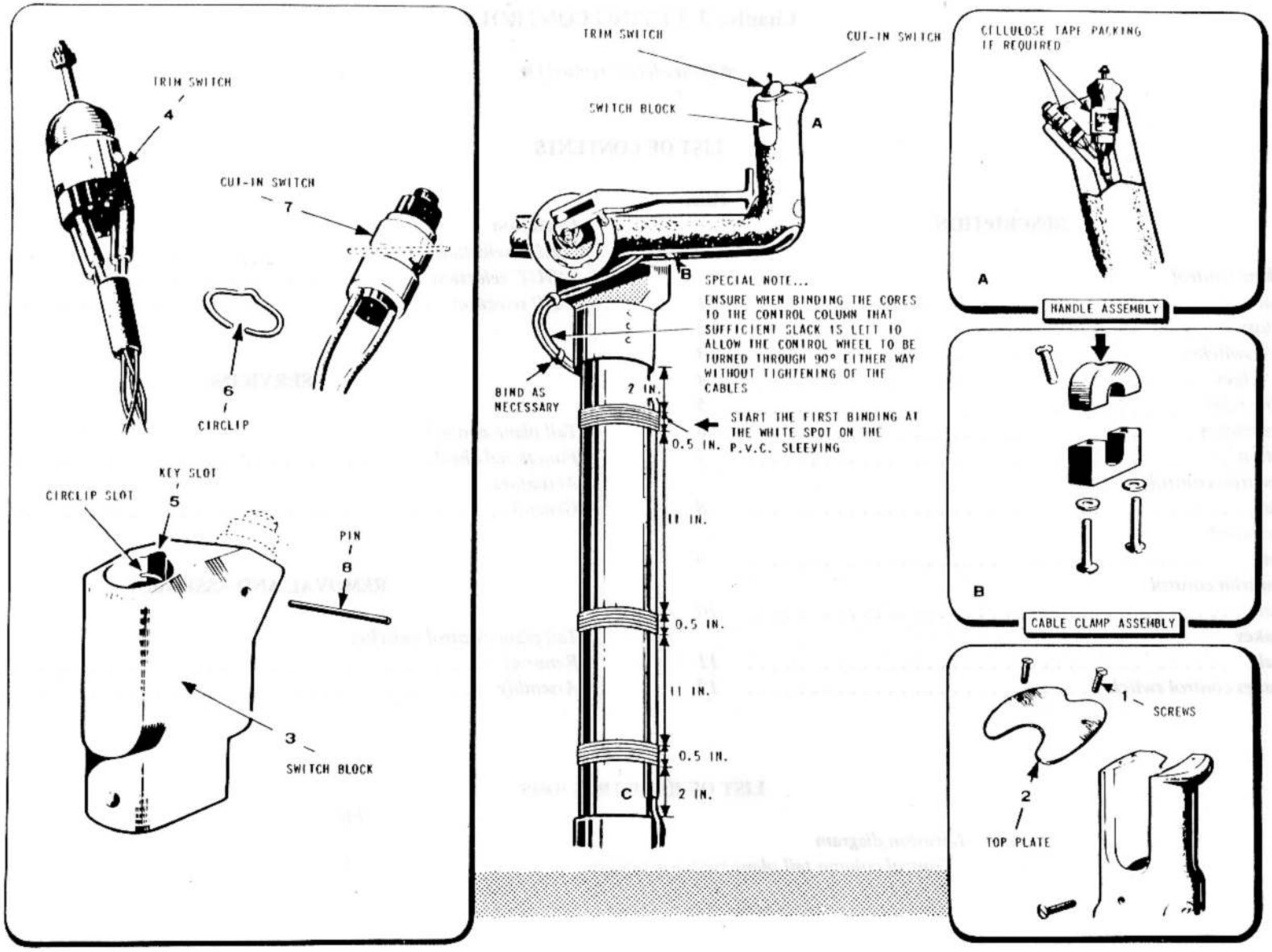

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FIG. 1. CONTROL COLUMN TAIL PLANE SWITCH ASSEMBLY

◄ FIG RENUMBERED ►

DESCRIPTION

TAIL PLANE CONTROL

General

1. Variation of the tail plane incidence is controlled by an electrically-operated linear actuator which forms an extensible strut between the tail plane and fuselage. The actuator installed is a Type 4023. Operation of the actuator is controlled by a cut-in switch and a trim switch fitted to the control column. The switches operate in conjunction with an isolating relay, two S.T.C. relays, two limit switches, and a reversing relay. The tail plane setting is shown on the instrument flying panel by a Desynn indicator which is controlled by a transmitter embodied in the actuator.

Actuators

2. Connection to the Type 4023 unit is made by Plessey plug and socket. Connection to the Desynn transmitter is made by a short length of cable which at one end is permanently connected to the actuator, and at the other end is fitted with a Plessey socket which mates with a plug mounted nearby on the fuselage. The actuator incorporates mechanical stops and a slipping clutch which prevent damage to the unit or the airframe if for any reason it should run away.

Control switches

3. The cut-in and trim switches are fitted in a removable block embodied in the right handle of the control column, the cut-in switch being located forward of the trim switch and secured by a pin which engages tangentially with a circular groove in the switch body. The securing pin is accessible when the switch block is removed from the handle. The trim switch is secured by a wire circlip having a small locating lug, and to ensure that the switch can only be operated in a fore-and-aft direction the switch body has a small locating pip which slides in a vertical key slot in the switch block. During fitting, the circlip is slid down the switch body with the lug opposite the key slot; when at the correct position the lug is turned by means of a narrow blade so that it engages a small horizontal slot cut into the switch block at right angles to the key slot. To prevent any pull being transmitted to the switch connections, the switch cables are secured by a split clamp inside the right arm of the control column. The two sections of the clamp are held together by two round-headed screws which are accessible from the underside of the arm.

S.T.C. relays

4. Two small S.T.C. relays, one wired in the NOSE UP circuit and the other in the NOSE DOWN circuit, are located in a box at the base of the control column, below the pilot's floor. The relays are used as slaves between the trim switch and the reversing relay near J.B.6 in the rear fuselage.

Isolating relay

5. This relay is installed near J.B.6 and its use ensures that the tail plane actuator will only function while the cut-in switch is operated simultaneously with the trim switch. Its operation controls the power supply fed to the actuator through the reversing relay. A Type ZR12 diode is connected across the energizing and earth terminals of the relay to minimize sparking at the cut-in switch contacts.

Limit switches

6. Normal tail plane travel is limited by two microswitches installed one above and one below the tail plane. The switches are mounted on the fuselage and operated by adjustable tappets, fitted to the tail plane, whenever the latter exceeds predetermined limits of travel. Setting of the limit switches is described in A.P. 101B-0417-1A, Sect. 3, Chap. 4.

Operation

7. Provided that the isolating relay is closed by operating the cut-in switch, selecting NOSE UP connects circuit CC5-CC52A to close the NOSE UP S.T.C. relay. This completes circuit CC5-CC53-CC55 to one coil of the reversing relay which closes to cause the actuator to extend and apply NOSE UP trim. Selecting NOSE DOWN connects circuits CC5-CC51A to energize the NOSE DOWN S.T.C. relay which then completes circuit CC5-CC54-CC56 to the other coil of the reversing relay, thereby causing the actuator to apply NOSE DOWN trim. If tail plane trim is selected long enough for either limit switch to operate, the reversing relay will open to break the power supply to the actuator and stop any further tail plane travel.

RUDDER TRIM CONTROL

General

8. Rudder trim is controlled by a trimming tab which is operated by a Type 258 electrical actuator at the base of the rudder. The actuator is controlled by two independent single-pole 3-position switches. The amount of trim is shown on the instrument flying panel by a Desynn indicator which is operated by a transmitter integral with the actuator.

FLAPS CONTROL

General

9. The hydraulically-operated flaps are electrically controlled by a Type 205 rotary valve actuator installed in the roof of the bomb bay. The actuator is controlled by a 2-position switch, labelled FLAPS-UP-DOWN, fitted on the alighting gear panel. A Desynn indicator showing the flaps position is mounted on the instrument flying panel and operated by a transmitter installed in the inboard trailing edge of the port wing. The transmitter is actuated by a linkage coupled to the flap control rod.

AILERON TRIM CONTROL

General

10. Aileron trim is electrically controlled by a Type 259 actuator coupled to the aileron mechanism at the base of the control column, and a 3-position switch, labelled AILERON TRIM-L-R, fitted on the top panel of the console. The amount of trim is shown on the instrument flying panel by a Desynn indicator operated by a transmitter embodied in the actuator.

AIR BRAKES

General

11. The air brakes system consists of a number of hydraulically operated drag channels which when actuated by hydraulic jacks project above and below the main planes. The hydraulic system is controlled by a Type 217 rotary valve actuator located in the roof of the bomb bay. The Type 217 actuator is operated by a Type 200 electrical rotary actuator via a mechanical linkage. The electrical actuator is controlled by a switch mounted on the control column.

Air brakes control switch

12. The system is controlled by a three position switch labelled IN-MID-OUT, which is located on the control column. The switch operates in conjunction with a Type S relay in the d.c. distribution box, a solenoid operated hydraulic cock in the bomb bay and two microswitches mounted on the air brake jack assembly in the starboard wing.

Operation

'MID' selection

13. When MID is selected from IN the supply C9 is fed via C91-C92 and both microswitches to energize and close the Type S relay. This completes circuit C9-C94 to the actuator which operates the valve to retract the jack. When the jack piston reaches the halfway position the short cam operates the No. 1 microswitch so that contacts AB open and AC close. This action de-energizes the relay, causing the valve actuator to reverse, and at the same time energizes the solenoid-operated cock which closes the hydraulic circuit to lock the brakes in the MID position.

'OUT' selection

14. On selecting OUT a supply is fed from C9 to C92 to energize and close the relay and complete circuit C9-C94 to the actuator. This results in the valve operating to retract the jack and fully extend the brakes.

'IN' selection

15. If the selector switch is returned to 'IN' the relay is de-energized and opens, and the supply C9 is changed over to C93, causing the actuator to move the hydraulic valve to the 'IN' position and retract the brakes.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

TAIL PLANE CONTROL

Functional check

16. The functional check detailed below should be made in accordance with the servicing schedule or whenever the control circuit has been broken down in any way.

(1) Operate the trim switch only - the tail plane should remain stationary.

(2) Operate the cut-in switch only - the tail plane should remain stationary.

(3) Operate the cut-in switch then select NOSE UP by the trim switch, the tail plane should move in the required direction.

(4) Repeat (3) but selecting NOSE DOWN.

(5) Repeat (3) and (4) but operating the trim switch in short 'blips'.

(6) The release of the cut-in switch at any time during (3) (4) and (5) should result in the immediate stopping of all tail plane movement.

Note . . .

As the contacts and coils of the reversing relay are short rated prolonged operation of the system should be avoided.

ACTUATORS

General

17. Servicing instructions for Type 258 and Type 259 actuators are given in A.P. 113E-0143-16. The Type 205 and Type 217 hydraulic valve actuators in the flap and air brake control circuits both utilize a Type 200 rotary actuator to operate the hydraulic valve, and servicing instructions for this actuator are given in A.P. 113E-0248-1.

REMOVAL AND ASSEMBLY

TAIL PLANE CONTROL SWITCHES

(fig. 1)

Removal

Note . . .

To avoid ingress of swarf and/or scoring of the inner torque tube of the control columns fitted with a vertical conduit channel, the channel must not be removed in-situ or its attachment rivets substituted by self tapping screws.

18. To remove the switches:-

(1) Disconnect the tail plane control cables at the base of the control column, and remove the P.V.C. tubing carrying the cables down the column. Remove the lower half of the cable clamp fitted in the right arm of the control wheel.

(2) Remove the three countersunk screws (1) and the top plate (2), and withdraw the switch mounting block (3).

(3) Remove the trim switch (4) by inserting a narrow thin blade down the side of the switch and turning the circlip (6) until it aligns with the key slot (5).

(4) Remove the cut-in switch (7) by driving out the pin (8).

(5) Withdraw the switch cables from the P.V.C. tubing which was bound to the column.

Assembly

19. Assembly of the trim switches is the reverse of the removal procedure but it is essential that the following precautions should be observed.

(1) The switches must be a firm fit in the switch mounting block. If for this reason individual switches require packing, it is permissible to bind them with cellulose tape at the positions shown. The tape must not cover the locating pip on the trim switch or the circular groove in the body of the cut-in switch.

(2) The switch mounting block must be a firm fit in the control handle and, before the switches are fitted, must be cleared of any swarf or other foreign matter.

(3) As the large rubber sleeve which holds the trim switch cables together also serves the purpose of keeping the switch cover close to the switch body, it is important that the sleeve should be pushed as near as possible to the switch to retain the cover in position.

(4) It is essential at all times, either during storage or fitting, that swarf is not allowed ingress to the switch assemblies.

(5) After the switches have been re-assembled in accordance with the foregoing precautions, they must be manually operated approximately 50 times before any electrical loading is applied to them.

(6) On the conclusion of tests, the switch cables should be run through the P.V.C. tubing and then bound to the control column as shown in Fig.1. It is important that, when binding the cables, sufficient slack is left in them to allow a full 90 deg each-way movement of the control wheel without causing any undue tightening at full travel. The P.V.C. tubing is normally marked with a white ring to denote the first binding-point near the top of the column. If the marking is not visible, the tubing should be ringed at a point 20 in. from the switch mounting block in the control handgrip and the binding started at the position shown.

(7) In conjunction with the relevant routeing diagram connect the cables to the terminals at the base of the control column below the pilot's floor.

20. On completion of the above operations the functioning tests detailed in para. 16 should be carried out.

to operate the hydraulic valve, and servicing instructions for this actuator are given in A.P. 113E-0248-1.

REMOVAL AND ASSEMBLY

TAIL PLANE CONTROL SWITCHES
(fig.6)

Removal

Note...

To avoid ingress of swarf and/or scoring of the inner torque tube of the control columns fitted with a vertical conduit channel, the channel must not be removed in-situ or its attachment rivets substituted by self tapping screws.

18. To remove the switches:-

(1) Disconnect the tail plane control cables at the base of the control column, and remove the P.V.C. tubing carrying the cables down the column. Remove the lower half of the cable clamp fitted in the right arm of the control wheel.

(2) Remove the three countersunk screws (1) and the top plate (2), and withdraw the switch mounting block (3).

(3) Remove the trim switch (4) by inserting a narrow thin blade down the side of the switch and turning the circlip (6) until it aligns with the key slot (5).

(4) Remove the cut-in switch (7) by driving out the pin (8).

(5) Withdraw the switch cables from the P.V.C. tubing which was bound to the column.

Assembly

19. Assembly of the trim switches is the reverse of the removal procedure but it is essential that the following precautions should be observed.

(1) The switches must be a firm fit in the switch mounting block. If for this reason individual switches require packing, it is permissible to bind them with cellulose tape at the positions shown. The tape must not cover the locating pip on the trim switch or the circular groove in the body of the cut-in switch.

(2) The switch mounting block must be a firm fit in the control handle and, before the switches are fitted, must be cleared of any swarf or other foreign matter.

(3) As the large rubber sleeve which holds the trim switch cables together also serves the purpose of keeping the switch cover close to the switch body, it is important that the sleeve should be pushed as near as possible to the switch to retain the cover in position.

(4) It is essential at all times, either during storage or fitting, that swarf is not allowed ingress to the switch assemblies.

(5) After the switches have been reassembled in accordance with the foregoing precautions, they must be manually operated approximately 50 times before any electrical loading is applied to them.

(6) On the conclusion of tests, the switch cables should be run through the P.V.C. tubing and then bound to the control column as shown. It is important that, when binding the cables, sufficient slack is left in them to allow a full 90 deg each-way movement of the control wheel without causing any undue tightening at full travel. The P.V.C. tubing is normally marked with a white ring to denote the first binding-point near the top of the column. If the marking is not visible, the tubing should be ringed at a point 20 in. from the switch mounting block in the control handgrip and the binding started at the position shown.

(7) In conjunction with the relevant routeing diagram connect the cables to the terminals at the base of the control column below the pilot's floor.

20. On completion of the above operations the functioning tests detailed in para.16 should be carried out.

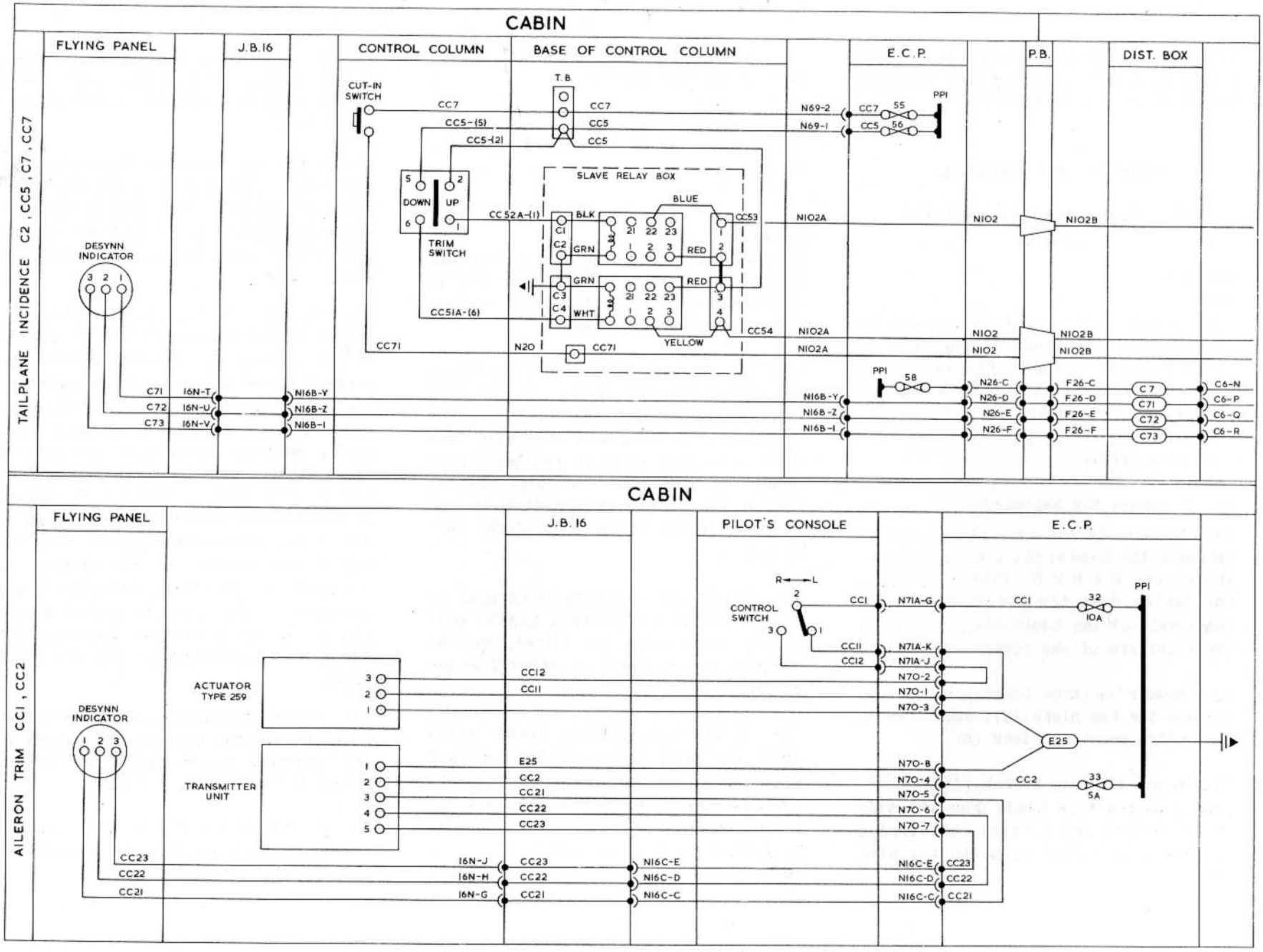


FIG. 7. TAIL PLANE CONTROL AND AILERON TRIM

◀ CABLE RATINGS DELETED ▶

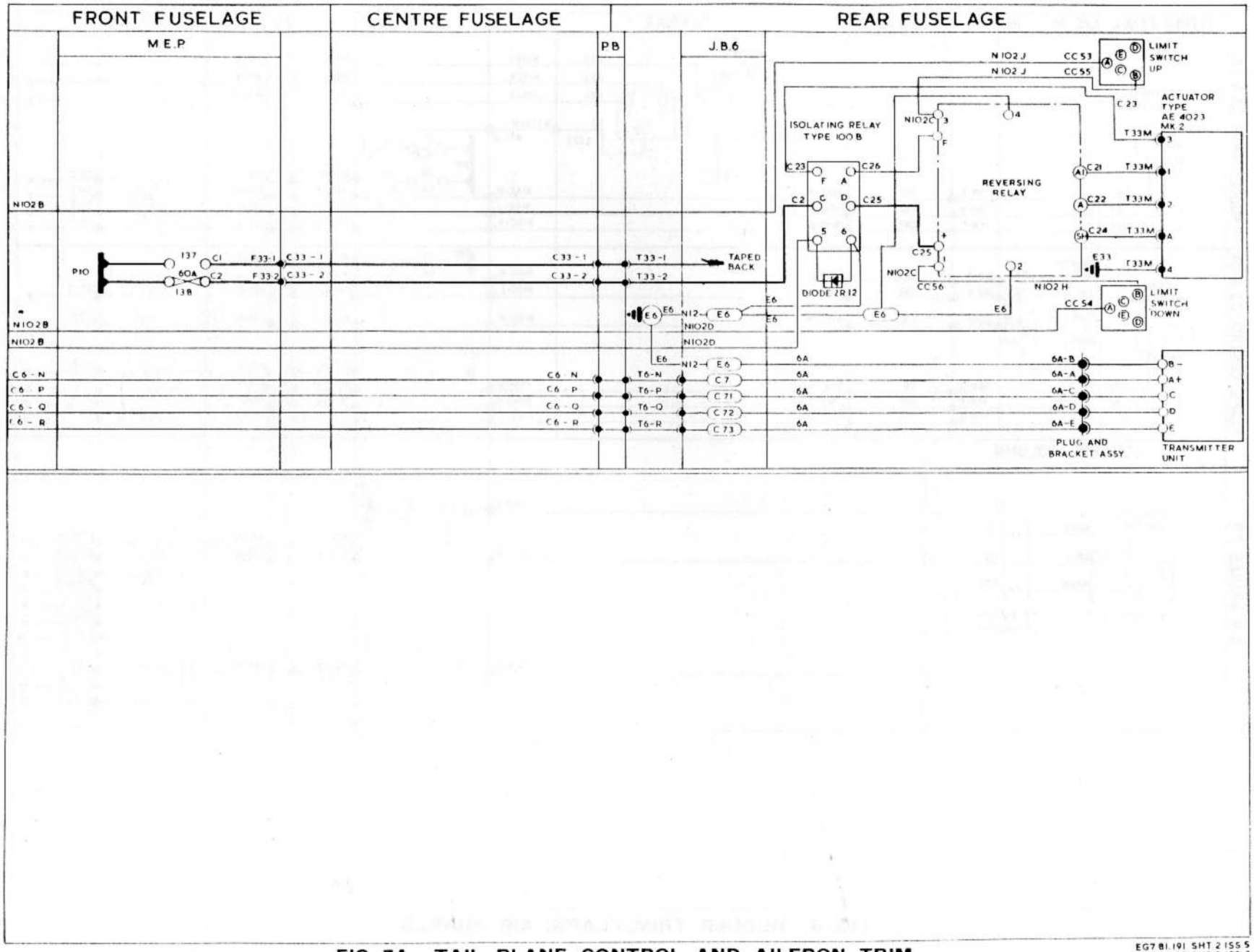


FIG. 7A. TAIL PLANE CONTROL AND AILERON TRIM

EG7 81 191 SHT 2 ISS 5
EG7 81 197 SHT 2 ISS 3

◄ CABLE IDENT AMENDED ►

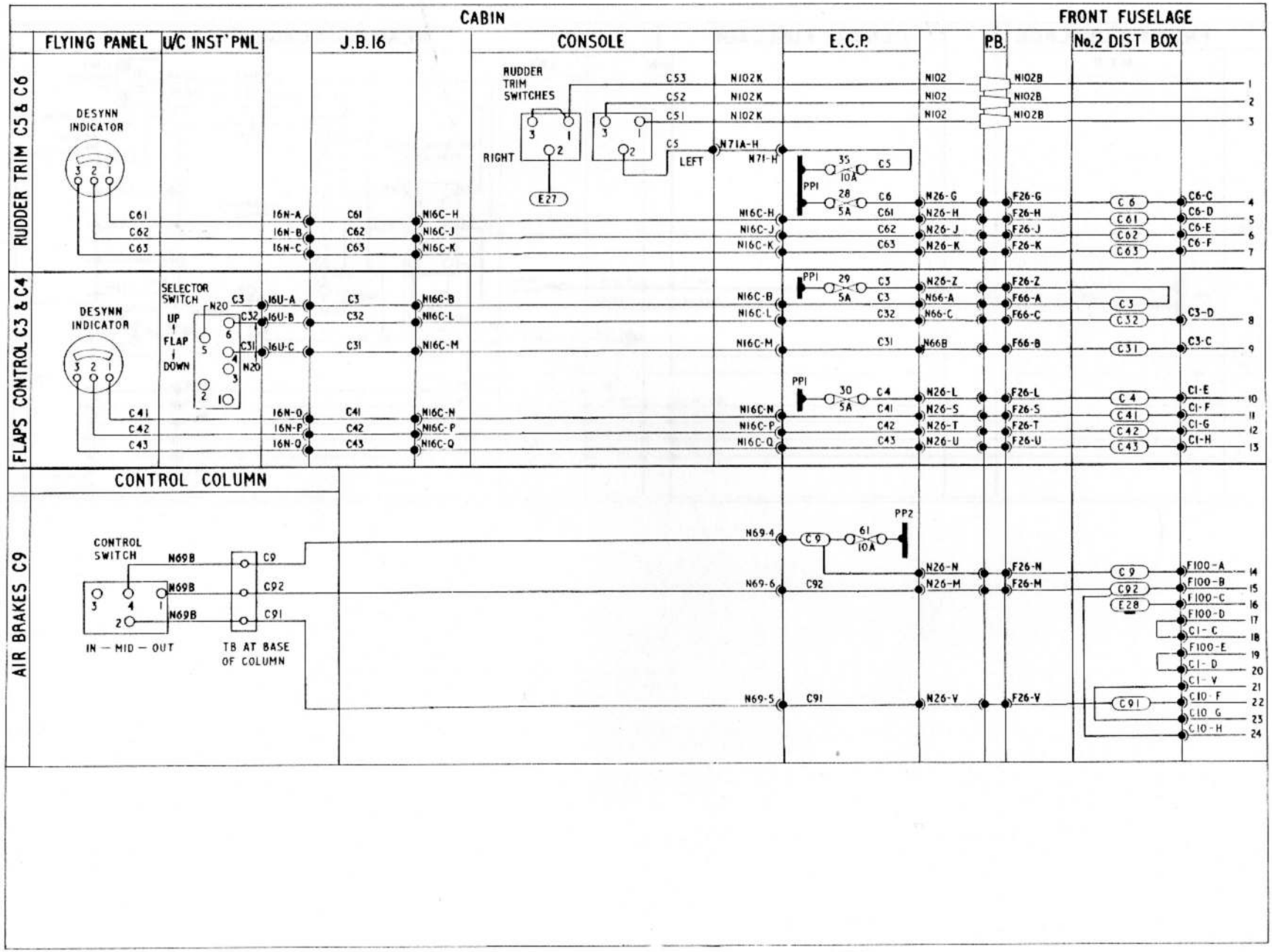
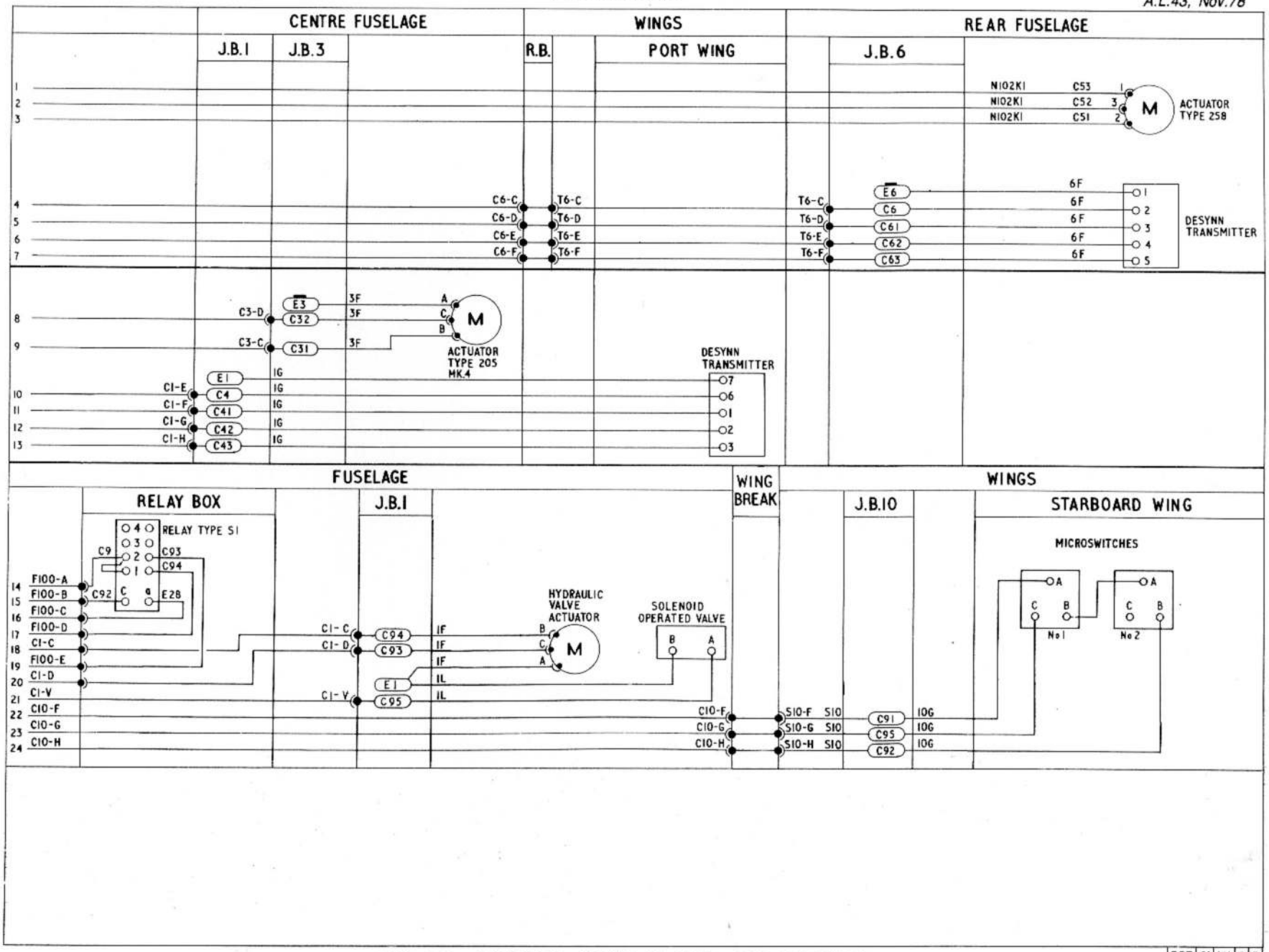


FIG. 8. RUDDER TRIM, FLAPS, AIR BRAKES



EG7 81 191 2 5

FIG. 8A. RUDDER TRIM, FLAPS, AIR BRAKES

◀CABLE RATINGS DELETED▶

Chapter 4 INSTRUMENT POWER SUPPLIES

◀PRE MOD. 5466 (SEE SUPPLEMENT FOR POST MOD. 5466)▶

LIST OF CONTENTS

◀Note... *Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*▶

DESCRIPTION

General

1. Power supplies of 28-volts d.c. and 115-volts, 400 Hz three-phase a.c. are required to operate the flight instruments. The a.c. supplies are normally provided by two engine driven turbo-alternators *(Chap.13)*. The output from the turbo-alternators is fed via fuses, a transformer and the closed contacts 5-5a and 7-7a of No.4 and No.8 relay to the 115-volt, 400 Hz, three-phase instrument supply busbars TR11 and TB11. Stand-by a.c. supplies are provided by two Type 100A inverters located in the ◀starboard equipment compartment. Power factor▶ capacitors are provided to offset the low power factor caused by the highly inductive windings of the oil pressure gauge transformers. The capacitors are ◀installed in the No.2 distribution▶ box. A 28-volt d.c. supply, taken from the normal aircraft d.c. distribution system, is required by the G4B compass installation and the turn and slip indicator. Provision is also made for alternative supplies for the turn and slip indicator should the primary source of power fail.

Normal operation

2. During the normal procedure of starting the port (No.1) engine first, No.2 inverter starts and supplies the instruments with a.c. power until the starboard (No.2) engine is started, when supplies are normally taken from No.1 inverter.

3. With the No.1 MASTER STARTING switch at ON the following events occur simultaneously:-

(1) A 28-volt d.c. supply from busbar PP1 is connected to the operating coil of the Type 9B No.2 relay on the engine starting panel, via fuse 23, M8, M81, fuse 60 and F4. The operation of the Type 9B, No.2 relay connects a parallel supply from F4 to the turn and slip

indicator via relay contacts 5-6, the TURN & SLIP SUPPLY switch, mounted on the main instrument panel, and F42.

(2) Both the relay No.7 in the No.2 distribution box and the EMER. INST. SUPPLY No.2 INV magnetic indicator on the main instrument panel are energized from busbar PP1 via fuse 23, M8, the closed contacts of the No.1 MASTER STARTING switch, M81, the closed contacts 4 and 4a of relay No.8 and M83.

(3) A 28-volt d.c. supply is connected from busbar PP1, via M2, closed contacts 3 and 3a of relay No.7 and M21 to a control panel Type 12, causing the No.2 inverter to start up.

(4) The 115-volt, 400 Hz, three-phase output from inverter No.2 is connected to the instrument supply busbars TB11 via TB2 and TR11 via TR2 and closed contacts 6-6a and 8-8a of relay No.8.

4. With the No.2 MASTER STARTING switch at ON the following events occur simultaneously:-

(1) A d.c. supply from busbar PP2 is connected to the open contact 3 of Type 9B, No.2 relay via fuse 90, M71, fuse 57 and F5.

(2) A d.c. supply is connected to a suppressor Type P, and subsequently to the GM4B compass amplifier, repeater junction box and master indicator. This supply is routed from busbar PP2 via fuse 90, M71, closed contacts 2-2a of relay No.8 and M65.

5. With the INSTRUMENT A.C. SELECTOR switch held in the No.1 INV position the following events occur simultaneously:-

(1) A d.c. supply from busbar PP2 is connected to contact 6 of an under voltage and phase sequence unit (U.V.P.S.U.) relay via fuse 163, M6, contacts 1 and 2 of the INSTRUMENT A.C. SELECTOR switch and M61.

(2) A parallel d.c. supply is taken from M61 to energize and close relay No.8 causing:-

(a) The d.c. supply to suppressor Type P to be disconnected.

(b) The d.c. supply to No.2 inverter to be disconnected.

(c) The energization of the EMER. INST. SUPPLY No.1 INV magnetic indicator.

(d) No.2 relay to be energized and a d.c. supply to be applied to No.1 inverter via its associated control panel Type 12.

(e) The output from No.1 inverter to be connected to the instrument supply busbars TB11 and TR11 and the U.V.P.S.U.

6. As soon as the U.V.P.S.U. senses that the No.1 inverter output voltage and phase sequence are correct the INSTRUMENT A.C. SELECTOR switch can be released to the neutral position. In this condition the relay in the U.V.P.S.U. is energized and contacts 6-7 close, providing a parallel connection between fuse 163 and No.8 relay coil which completes a holding circuit for No.8 relay. The suppressor Type P is then supplied from busbar PP2 via fuse 163, contacts 5 and 6 of the INSTRUMENT A.C. SELECTOR switch, M63, contacts 1-1a of relay No.8 and M65.

7. When either of the a.c. generators *(Chap.13)* is on line, the instruments may be supplied from the main a.c. busbars via a 200/115V 1kVA transformer. With the INSTRUMENT A.C. SELECTOR switch held in the MAIN SUPPLY position a supply from busbar PP2 is connected to the coil of relay No.4 via fuse 163, M6, contacts 2 and 3 of the INSTRUMENT A.C. SELECTOR switch and M62. With relay No.4 in the closed condition the following events occur simultaneously:-

(1) The energizing supply to relay No. 2 is broken at the now open contacts 4-4a of relay 4, therefore the d.c. input to No.1 inverter is disconnected.

(2) The output from the 1kVA transformer is connected to the instrument supply busbars via contacts 7-7a and 5-5a of both No.4 and No.8 relays.

(3) The U.V.P.S.U. samples the output from the kVA transformer and the relay, which is an integral part of the U.V.P.S.U., remains closed whilst the voltage and phase sequence of the transformer output are within limits.

(4) A parallel supply is connected from busbar PP2 to the coil of No.4 relay via fuse 163, contacts 5 and 6 of the INSTRUMENT A.C. SELECTOR switch, M63, contacts 1-1a of relay No.4, M64, closed contacts 2 and 1 of the U.V.P.S.U. relay and M62.

8. When the INSTRUMENT A.C. SELECTOR switch is released to the neutral position No.8 relay remains energized under circumstances similar to those described in para.6, No.4 relay remains energized as described in para.7(4).

Alternator supply failure

9. Failure of the a.c. supply from the alternators causes the U.V.P.S.U. relay to de-energize and open resulting in No.4 and No.8 relays de-energizing and opening. In this condition No.2 inverter commences to run, under the conditions described in para.3.

10. It is possible to select No.1 inverter for use as an alternative to the alternators. Should the No.1 inverter fail No.2 inverter automatically cuts-in and supplies the instruments. If No.1 inverter fails, the U.V.P.S.U. relay is de-energized and the holding supply for No.8 relay coil is disconnected. No.2 inverter then commences to run as described in para.3.

Turn and slip indicator

General

11. This instrument is provided with three alternative sources of power supply, two from the main batteries and one from the emergency batteries.

Operation

12. The power supplies are initially controlled by a switch labelled TURN & SLIP SUPPLY/EMERGENCY mounted on the pilot's main instrument panel. Normally the switch allows operation of the indicator from the main batteries via the engine master starting switches and the Type 9B, No.2 relay on the engine starting panel. Setting the No.1 engine master switch to ON, connects a supply from fuse 23 to the turn and slip indicator as described in para.3(1). If the supply from fuse 23 fails the relay is de-energized and the supply to the indicator is transferred to fuse 90, refer to para. 4(1). If both normal supplies become unserviceable the indicator will continue to function from the emergency batteries after setting the TURN & SLIP SUPPLY/EMERGENCY switch to EMERGENCY.

Fatigue meter

13. This instrument takes a 28-volt supply from the alighting gear circuit FF1 *(Chap.5)*, via the armament safety relay which is energized only when the alighting gear is retracted.

Periscopic sextant

14. The 28-volt d.c. supply required for heating and lighting this instrument is fed from fuse 54 in the E.C.P. via the periscope mounting. The sextant, which has an integral switch, is placed in the mounting when required for use.

Automatic height encoding

15. The height encoding equipment is supplied with d.c. from busbar PP2 via fuse 204. Single-phase 115-volt 400 Hz a.c. is supplied from the output of the turbo-alternators via busbar 1XC and fuse 311. An a.c. and a d.c. test socket, located on the I.F.F. equipment tray, are supplied from fuse 321 (a.c.) and fuse 206 (d.c.). A further d.c. test supply is available on terminal FF3 in the E.C.P., via fuse 205 from busbar PP2.

Oil pressure gauge step-down transformers

16. The 26-volt a.c. supply required to operate the gauges is obtained from the instrument supply busbars by two step-down transformers in the No.2 distribution box. For power factor correction two 0.25 μF capacitors are connected between the input side of the transformers and earth.

Artificial horizon

17. The three-phase 115-volt, 400 Hz a.c. supplies required for the operation of the artificial horizon are taken from the instrument supply busbars TB11, TR11 and EW.

GM4B compass amplifier

18. The three-phase a.c. supplies required by the amplifier are also taken from the instrument supply busbars. The amplifier derives its d.c. supply as described in para.4(2).

Radio supplies

19. A 26V a.c. supply is taken from the

instrument supply busbars via a step-down transformer and connected to the radio compass system and the V.O.R./I.L.S. system.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

Inverters

20. General information on the servicing of the inverters will be found in A.P. 113D-0104-16.

REMOVAL AND ASSEMBLY

Inverters

21. Access to the inverters is through the upper equipment compartment hatch. The inverters can be removed after disconnecting the input and output plugs and sockets and undoing the bolts securing the inverter assembly to its mounting.

instrument supply busbars via a step-down transformer and connected to the radio compass system and the V.O.R./I.L.S. system.

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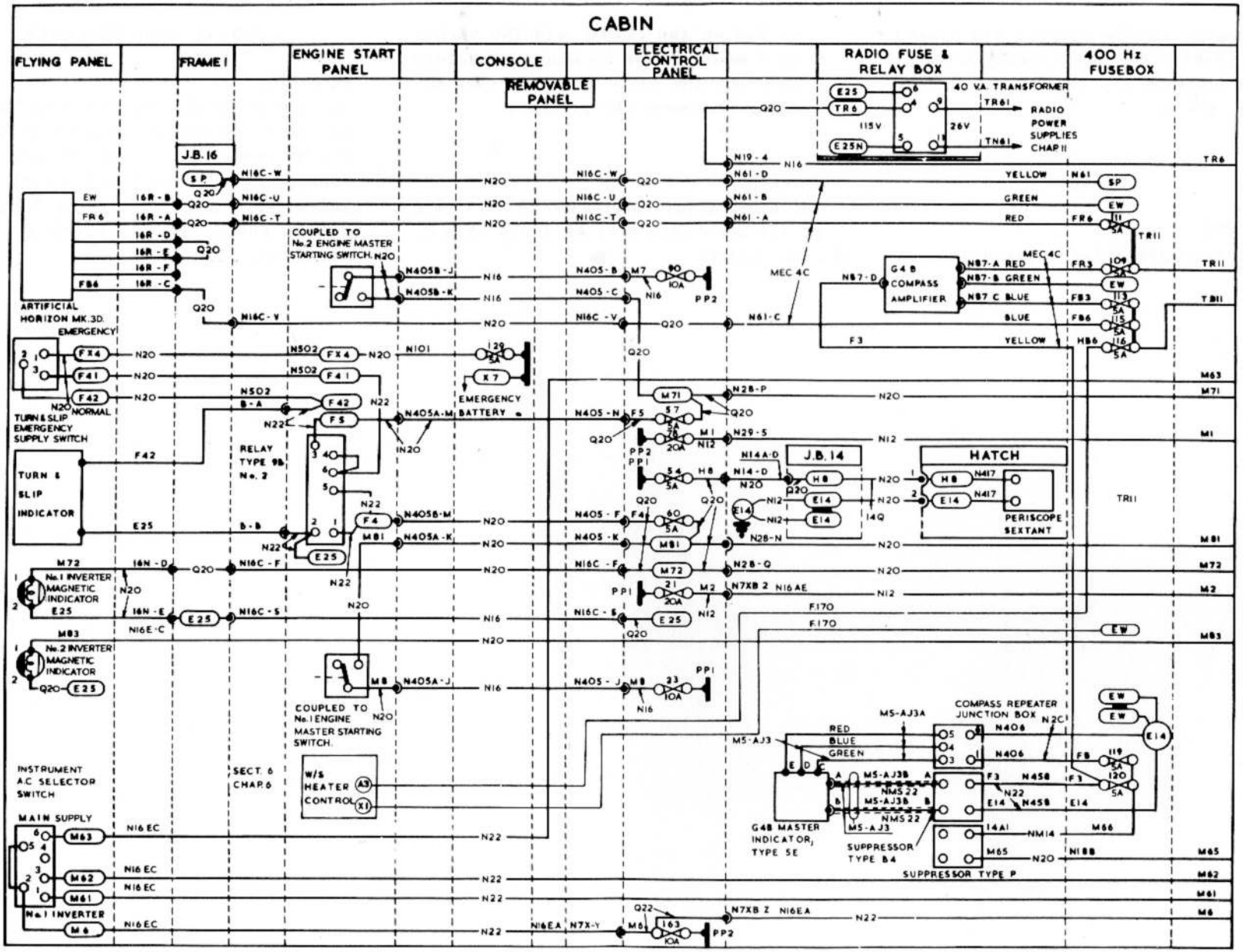

FIG. 2. INSTRUMENT POWER SUPPLIES AND DISTRIBUTION

◀ MOD. 4865 EMBODIED ▶

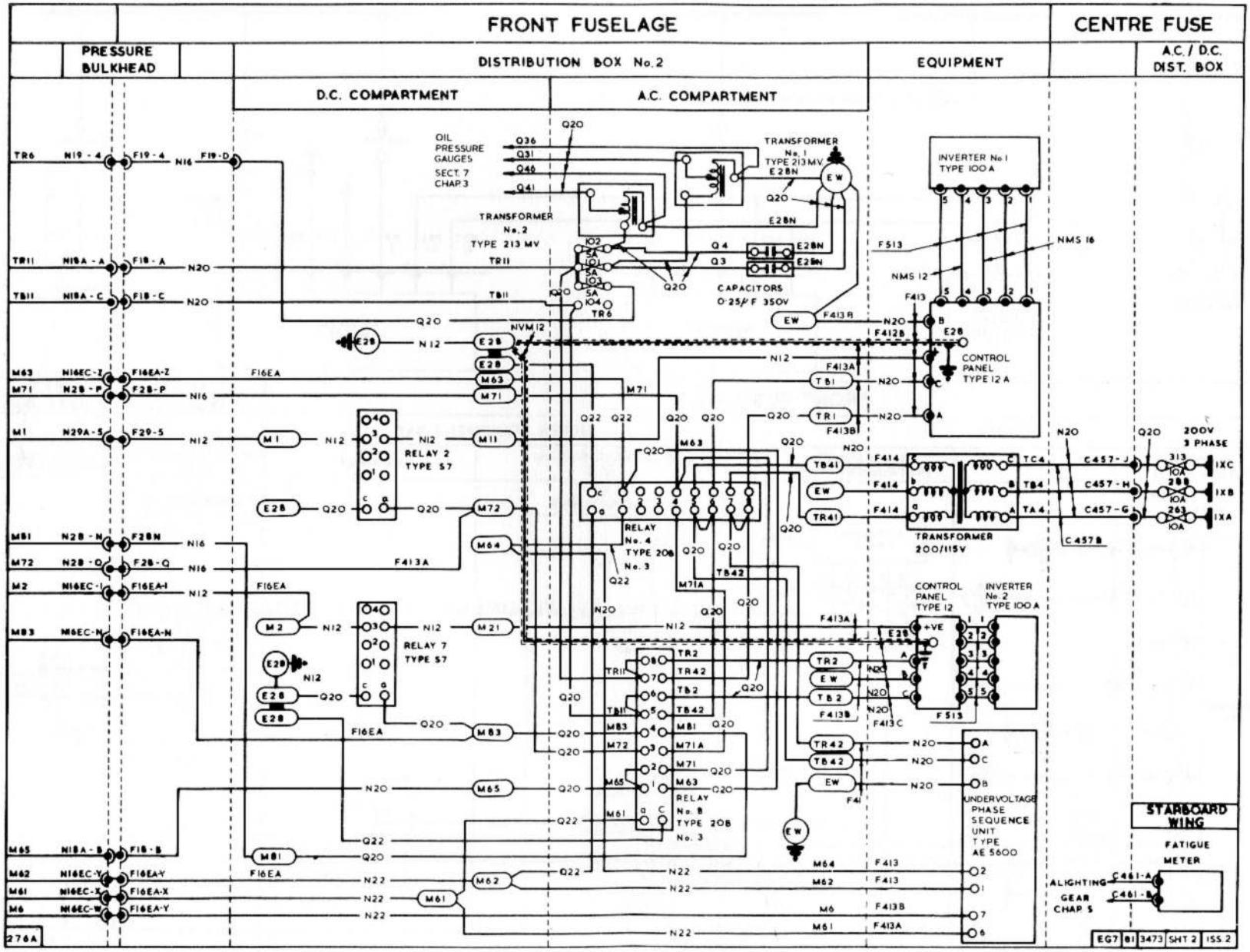

FIG. 2A. INSTRUMENT POWER SUPPLIES AND DISTRIBUTION

◀ MOD. 4865 EMBODIED ▶

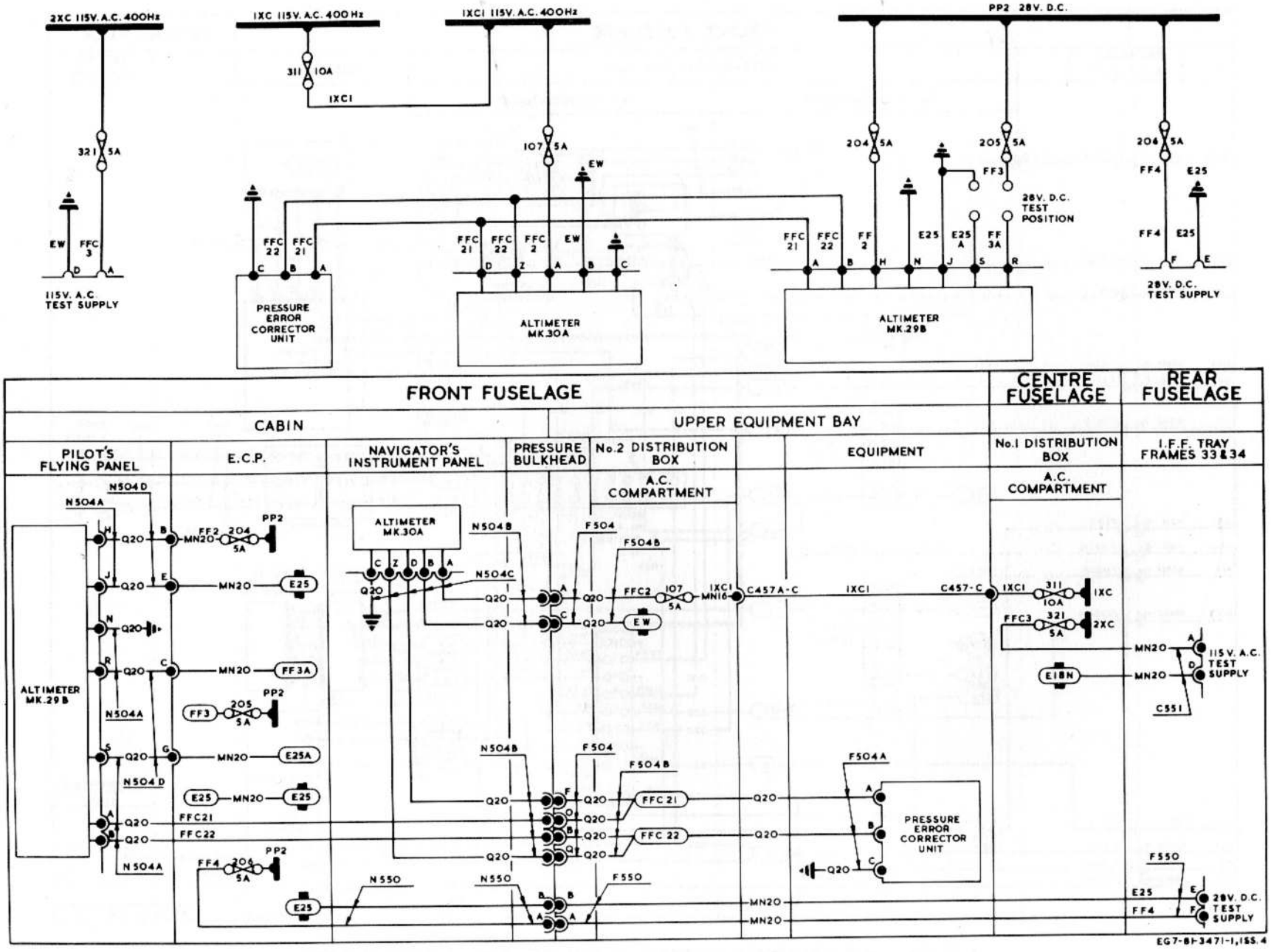

FIG.3. INSTRUMENT POWER SUPPLIES AND DISTRIBUTION — AUTOMATIC HEIGHT ENCODING

◀ MOD.4865 EMBODIED ▶

1018-0417-18/32/176827/162/5-75/BAC/1307

Chapter 5 ALIGHTING GEAR

◀PRE MOD. 5466 (SEE SUPPLEMENT FOR POST MOD. 5466)▶

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LIST OF ILLUSTRATIONS

◀**Note**... *Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*▶

LIST OF TABLES

DESCRIPTION

General

1. The alighting gear is hydraulically-operated and electrically-controlled. A Type C5182Y alighting-gear selector switch unit controls a Type 204 rotary actuator and hydraulic valve installed in the roof of the pack bay. A master switch is incorporated in the control circuit to prevent inadvertent retraction on the ground.

2. The alighting gear UP circuit U12, is used to energize the coil of the armament safety relay, via the armament test microswitch and U12B, and to control the operation of the circuits to the fatigue meter *(Sect.7, Chap.2)*.

Selector switch unit

3. The selector switch unit *(A.P.113D-1130-1)* is fitted on a sloping panel forward of the throttle levers. The UP and DOWN selector buttons are spring-loaded, pressure on one releasing the other. To prevent accidental operation of the UP button on the ground, a solenoid in the unit prevents the buttons being operated while the main wheel legs are compressed. When the legs extend, on the aircraft becoming airborne or being jacked up, a microswitch fitted on the starboard leg torque link, closes and completes the circuit to the solenoid locking coil, this releases a mechanical lock to allow UP to be selected.

Emergency UP selection

4. The UP mechanical lock can be overriden in an emergency, or if required during servicing, by turning the knobbed ring which encircles the UP button clockwise through 60 degrees (or 90 degrees according to type) and then depressing the button in the normal manner. If UP selection is made in this way the mechanical lock will remain inoperative until reset. To reset, lightly depress the DOWN selector button and hold depressed. Insert into the small hole in the face of the UP selector button a resetting tool (See Table 1). Exert a steady pressure on the resetting tool to overcome internal spring tension until the UP button rises and the knobbed ring rotates counter-clockwise to its normal position (the knob horizontal to the switch body) under its own internal spring pressure. Ensure UP button cannot be depressed using normal finger pressure.

WARNING

Under no circumstances must the knobbed ring be turned past the 60 deg (or 90 deg) stop as such action will damage the switch, and may result in inadvertent retraction of the alighting gear, similarly it is important that returning the UP selector button to the normal mode be carried out as detailed. Any attempt to reset it by any other method, or by using a different tool will cause damage to the switch mechanism.

Master switch

5. The master switch fitted on the take-off panel prevents inadvertent retraction of the alighting gear by operation of the UP button while its mechanical lock is overridden. The switch is connected in series with the power supply and the control circuit, and has two positions, LIVE and SAFE. On the ground the switch must be at SAFE at all times except when retraction tests are being made with the aircraft jacked up.

Position indicator and microswitches

6. A Type C1224Y alighting gear indicator *(A.P.113F-0607-1)* is mounted alongside the selector switch unit and is operated by microswitches installed in the nose and main wheel bays. The microswitches ◀ are shown in fig. 2 and 2A, with their ▶ adjustment. The microswitch shown forward of the nose wheel leg is actuated by the nose wheel door and connected in parallel with the nose wheel UP switch. Door-operated microswitches are not installed in the main wheel bays but in some aircraft it may be found that a spare cable for use with a door switch is fitted and taped up in each bay. These cables are referenced 7A4 (port) and 8A6 (starboard). Another microswitch, fitted in the throttle box, brings on the nose wheel red light if the throttle lever of either engine is closed past its fast idling stop with the alighting gear retracted. Cams on the throttle lever shafts are arranged to close the microswitch contacts when the levers are less than one third open. Microswitch actuation is adjusted by varying the switch position in relation to the cam by utilizing the elongated holes in the attachment bracket. Adjustment and location details for all the microswitches in the position ◀ indicator circuit are given in fig. 1, 2 and 2A. ▶

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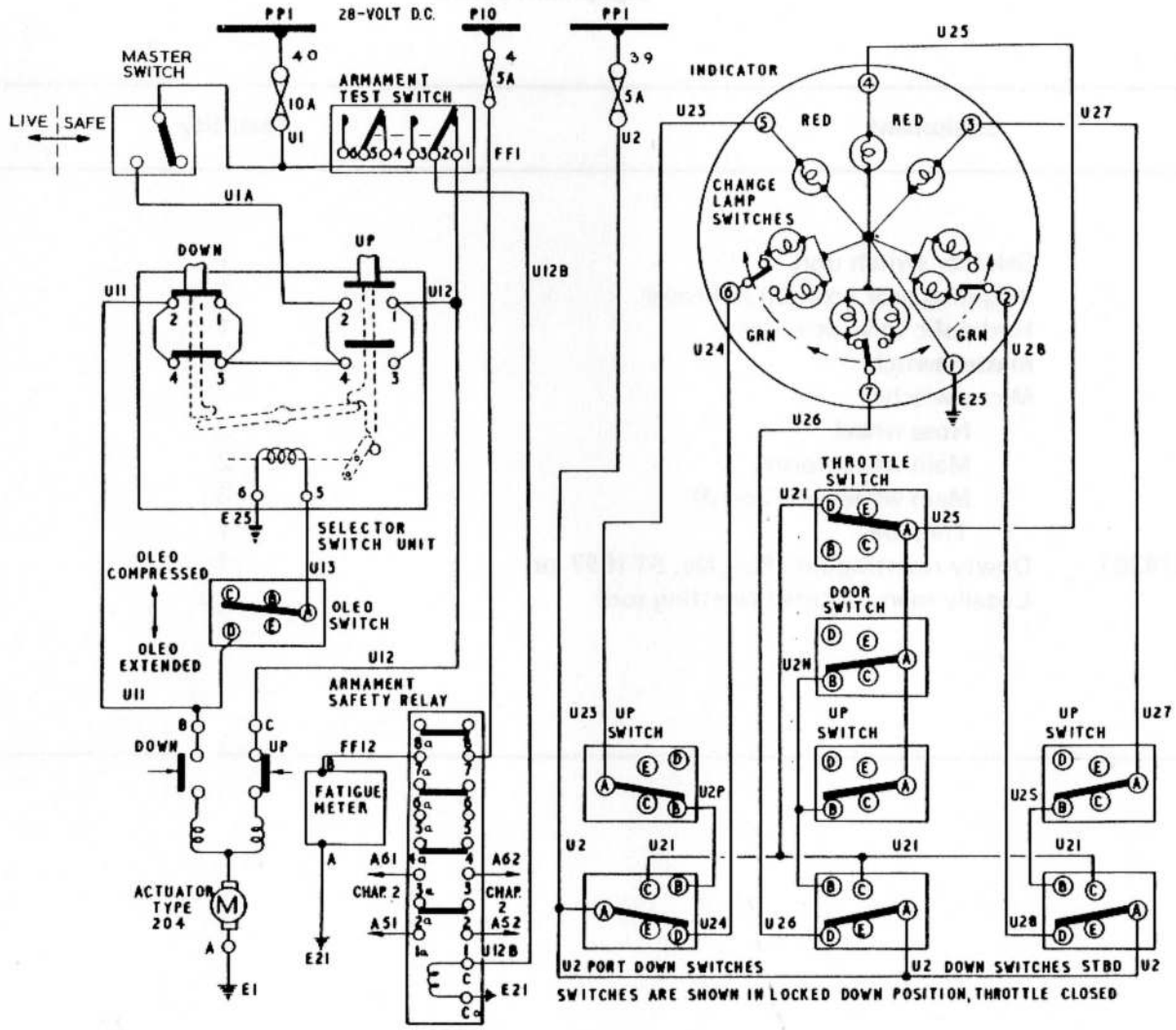

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FIG. 1 ALIGHTING GEAR CONTROL AND INDICATION

◀ MASTER SWITCH TO SAFE - ANOTATION ADDED ▶

TABLE 1

Equipment details

Ref. No.	Equipment	Quantity	Relevant A.P.
5CW/4664472	Selector switch unit	1	113D-1130-1
5CX/4330226	Alighting gear position indicator	1	113F-0607-13A
5W/4511895	Hydraulic valve actuator	1	113E-0248-1
5CW/4408108	Master switch	1	
5CW/4400883	Microswitches		
	Nose wheel	3	
	Main wheel (port)	2	
	Main wheel (starboard)	3	
	Throttle	1	
27Q/5120-99-4674381	Dowty resetting tool Part No. ST1657 or	1	
	Locally manufactured resetting tool		113D-1130-1 Chapter 1 Figure 3

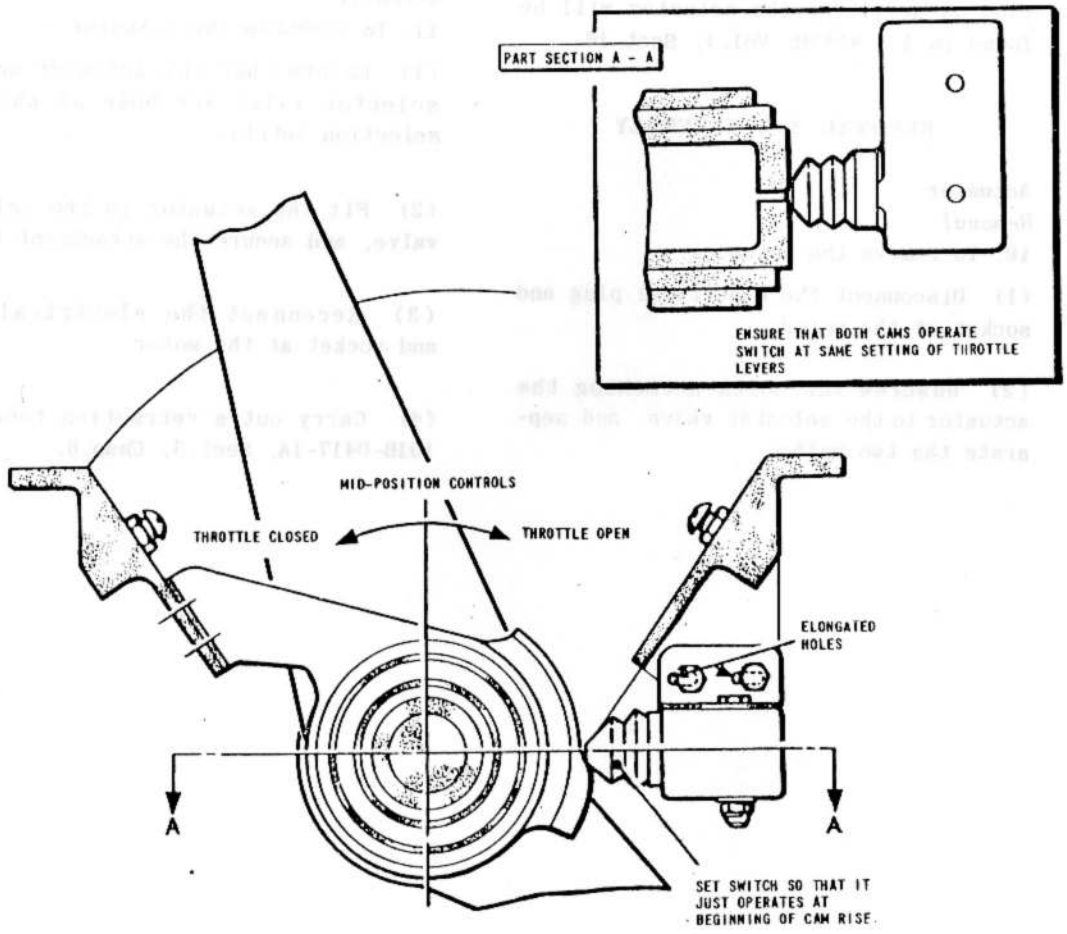


Fig. 1. Microswitch adjustment - throttle box

◄ FIG RENUMBERED ►

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

Circuit checks

Indicator circuit

7. The alighting gear indicator circuits are not switched but fed direct from busbar PP1 which is controlled by the BATTERY isolation switch. The functioning of the circuits may be checked as follows:-

(1) Set the throttle levers fully open.

(2) Switch on the BATTERY ISOLATION switch and check that all three green DOWN lights are on.

(3) Break each DOWN switch in turn; the respective green light should go out and the red light come on.

(4) At each main wheel in turn, break the UP switch while keeping the DOWN switch broken; the red light should go out each time.

(5) With the nose wheel DOWN switch broken and the red light on, break both the UP switch and the door switch; the red light should go out.

(6) With both the UP and DOWN switches broken in either main wheel circuit and no lights on, move the throttle levers, in turn, to less than one third open;

the nose wheel red light should come on each time.

Control circuit

8. Due to the safety precautions necessary when the aircraft is on the ground *(para. 3)* an electrical functioning check on this circuit can only take place with the weight of the aircraft removed from its main wheels, this allows the safety lock microswitch to operate and energize the locking coil in the selector switch unit and release the mechanical lock.

Actuator

9. Servicing of the actuator will normally be confined to checking the length of the brushes and removing carbon dust, two operations which require the removal of the motor end cover. Further information on servicing the actuator will be found in A.P.4343D, Vol.1, Sect.16.

REMOVAL AND ASSEMBLY

Actuator

Removal

10. To remove the actuator:-

(1) Disconnect the electrical plug and socket at the motor.

(2) Unscrew the bolts attaching the actuator to the selector valve, and separate the two units.

(3) Remove the actuator.

Assembly

11. To assemble the actuator:-

(1) Ensure that the actuator and the selector valve are both at the same selection setting.

(2) Fit the actuator to the selector valve, and secure the attachment bolts.

(3) Reconnect the electrical plug and socket at the motor.

(4) Carry out a retraction test, A.P. 101B-0417-1A, Sect.3, Chap.6.

TABLE 1

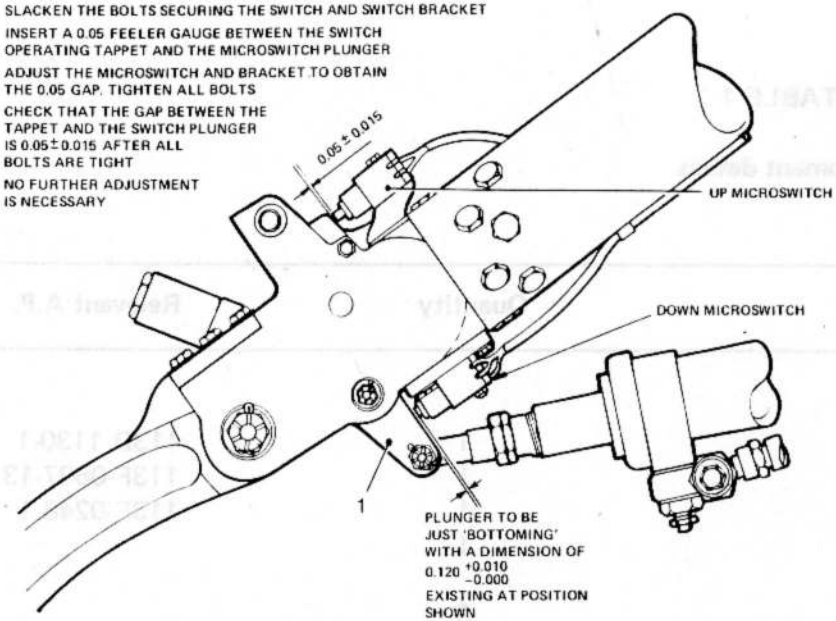
Equipment details

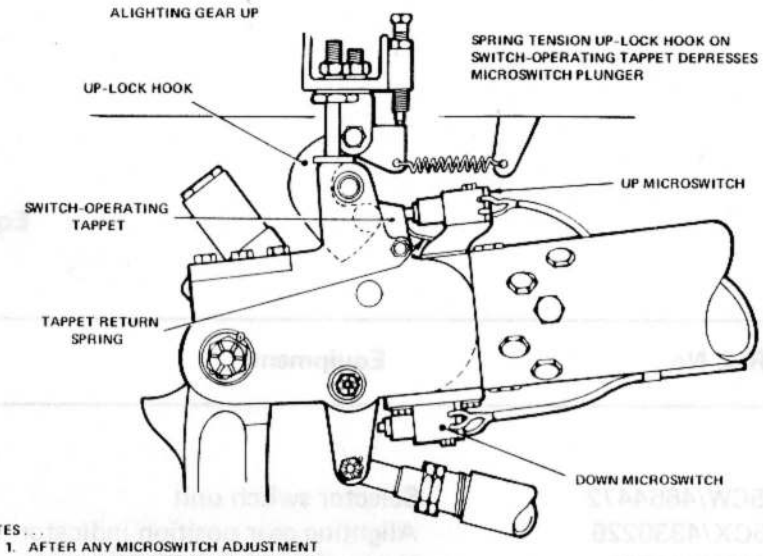
Ref. No.	Equipment	Quantity	Relevant A.P.
5CW/4664472	Selector switch unit	1	113D-1130-1
5CX/4330226	Alighting gear position indicator	1	113F-0607-13A
5W/4511895	Hydraulic valve actuator	1	113E-0248-1
5CW/4408108	Master switch	1	
5CW/4400883	Microswitches		
	Nose wheel	3	
	Main wheel (port)	2	
	Main wheel (starboard)	3	
	Throttle	1	
◄ 5CW/9504373	Microswitch		
	Throttle	1	►
27Q/5120-99-4674381	Dowty resetting tool Part No. ST1657 or Locally manufactured resetting tool	1	113D-1130-1 Chapter 1 Figure 3

UK RESTRICTED

UP MICROSWITCH ADJUSTMENT WITH U/C IN THE DOWN POSITION

1. SLACKEN THE BOLTS SECURING THE SWITCH AND SWITCH BRACKET
2. INSERT A 0.05 FEELER GAUGE BETWEEN THE SWITCH OPERATING TAPPET AND THE MICROSWITCH PLUNGER
3. ADJUST THE MICROSWITCH AND BRACKET TO OBTAIN THE 0.05 GAP. TIGHTEN ALL BOLTS
4. CHECK THAT THE GAP BETWEEN THE TAPPET AND THE SWITCH PLUNGER IS 0.05 ± 0.015 AFTER ALL BOLTS ARE TIGHT
5. NO FURTHER ADJUSTMENT IS NECESSARY



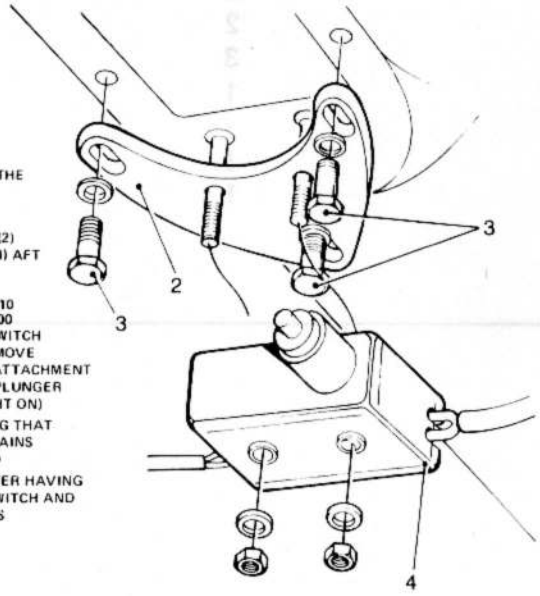


NOTES...

1. AFTER ANY MICROSWITCH ADJUSTMENT AN UNDERCARRIAGE RETRACTION TEST MUST BE MADE AND THE WARNING LIGHTS CHECKED
2. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE STATED

DOWN MICROSWITCH ADJUSTMENT
U/C IN DOWN POSITION

1. CONNECT A 24 VOLT SUPPLY TO THE EXTERNAL SUPPLY SOCKET
2. SLACKEN THE BOLTS (3)
3. MOVE THE ATTACHMENT PLATE (2) COMPLETE WITH MICROSWITCH (4) AFT TO THE LIMIT OF ITS TRAVEL (GREEN LIGHT OFF)
4. WITH A DIMENSION OF 0.120 +0.010 −0.000 EXISTING BETWEEN THE MICROSWITCH PLUNGER AND LOCK LEVER (1). MOVE THE MICROSWITCH (4) AND THE ATTACHMENT PLATE (2) FORWARD UNTIL THE PLUNGER IS JUST BOTTOMING (GREEN LIGHT ON)
5. TIGHTEN THE BOLTS (3) ENSURING THAT SOME PLUNGER MOVE MENT REMAINS WHEN ADJUSTMENT IS FINALISED
6. RE-CHECK THE ADJUSTMENT AFTER HAVING FINALLY REFITTED THE MICROSWITCH AND TIGHTENED THE SECURING BOLTS



DOOR MICROSWITCH ADJUSTMENT

1. JACK THE NOSE (SECT.2, CHAP.4)
2. CONNECT A 24 VOLT SUPPLY TO THE EXTERNAL SUPPLY SOCKET
3. DISCONNECT THE PORT DOOR ACTUATING LINK (FIG.1) AT IT'S LOWER END
4. UNLOCK AND SELECT THE NOSE UNDERCARRIAGE UP/FLIGHT SELECTOR TO UP. USING THE HAND PUMP, FULLY RAISE THE NOSE WHEEL, ENSURING THAT THE DISCONNECTED LINK IS HELD CLEAR
5. SLACKEN THE TAPPET LOCKNUT (6)
6. SCREW TAPPET (6) AWAY FROM THE MICROSWITCH (7) (RED LIGHT ON)
7. SCREW TAPPET (5) TOWARDS THE MICROSWITCH (7) UNTIL A DEFINITE CLICK IS HEARD (RED LIGHT OFF) AND GIVE A FURTHER TWO COMPLETE TURNS
8. TIGHTEN THE LOCKNUT (6) AND ENSURE THAT SOME PLUNGER MOVEMENT STILL REMAINS
9. SELECT THE NOSE UNDERCARRIAGE UP/FLIGHT SELECTOR TO FLIGHT. USING THE HAND PUMP, FULLY LOWER THE NOSE WHEEL, ENSURING THAT THE DISCONNECTED DOOR LINK IS HELD CLEAR. WIRE LOCK THE UP/FLIGHT SELECTOR IN THE FLIGHT POSITION
10. RECONNECT THE PORT DOOR ACTUATING LINK

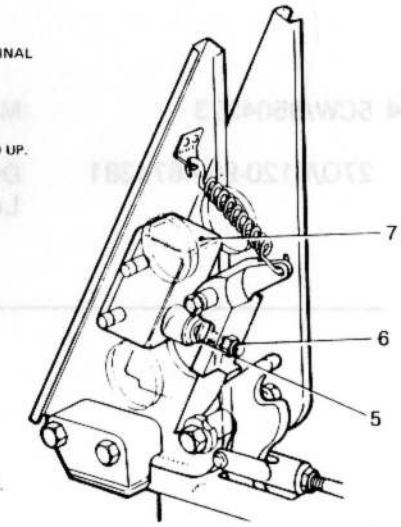
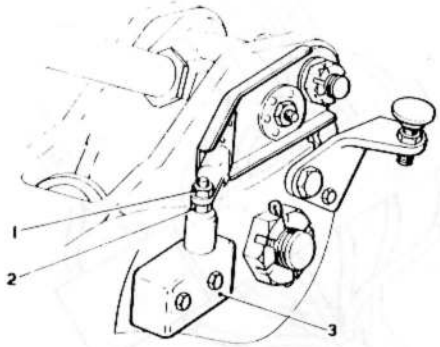


FIG. 2. MICROSWITCH ADJUSTMENT - NOSE UNDERCARRIAGE

DOWN MICROSWITCH

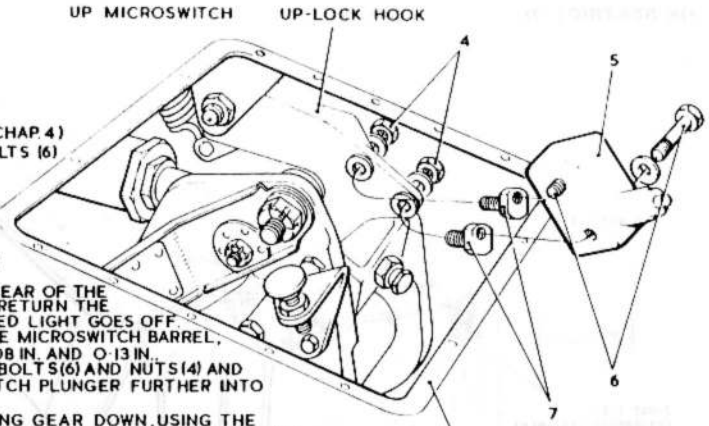


DOWN MICROSWITCH ADJUSTMENT

1 CONNECT A 24-VOLT POWER SUPPLY TO THE EXTERNAL SUPPLY SOCKET
2 SLACKEN LOCKNUT (1)
3 SCREW STRIKER BOLT (2) AWAY FROM MICROSWITCH (3) (GREEN LIGHT OFF)
4 SCREW STRIKER BOLT (2) TOWARDS MICROSWITCH (3) UNTIL A DEFINITE CLICK IS HEARD (GREEN LIGHT ON) AND THEN GIVE A FURTHER TWO COMPLETE TURNS
5 TIGHTEN LOCKNUT (1) AND ENSURE THAT SOME PLUNGER MOVEMENT REMAINS

UP MICROSWITCH ADJUSTMENT

1 JACK AND TRESTLE THE AIRCRAFT WITH THE WHEELS CLEAR OF THE GROUND (SECT.2, CHAP.4)
2 CONNECT A 24-VOLT POWER SUPPLY TO THE EXTERNAL SUPPLY SOCKET. GREEN LIGHT ON.
3 REMOVE THE APPROPRIATE ACCESS PANEL FROM THE UPPER SURFACE OF THE MAIN PLANE INNER WING (SECT.2, CHAP.4)
4 SLACKEN THE NUTS (4) AND MICROSWITCH ATTACHMENT BOLTS (6)
5 TURN THE HEADS OF THE ECCENTRIC BOLTS (7) SO THAT THE MICROSWITCH ATTACHMENT TAPPED HOLES ARE AT THE FURTHEST POINT OF ADJUSTMENT AWAY FROM THE HOOK. TIGHTEN THE ATTACHMENT BOLTS (6) AND NUTS (4)
6 RETRACT THE ALIGHTING GEAR, USING THE HAND PUMP, APPLYING FULL JACK PRESSURE. CHECK THAT THE RED LIGHT COMES ON DURING OPERATION, AND GOES OFF WHEN THE UP-LOCK HOOK IS FULLY ENGAGED.
7 THROUGH THE ACCESS PANEL, LIFT THE UP-LOCK HOOK CLEAR OF THE LATCH PIN, AND ENSURE THAT THE RED LIGHT COMES ON. RETURN THE UP-LOCK HOOK TO THE ENGAGED POSITION AND ENSURE RED LIGHT GOES OFF.
8 USING FEELER GAUGES, CHECK THAT THE GAP BETWEEN THE MICROSWITCH BARREL, AND OPERATING FACE OF THE SIDE STAY IS BETWEEN 0·08 IN. AND 0·13 IN.
9 IF THE GAP IS IN EXCESS OF 0·13 IN., SLACKEN ATTACHING BOLTS (6) AND NUTS (4) AND ROTATE ECCENTRIC BOLT (7) TO DEPRESS THE MICROSWITCH PLUNGER FURTHER INTO OVERTRAVEL
10 EXHAUST THE JACK PRESSURE AND SELECT THE ALIGHTING GEAR DOWN, USING THE HAND PUMP. SLOWLY LOWER THE ALIGHTING GEAR UNTIL THE D-DOOR UNLOCKS. PULL THE DOOR OPEN AND OPERATE THE DOWN SEQUENCE VALVE. THE RED LIGHT MUST NOT COME ON. IF THE RED LIGHT DOES COME ON REPEAT OPERATION 9.
11 SELECT THE ALIGHTING GEAR UP, FULLY RETRACT THE ALIGHTING GEAR USING THE HAND PUMP, AND RECHECK THE PLUNGER GAP AS IN OPERATION 8.



STARBOARD OLEO LEG MICROSWITCH ADJUSTMENT

1 JACK AND TRESTLE THE AIRCRAFT WITH THE WHEELS CLEAR OF THE GROUND (SECT.2, CHAP.4)
2 INSERT A 0·120 IN. FEELER GAUGE BETWEEN THE MICROSWITCH PLUNGER AND THE OLEO STRIKER PIN. THE PLUNGER SHOULD JUST BE BOTTOMING
3 IF THE ADJUSTMENT (OPERATION 2) IS INCORRECT PROCEED AS FOLLOWS:-
(A) REMOVE THE MICROSWITCH ATTACHMENT NUTS (8) AND WASHERS, AND WITHDRAW THE MICROSWITCH TOGETHER WITH LAMINATED PACKING PLATE (9)
(B) BY PEELING A NEW LAMINATED PACKING PLATE REF. No. 26FZ/706 ADJUST THE MICROSWITCH TO OBTAIN THE CONDITION DESCRIBED IN OPERATION 2
4 RE-CHECK THE ADJUSTMENT AFTER HAVING FINALLY REFITTED THE MICROSWITCH AND TIGHTENED THE SECURING NUTS

AFTER ADJUSTMENT OF THE UP OR DOWN MICROSWITCHES, AN ALIGHTING GEAR RETRACTION TEST MUST BE MADE AND THE WARNING LIGHTS CHECKED

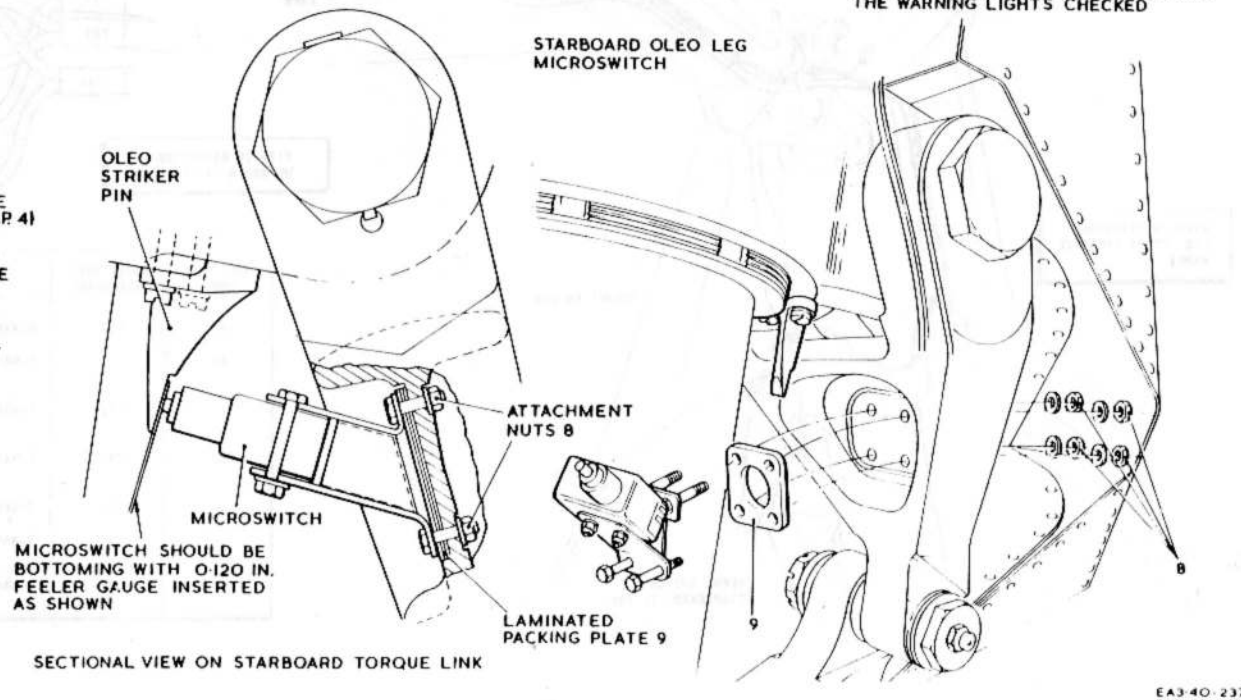


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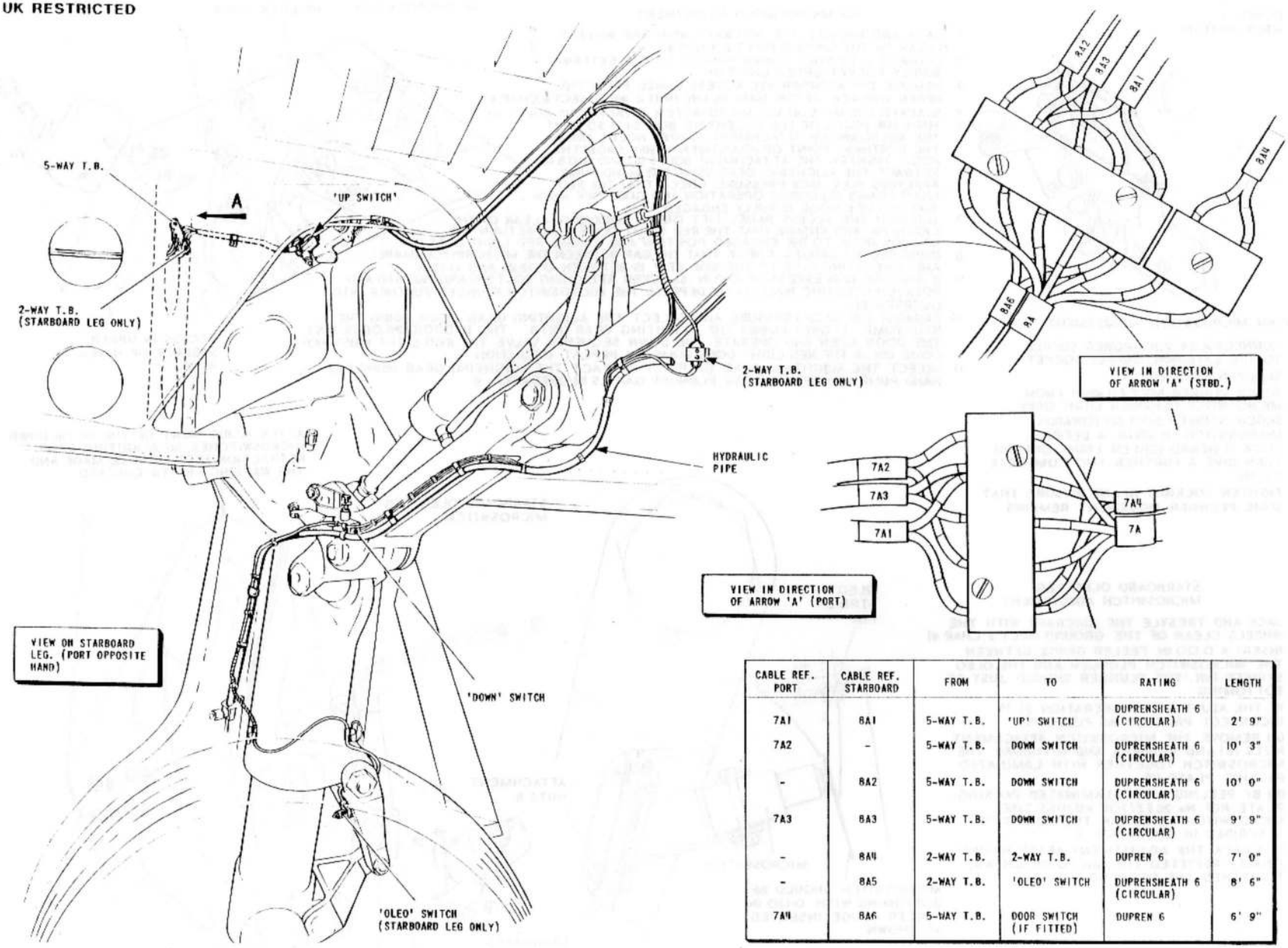
FIG. 2A. MICROSWITCH ADJUSTMENT - MAIN UNDERCARRIAGE

◀ FIG RENUMBERED ▶

UK RESTRICTED



CABLE REF. PORT	CABLE REF. STARBOARD	FROM	TO	RATING	LENGTH
7A1	8A1	5-WAY T.B.	'UP' SWITCH	DUPRENSHEATH 6 (CIRCULAR)	2' 9"
7A2	-	5-WAY T.B.	DOWN SWITCH	DUPRENSHEATH 6 (CIRCULAR)	10' 3"
-	8A2	5-WAY T.B.	DOWN SWITCH	DUPRENSHEATH 6 (CIRCULAR)	10' 0"
7A3	8A3	5-WAY T.B.	DOWN SWITCH	DUPRENSHEATH 6 (CIRCULAR)	9' 9"
-	8A4	2-WAY T.B.	2-WAY T.B.	DUPREN 6	7' 0"
-	8A5	2-WAY T.B.	'OLEO' SWITCH	DUPRENSHEATH 6 (CIRCULAR)	8' 6"
7A4	8A6	5-WAY T.B.	DOOR SWITCH (IF FITTED)	DUPREN 6	6' 9"

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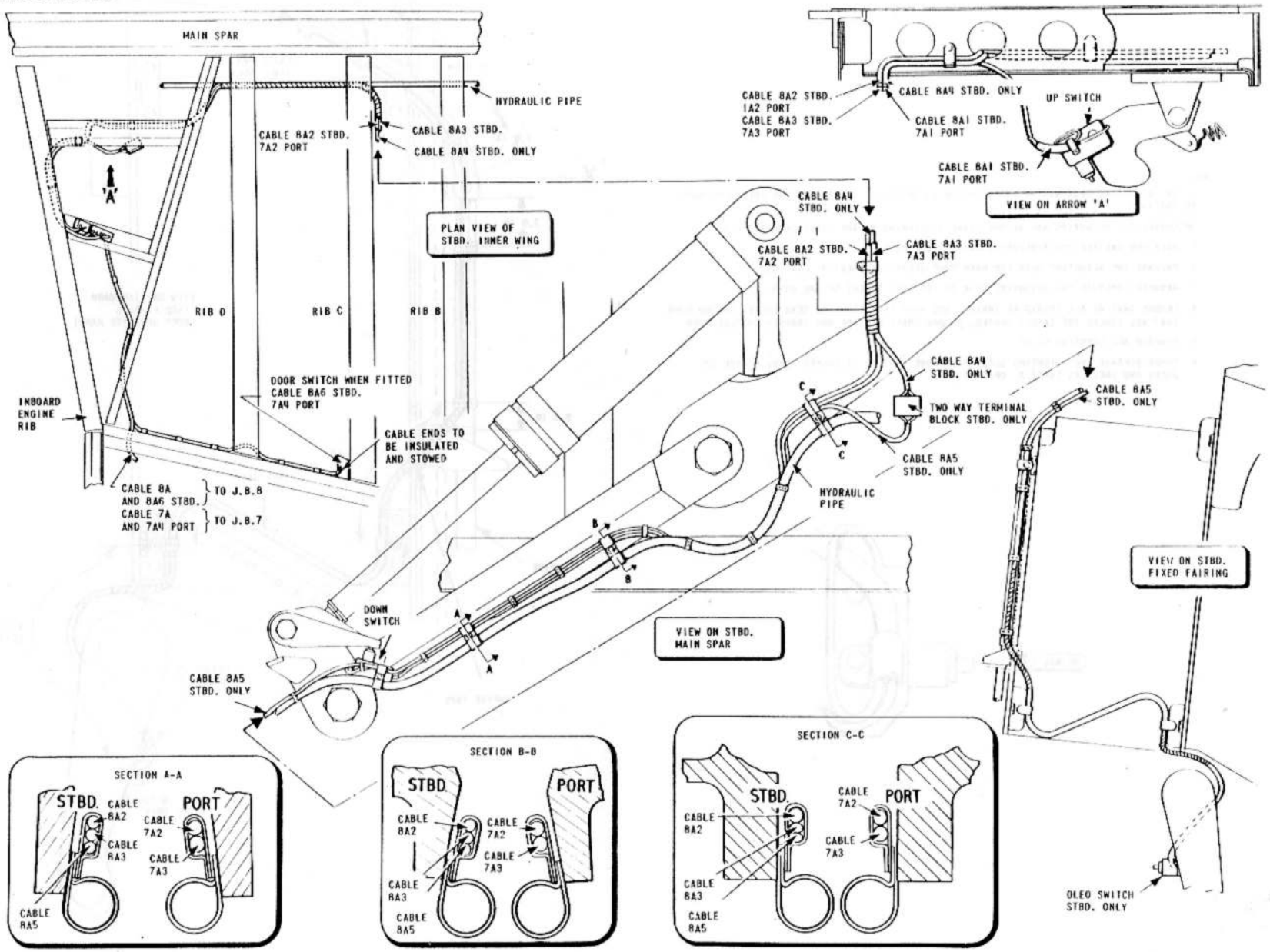
FIG. 3. MAIN WHEELS - WIRING INSTALLATION

◀ FIG RENUMBERED ▶

UK RESTRICTED



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EB7-81-1307/8-26/16
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FIG. 3A. MAIN WHEELS - WIRING INSTALLATION

◀ FIG RENUMBERED ▶

UK RESTRICTED

NOTE...

IF THE ALIGHTING GEAR WIRING INSTALLATION IS DISTURBED OR REWIRED THE FOLLOWING MUST BE OBSERVED.

ON COMPLETION OF WIRING AND BEFORE FINAL TIGHTENING OF THE CABLE SECURING CLIPS:-

1 JACK AND TRESTLE THE AIRCRAFT (SECT.2, CHAP.4).

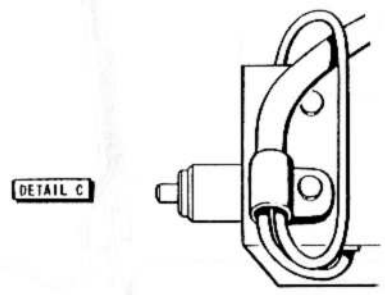
2 PREPARE THE ALIGHTING GEAR FOR HAND PUMP OPERATION (SECT.3 CHAP.6).

3 MANUALLY OPERATE THE ALIGHTING GEAR TO ITS FULL EXTENT UP AND DOWN.

4 ENSURE THAT AT ALL POINTS OF TRAVEL, AND WITH THE ALIGHTING GEAR LOCKED UP AND DOWN, THAT ALL CABLES ARE SAFELY ROUTED, DO NOT CHAFE AND ARE NOT TRAPPED OR STRETCHED.

5 TIGHTEN ALL SECURING CLIPS.

6 POWER OPERATE THE ALIGHTING GEAR AND ENSURE THAT IT IS LOCKED DOWN; REMOVE THE JACKS AND TRESTLES (SECT.3, CHAP.5).



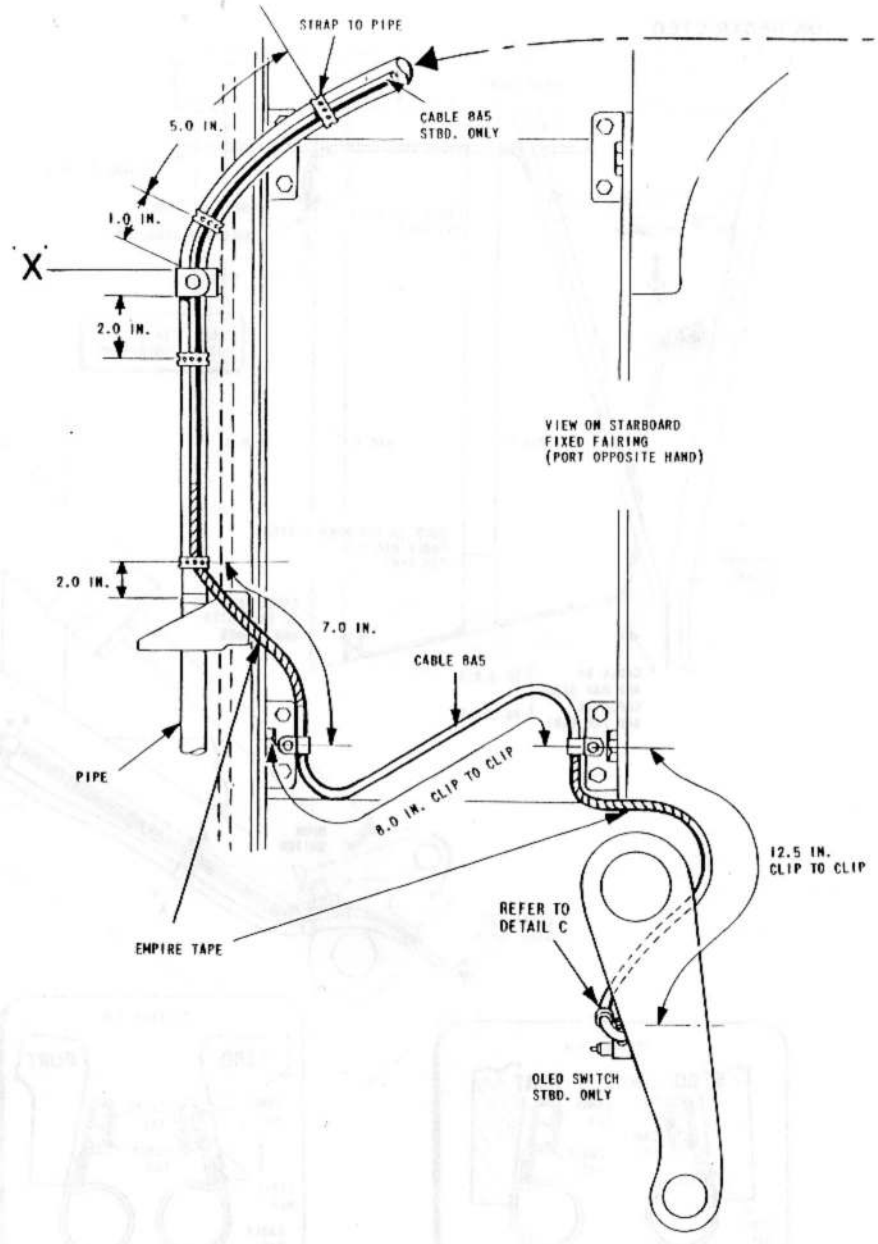


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FIG. 3B. MAIN WHEELS - WIRING INSTALLATION

◀ FIG RENUMBERED ▶

UK RESTRICTED

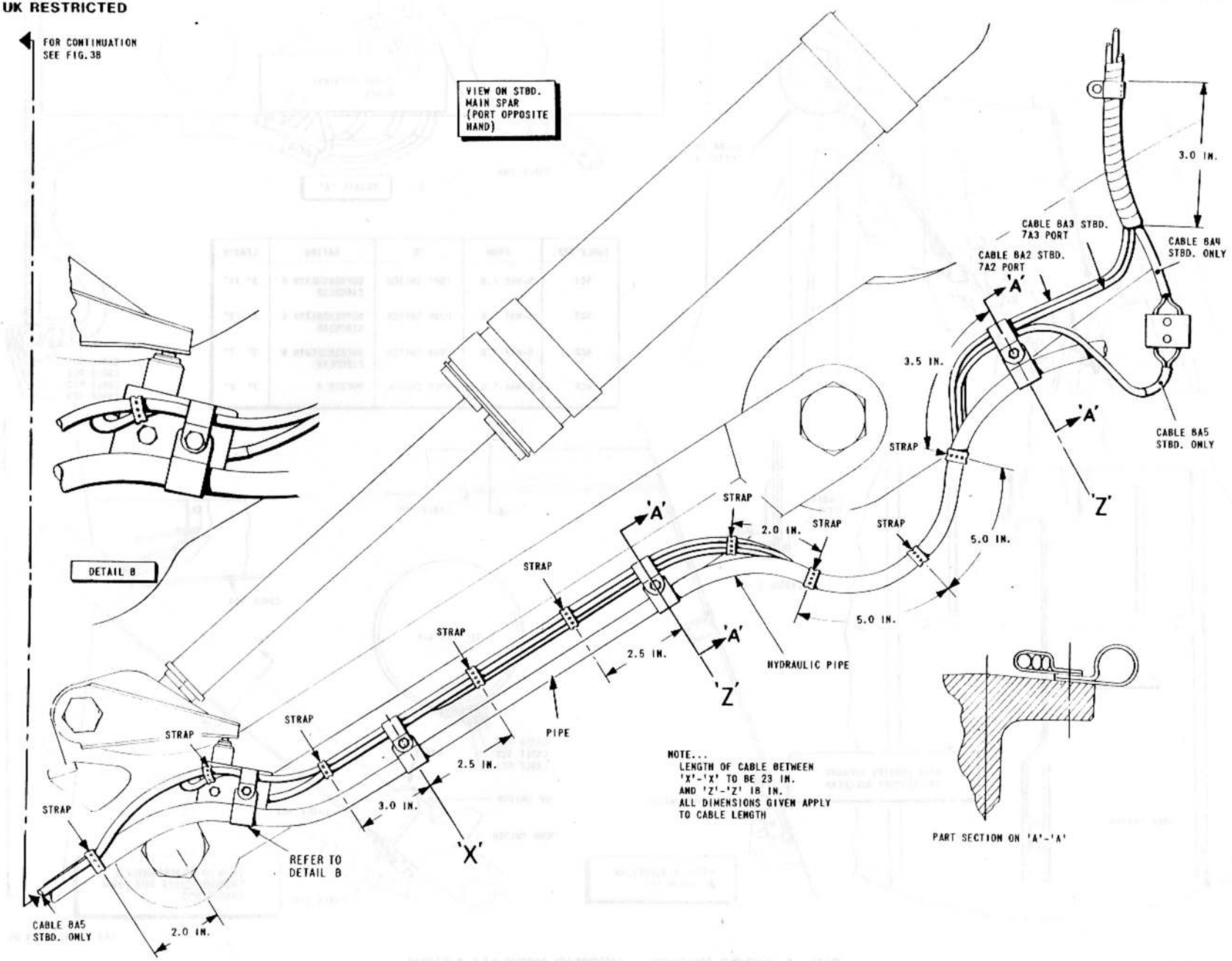

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FIG.3C. MAIN WHEELS - WIRING INSTALLATION

◀ FIG RENUMBERED ▶

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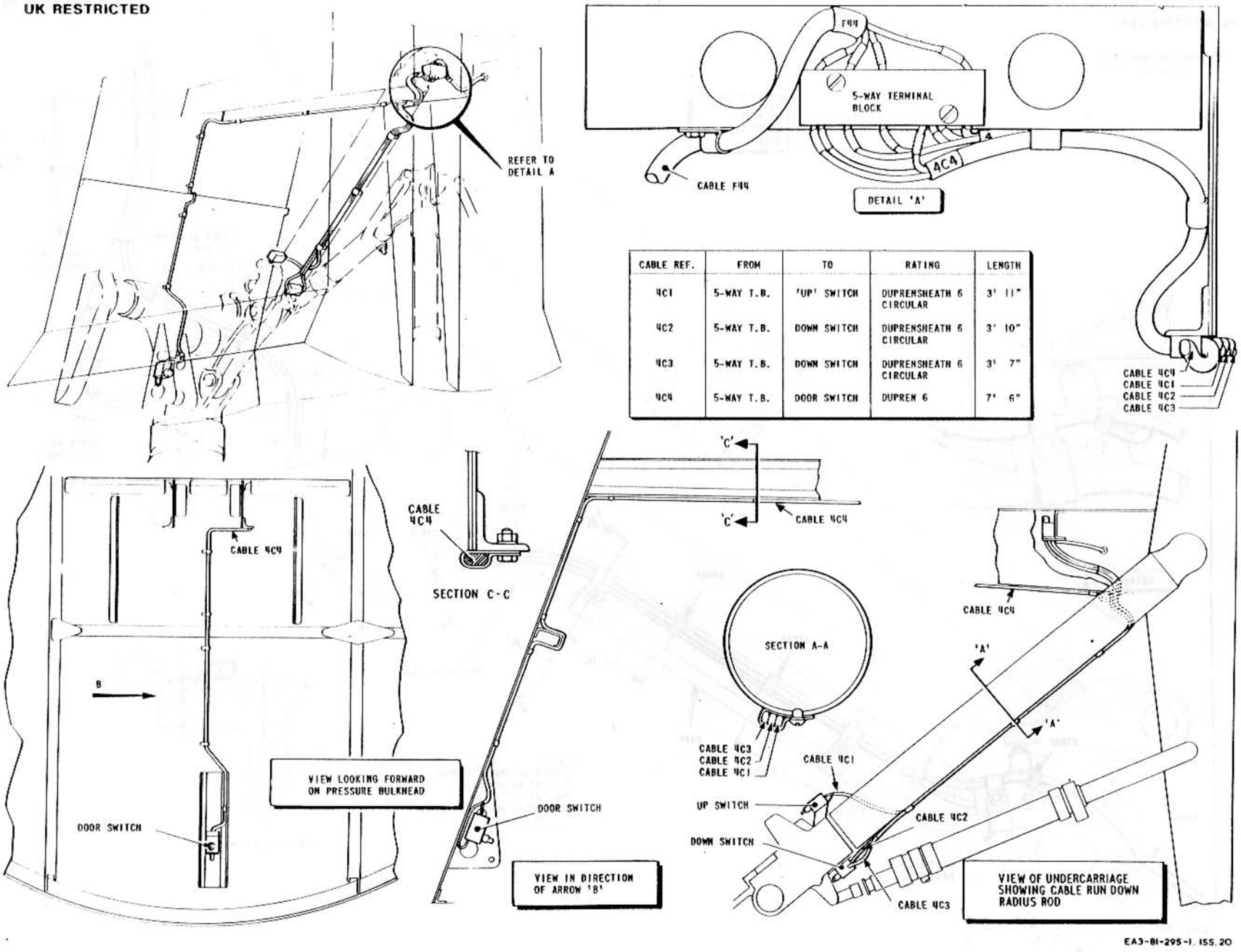

CABLE REF.	FROM	TO	RATING	LENGTH
4C1	5-WAY T.B.	'UP' SWITCH	DUPRENSHEATH 6 CIRCULAR	3' 11"
4C2	5-WAY T.B.	DOWN SWITCH	DUPRENSHEATH 6 CIRCULAR	3' 10"
4C3	5-WAY T.B.	DOWN SWITCH	DUPRENSHEATH 6 CIRCULAR	3' 7"
4C4	5-WAY T.B.	DOOR SWITCH	DUPREN 6	7' 6"

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FIG. 4. NOSE WHEEL - WIRING INSTALLATION

◀ FIG RENUMBERED ▶

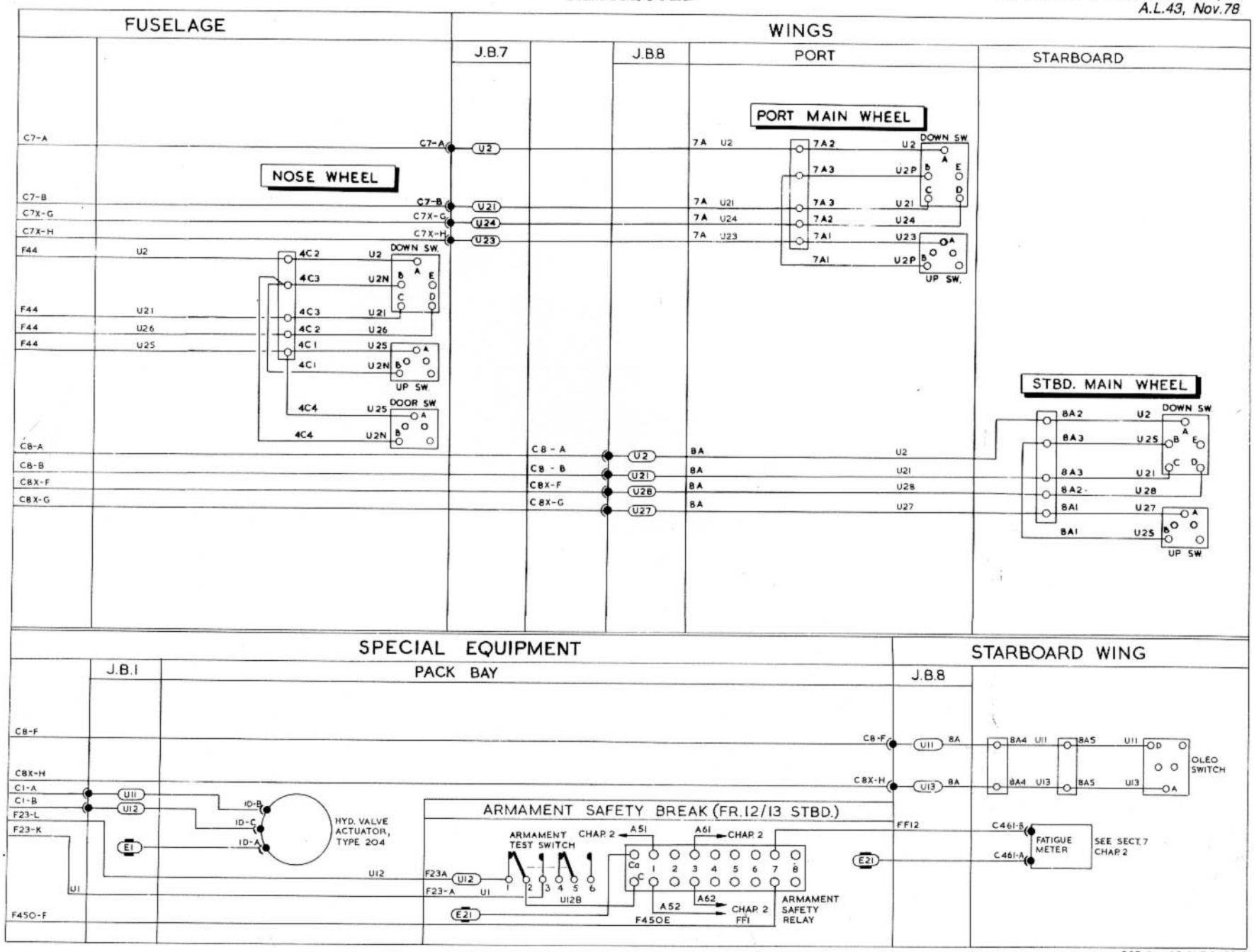


FIG. 6A. ALIGHTING GEAR CONTROL AND INDICATOR

◂ MOD. 5101, 5184 EMBODIED ▸

Chapter 6 HEATING AND AIR CONDITIONING

◀PRE MOD. 5466 (SEE SUPPLEMENT FOR POST MOD. 5466)▶

LIST OF CONTENTS

◀**Note**... *Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*▶

▶◀

DESCRIPTION

CABIN AIR SYSTEM

General

1. A complete installation is provided for the maintenance of pressurized hot or cold air in the cabin. The hot air originates from the engine compressor and passes through a mixing valve in the port inner wing leading edge. The mixing valve is operated by a rotary actuator Type 233, and is controlled by a centre-off switch labelled CABIN AIR HOT/COLD fitted on the miscellaneous instrument panel. On this panel is also mounted a mixing valve indicator graduated from HOT to COLD. It is a Desynn-type indicator operated by a transmitter unit linked to the mixing valve mechanism. Pressure in the cabin is maintained by a Normalair pressure controller fitted on the pressure bulkhead. A warning circuit is provided to ensure that the crew receive audible warning should the pressure fall to a dangerous level. Further information on the air conditioning and pressurization will be found in A.P.101B-0417-1A, Sect.3, Chap.8A.

Gate valves

2. The hot air from the engine compressor is controlled by two gate valves, one to each engine. These gate valves are operated by Type 234 rotary actuators controlled from the miscellaneous instrument panel by switches labelled ENGINE AIR TO CABIN No.1 and No.2. Switch No.1 operates the port engine gate valve and switch No.2 the starboard engine valve.

Low pressure warning

3. A switch incorporated in the pressure controller operates a warning device whenever there is a serious loss of pressure. The closing of the switch contacts is arranged to energize a Type 9B2A relay, which in turn closes and provides a supply to a warning horn. Both the relay and the horn are mounted on brackets at the starboard side of the navigator's station. The pilot may override the warning horn by a switch, labelled CABIN PRESSURE WRNG. HORN ON/OFF/TEST located on the miscellaneous instrument panel.

Pressure controller

4. A Normalair pressure controller is mounted on the forward face of the pressure bulkhead. It has a connection to the pitot system and contains a bellows to which is attached the warning circuit contacts. Full information covering this unit will be found in A.P.107B-1415-1.

Cooling fans

5. To increase the circulation of cooling air in the pressure cabin, two cooling fans are fitted, one at the pilot's station and one in the rear of the cabin. The fan at the pilot's station is located, together with its control switch on the miscellaneous instrument panel, whilst that at the rear of the cabin is located above the A.E.O's control panel with the control switch on the coaming. Both fans are fed from fuse 48 in the E.C.P.

HEATERS

Direct vision window

6. The pilot's 'D.V.' window panel is electrically heated by an almost invisible gold-film heating element sandwiched between the glass laminations. Also incorporated in the panel is a sensing control element which operates in conjunction with a Plessey controller Type 4, Mk.1 – situated on the engine-start panel structure. Power supplies to the heater are controlled by a switch, labelled WINDSCREEN, on the take-off panel. Connections to the elements are made by non-interchangeable 2-pin plugs and sockets below the canopy coaming.

Control unit

7. A Plessey controller, Type 4 Mk.1, and a diamond 'H' Type BS, relay control the electrical supply to the heater element in the D.V. window panel by energizing and de-energizing the coil of the Diamond 'H' relay. Transductors in the controller provide the necessary output current to operate an incorporated slave-relay which energizes the coil of the Diamond 'H' relay. The operation of the transductors is dependent upon the resistance of the temperature-sensing element incorporated in the windscreen and, since the resistance varies with the temperature, complete control is obtainable. The controller is fully described in A.P.107C-0404-16.

Pressure head heater

8. To prevent the formation of ice in the pitot system, a heater element is provided in the pressure head. The supply to the element, fed from busbar PP1 through a fuse in the E.C.P., is controlled by a switch labelled PRESS HEAD mounted on the take-off panel.

Fuel tank vent valve heater

9. Provision is made for fitting a vent valve with an intergral heater element at the aft end of the No.3 fuel tank. The heater circuit is controlled by a switch, labelled VENT VALVES, mounted, on the take-off panel and protected by a fuse in the console fuse panel. If the vent valve is not fitted the heater supply cable is coiled and stowed, and the fuse removed.

DE-MISTING

General

10. Misting of the canopy sandwich is prevented by circulating dry air through the interspace between its inner surfaces. A motor-driven blower provided for this purpose is mounted forward of the navigator's table on a bracket attached to the table structure. The power supply to the motor is fed through a suppressor and controlled by the CANOPY DE-MIST switch on the take-off panel. The air is blown through a chemical dryer before it enters the canopy interspace. The complete de-misting installation is fully described in A.P.101B-0417-1A, Sect.3, Chap.8C.

EQUIPMENT COOLING

Pack bay

11. Air scoops are provided to facilitate the cooling of the equipment in the pack bay. The scoops are operated by an actuator. Type 206 which is controlled by the switch labelled INLET SCOOPS OPEN/CLOSED fitted on the A.E.O's starboard wall panel. Two lamps labelled OPEN and CLOSED and coloured green and amber respectively, are positioned one on either side of the switch to provide an indication of the setting of the scoops. Microswitches operated by the rear shutter mechanism in the open and closed positions provide the switching of the supplies to the relevant indicator lamp.

Alternator bay

12. Two fans are provided, one in each alternator bay, to assist the cooling of the alternator bay equipment when the speed of the aircraft is such that ram air cooling is inadequate. The supplies to the fans are drawn from the 200-volt, 3-phase, 400 Hz a.c. busbars via relays on the contactor panel. The relay coils are supplied from the 28-volt d.c. busbars and are controlled by a thermostatic switch mounted in the respective alternator bay.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

CABIN AIR SYSTEM

Valve actuators

13. Normal servicing of the valve actuators is confined to checking brush length, examination of the commutator, and removal of any accumulated carbon dust, which can be accomplished by removing the motor and cover. Access to both mixing and gate valve actuators is through the leading-edge panels inboard of each engine.

Desynn indicator and transmitter unit

14. Faulty indicators or unserviceable transmitter units should be removed and replaced by new items.

Low pressure warning

15. The warning circuit should be tested by removing the terminal cover of the pressure controller and short-circuiting the two terminals and, provided that the warning horn switch is set to ON, the horn will function. A further test may be carried out by operating the override switch to the TEST position, when the warning horn should function.

Note. . .

The above test circuit by-passes the pressure controller contacts and therefore only provided a confidence check on the power supply, relay and horn operation.

HEATER CIRCUITS

D.V. window checks

16. At normal ground level the resistance of the control element should be 30 ± 0.5 ohms at 20 deg C. The heater element may be considered to be serviceable if, with 24 volts across its terminals, it will pass a current not more than 3 .....

amp and not less than 2.5 amp. This check can be made by connecting a suitable ammeter into the plug and socket connection near the window assembly.

Note...

During the above test the current applied to the heater must not flow continuously for more than 15 seconds unless a temperature control unit is used.

Replacement windows

17. It is advisable to carry out a bench test on any replacement window that has been in store. As the internal connections in the window rely on intimate contact between the elements and the window busbars the panel should be first heated to a temperature not exceeding 40 deg C and allowed to cool off before applying the test current.

Control unit check

18. Remove fuses 53 and 116, and disconnect plugs and sockets (N74) at the window. Connect a decade box, set at 28 ohms, in place of the sensing control element and a 28-volt test lamp in place of the heater element; check the refit fuses 53 and 116. Switch on the instruments 400 Hz supply and the control switch; the test lamp should light. Increase the decade resistance setting until the test lamp is extinguished, note the resistance which should be between 30.0 to 30.5 ohms. Decrease the decade resistance setting until the test lamp lights, note the resistance which should be 0.3 to 0.8 below the previously noted value at which the lamp was extinguished. Switch off the 400 Hz supply and the control switch and reconnect the plugs and sockets (N74) at the window. Check that the heater functions by switching on the 400 Hz supply and the control switch and note that the window heats up.

Note...

If the ambient temperature (above 20 deg C) prevents the heater switching on, connect a decade box set at 400 ohms across terminals A1 and A2 of the Plessey controller. Do not leave connected for more than 15 seconds and do not disturb the sensing control element connections.

Pressure head heater

19. Minimum maintenance is required on the pressure head. In the event of unserviceability a new head should be fitted.

DE-MISTING

Blower motor

20. Servicing of the blower motor is confined to checking brushes, inspecting the commutator, and the removal of carbon dust. Access to the brushes is accomplished by the removal of the end cover from the motor.

EQUIPMENT COOLING

Scoop actuator and alternator bay fans

21. Normal servicing of the actuator and fans is confined to checking the brushes, examination of the commutator, and removal of any accumulated carbon dust, which can be accomplished by removing the motor end cover of the actuator, or the conical fairing of the fans. The impeller blades of the fans must be examined for damage to the leading and trailing edges, and the impeller boss checked for security and damage. The clearance between the blade tips and outer casing must be checked to ensure that the impeller can rotate freely.

REMOVAL AND ASSEMBLY

CABIN AIR SYSTEM

General

22. The removal of any actuator, the Desynn transmitter, or the pressure controller is described in Sect.3, Chap. 8A.

HEATER CIRCUITS

Direct vision window

23. Care must be taken on the removal of the window to ensure that the fragile connecting wires of the two elements are not damaged. Only the heating panel part of the window need be removed by taking out the bolt which acts as a hinge pin.

Pressure head heater

Removal

24. To remove the pressure head:-

(1) Disconnect the electrical supply at the terminal block in the port wing-tip adjacent to the pressure head boom.

(2) Unscrew the pitot/static gland nuts at the rear end of the boom and remove the nuts and sealing grommets from the pipes.

(3) Remove the countersunk screws securing the pressure head to the forward end of the boom.

(4) Withdraw the pressure head sufficiently to allow the unions at the rear of the head to be disconnected.

(5) Fully withdraw the pressure head and electrical cable.

Assembly

25. Assembly of the unit is the reverse of the removal procedure. After the unit has been installed a pitot/static system check must be carried out *(Sect. 7, Chap. 4)*.

Note...

During assembly replace all gland nuts and sealing grommets that have been disturbed and ensure that the drain hole in the pressure head is positioned downwards.

amp and not less than 2.5 amp. This check can be made by connecting a suitable ammeter into the plug and socket connection near the window assembly.

Note...

During the above test the current applied to the heater must not flow continuously for more than 15 seconds unless a temperature control unit is used.

Replacement windows

◀ **17.** It is advisable to carry out a bench test on any replacement window that has been in store. As the internal connections in the window rely on intimate contact between the elements and the window busbars the panel should be first heated to a temperature not exceeding 40 deg C and allowed to cool off before applying the test current.

Control unit check

18. Remove fuses 53 and 116, and disconnect plugs and sockets (N74) at the window. Connect a decade box, set at 28 ohms, in place of the sensing control element and a 28-volt test lamp in place of the heater element; check the refit fuses 53 and 116. Switch on the instruments 400 Hz supply and the control switch; the test lamp should light. Increase the decade resistance setting until the test lamp is extinguished, note the resistance which should be between 30.0 to 30.5 ohms. Decrease the decade resistance setting until the test lamp lights, note the resistance which should be 0.3 to 0.8 below the previously noted value at which the lamp was extinguished. Switch off the 400 Hz supply and the control switch and reconnect the plugs and sockets (N74) at the window. Check that the heater functions by switching on the 400 Hz supply and the control switch and note that the window heats up.

Note...

If the ambient temperature (above 20 deg C) prevents the heater switching on, connect a decade box set at 400 ohms across terminals A1 and A2 of the Plessey controller. Do not leave connected for more than 15 seconds and do not disturb the sensing control element connections.

Pressure head heater

19. Minimum maintenance is required on the pressure head. In the event of unserviceability a new head should be fitted.

DE-MISTING

Blower motor

20. Servicing of the blower motor is confined to checking brushes, inspecting the commutator, and the removal of carbon dust. Access to the brushes is accomplished by the removal of the end cover from the motor.

EQUIPMENT COOLING

Scoop actuator and alternator bay fans

21. Normal servicing of the actuator and fans is confined to checking the brushes, examination of the commutator, and removal of any accumulated carbon dust, which can be accomplished by removing the motor end cover of the actuator, or the conical fairing of the fans. The impeller blades of the fans must be examined for damage to the leading and trailing edges, and the impeller boss checked for security and damage. The clearance between the blade tips and outer casing must be checked to ensure that the impeller can rotate freely.

REMOVAL AND ASSEMBLY

CABIN AIR SYSTEM

General

22. The removal of any actuator, the Desynn transmitter, or the pressure controller is described in Sect.3, Chap. 8A.

HEATER CIRCUITS

Direct vision window

23. Care must be taken on the removal of the window to ensure that the fragile connecting wires of the two elements are not damaged. Only the heating panel part of the window need be removed by taking out the bolt which acts as a hinge pin.

Pressure head heater

Removal

24. To remove the pressure head:- ▶

(1) Disconnect the electrical supply at the terminal block in the port wing-tip adjacent to the pressure head boom.

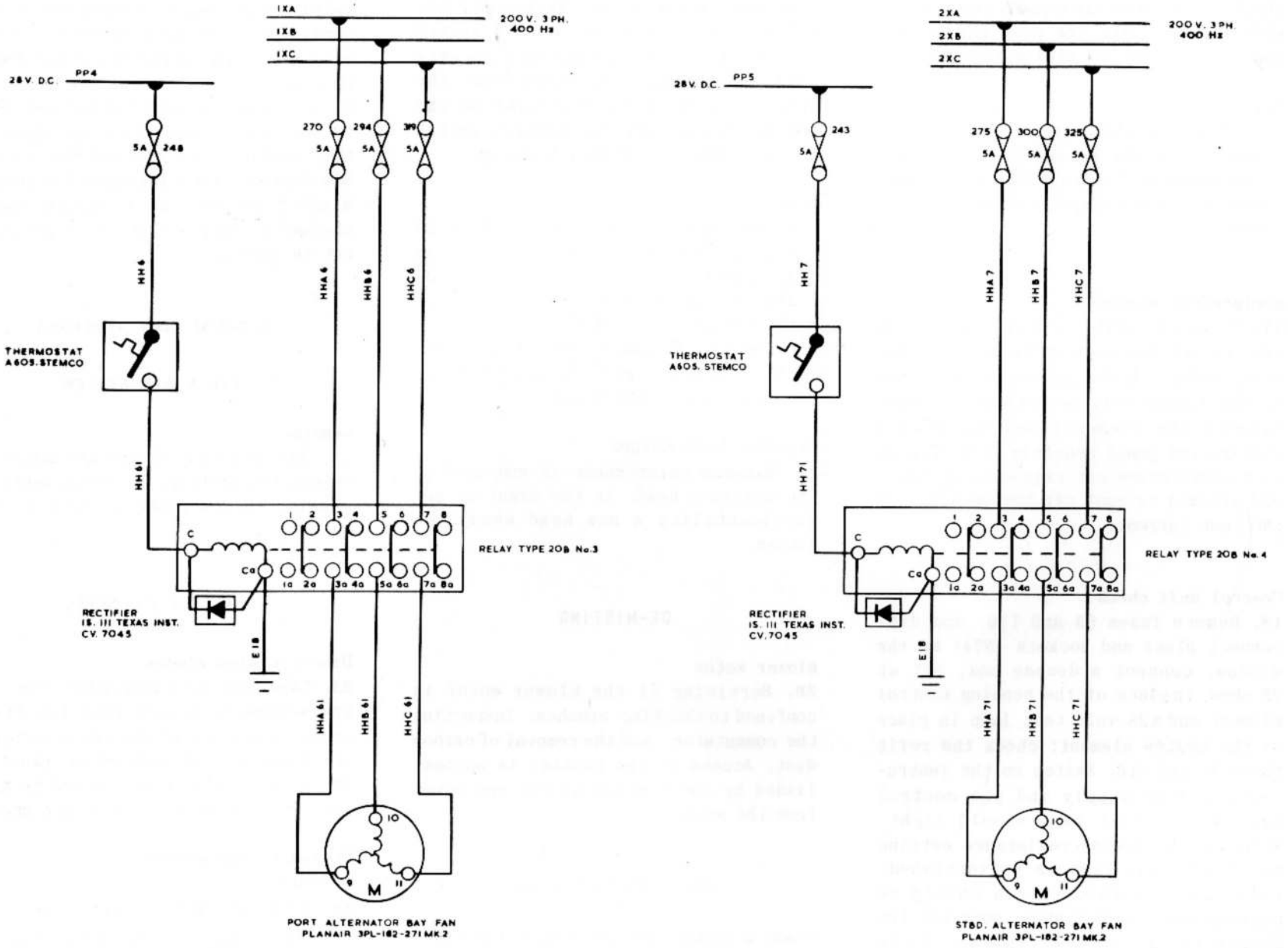


FIG. 3. ALTERNATOR BAY COOLING FANS

E.G7.81.221. ISS 1

◀ MINOR AMENDMENTS ▶

(2) Unscrew the pitot/static gland nuts at the rear end of the boom and remove the nuts and sealing grommets from the pipes.

(3) Remove the countersunk screws securing the pressure head to the forward end of the boom.

(4) Withdraw the pressure head sufficiently to allow the unions at the rear of the head to be disconnected.

(5) Fully withdraw the pressure head and electrical cable.

Assembly

25. Assembly of the unit is the reverse of the removal procedure. After the unit has been installed a pitot/static system check must be carried out *(Sect.7, Chap. 4)*.

Note...

During assembly replace all gland nuts and sealing grommets that have been disturbed and ensure that the drain hole in the pressure head is positioned downwards.

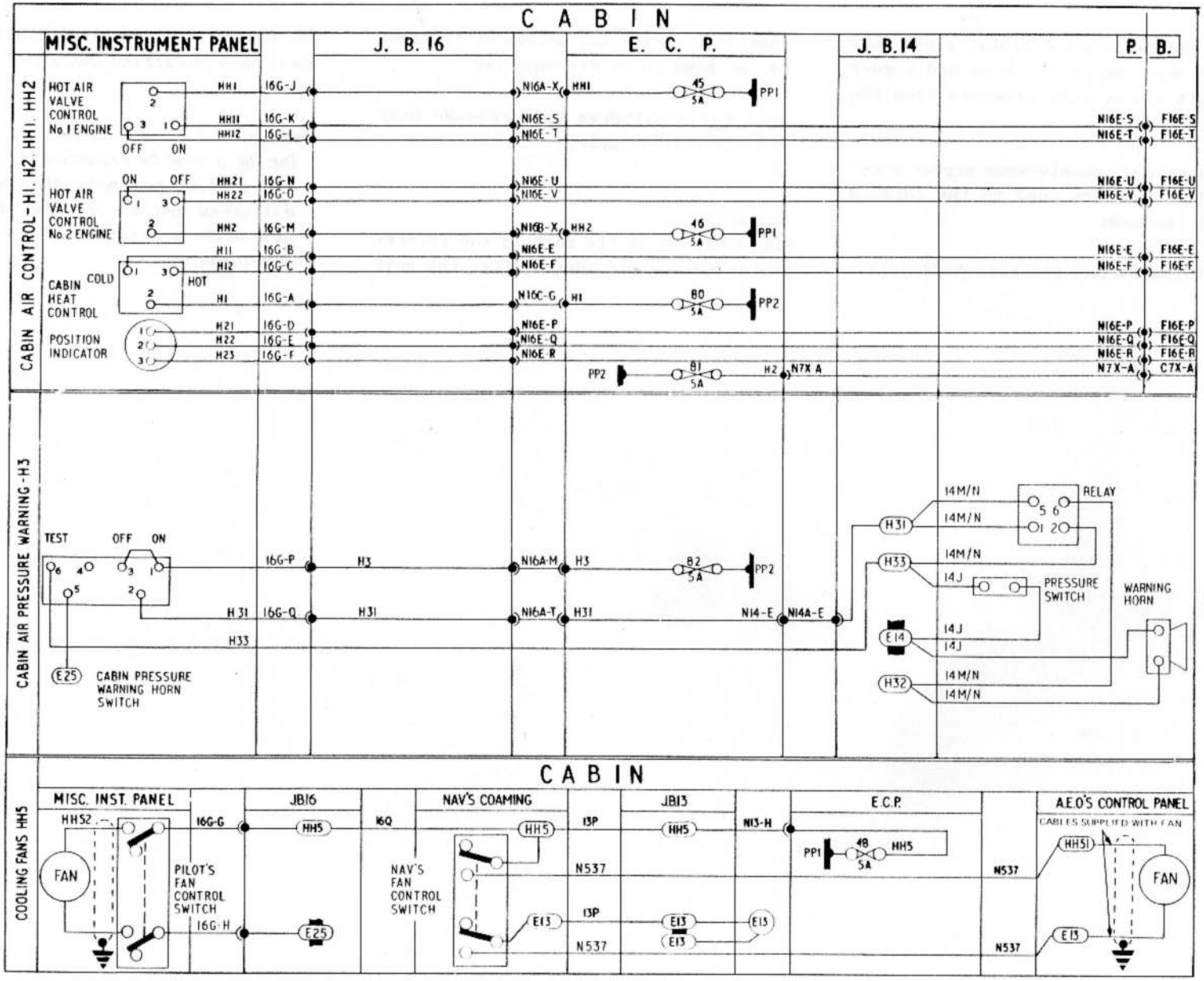
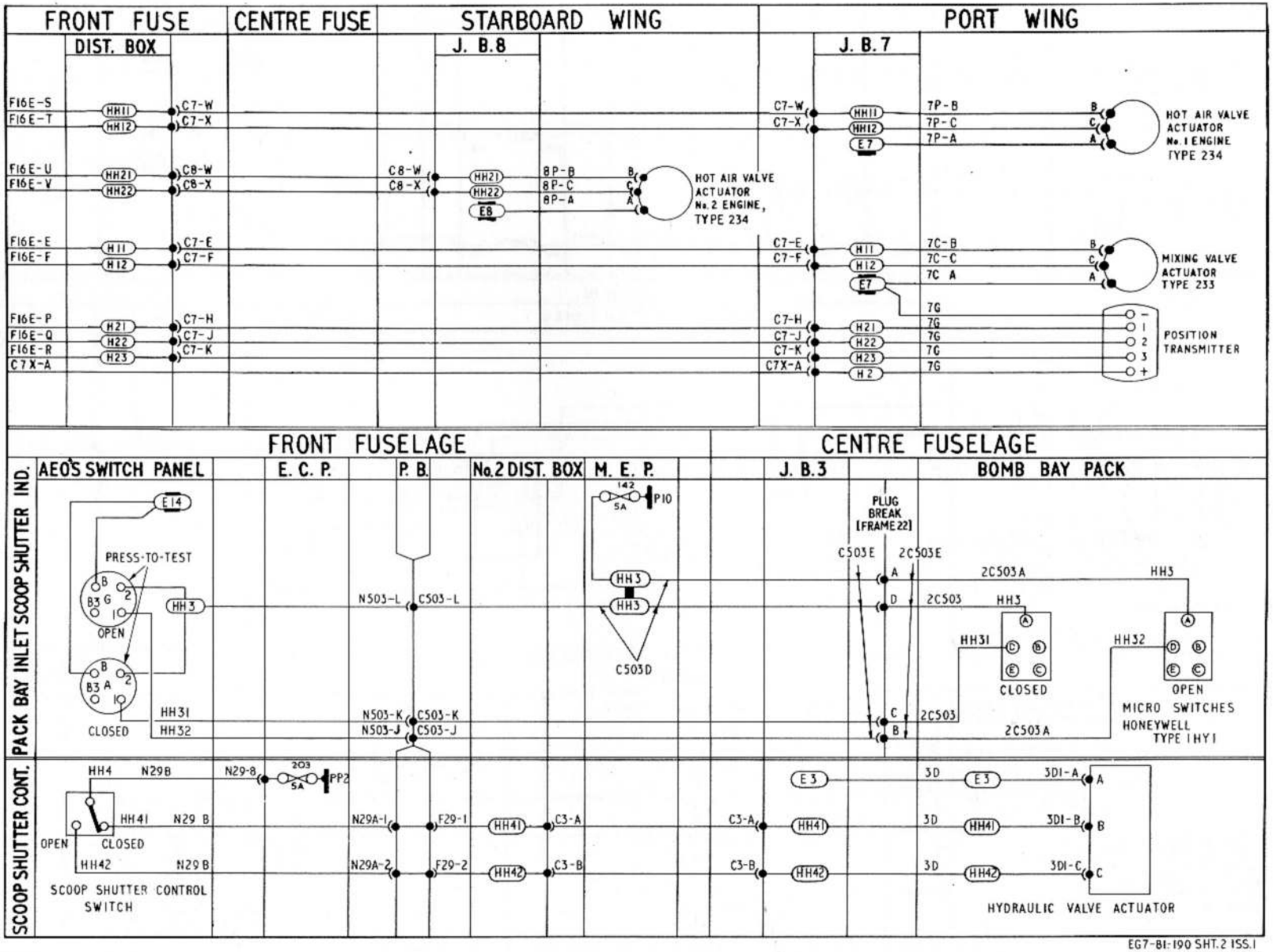


FIG.4. CABIN AIR - AIR PRESSURE WARNING - SCOOP SHUTTERS

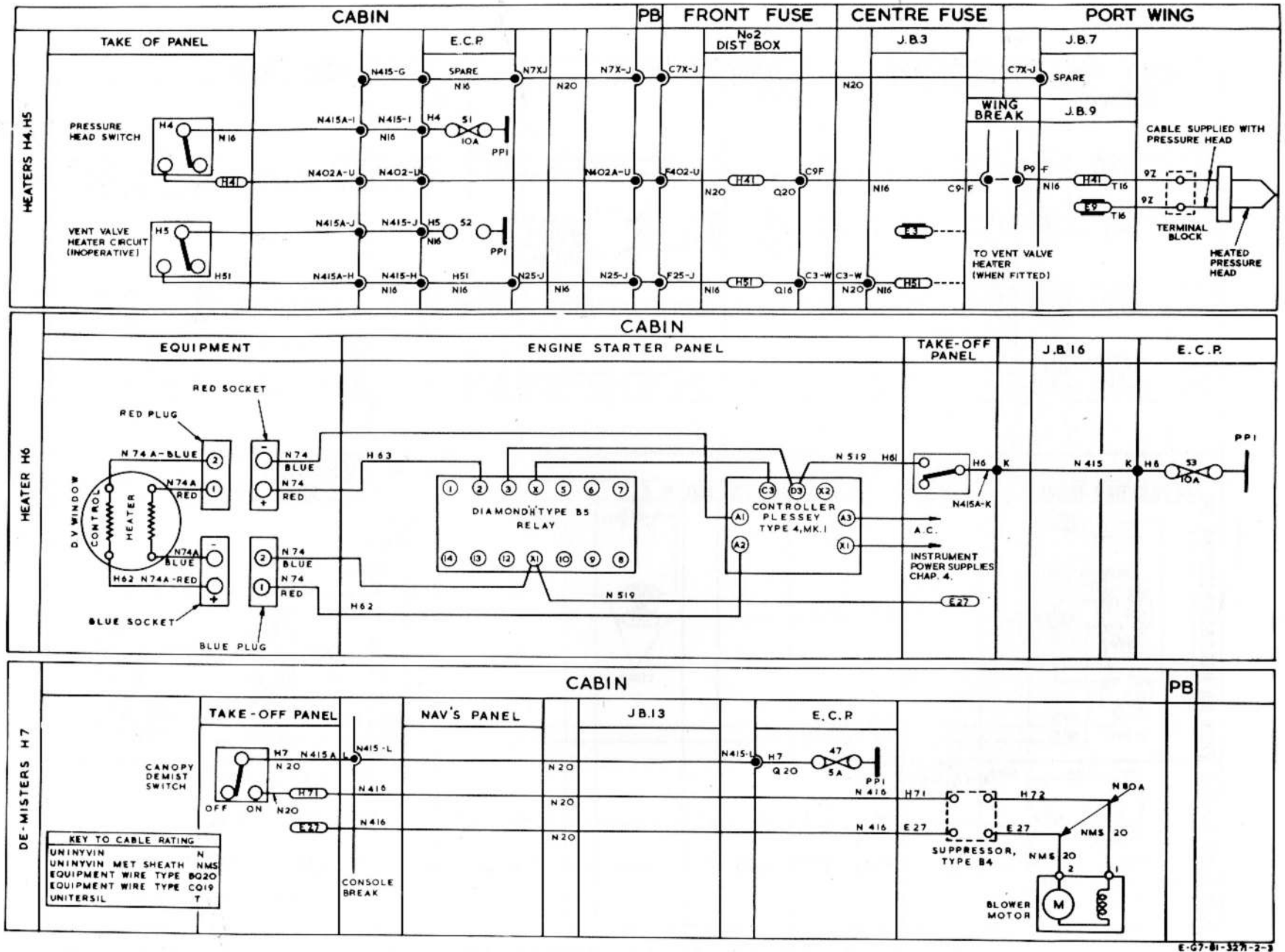
◂SWITCH TERMINALS AMENDED▸



EG7-81-190 SHT.2 ISS.1
EG7-81-3271 SHT.2 ISS.6

FIG.4A. CABIN AIR - AIR PRESSURE WARNING - SCOOP SHUTTERS

◄ CABLES RATINGS DELETED ►



E-G7-81-327-2-3
E-G7-81-190-2-1A

FIG. 5. HEATERS AND DE-MISTERS

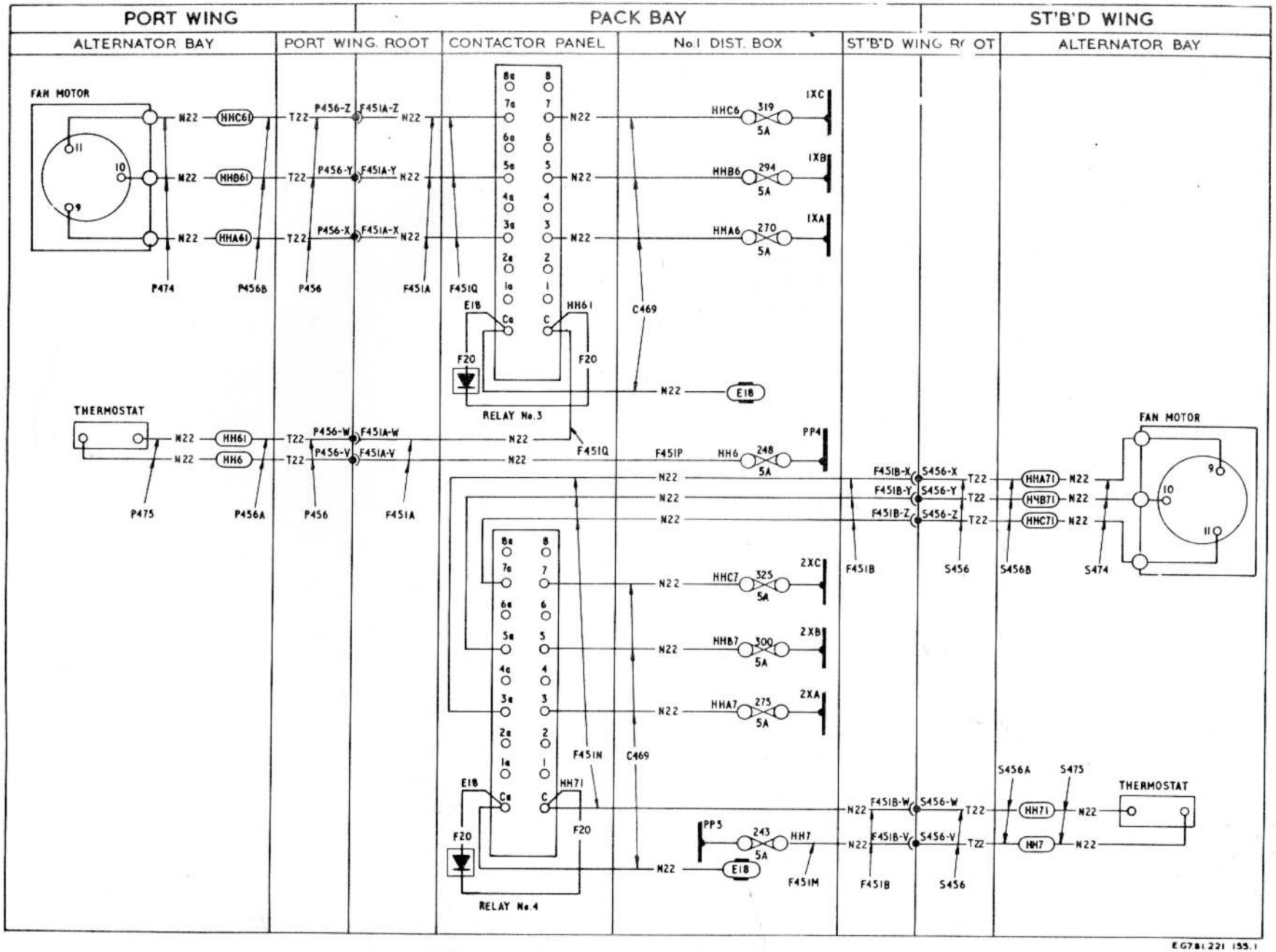


FIG.6. ALTERNATOR BAY COOLING FANS

◀MINOR AMENDMENTS▶

Chapter 7 ENGINE STARTING AND CONTROL

◀*(completely revised)*▶

LIST OF CONTENTS

Note...*Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*

DESCRIPTION

General

1. The Avon Mk. 102 engines are started by Type S.B.S. 720 single-breech starters using No. 9, Mk. 1 cartridges as the propellant. High energy ignition units are used in the engine ignition system. The main components in the starting control circuits consist of MASTER STARTING, IGNITION, and START switches on the starter panel, two time delay switches, two fuel pump isolation switches, and two Type S relays fitted in the E.C.P. Two push-switches are embodied in the high pressure cock handles for use when relighting the engines in flight.

Ignition system

2. The H.E. ignition units may be either Rotax Type NB 25/2 or B.T.H. C10TS/3, and are installed one on the main plane front spar inboard of each engine and the other outboard of each engine nacelle. Each unit is supplied with a separately fused d.c. power supply. This minimizes the risk of a complete ignition failure due to one faulty unit blowing the main fuse. Both types of ignition units are described in A.P. 1374G, Vol. 1.

Time-delay switches

3. Two Type FHM/A/25 time-delay switches *(A.P. 4343C, Vol. 1, Book 2, Sect. 3)* are installed at the port side in the nose forward of the rudder pedals. Each switch incorporates a magnetic clutch and a motor-driven switch mechanism designed to operate a series of contacts, referenced A, B, C and D, in a set sequence.

Fuel pump isolation switches

4. These switches, labelled NORMAL and ISOL, are mounted aft of the levers on the throttle box. Each switch controls a solenoid-operated valve on its associated engine.

OPERATION

Engine starting

5. After closing the MASTER STARTING and IGNITION switches, pressing the START switch initiates the operation of the time-delay switch as follows:–

(1) The magnetic clutch is energized and contacts 'A' close.

(2) Contacts 'C', closed at start, open 5^{+2}_{0} seconds later.

(3) Contacts 'B', closed at start, open 29 ± 2 seconds later.

(4) The overrun contacts 'D', closed at start, open 1.0 second (minimum) after contacts 'B' open.

The above cycle of operations results in the following action:-

(1) The cartridge is fired.

(2) The Type S relay closes to energize the H.E. ignition units.

(3) The engine should start up.

Engine relighting

6. Under suitable conditions, an engine can be relighted in flight by using the relight switch embodied in its H.P. fuel cock lever. The operation of the relight switches by-passes the time delay switches and feeds a direct supply to energize the Type S relays, which close to operate the ignition system.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

General

7. After the cartridges have been removed from both starter units, and the H.E. ignition units have been disconnected, functioning tests, using test lamps, may be made on the installation.

WARNING

The energy stored in the capacitors of high energy ignition units can be of a LETHAL NATURE. No servicing should be attempted until at least one minute has elapsed after disconnection of the low tension supply to the input plug.

Ignition supply check

8. The ignition circuits may be checked as follows:-

(1) Disconnect cables 7K and 7L (port) and 8K and 8L (starboard) from the H.E. ignition units and connect test lamps across pins A and B at each cable socket.

(2) Switch ON the MASTER STARTING and IGNITION switches.

(3) Press the port START button - the two port test lamps should light for a period of 29 ± 2 seconds.

(4) Press the port relight button - the port test lamps should light immediately.

(5) Repeat checks (3) and (4) with the starboard switches and test lamps.

(6) Remove the test lamps and reconnect the H.E. ignition units.

Cartridge circuit check

9. The following procedure will check the cartridge circuit up to the engine break point:-

(1) Disconnect cables 11K (port) and 12K (starboard) at the break point at the starboard side of the engines and connect test lamps across each cable socket.

(2) Switch ON the MASTER STARTING switches.

(3) Press the port START button - the port test lamp should light for approximately 5 seconds.

(4) Press the starboard START button - the starboard test lamp should light for approximately 5 seconds.

(5) Remove the test lamps and reconnect the cables.

Fuel pump isolation valve check

10. It is sometimes possible to hear valves operate when the appropriate switch is operated. If they cannot be heard, the circuits may be checked as follows:-

(1) Disconnect cable 11B from the port engine valve and cable 12B from the starboard engine valve and connect test lamps across each cable socket.

(2) Operate, in turn the port and starboard fuel pump isolation switches - the appropriate test lamp should light each time.

(3) Remove the test lamps and reconnect the cables to the valves.

(4) The overrun contacts 'D', closed at start, open 1.0 second (minimum) after contacts 'B' open.

The above cycle of operations results in the following action:-

(1) The cartridge is fired.

(2) The Type S relay closes to energize the H.E. ignition units.

(3) The engine should start up.

Engine relighting

6. Under suitable conditions, an engine can be relighted in flight by using the relight switch embodied in its H.P. fuel cock lever. Reference to fig.1 will show that the operation of the relight switches by-passes the time delay switches and feeds a direct supply to energize the Type S relays, which close to operate the ignition system.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

General

7. After the cartridges have been removed from both starter units, and the H.E. ignition units have been disconnected, functioning tests, using test lamps, may be made on the installation.

WARNING

◀ The energy stored in the capacitors of high energy ignition units can be of a LETHAL NATURE. No servicing should be attempted until at least one minute has elapsed after disconnection of the low tension supply to the input plug. ▶

Ignition supply check

8. The ignition circuits may be checked as follows:-

(1) Disconnect cables 7K and 7L (port) and 8K and 8L (starboard) from the H.E. ignition units and connect test lamps across pins A and B at each cable socket.

(2) Switch ON the MASTER STARTING and IGNITION switches.

(3) Press the port START button - the two port test lamps should light for a period of 29 ± 2 seconds.

(4) Press the port relight button - the port test lamps should light immediately.

(5) Repeat checks (3) and (4) with the starboard switches and test lamps.

(6) Remove the test lamps and reconnect the H.E. ignition units.

Cartridge circuit check

9. The following procedure will check the cartridge circuit up to the engine break point:-

(1) Disconnect cables 11K (port) and 12K (starboard) at the break point at the starboard side of the engines and connect test lamps across each cable socket.

(2) Switch ON the MASTER STARTING switches.

(3) Press the port START button - the port test lamp should light for approximately 5 seconds.

(4) Press the starboard START button - the starboard test lamp should light for approximately 5 seconds.

(5) Remove the test lamps and reconnect the cables.

Fuel pump isolation valve check

10. It is sometimes possible to hear valves operate when the appropriate switch is operated. If they cannot be heard, the circuits may be checked as follows:-

(1) Disconnect cable 11B from the port engine valve and cable 12B from the starboard engine valve and connect test lamps across each cable socket.

(2) Operate, in turn the port and starboard fuel pump isolation switches - the appropriate test lamp should light each time.

(3) Remove the test lamps and reconnect the cables to the valves.

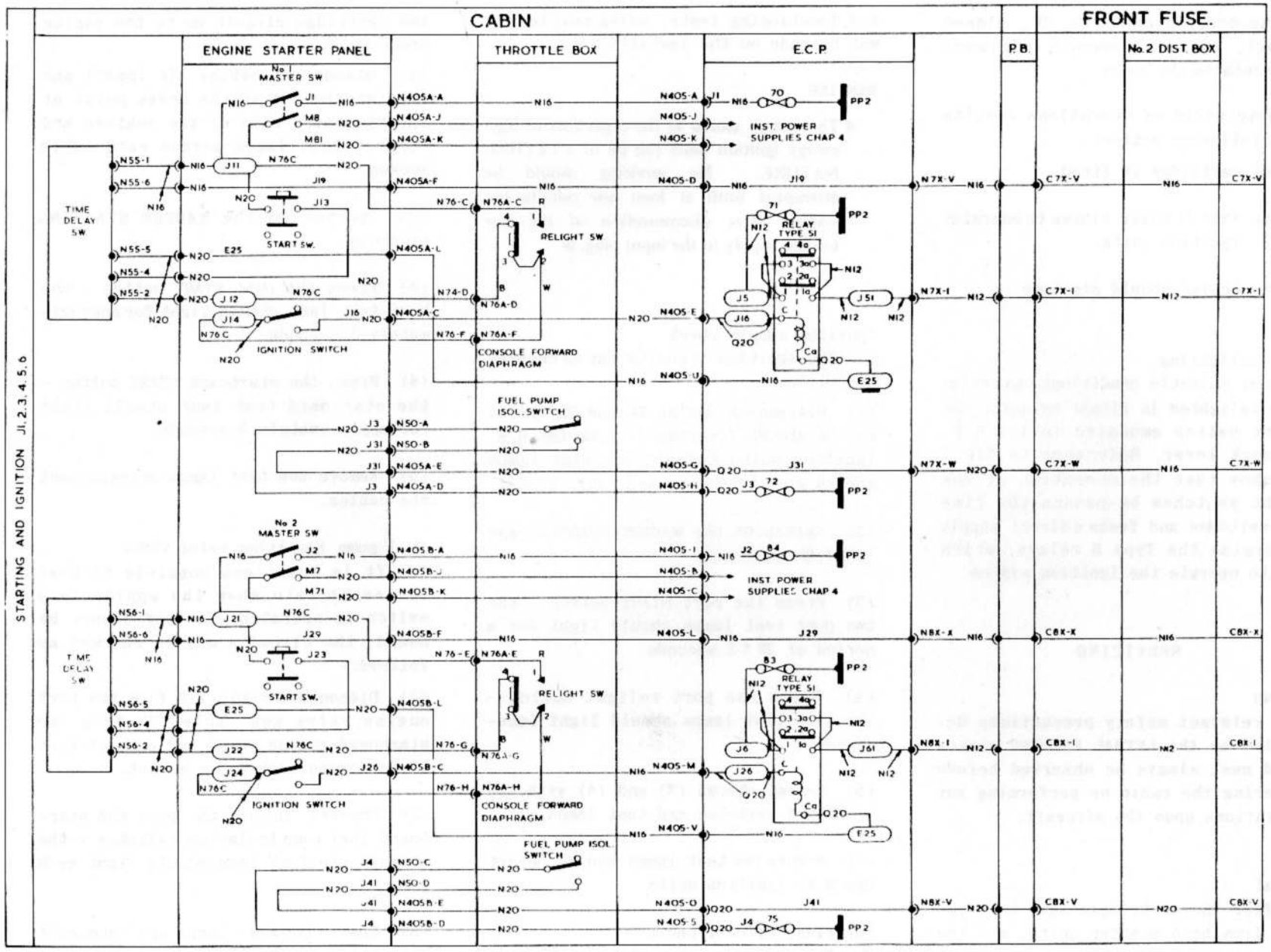


FIG. 2. ENGINE SERVICES

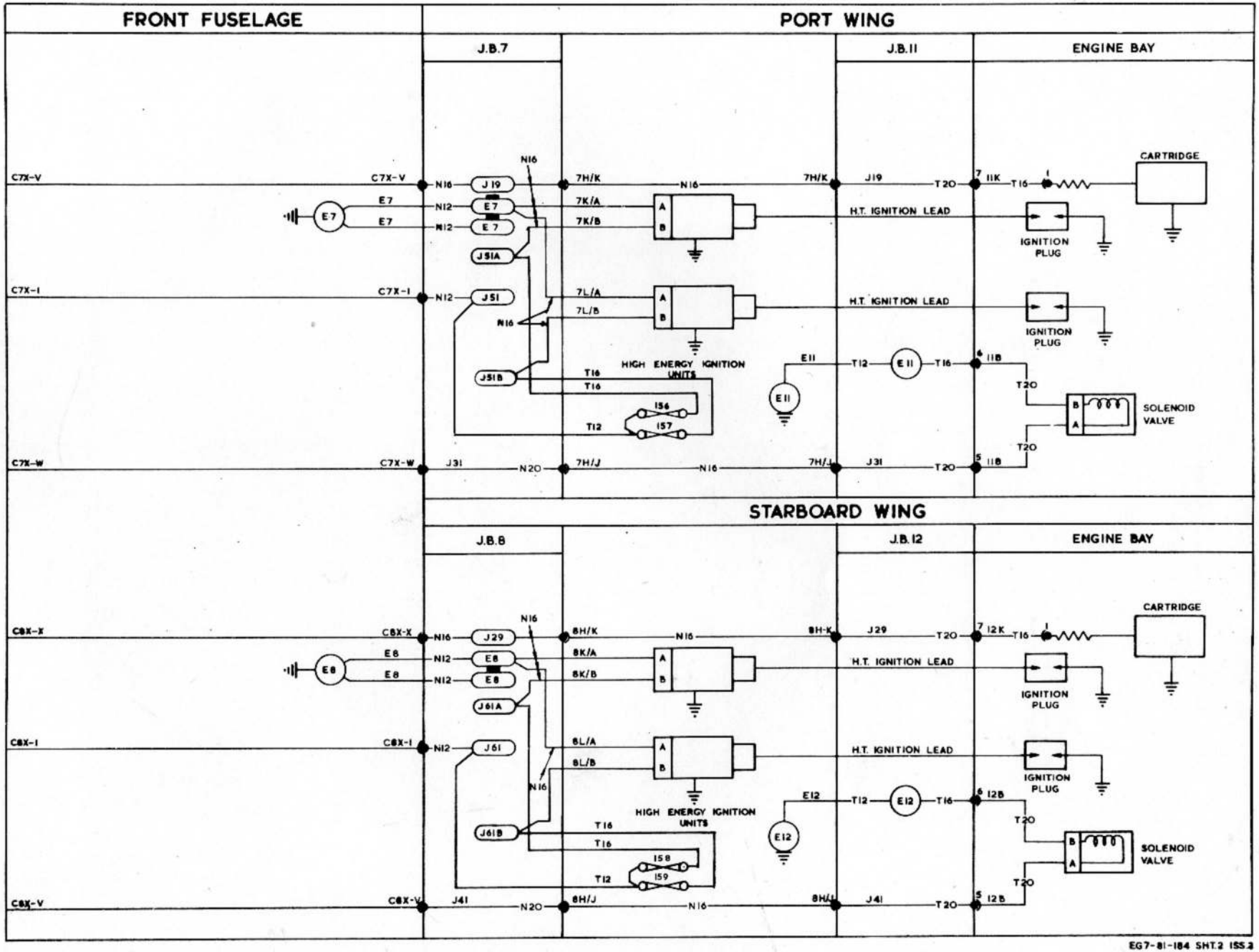


FIG. 2A. ENGINE SERVICES

◀MOD.4797 INCORPORATED▶

Chapter 8 LIGHTING

◀PRE MOD. 5466 (SEE SUPPLEMENT FOR POST MOD. 5466)▶

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◀**Note**... *Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*▶

▶◀

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

EXTERNAL LIGHTING

General

1. All external lighting circuits are controlled from the console by individual switches and an 'EXTERNAL LIGHTS MASTER SWITCH'. The lamp circuits are protected by a 40-amp fuse in the E.C.P. which connects the supply busbar, PP2, to the external lights busbar PP3. A complete list of the lamp filaments used is included in Table 3 in the General Information Chapter at the beginning of the section.

Navigation lamps

2. Four navigation lamps, one on each wing tip and two at the tail, are installed in the aircraft. One tail lamp is mounted below the rudder and the other fitted behind a transparent window under the tail structure.

Wing tip fuel tank or pod lamps

3. As the normal wing tip lamps are obscured when jettisonable fuel tanks, or wing-tip pods are carried, the nose of each unit is fitted with an extra navigation lamp which is connected into the normal lamp circuit by means of a spring contact block. If the units have to be jettisoned at night the extra lamps are lost and the wing tip lamps, then being visible, assume their normal function.

Identification lamp

4. A downward identification lamp, Type C, fitted with a domed front is installed on the underside of the fuselage just forward of the pack bay. The lamp is controlled from a switch on the console labelled IDENT LAMP, ON/OFF.

Landing lamp

5. A retractable landing lamp, Type J, is installed on the underside of the port wing. The supply to the lamp motor is not controlled by the master switch but is drawn direct from busbar PP3 via

a 5-amp fuse. The lamp is controlled from the console by a 3-position switch labelled 'OFF LOW-HIGH'. Setting the switch to 'LOW' operates the lamp to the half-extended position, at which point the filament is automatically switched on. When set to 'HIGH' the lamp moves to the fully extended position. Further information is contained in A.P.4343D, Vol.1, Sect.16, A.P.4343E, Vol.1, Sect.7, Chap.56 and in A.P.113E-0278-1.

Taxying lamps

6. Taxying lamps fitted near the navigation lamp in each wing tip are jointly controlled by a 2-position switch on the console.

Anti-collision lamps

7. Two rotating anti-collision lamps, Type G8400A-8-24 are fitted one above and one below the rear fuselage between frames 32 and 34, and are controlled by a switch annotated ANTI-COLLISION, ON/OFF, mounted on the console. Detailed information on the rotating lamps is given in A.P.113F-0203-1.

INTERNAL LIGHTING

Navigator's station

8. General lighting in the cabin is provided by a Mk.1A dome lamp on a bracket at the port side, above the chart table. Two adjustable lamps are also installed, one being fitted above the navigator's instrument panel and the other on a bracket above the A.E.O.'s control equipment at the starboard side of the cabin. Both lamps are controlled by dimmer switches mounted adjacent to them. In addition six flood lamps are fitted to illuminate the instruments and control units. These lamps together with the IFF/SSR control unit lamps are controlled by the dimmer switch labelled PANEL LIGHTING on the port coaming panel. The remaining two dimmer switches on the panel control the integral lamps in the navigator's station box, and the Tacan and HF radio control units. These switches are labelled UA60 STN. BOX LIGHTS and HF AND TACAN CONTROL UNITS respectively.

Cabin lighting

Instrument panels

9. Illumination of the pilot's instrument panels is provided by four ultraviolet lamps, eight red flood lamps, five pillar lamps, a bridge lamp, an accelerometer lamp and a lamp integral with the E2B compass. These lamps are controlled by dimmer switches labelled either U/V or RED mounted on the dimmer switch panels, which are located on the port console and starboard coaming panel, and control the port and starboard lamps respectively. Additional control of the brilliance of the bridge lamps which illuminate the pilot's altimeter, and the two pillar lamps, which illuminate the radio altimeter and the O.B.S. indicator, is effected by a 50-ohm dimmer switch preset to 40-ohm. The brilliance of the accelerometer lamp is also effected by a 15-ohm resistor which is fitted behind the port coaming panel at frame 2 and is connected in series with the lamp supply.

Coaming panel

10. The radio altimeter, VHF, and VOR/ILS control units, which are fitted on the coaming panel, and the No.1 UHF control unit, which is fitted in the starboard fixed panel, are illuminated by integral lamps which are controlled by the dimmer switch labelled RADIO on the coaming dimmer panel; this switch also controls the brilliance of the Tacan indicator bridge lighting on the starboard fixed panel. The remaining dimmer switch on the panel, which is labelled UA60 STN. BOX, controls the integral lighting of the pilot's station box which is also fitted on the coaming panel.

Pilot's emergency lighting

11. In addition to the normal lighting system for the main instrument panel, two red flood lamps, one on each side of the cabin, are installed for emergency use. The lamps are controlled by a switcy labelled 'EMERG LIGHTS', fitted on the coaming panel. Under normal operating conditions the E2B compass lamp is supplied and controlled by the starboard red flood lamps dimmer switch via the OFF contacts of the EMERG LIGHTS switch. When the switch is selected to ON a supply to the emergency flood lamps and the E2B compass is drawn from busbar X7 which is connected to the emergency battery. To enable the switch to be readily located and identified in the dark, it is positioned so that the toggle of the switch protrudes above the top of the starboard coaming panel. For identification purposes a plate, which incorporates a fluorescent dot, is attached to the face of the panel directly in front of the switch position.

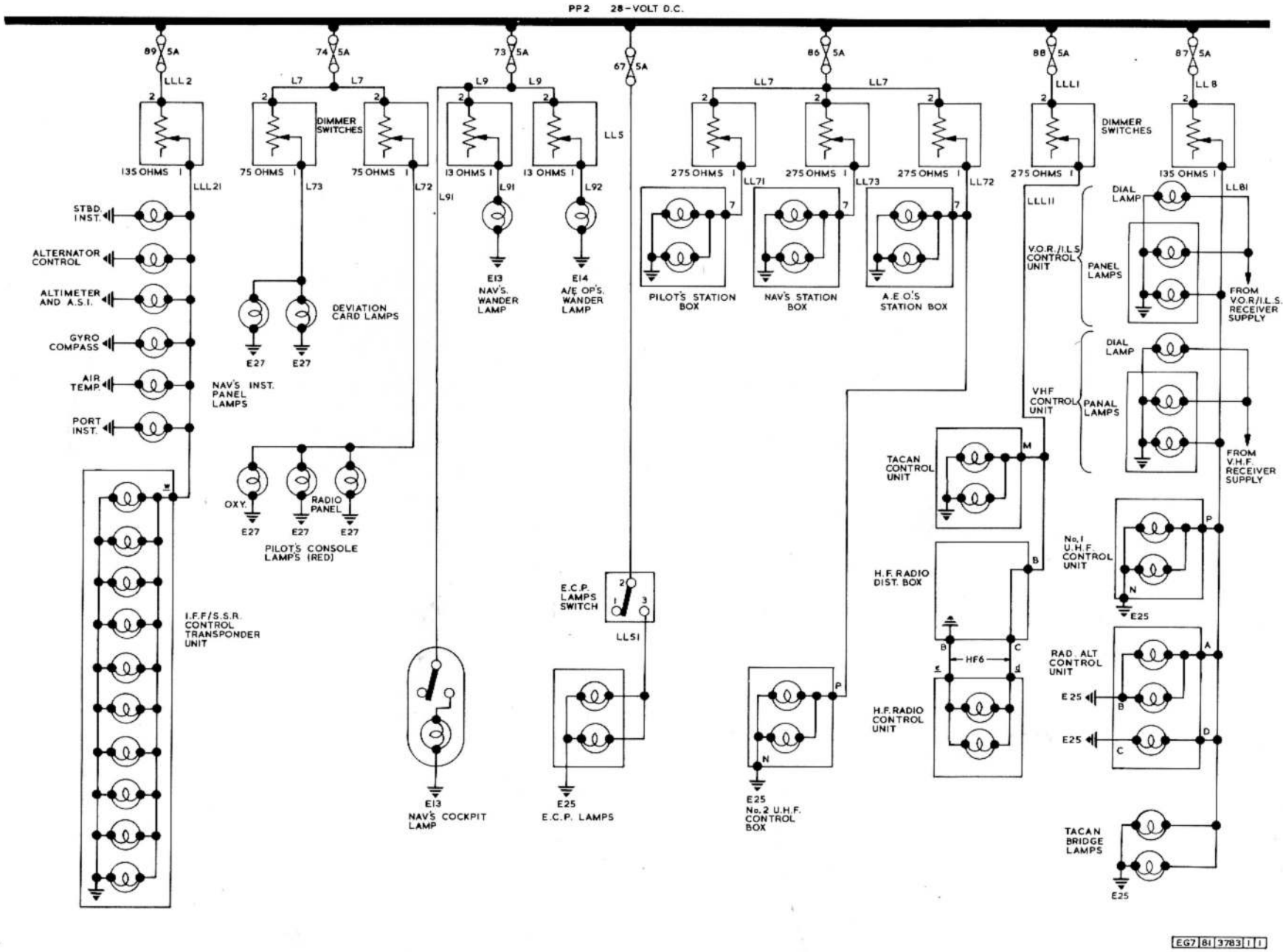

FIG.1A. INTERNAL LIGHTING

◄ CONTROL UNIT TERMINALS ADDED ►

Console lighting

12. In addition to the cabin lighting described above, five red lamps are installed for lighting the console, the pilot's oxygen regulator, and the deviation card holder. These lamps are controlled by dimmer switches labelled PILOTS CONSOLE and DEVIATION CARD LTS and are mounted on the console dimmer panel.

A.E.O.'s station

13. The lamps integral with the A.E.O.'s station box, fitted on the starboard coaming and the No.2 VHF control unit above the E.C.P. are controlled by a dimmer switch located adjacent to the box and labelled A.E. OPERATORS UA60 STN. BOX LIGHTS. The special equipment control panel integral lighting and frequency meter pillar lamps are supplied from busbar PP2 via fuses 160, 161 and 162.

SERVICING LAMPS

Starboard equipment compartment

14. A Mk.1A lamp, for use when servicing the generator control equipment etc. is fitted above the access door, and a socket for use with an inspection lamp and extension lead is mounted on the MEP. Both items of equipment are supplied with 28-volt d.c. from P10 via fuses on the MEP busbar panel.

Inspection lamp

15. An inspection lamp and extension lead, stowed in two canvas bags below the control equipment at the A.E.O.'s station at the starboard side of the cabin, are intended for use during servicing operations.

Console lighting

12. In addition to the cabin lighting described above, five red lamps are installed for lighting the console, the pilot's oxygen regulator, and the deviation card holder. These lamps are controlled by dimmer switches labelled PILOTS CONSOLE and DEVIATION CARD LTS and are mounted on the console dimmer panel.

A.E.O.'s station

13. The lamps integral with the A.E.O.'s station box, fitted on the starboard coaming and the No.2 VHF control unit above the E.C.P. are controlled by a dimmer switch located adjacent to the box and labelled A.E. OPERATORS UA60 STN. BOX LIGHTS. The special equipment control panel integral lighting and frequency meter pillar lamps are supplied from busbar PP2 via fuses 160, 161 and 162.

SERVICING LAMPS

Starboard equipment compartment

14. A Mk.1A lamp, for use when servicing the generator control equipment etc. is fitted above the access door, and a socket for use with an inspection lamp and extension lead is mounted on the MEP. Both items of equipment are supplied with 28-volt d.c. from P10 via fuses on the MEP busbar panel.

Inspection lamp

15. An inspection lamp and extension lead, stowed in two canvas bags below the control equipment at the A.E.O.'s station at the starboard side of the cabin, are intended for use during servicing operations.

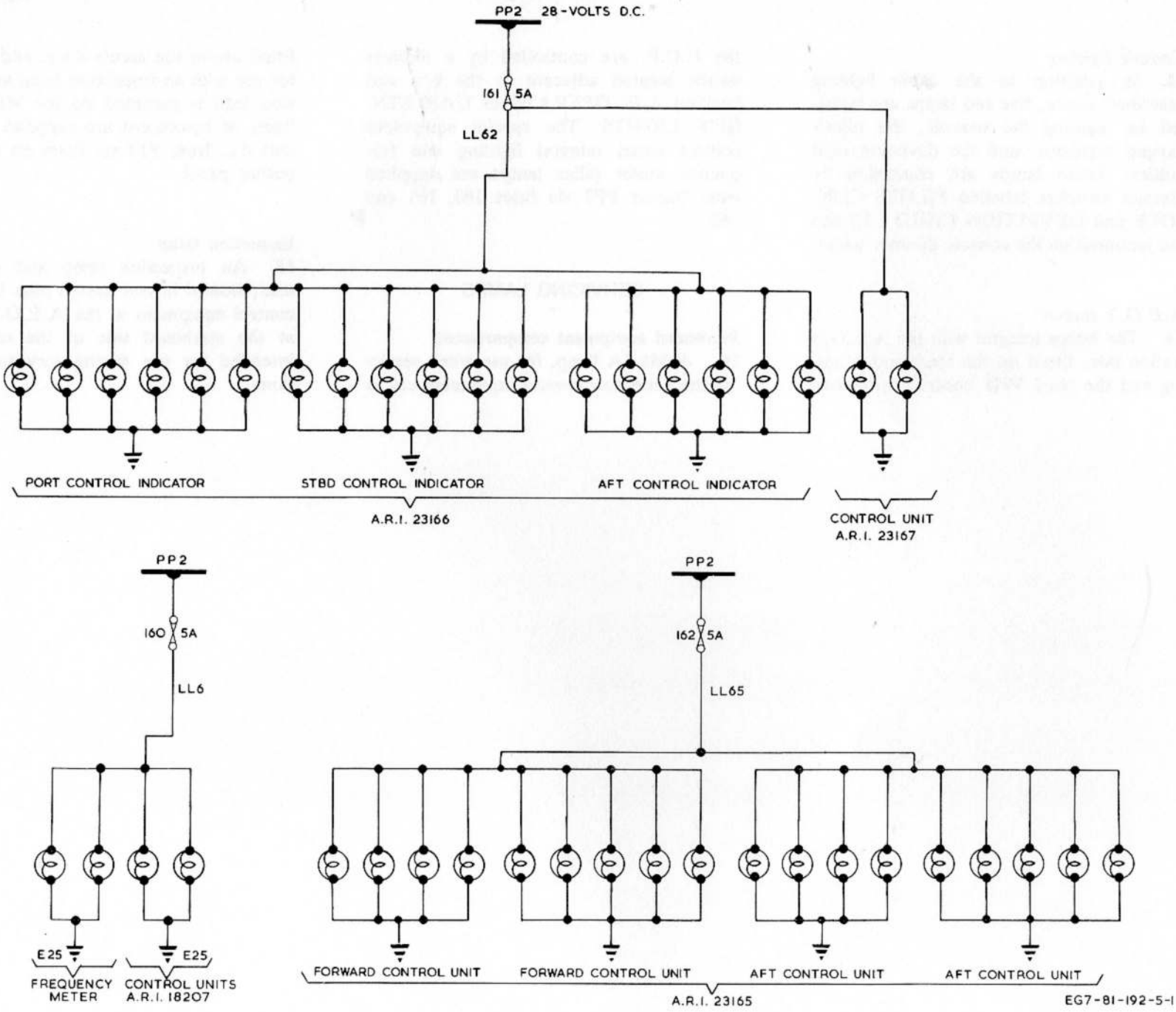

FIG. 3. SPECIAL EQUIPMENT LIGHTING

◀ MOD 5176 EMBODIED ▶

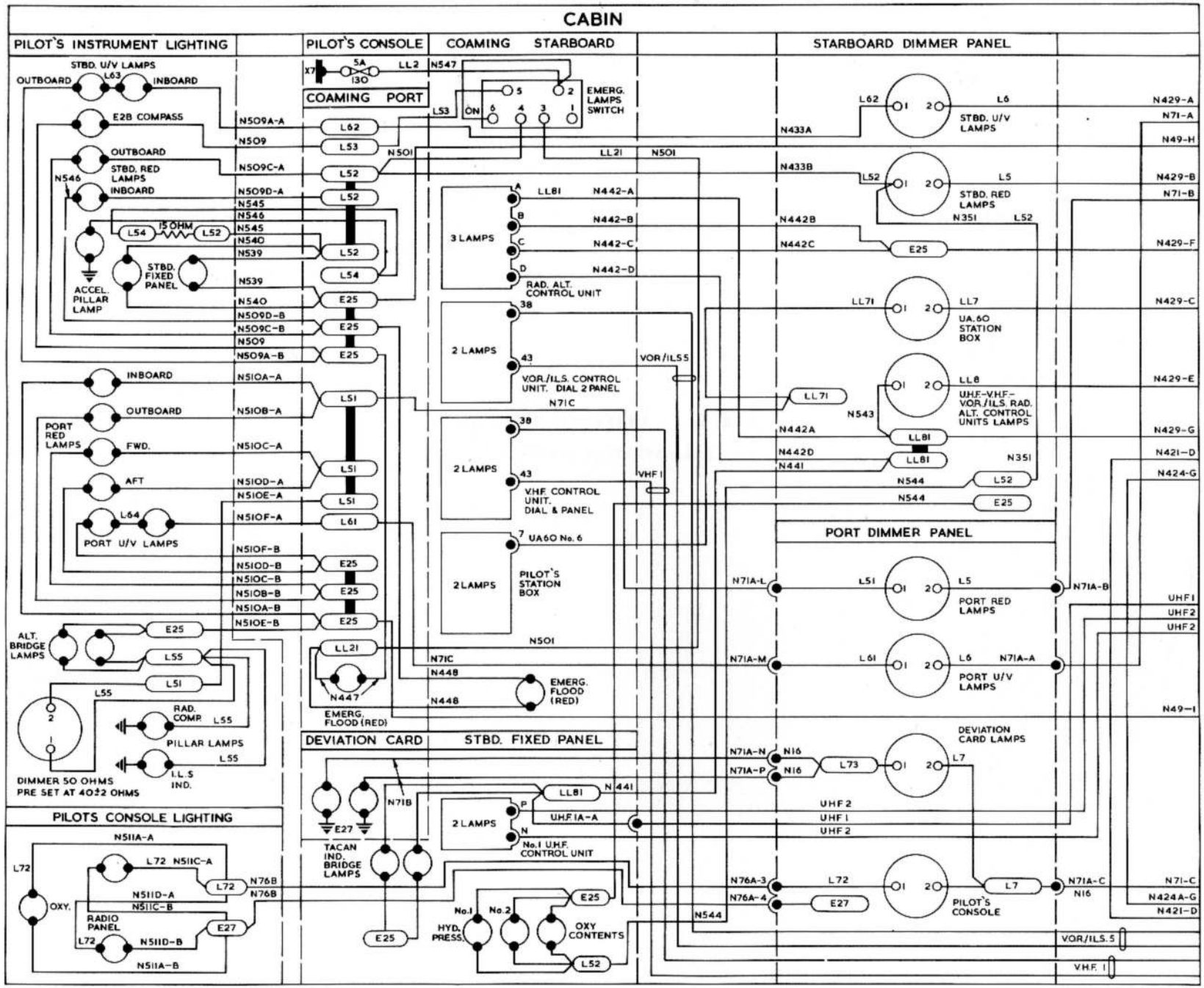

FIG. 4. INTERNAL LIGHTING

◄ LAMP SYMBOLS AMENDED ►

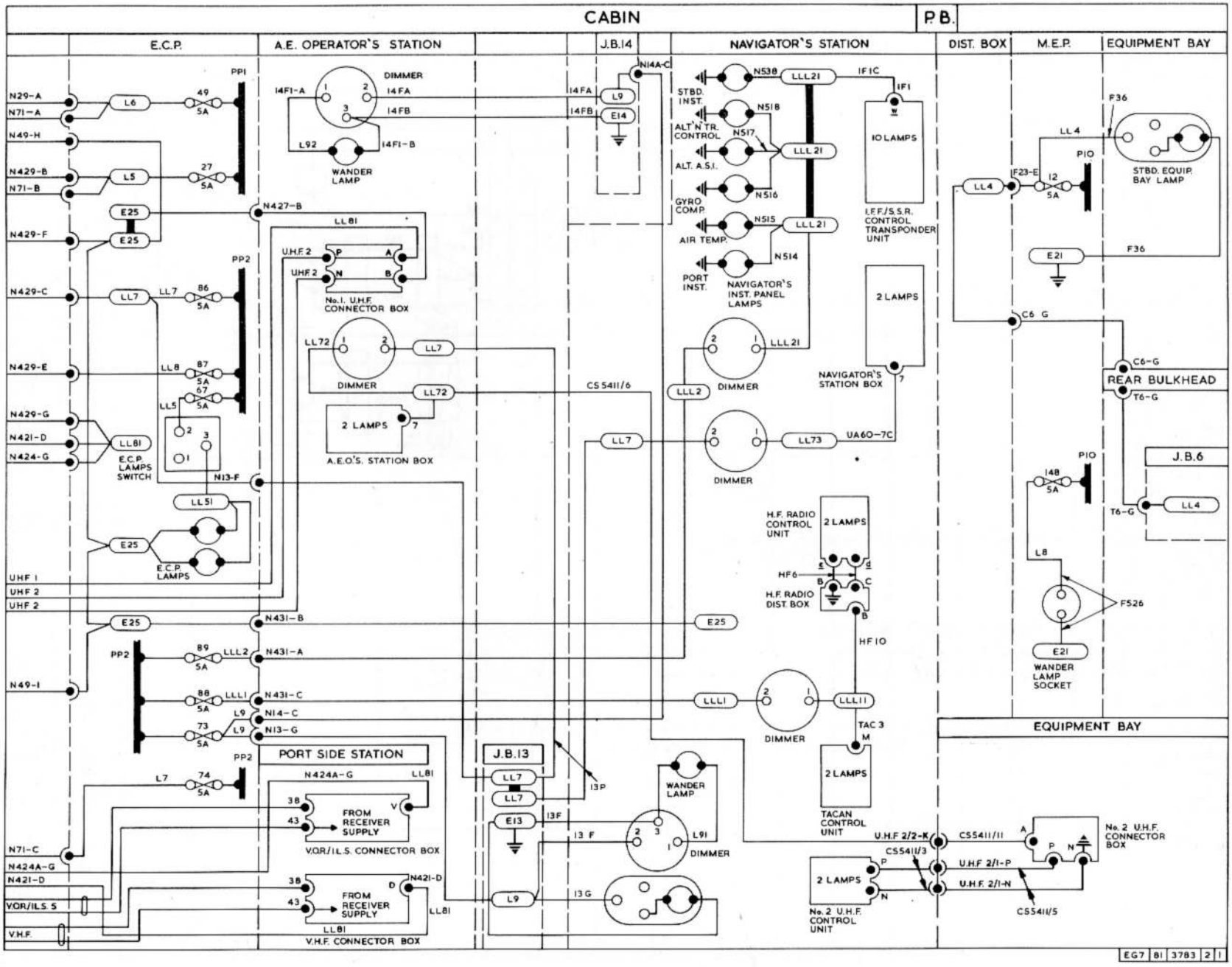

FIG. 4A. INTERNAL LIGHTING

◄ CONTROL UNIT INTERNAL CIRCUITS DELETED ►

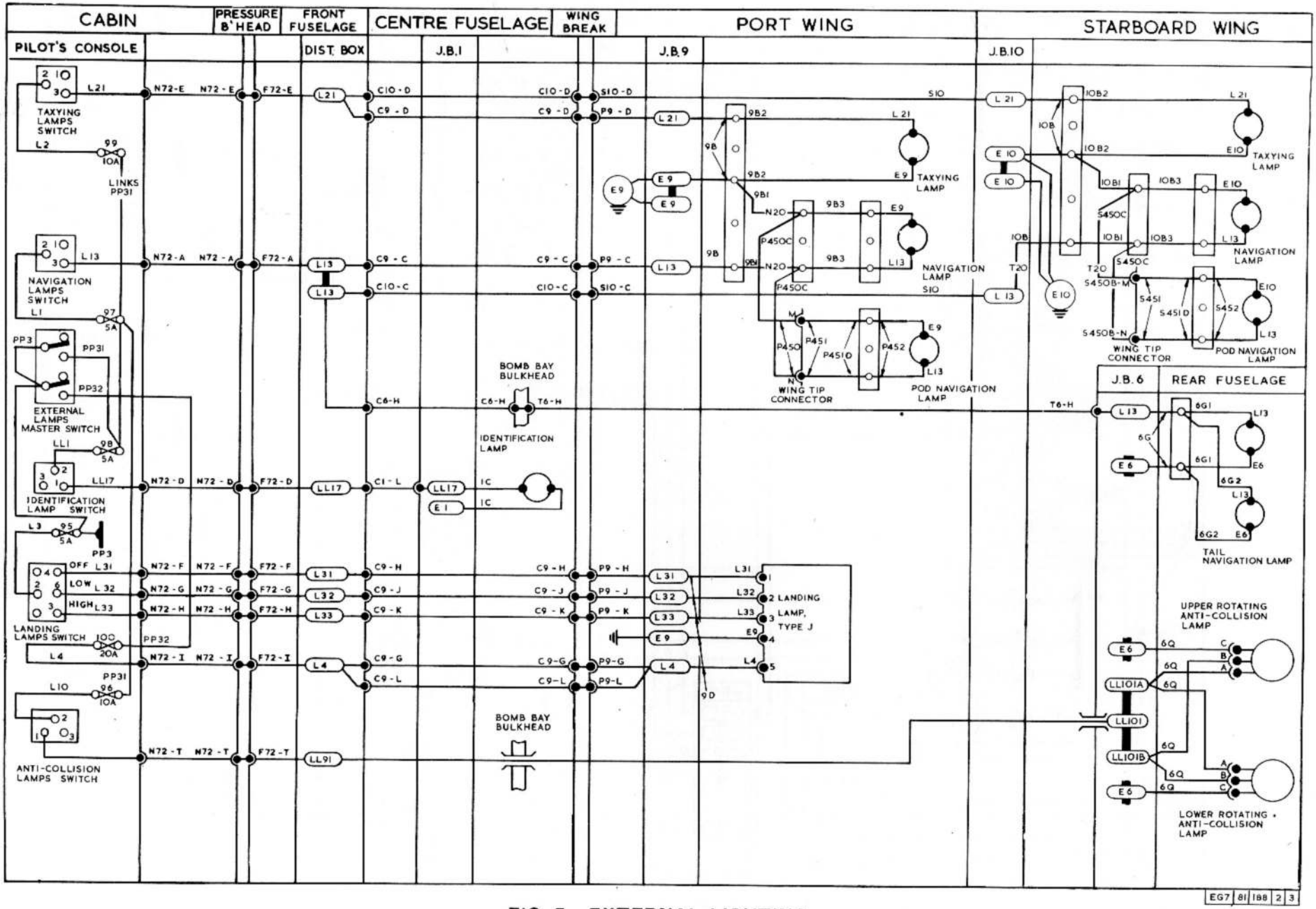

FIG. 5. EXTERNAL LIGHTING

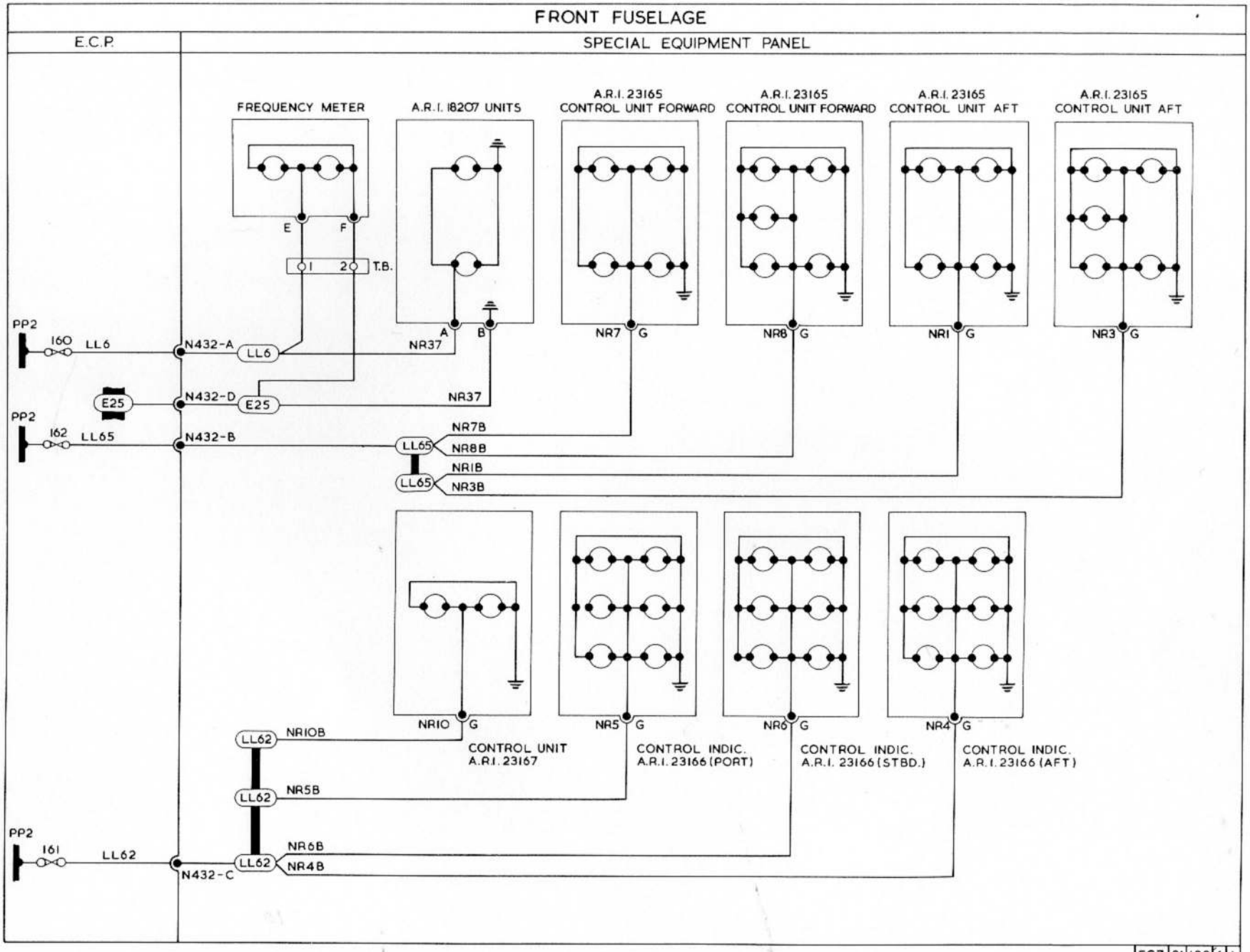

FIG. 6. SPECIAL EQUIPMENT LIGHTING

◂MOD.5176 EMBODIED▸

Chapter 9 D.C. POWER SUPPLIES

◀ *(completely revised)* ▶

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LIST OF ILLUSTRATIONS

Note... *Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*

Introduction

1. This chapter contains descriptive and servicing information appertaining to the d.c. generating system and the batteries.

DESCRIPTION

General

2. Power for the electrical services and for battery charging is provided by two Type P3 generators *(A.P. 113B-0217-1)* operating in parallel with their output automatically controlled at 28-volts. The generators are six-pole, self-excited, shunt-wound machines rotating in a clockwise direction.

Generator drive

3. Each generator is driven through a two-speed gearbox which, in turn, is coupled to the accessories gearbox. The two-speed gearbox provides that a high output is available from a generator at low engine rev/min. The gear change is automatic and controlled by a centrifugal clutch mechanism when this is subjected to a variation, within limits, of engine rev/min. At low speeds the clutch is IN and high gear is engaged, with the result that the generator runs at 1.1072 times the engine speed. When the engine speed rises to between 5930 and 6890 rev/min the high gear is automatically disengaged and the generator is then driven at 0.64 engine speed. On the reduction of engine rev/min to between 5900 and 5150, high gear is re-engaged and generator output then increases relative to the engine speed.

Operation

4. The output from each generator, after passing through a Type X3 suppressor located near the fuselage in the leading edge of the main plane, is controlled by a Type 23 voltage regulator, a Type A differential cut-out, and a Type D circuit breaker, all of which are on the M.E.P. in the starboard equipment compartment. Also on the M.E.P. is a Type 32 master voltage regulator which balances and maintains the output of both generators at 28 volts. The generators are initially controlled by generator switches which are fitted on the take-off panel and field circuit breakers fitted at the E.C.P., generator failure

is indicated by red warning lamps fitted on the engine instrument panel. The output from the generators is connected to busbar P10 and fed to the battery busbar P9 via the Type R relay on the busbar panel.

Main relay, Type R

5. The function of this relay is to isolate the services connected to busbar P10 from the battery busbar P9. It is normally controlled by the BATTERY ISOLATION switch on the take-off panel but is also connected in the inertia crash switch circuit. If the inertia switch(es) should operate in a crash landing, the relay opens and disconnects the power supply to all electrical circuits except those for the fire extinguishers, canopy jettison and hatch jettison. For information on the inertia switches reference should be made to Chap.12.

External power supply

6. A three-pole plug is fitted on the M.E.P. for the purpose of connecting an external power supply to the aircraft. To cater for an external supply cable having a two-pole connector, an adapter, (Ref.No.105G/11) should be used.

Batteries

Note ...

Extra care must be taken when changing batteries due to the restricted access on embodiment of SEM/CAN/0136.

Main batteries

7. Four Type C lead-acid batteries are installed between frames 12 and 13 at the port side of the fuselage. Each battery is rated at 12-volts, 40Ah and all four are connected in series-parallel

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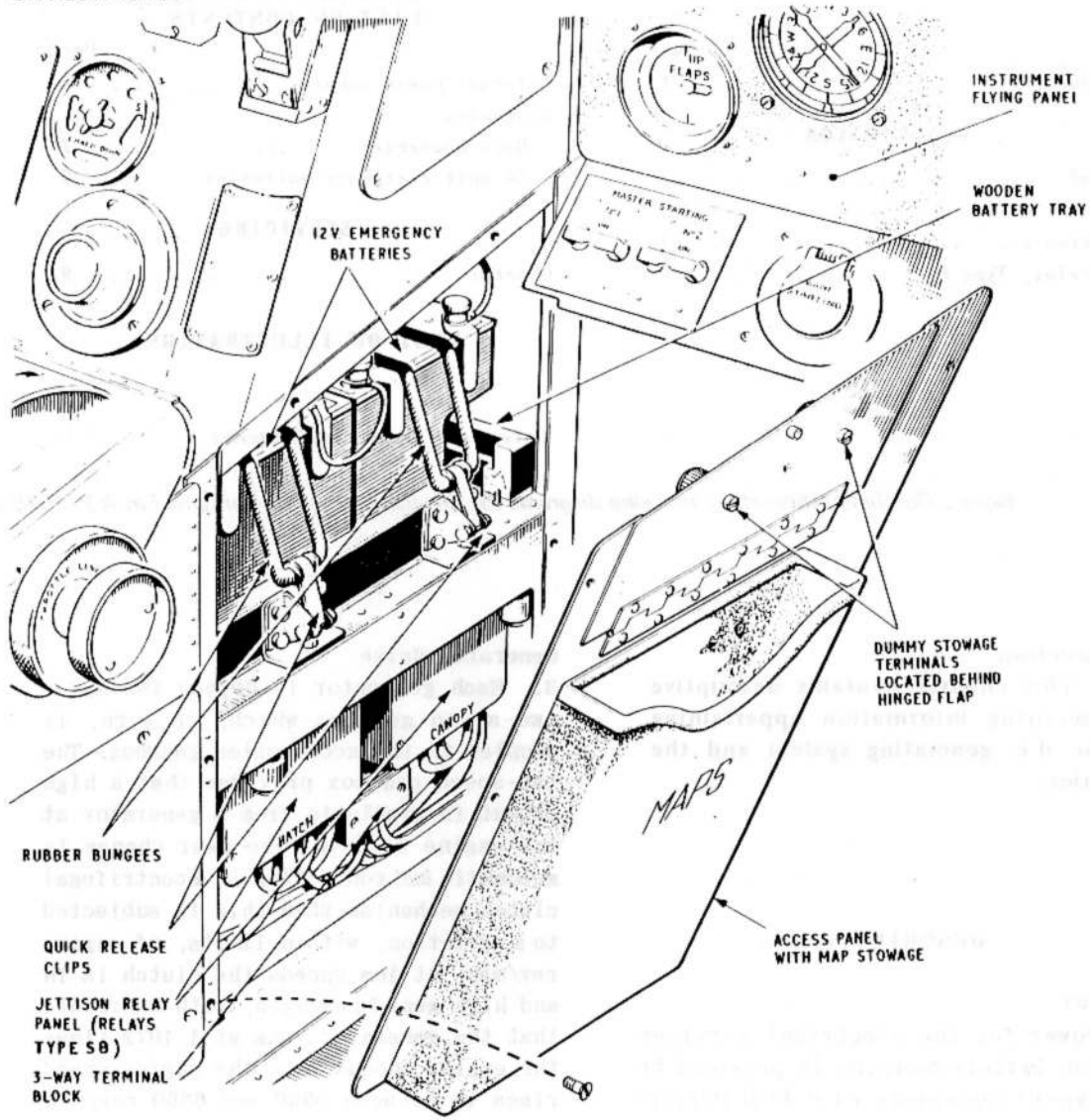

Fig.1. Location of emergency batteries

giving 24-volts, 80Ah. The batteries are carried on a sliding tray mounted on rollers and are reached through an access door at the port side of the fuselage forward of the main plane. The access door hinges downwards and is used as a platform upon which the batteries and tray can be run. As a number of circuits are not controlled by switches but are directly connected to the main positive supply, to conserve battery current it is essential that while the aircraft is on the ground the BATTERY ISOLATION switch should be OFF. When a power supply is required for servicing purposes an external source should be used.

24-volt emergency batteries

8. Two lead-acid batteries, rated at 12 volts 4Ah each, are provided for the emergency operation of the turn and slip indicator and the canopy and hatch jettison circuits. The batteries are anchored by rubber bungees to a tray installed in the lower section of the console structure. Access to the batteries is obtained by means of a hinged flap located above the pilot's map stowage compartment. Two dummy stowage terminals are fitted at the rear of the flap for stowing the connecting cables.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

General

9. The generators are accessible after the removal of large detachable panels secured by screws to the upper surface of the main plane inboard of each engine. The removal and assembly of the generators is described and illustrated in A.P.101B-0417-1A, Sect.4, Chap.1. Suspected wiring faults should be investigated using the combined theoretical and routeing diagrams in A.P.101B-0417-10 (Servicing Diagrams Manual).

Charging circuit failure

10. If indication of a generator fault is given by a generator warning light, the main components in the suspect system should be examined, particular attention being given to the connections at the circuit breaker, voltage regulator, and cut-out etc. in its circuit. If the aircraft has had recent prolonged periods of high-altitude flying it is advisable to check the generator brushes as, under these flight conditions, abnormal brush wear can take place and quickly cause a generator to become unserviceable. The finding of worn brushes in one generator should lead to an examination of the brushes in the other, although that unit may apparently be operating satisfactorily. Brushes should be renewed if found to be less than 0.42 in. in length or if their condition suggests that they will wear below that minimum before the next servicing examination is due. New brushes should be an easy sliding fit in their holders and bedded over their full thickness and at least 80 per cent of their axial length. Brush spring pressure should be maintained at 17 to 19 oz. After a visual examination of a suspected generator, its insulation should be tested to the figure given in its associated A.P. If, after test, it is considered serviceable, it should be run to enable voltage regulator checks to be made in accordance with the instructions given in the following paragraphs.

Voltage regulator setting

11. The following procedure should be adopted when setting up the voltage regulators:-

(1) Switch OFF the BATTERY ISOLATION switch on the take-off panel.

(2) Connect a ground supply to the external power plug.

(3) Switch OFF both generator switches on the take-off panel.

(4) Close both field circuit breakers on the E.C.P.

(5) Connect a Type D testmeter (set to the 30-volt range) to No.1 voltmeter socket on the E.C.P.

(6) Start up No.1 engine. When it reaches approximately 3500 rev/min adjust the trimmer on the port voltage regulator to give a meter reading of 24 volts. Vary the engine speed and verify that the reading remains steady at 24 ± 0.5 volts.

(7) Leaving No.1 engine idling, change over the testmeter connection to No.2 volt meter socket.

(8) Start up No.2 engine and repeat the procedure (6) with the starboard voltage regulator, again setting to 24 ± 0.5 volts.

(9) Disconnect external power supply and switch off all internal loads.

(10) Switch ON both generator switches and run up both engines together to approximately 3500 rev/min and adjust the trimmer of the master voltage regulator until a steady reading of 28 volts is obtained. Vary the engine speed over its normal range and check that the voltage does not vary more than 0.5 volt either way. During this check the test-meter may be connected to either meter socket.

Load balancing tests

12. Provided that the voltage regulators have been adjusted in the manner described in para.11, it should not be necessary to carry out load-balancing tests between the generator circuits.

Check for differential cut-outs, Type A

13. The Type A differential cut-out which is fully described in A.P.113D-0802-16 can be checked by following the procedure detailed below: -

(1) Connect a sensitive 0-3 voltmeter across terminal No.1 of the cut-out being checked and terminal No.2 of its associated Type D circuit breaker.

(2) Start the engine and slowly increase its speed until the differential cut-out contacts close. This should take place when the generator voltage is between 0.35-0.75 volt above the battery busbar voltage. (No action need be taken if the differential voltage is slightly above the top limit of 0.75 volt.)

(3) Slowly decrease the engine speed until sufficient current flows from the battery to the generator to open the differential cut-out contacts. This should occur at a reverse current of between 15 and 25 amps but no action need be taken if the upper limit is slightly exceeded.

Main batteries

14. The batteries must be removed from the aircraft and serviced in accordance with the Servicing Schedule. During removal or replacement the four batteries must not be placed on the access door simultaneously or damage to the door structure may result. Whenever the batteries are removed, the battery cables should be stowed on the terminals provided for the purpose. The structure and equipment adjacent to the batteries must be kept clean and free from any trace of electrolyte.

24-volt emergency batteries

15. In accordance with the aircraft Servicing Schedule, these batteries should be removed and charged at the rate shown on the battery label. The battery tray and adjacent structure must be kept clean and free from any trace of electrolyte.

(10) Switch ON both generator switches and run up both engines together to approximately 3500 rev/min and adjust the trimmer of the master voltage regulator until a steady reading of 28 volts is obtained. Vary the engine speed over its normal range and check that the voltage does not vary more than 0.5 volt either way. During this check the test-meter may be connected to either meter socket.

Load balancing tests

12. Provided that the voltage regulators have been adjusted in the manner described in para.11, it should not be necessary to carry out load-balancing tests between the generator circuits.

Check for differential cut-outs, Type A

13. The Type A differential cut-out which is fully described in A.P.113D-0802-16 can be checked by following the procedure detailed below:-

(1) Connect a sensitive 0-3 voltmeter across terminal No.1 of the cut-out being checked and terminal No.2 of its associated Type D circuit breaker.

(2) Start the engine and slowly increase its speed until the differential cut-out contacts close. This should take place when the generator voltage is between 0.35-0.75 volt above the battery busbar voltage. (No action need be taken if the differential voltage is slightly above the top limit of 0.75 volt.)

(3) Slowly decrease the engine speed until sufficient current flows from the battery to the generator to open the differential cut-out contacts. This should occur at a reverse current of between 15 and 25 amps but no action need be taken if the upper limit is slightly exceeded.

Main batteries

14. The batteries must be removed from the aircraft and serviced in accordance with the Servicing Schedule. During removal or replacement the four batteries must not be placed on the access door simultaneously or damage to the door structure may result. Whenever the batteries are removed, the battery cables should be stowed on the terminals provided for the purpose. The structure and equipment adjacent to the batteries must be kept clean and free from any trace of electrolyte.

24-volt emergency batteries

15. In accordance with the aircraft Servicing Schedule, these batteries should be removed and charged at the rate shown on the battery label. The battery tray and adjacent structure must be kept clean and free from any trace of electrolyte.

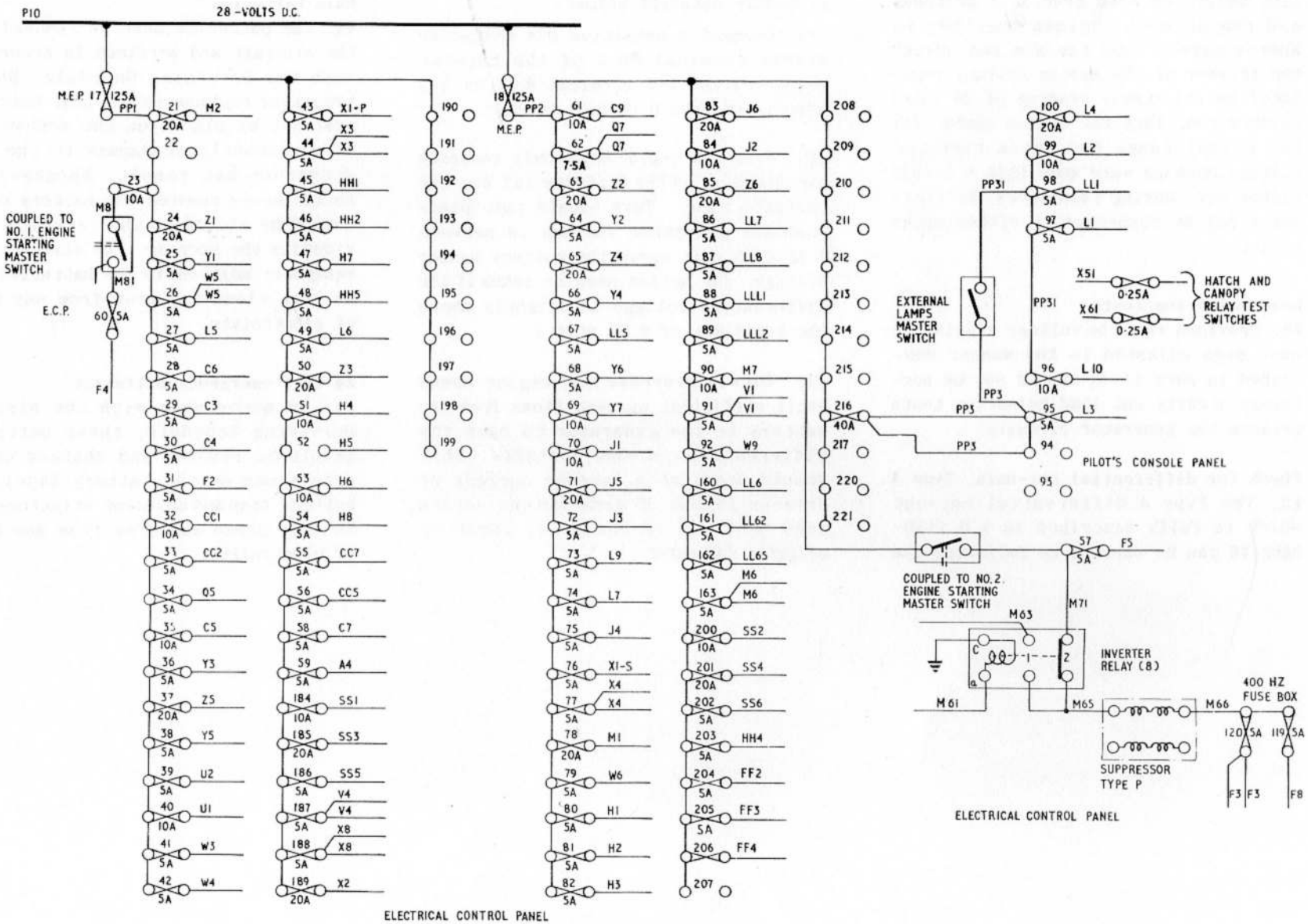

FIG. 3. D.C. POWER SUPPLIES DISTRIBUTION

◂TITLE AMENDED▸

UK RESTRICTED

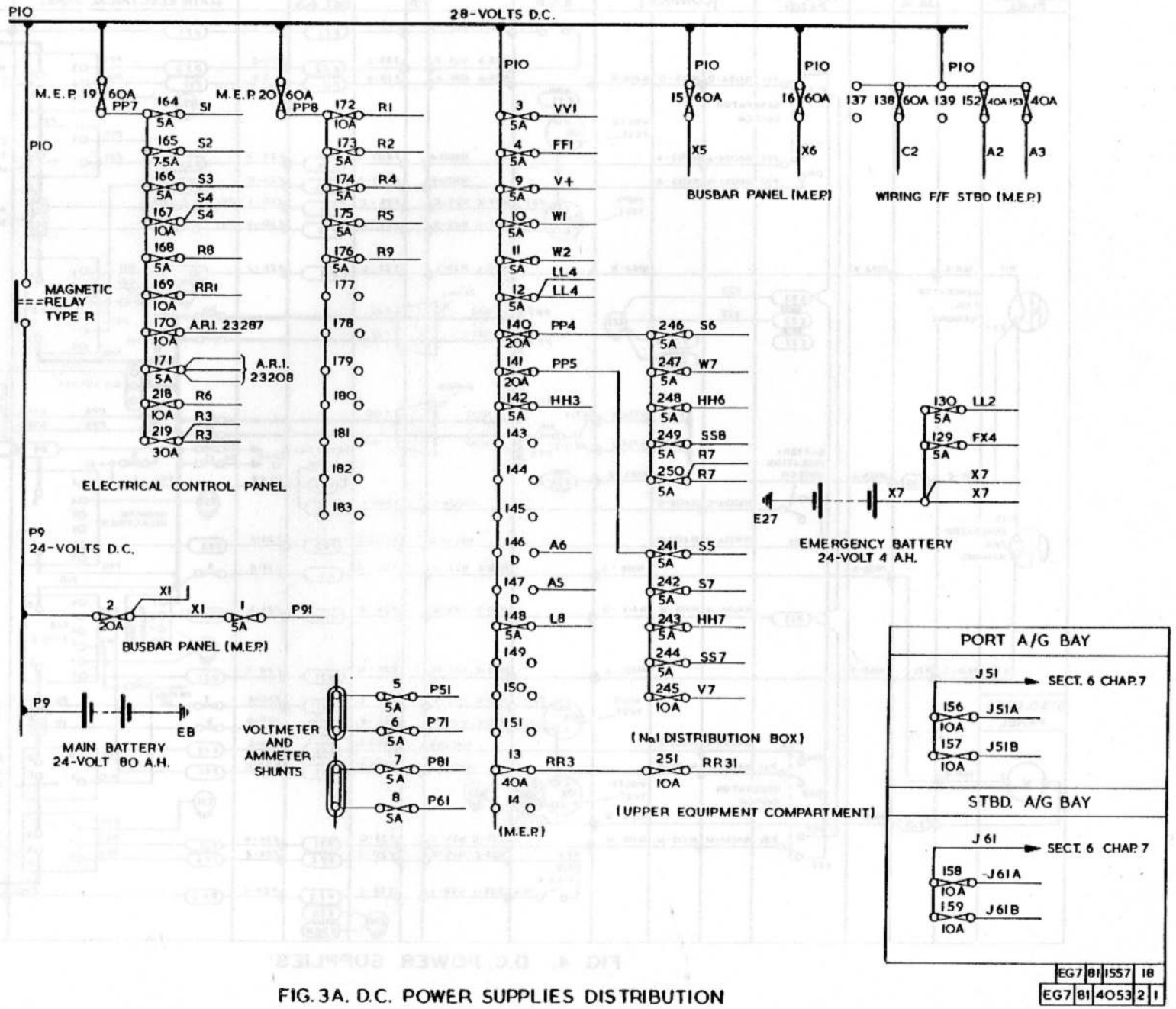

FIG. 3A. D.C. POWER SUPPLIES DISTRIBUTION

◂MOD 5506 EMBODIED▸

EG7 81 1557 18
EG7 81 4053 2 1

UK RESTRICTED

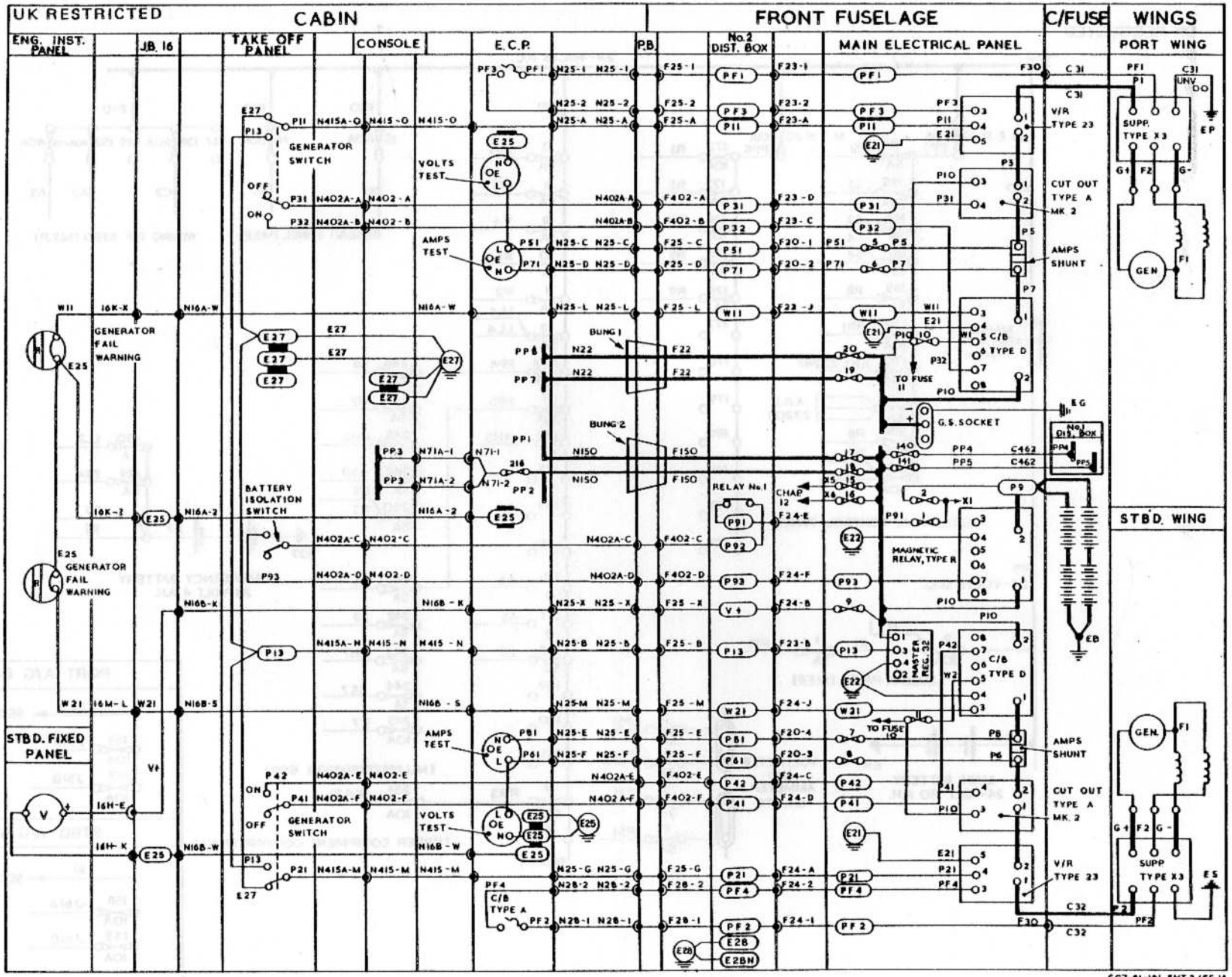

FIG. 4. D.C. POWER SUPPLIES

Chapter 10 FUEL SYSTEM

◀ *(completely revised)* ▶

LIST OF CONTENTS

Note... *Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*

DESCRIPTION

General

1. Three fuel tanks are permanently installed in the aircraft in the compartment above the bomb bay. The tanks are fitted with electrically-driven immersed fuel pumps, the power supply to each passing through an interference suppressor. Fuel delivery from the pumps is controlled by electrically actuated cocks. Provision is also made to mount a jettisonable fuel tank below each wing tip but these tanks are without pumps or cocks.

Main tanks

2. The main tanks, numbered 1, 2 and 3 from the forward end of the aircraft, are each fitted with two Type SPE.1003 fuel pumps which project into the base of the tank through adapter plates in the roof of the bomb bay. The pumps are positioned port and starboard and near to each is a fuel cock which is operated by a Type 201 rotary actuator.

Control switches

3. The fuel pumps are controlled by single-pole ON/OFF switches on the engine instrument panel whilst the associated fuel cocks are controlled by two-position ON/OFF switches fitted on the take-off panel.

Circuit protection

4. The fuel pumps and cocks are protected by fuses in the E.C.P., those serving the pump circuits are rated at 20A and those for the cock circuits at 5A.

Fuel pump test panel

5. For checking the operation and current consumption of each pump in the main fuselage tanks, a set of six push-button switches and a socket for a plug-in type ammeter are fitted on the forward face of the E.C.P.

SERVICING

General

6. All fuel pump tests should be made with the pumps immersed in fuel and operating under no-flow conditions with the appropriate cock closed.

Fuel pump test

7. The following procedure is given

for checking the operation and current consumption of the fuel pumps.

(1) Ensure that the pump and cock switches are OFF.

(2) Connect a Type D testmeter, set to the 0-30 amp range, or a suitable ammeter, to the socket on the test panel in the E.C.P.

(3) Operate each pump test switch, in turn, for at least 30 seconds.

8. When operating with 24 volts at its terminals, the Type SPE.1003 pump should take a maximum current of 11.5 amp when sustaining a no-flow pressure of 16.5 lb/in^2.

Interpretation of testmeter readings

9.

(1) A steady reading not exceeding the current consumption figures given in para.8 with the relevant test voltage will indicate that a pump is serviceable. Pumps showing appreciably higher current figures than these are suspect and should be replaced with new or reconditioned units.

(2) A fluctuating reading indicates either faulty brushes, commutator, or internal connections.

(3) A zero reading indicates an open circuit due to either a blown fuse, faulty wiring, or complete motor failure.

Voltage drop

10. The test voltage given in para.8 as 24 is that which should be available at the pump terminals and does not take into consideration the voltage drop between the busbar supply and the pump units when on load. The drop between the busbar and the pumps in the No.1, 2 and 3 fuselage tanks is approximately 1.25 volts, 1.75 volts and 2 volts respectively. This voltage drop should be allowed for when making tests.

Cock actuators

11. The cock assemblies, Type 201, incorporate Type 200 actuators which are described in A.P.4343D, Vol.1. Normal servicing of the units is usually confined to checking brush length and removing carbon dust which can be done after the removal of the end cover from the motor.

REMOVAL AND ASSEMBLY

Fuel pumps

12. A fault on the pump motor necessitates the removal of the complete pump assembly. Instructions covering this procedure are given in A.P.101B-0417-1A, Sect.4, Chap.2.

Actuators

Removal

13.

(1) Disconnect the electrical plug and socket from the motor.

(2) Slacken the bolts attaching the actuator to the body of the cock and separate the two units.

(3) Remove the actuator.

Assembly

14.

(1) Ensure that the actuator and the cock are both at the same selection setting.

(2) Fit the actuator to the cock and secure the attachment bolts.

(3) Reconnect the electrical plug and socket to the motor.

(4) Carry out a functioning test of the cock actuator.

for checking the operation and current consumption of the fuel pumps.

(1) Ensure that the pump and cock switches are OFF.

(2) Connect a Type D testmeter, set to the 0-30 amp range, or a suitable ammeter, to the socket on the test panel in the E.C.P.

(3) Operate each pump test switch, in turn, for at least 30 seconds.

8. When operating with 24 volts at its terminals, the Type SPE.1003 pump should take a maximum current of 11.5 amp when sustaining a no-flow pressure of 16.5 lb/in^2.

Interpretation of testmeter readings

9.

(1) A steady reading not exceeding the current consumption figures given in para.8 with the relevant test voltage will indicate that a pump is serviceable. Pumps showing appreciably higher current figures than these are suspect and should be replaced with new or reconditioned units.

(2) A fluctuating reading indicates either faulty brushes, commutator, or internal connections.

(3) A zero reading indicates an open circuit due to either a blown fuse, faulty wiring, or complete motor failure.

Voltage drop

10. The test voltage given in para.8 as 24 is that which should be available at the pump terminals and does not take into consideration the voltage drop between the busbar supply and the pump units when on load. The drop between the busbar and the pumps in the No.1, 2 and 3 fuselage tanks is approximately 1.25 volts, 1.75 volts and 2 volts respectively. This voltage drop should be allowed for when making tests.

Cock actuators

11. The cock assemblies, Type 201, incorporate Type 200 actuators which are described in A.P.4343D, Vol.1. Normal servicing of the units is usually confined to checking brush length and removing carbon dust which can be done after the removal of the end cover from the motor.

REMOVAL AND ASSEMBLY

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12. A fault on the pump motor necessitates the removal of the complete pump assembly. Instructions covering this procedure are given in A.P.101B-0417-1A, Sect.4, Chap.2.

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Removal

13.

(1) Disconnect the electrical plug and socket from the motor.

(2) Slacken the bolts attaching the actuator to the body of the cock and separate the two units.

(3) Remove the actuator.

Assembly

14.

(1) Ensure that the actuator and the cock are both at the same selection setting.

(2) Fit the actuator to the cock and secure the attachment bolts.

(3) Reconnect the electrical plug and socket to the motor.

(4) Carry out a functioning test of the cock actuator.

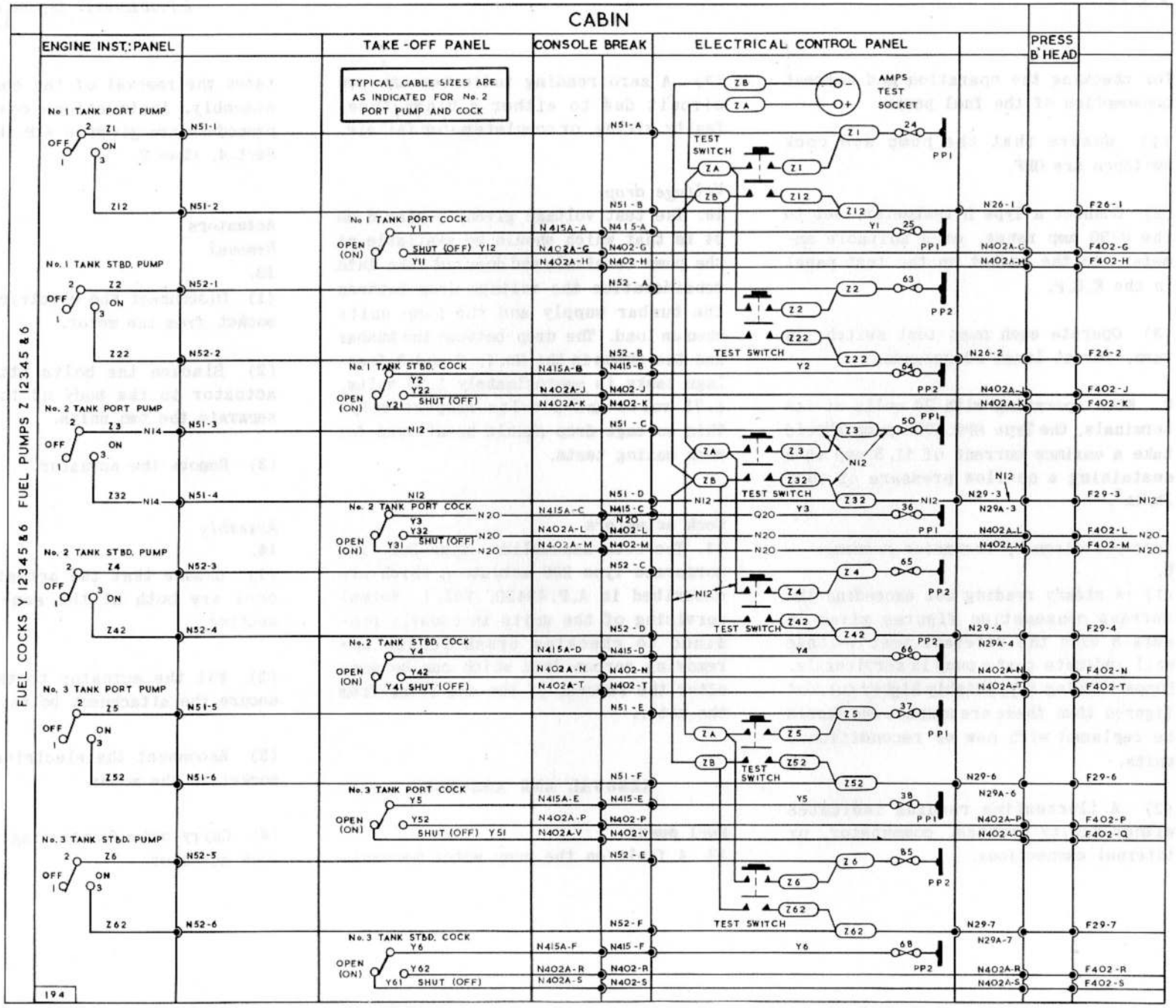

FIG. 2. FUEL PUMPS AND COCKS

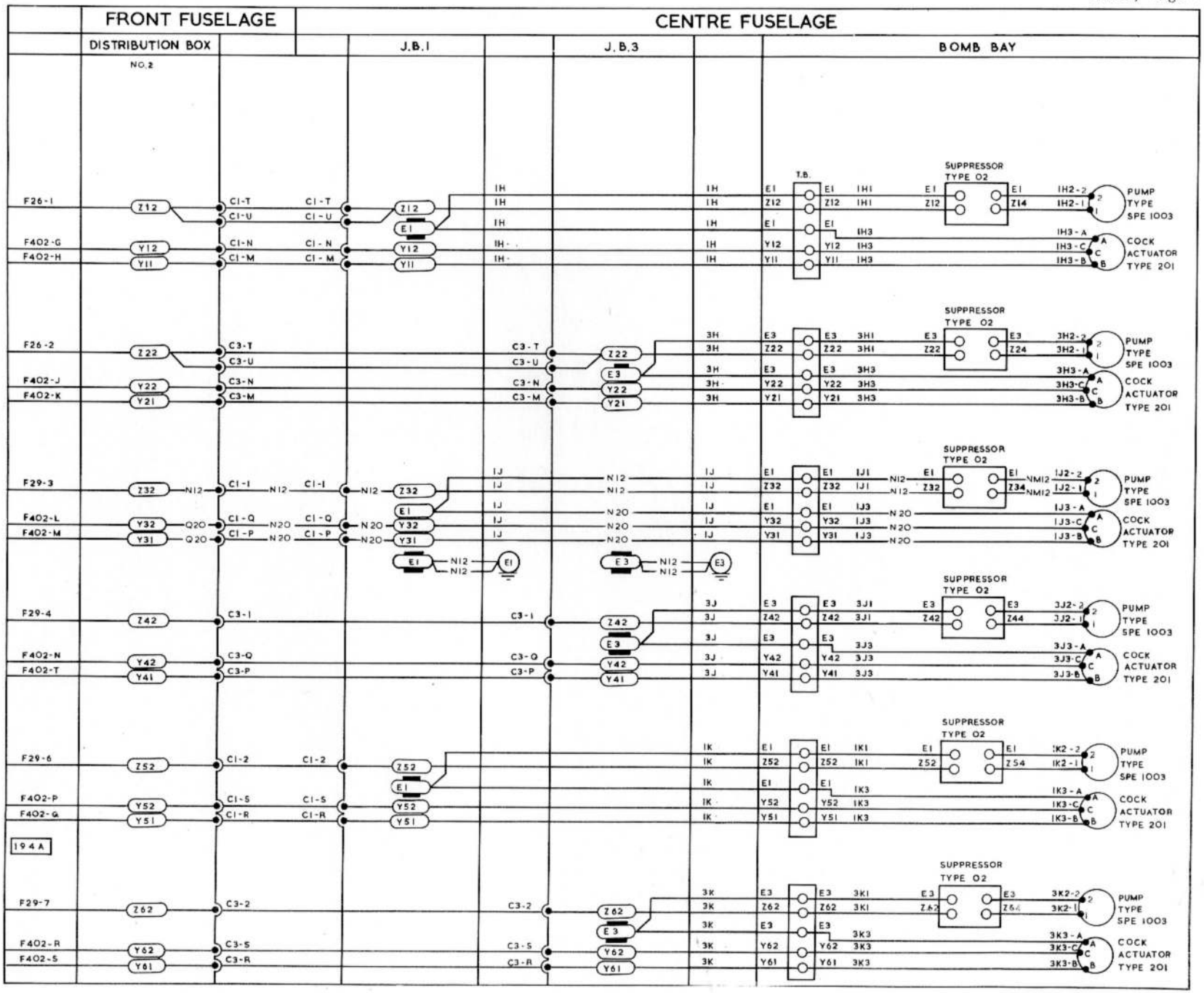

FIG. 2A. FUEL PUMPS AND COCKS

EG7-81-186-SHT. 2 ISS. 1

Chapter 11 RADIO AND RADAR POWER SUPPLIES

◀PRE MOD. 5466 (SEE SUPPLEMENT FOR POST MOD. 5466)▶

LIST OF CONTENTS

◀**Note**... *Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*▶

▶◀

DESCRIPTION

General

1. Both a.c. and d.c. power supplies are required to operate the wireless and radar systems which comprise:- Intercomm., H.F., V.H.F., U.H.F., radio altimeter, radio compass, V.O.R./I.L.S., I.F.F., Tacan, Green satin and special equipment. The a.c. supplies are provided by two turbine-driven 200 volt 400 Hz, 3-phase alternators *(Chap.13)*, the 28 volt d.c. supplies are taken from the aircraft normal supplies *(Chap.9)*.

Intercomm.

2. The intercomm. system operates on 28 volt d.c. from busbar PP8; fuse 174 in the E.C.P. supplies (a) the JB6043 via the I/COMM MASTER switch on the aft face of the radio fuse and relay box, and (b) the ground crew amplifier UA60 No.5A via the I/COMM MASTER and the GROUND CREW AMPL'R. switch on the pilot's coaming panel. Fuse 176 in the E.C.P. supplies the 28 volt d.c. required to energize the ground crew isolating relay, the supply being controlled by the EXTL. I/C GROUND/FLIGHT switch on the pilot's coaming panel. Fuse 177 in the E.C.P. provides a separate supply to the JB6043, to power the emergency intercomm. amplifier.

H.F.

3. Two d.c. supplies and one a.c. supply are required for the operation of the H.F. system, the supplies being fed into the H.F. distribution box. The d.c. supplies are routed from busbar PP7 via fuses 169 and 219 in the E.C.P., whilst the a.c. supply from busbar 1XC2 is routed via fuse 227 in the radio fuse and relay box. The supplies are controlled by system switches.

U.H.F.

4. The d.c. supply required to operate the No.1 U.H.F. installation is taken from busbar PP7 and routed via fuse 218 in the E.C.P. to the No.1 U.H.F. interconnecting box, where it is controlled by the No.1 U.H.F. control unit function switch on the starboard instrument panel. The supply to operate the No.2 U.H.F. installation is taken from busbar P10 and routed via fuse 13 on the M.E.P and fuse 251 in the upper equipment compartment to the No.2 U.H.F. interconnecting box where it is controlled by the No.2 U.H.F. control unit on the rear face of the radio fuse and relay panel. A separate d.c. supply to energise the aerial change-over relay is taken from busbar PP7 via fuse 168 in the E.C.P. and the U.H.F. AERIALS change-over switch on the starboard instrument panel.

V.H.F.

5. The d.c. supplies required for operation of the V.H.F. system are taken from busbar PP8 and routed via fuses 172 and 173 in the E.C.P. Fuse 172 supplies the V.H.F. interconnecting box through contacts 5-5a of relay No.3 in the E.C.P. Fuse 173 is connected to interconnecting box via the energizing coil and contacts 1-1a and 3-3a of relay No.3. The relay is controlled by the power control ON switch on the V.H.F. control unit on the pilot's coaming panel.

V.O.R./I.L.S.

6. The V.O.R./I.L.S. installation requires 28 volt d.c. and 26 volt a.c. for operation. The d.c. supply is taken from busbar PP7 to (a) the V.O.R./I.L.S. interconnecting box via fuse 167 in the E.C.P., the energizing coil and contacts 1-1a, 3-3a and 5-5a of relay No.4 in the E.C.P., and (b) the V.O.R./I.L.S. marker interconnecting box via fuse 167 and the MARKER switch, situated on the pilot's coaming panel. 26 volt a.c. is fed from busbar TR61 to the V.O.R./I.L.S. interconnecting box via fuse 225 in the radio fuse and relay box and contacts 7-7a of relay No.4. Relay No.4 is controlled by the OFF/VOL switch on the Type 7430M controller, mounted on the pilot's coaming panel.

Radio altimeter

7. The radio altimeter installation is connected to a 200 volt single-phase a.c. supply via fuse 295 in No.1 distribution box and a 28 volt d.c. supply via fuse 250 also in No.1 distribution box. Both the a.c. supply, which is derived from busbar 1XB, and the d.c. supply, which is derived from busbar PP4, are connected directly to the transmitter/receiver and to JB16507. The power supplies are controlled by the LIMIT SELR. switch in the control unit mounted on the pilot's coaming panel.

Radio compass

8. A 28 volt d.c. supply from busbar PP8 is taken via fuse 175 in the E.C.P. to the radio compass control unit on the navigator's port wall panel, where integral switching controls the power distribution. A 26 volt a.c. supply from busbar TR61 is used by the RMI's and the master indicator for synchronization purposes.

Davall recorder

9. A 28 volt d.c. supply is required to operate the recorder and interface unit. The supply is taken from busbar PP7 via fuse 171.

I.F.F.

10. The I.F.F. equipment is supplied from the normal 28 volt d.c. system and from the output of No.1 alternator. When the function switch (navigator's panel) is moved from the OFF position, it completes the circuit which energizes a relay in the distribution panel. With the relay energized an a.c. supply from No.1 alternator is routed to the trans/rec unit and a d.c. supply is connected to the aerial switch unit. D.C. supplies are also fed direct to the transponder and via a LAMP CHECK switch, which enables the operator to carry out a confidence check on the fault light (navigator's panel) and OK light (controller) filaments. Also mounted on the navigator's panel is the aerial changeover switch (AERIAL C/O), this is marked UPPER, LOWER and FLIGHT: in the FLIGHT position the aerial switch unit is caused to oscillate at a rate of 40 Hz so that it alternately connects the upper and lower aerials to the transponder. In the other two positions the aerial switch unit is made to connect the transponder to the appropriate aerial.

Automatic height encoding

11. Power supplies to the automatic height encoding equipment are fully described in Chapter 4.

Tacan

12. Single-phase a.c. and d.c. supplies are required to operate the Tacan system. The a.c. supply is derived from busbar 1XA1 and fed to both the transmitter/receiver and the coupling unit via fuse 108 and contacts 3-3a of relay No.6 in the 400 Hz distribution box. The d.c. supply from busbar PP7 to the transmitter/receiver is taken via fuse 165 in the E.C.P.

Green satin

13. A three-phase, 115 volt a.c. supply is required to operate the Green satin equipment. The supply, taken from busbars 1XA, 1XB and 1XC is routed via fuses 264, 289 and 314 in No.1 distribution box, contacts 1-1a, 3-3a and 5-5a of relay No.1 on the distribution panel and a 200V/115V, 1kVA step-down transformer. The relay is energized by a supply from busbar PP7, through fuse 166 in the E.C.P., and controlled by the GREEN SATIN POWER switch fitted on the aft face of the radio fuse and relay box.

Special equipment

14. The special equipment, housed in the pack bay, is supplied from the aircraft's a.c. and d.c. power supplies via No.1 distribution box. The a.c. supplies are fed direct to the equipment, the d.c. supplies being controlled by switches on the A.E.O.'s panel. The a.c. and the d.c. supplies are also fed to the system coolers whenever the aircraft is operating in these roles. Selection of the system required is by six toggle type switches, grouped in banks of three on the A.E.O.'s panel and annotated AERIAL, D.C. and EQUIPMENT respectively. Each set of switches control the d.c. supplies to their associated system i.e. FORWARD or AFT, allowing the operator to select for use the desired system (A.R.I.23165 or A.R.I.18207) whilst retaining the alternative system in a stand-by 'warmed up' condition available for immediate use if necessary.

15. When the forward selection is switched to A.R.I.23165, the test switch, located on frame B, can be operated to energize two waveguide switches thereby diverting energy from the forward horn aerials to a test point also on frame B. The two test points, one at frame B the other at frame 48, provide a facility for functional testing of the special equipment systems. For further information regarding this special equipment, refer to Sect.9, Chap.4 of this publication.

16. The A.R.I.23287 radar installation is supplied with 28 volts d.c. from fuse 170 in the E.C.P. and 115 volts, single-phase a.c. from fuse 135 in the radio fuse and relay box.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

General

17. Faults in the power supplies should be investigated with the aid of the relevant combined routeing and theoretical diagrams in A.P.101B-0417-10, (Servicing Diagrams Manual) and the Air Publications covering any suspected equipment.

◀ **Davall recorder**

9. A 28 volt d.c. supply is required to operate the recorder and interface unit. The supply is taken from busbar PP7 via fuse 171.

I.F.F.

10. The I.F.F. equipment is supplied from the normal 28 volt d.c. system and from the output of No.1 alternator. When the function switch (navigator's panel) is moved from the OFF position, it completes the circuit which energizes a relay in the distribution panel. With the relay energized an a.c. supply from No.1 alternator is routed to the trans/rec unit and a d.c. supply is connected to the aerial switch unit. D.C. supplies are also fed direct to the transponder and via a LAMP CHECK switch, which enables the operator to carry out a confidence check on the fault light (navigator's panel) and OK light (controller) filaments. Also mounted on the navigator's panel is the aerial changeover switch (AERIAL C/O), this is marked UPPER, LOWER and FLIGHT: in the FLIGHT position the aerial switch unit is caused to oscillate at a rate of 40 Hz so that it alternately connects the upper and lower aerials to the transponder. In the other two positions the aerial switch unit is made to connect the transponder to the appropriate aerial.

Automatic height encoding

11. Power supplies to the automatic height encoding equipment are fully described in Chapter 4.

Tacan

12. Single-phase a.c. and d.c. supplies are required to operate the Tacan system. The a.c. supply is derived from busbar 1XA1 and fed to both the transmitter/receiver and the coupling unit via fuse 108 and contacts 3-3a of relay No.6 in the 400 Hz distribution box. The d.c. supply from busbar PP7 to the transmitter/receiver is taken via fuse 165 in the E.C.P.

Green satin

13. A three-phase, 115 volt a.c. supply is required to operate the Green satin equipment. The supply, taken from busbars 1XA, 1XB and 1XC is routed via fuses 264, 289 and 314 in No.1 distribution box, contacts 1-1a, 3-3a and 5-5a of relay No.1 on the distribution panel and a 200V/115V, 1kVA step-down transformer. The relay is energized by a supply from busbar PP7, through fuse 166 in the E.C.P., and controlled by the GREEN SATIN POWER switch fitted on the aft face of the radio fuse and relay box.

Special equipment

14. The special equipment, housed in the pack bay, is supplied from the aircraft's a.c. and d.c. power supplies via No.1 distribution box. The a.c. supplies are fed direct to the equipment, the d.c. supplies being controlled by switches on the A.E.O.'s panel. The a.c. and the d.c. supplies are also fed to the system coolers whenever the aircraft is operating in these roles. Selection of the system required is by six toggle type switches, grouped in banks of three on the A.E.O.'s panel and annotated AERIAL, D.C. and EQUIPMENT respectively. Each set of switches control the d.c. supplies to their associated system i.e. FORWARD or AFT, allowing the operator to select for use the desired system (A.R.I.23165 or A.R.I.18207) whilst retaining the alternative system in a stand-by 'warmed up' condition available for immediate use if necessary.

15. When the forward selection is switched to A.R.I.23165, the test switch, located on frame B, can be operated to energize two waveguide switches thereby diverting energy from the forward horn aerials to a test point also on frame B. The two test points, one at frame B the other at frame 48, provide a facility for functional testing of the special equipment systems. For further information regarding this special equipment, refer to Sect.9, Chap.4 of this publication.

16. The A.R.I.23287 radar installation is supplied with 28 volts d.c. from fuse 170 in the E.C.P. and 115 volts, single-phase a.c. from fuse 135 in the radio fuse and relay box.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

General

17. Faults in the power supplies should be investigated with the aid of the relevant routeing and theoretical diagrams in this publication and the Air Publications covering any suspected equipment. ▶

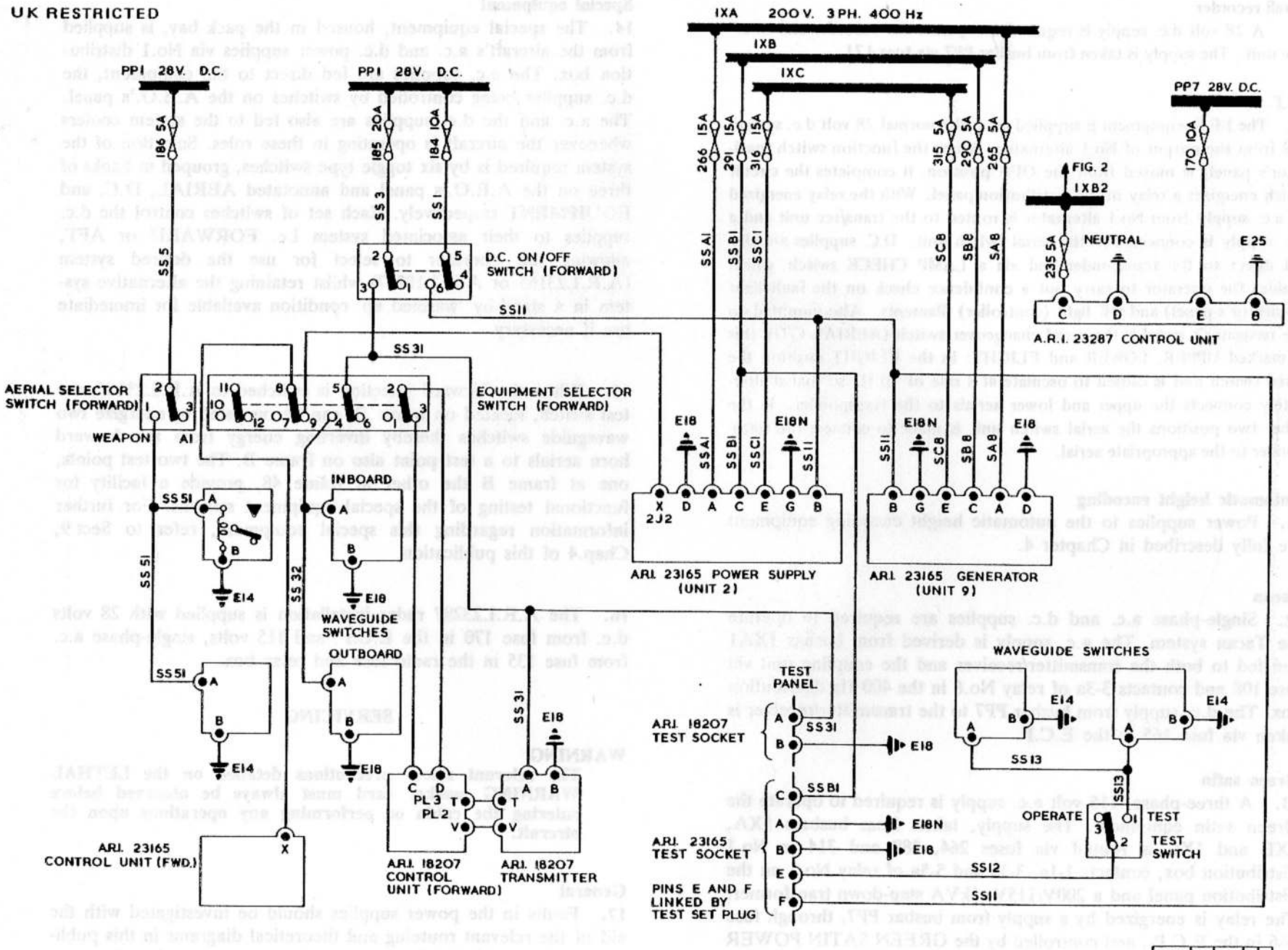

FIG. 3. SPECIAL EQUIPMENT SUPPLIES - FORWARD LOOKING SYSTEM AND A.R.I. 23287

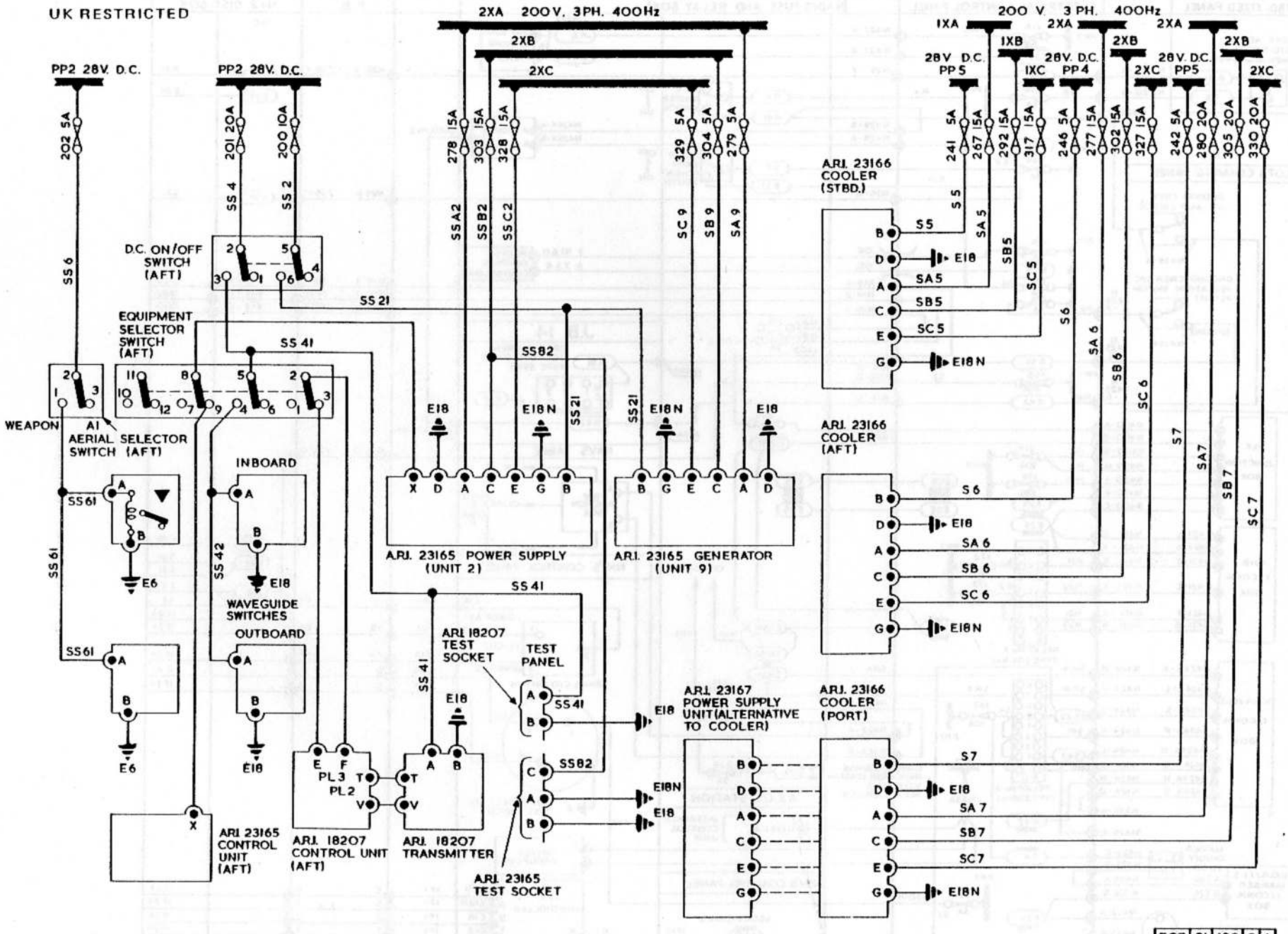

FIG. 4. SPECIAL EQUIPMENT SUPPLIES — AFT LOOKING SYSTEM AND COOLERS

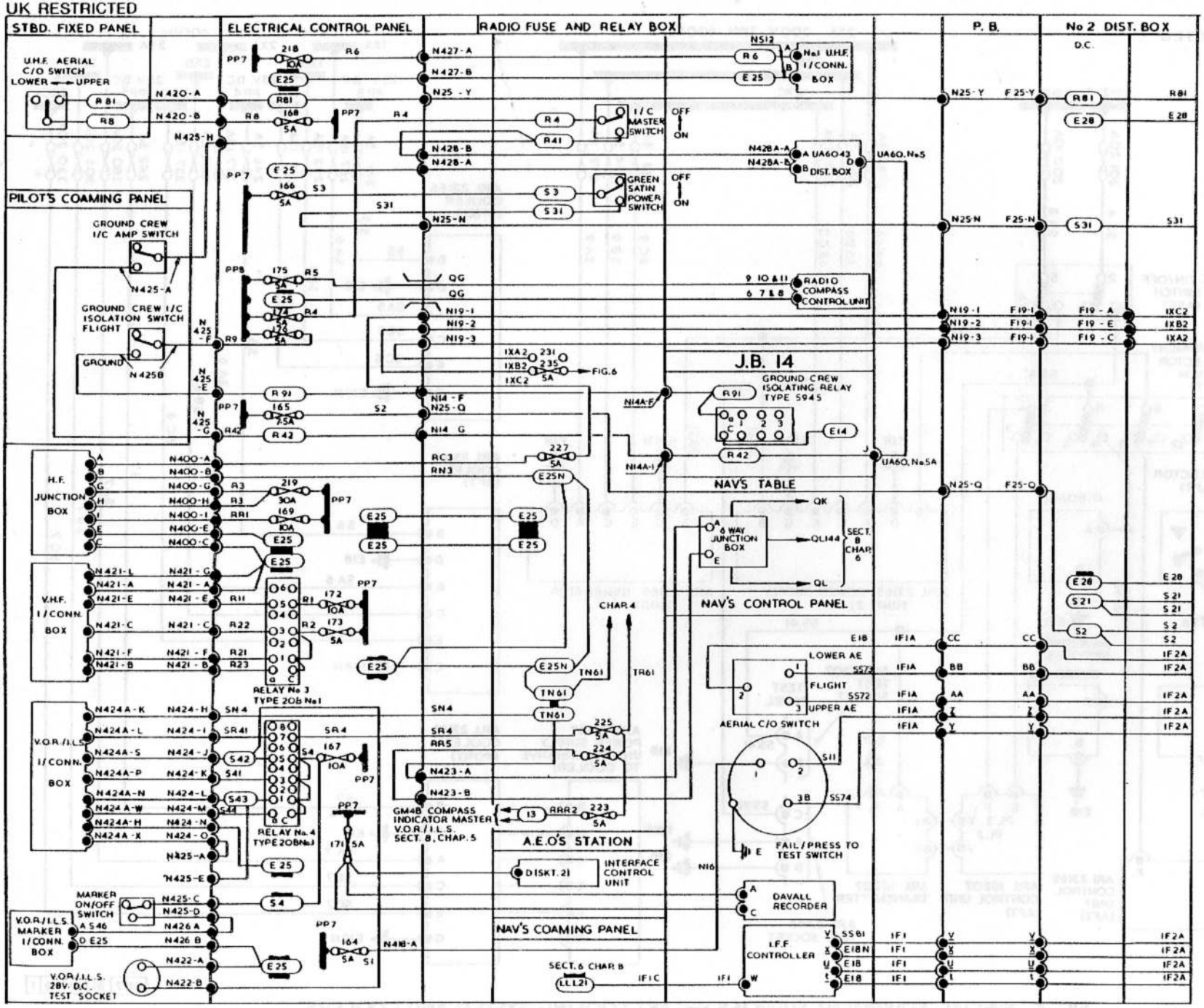

FIG. 5. RADIO AND RADAR SUPPLIES

◂MOD 5506 EMBODIED▸

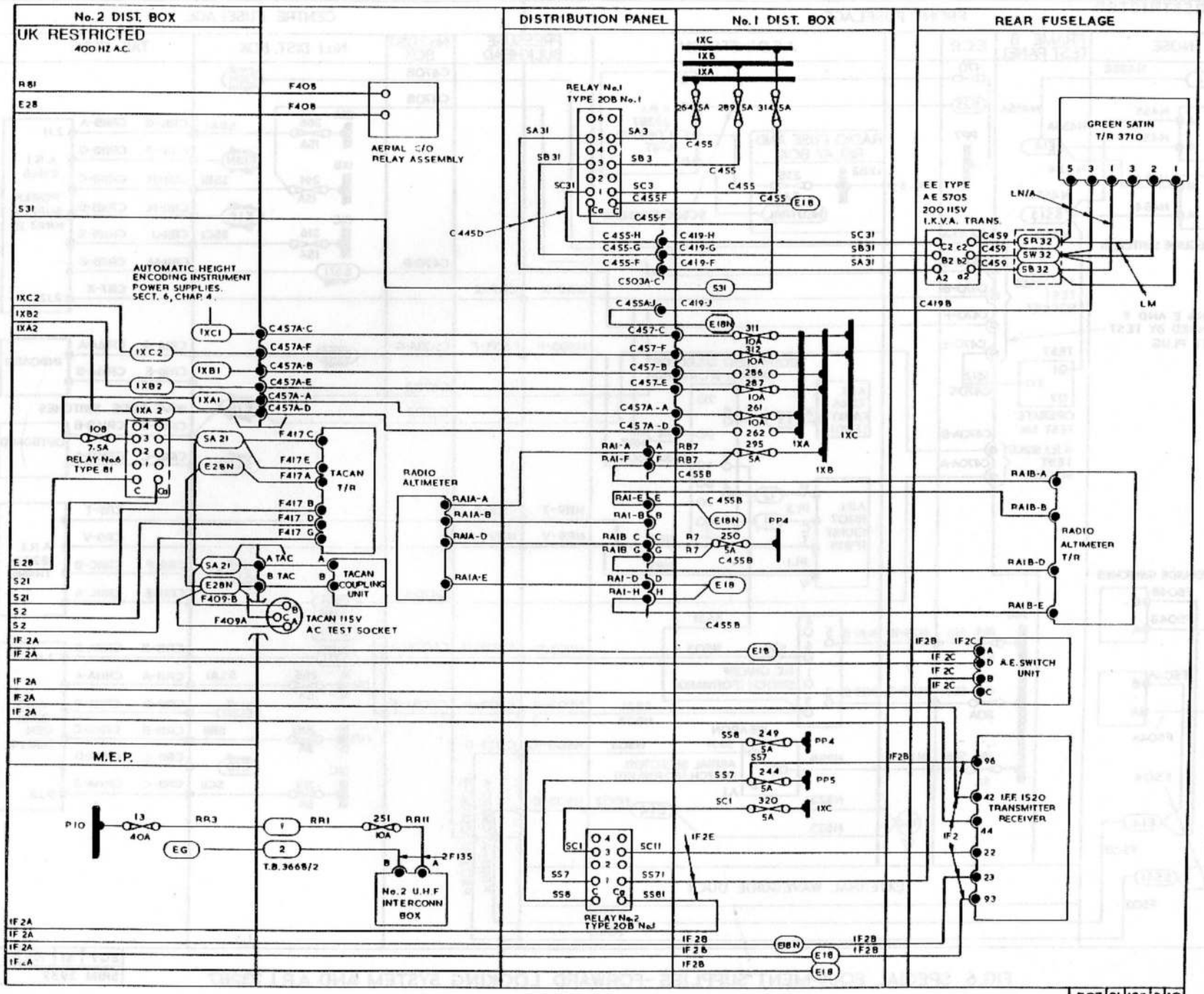

FIG. 5A. RADIO AND RADAR SUPPLIES

EG7 81 183 3 10
EG7 81 183 4 1
EG7 81 4053 2 1
SRIM 3932

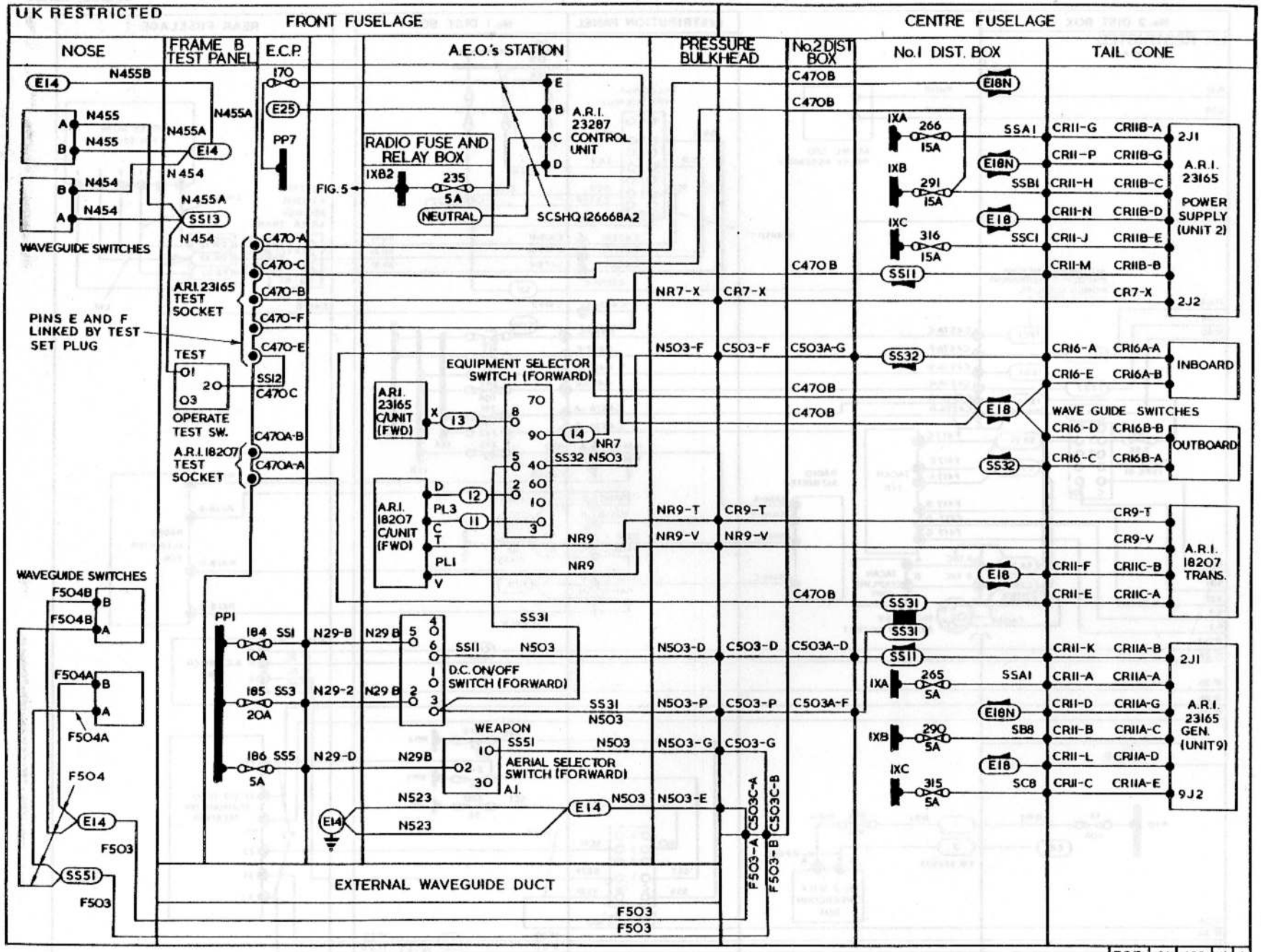

FIG. 6. SPECIAL EQUIPMENT SUPPLIES – FORWARD LOOKING SYSTEM AND A.R.I. 23287

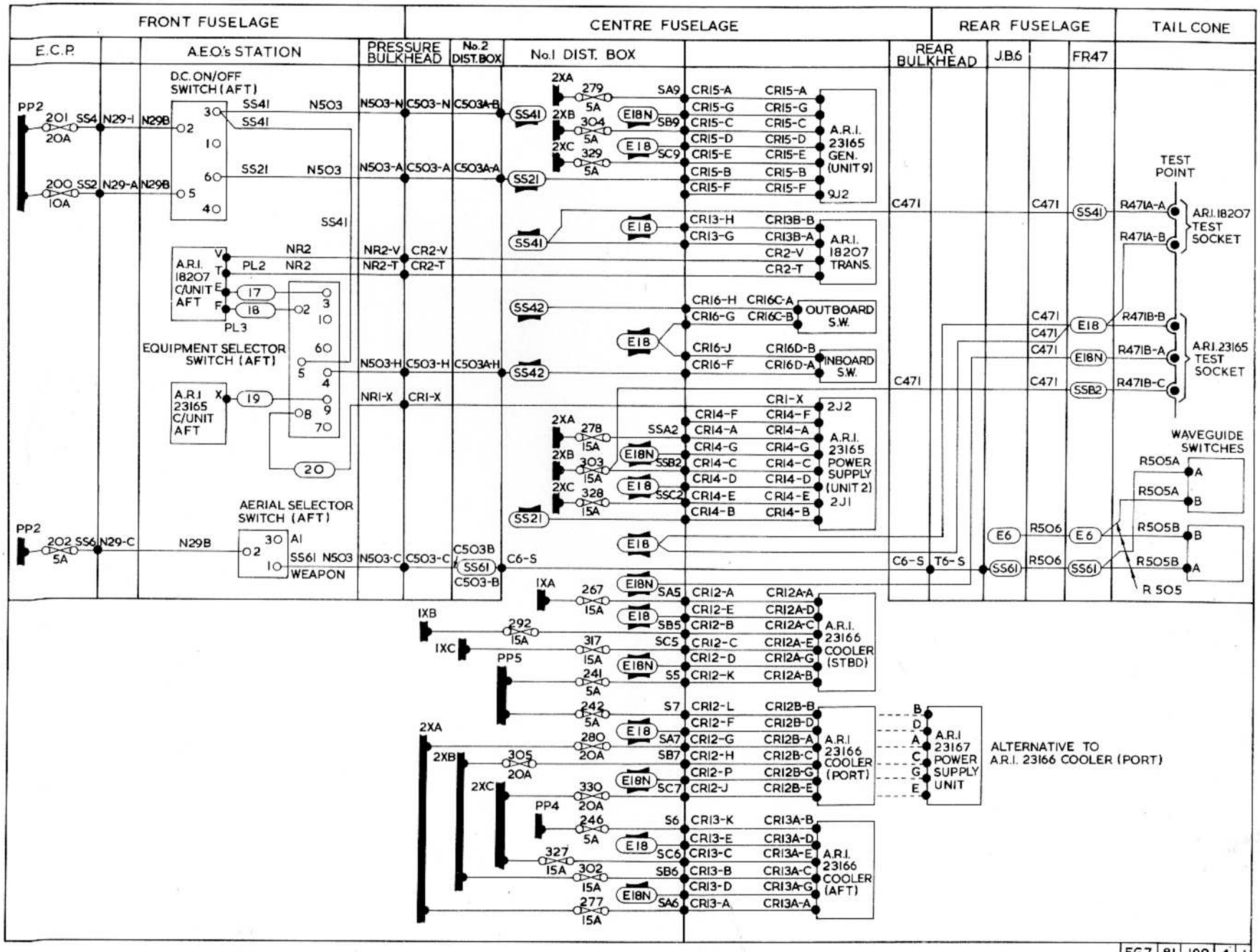

FIG.7. SPECIAL EQUIPMENT SUPPLIES-AFT LOOKING SYSTEM AND COOLERS

Chapter 12 WARNING AND EMERGENCY SERVICES

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LIST OF ILLUSTRATIONS

◀**Note**... *Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*▶

DESCRIPTION

FIRE EXTINGUISHER SYSTEM

General

1. A fire extinguisher system protects the engines, the fuselage fuel tanks, and the equipment in the pack bay. Two Type 14A or 138A extinguishers are installed, one in each main undercarriage bay. These extinguishers are fitted with dual operating heads but only the heads connected to the engine-spray rings are operative. A Type 12A or 89A extinguisher, mounted on the aft face of frame 27A in the rear fuselage, and two Type 60A extinguishers, one mounted forward of frame 13, and the other mounted aft of frame 20 protect the fuel tank and the equipment in the pack bay. The extinguishers operate in conjunction with a warning system consisting of warning lamps on the miscellaneous instrument panel, a second fuselage warning lamp on the A.E.O. starboard control panel, and fire detectors installed in the respective bays. An inertia switch circuit discharges all extinguishers automatically in a crash landing.

Fuselage fire protection

2. Resetting-type Firewire sensing elements, and a Type 365D control unit *(A.P.107E-0103-1)* are used for fuselage fire protection. The sensing elements consist of a stainless steel capillary tube with a nickel-chromium steel centre electrode insulated by a filling material in which are suspended aluminium oxide particles. The composition of the insulating material causes the element to have a negative temperature coefficient, i.e. the electrical resistance falls with increased temperature. The control unit is connected electrically to the element and when warning conditions occur the impedance of the element falls to a pre-determined value which allows it to hold an electrostatic charge. Every half cycle of the control unit operation the element discharges into a read-out circuit to initiate a warning. When the temperature falls, the impedance of the element increases and the electrostatic charge decreases, the read-out circuit is no longer actuated and the warning light is extinguished.

Engine fire protection

3. Fifteen Series 5 resetting-type detectors *(A.P.107E-0105-1)* are used for engine fire protection, seven being installed in the No.1 engine bay and eight in the No.2 engine bay, the detectors in each group being connected in parallel. The detector comprises a base housing a terminal block, and an alloy steel barrel containing a spring bow assembly which operates a pair of switch contacts connected in the warning lamp circuits of the appropriate engine. When subjected to a temperature of 300 deg C or above, the barrel expands and causes the switch contacts to close and bring on the warning light. When the temperature falls and the barrel contracts, the switch contacts automatically reopen and extinguish the warning light.

Inertia switches

4. Two piston-type inertia switches *(A.P.113D-1206-1)*, are mounted one below the fire detector control unit in the port equipment bay, and the other below No.1 inverter in the starboard equipment bay.

Operation

Engine fires

5. A fire in the No.1 engine bay which results in the operation of one or more of the resetting detectors, completes circuit X3 (fuse 44) and X31, causing the No.1 ENG. (port) fire warning lamp to light. Similarly, the operation of any of the No.2 engine bay detectors will bring on the No.2 ENG. (starboard) warning light. Pressing the push switch integral with the warning light will discharge one operating head of the appropriate extinguisher into the affected engine bay.

Fuselage fires

6. A fire in the pack bay will result in the sensing element impedance being reduced. The circuits within the control unit react to the change of impedance and relay A becomes energized, completing circuit X8 and X82 to the pack bay fire warning lamp. Pressing the push-switch integral with the warning lamp will discharge the three extinguishers into a common piping system which in turn discharges into the pack and fuel bays. An indicator fuse, which becomes dyed red if the extinguishers have been fired is mounted between frames 18 and 19 on the starboard fuselage skin above the pack bay access panels.

Inertia switch operation

7. The operation of both piston type

inertia switches completes the circuit X1-X16 to energize No.1 and No.3 relays in the distribution box. Relay No.1 closes and completes the circuits between X1 and X21, X13 and X14, resulting in the fuselage extinguishers discharging into the fuel tank and pack bays, and the engine extinguishers discharging into the engine bays. Energizing No.1 relay also breaks circuit P91-P92, and opens the Type R battery isolation relay *(Chap.9)*, which isolates the d.c. power supplies from all the electrical circuits except those for the fire extinguishers, canopy and hatch jettison. Simultaneously, the a.c. power supplies are isolated by No.3 relay, which when energized, completes the circuits between X17, and V20 and V50 resulting in the completion of an earth link to the over-voltage circuit in the control and protection units of both No.1 and No.2 alternator control circuits *(Chap.13)*. The control and protection unit circuitry becomes unstabilized and the units react accordingly, tripping the supplies from the respective alternators.

DETONATOR CIRCUITS

General

8. A complete system is installed in the aircraft for the emergency jettison of the pilot's canopy, the rear crew member's roof hatch and also the two wing tip pods or tanks if these are fitted. The system operates by exploding electrically fired detonators which are housed in the attachment bolts of the jettisonable components. The canopy is secured by 32 explosive bolts and the rear crew member's roof hatch by 34 similar bolts. When installed at the wing tips, each jettisonable pod or tank is attached by three bolts containing an explosive detonator. Provision is also made, by means of an explosive charge, to cut the elevator control tube at a point near the aft end of the console.

9. Canopy jettison is controlled from the take-off panel by the CANOPY/SNATCH MASTER and CANOPY JETTISON switches. The elevator control tube detonator is also controlled by the CANOPY/SNATCH MASTER switch together with a 2-pole microswitch on the snatch unit which is gas-operated upon the operation of the ejection seat-pan or face-screen firing handle. Hatch jettison is controlled by either the navigator's HATCH JETTISON and SAFETY switches at the port side of the navigator's seat or the A.E.O. HATCH JETTISON switch at the starboard side of the A.E.O. seat. Two microswitches accommodated in hatch-jettisoning mechanisms, situated on the rear of the pressure bulkhead behind each seat, provide for automatic hatch jettisoning when either ejection seat firing cable is operated *(A.P.101B-0417-1B, Sect.3, Chap.11)*. The SAFETY switch must be in the ON position before either JETTISON SWITCH or the hatch mechanism microswitches become operative. Two press-to-test switches with integral indicator lamps on the pilot's port console, when operated, indicate the existence of a D.C. supply at the output side of the canopy and hatch jettison relays.

Resistors

10. Each detonator is fed through a 15-ohm resistor, those used in the canopy and hatch circuits being housed in boxes holding a maximum of eight. Four boxes are used in the canopy circuits positioned two at each side of the cockpit below the coaming tube. The hatch resistors are carried in five boxes, three of which are situated in the aft end of the cabin and the others in the upper equipment compartment aft of the pressure bulkhead. A resistor for the elevator control tube detonator is situated inside the console. Three resistors are permanently fitted in each wing tip ready for use with wing tip pods or tanks when these are to be installed.

Power supplies

11. The normal power supplies to operate the canopy and hatch detonator circuits are taken from busbar P10, two series-connected 12 volt emergency batteries are provided as an alternative supply. The batteries, together with a jettison relay panel on which are mounted two Type S8 relays, are located inside the console behind the pilot's map stowage. One relay is wired in the canopy and elevator control tube detonator circuit, and the other in the hatch circuit. During normal operation both relays are energized from busbar P10 and the supplies to detonator circuits X5 and X6 are taken from P10 via the then-closed contacts of the relays. If either or both relays should become de-energized and open, the power supply to the affected circuit(s) is automatically changed to the emergency battery busbar X7.

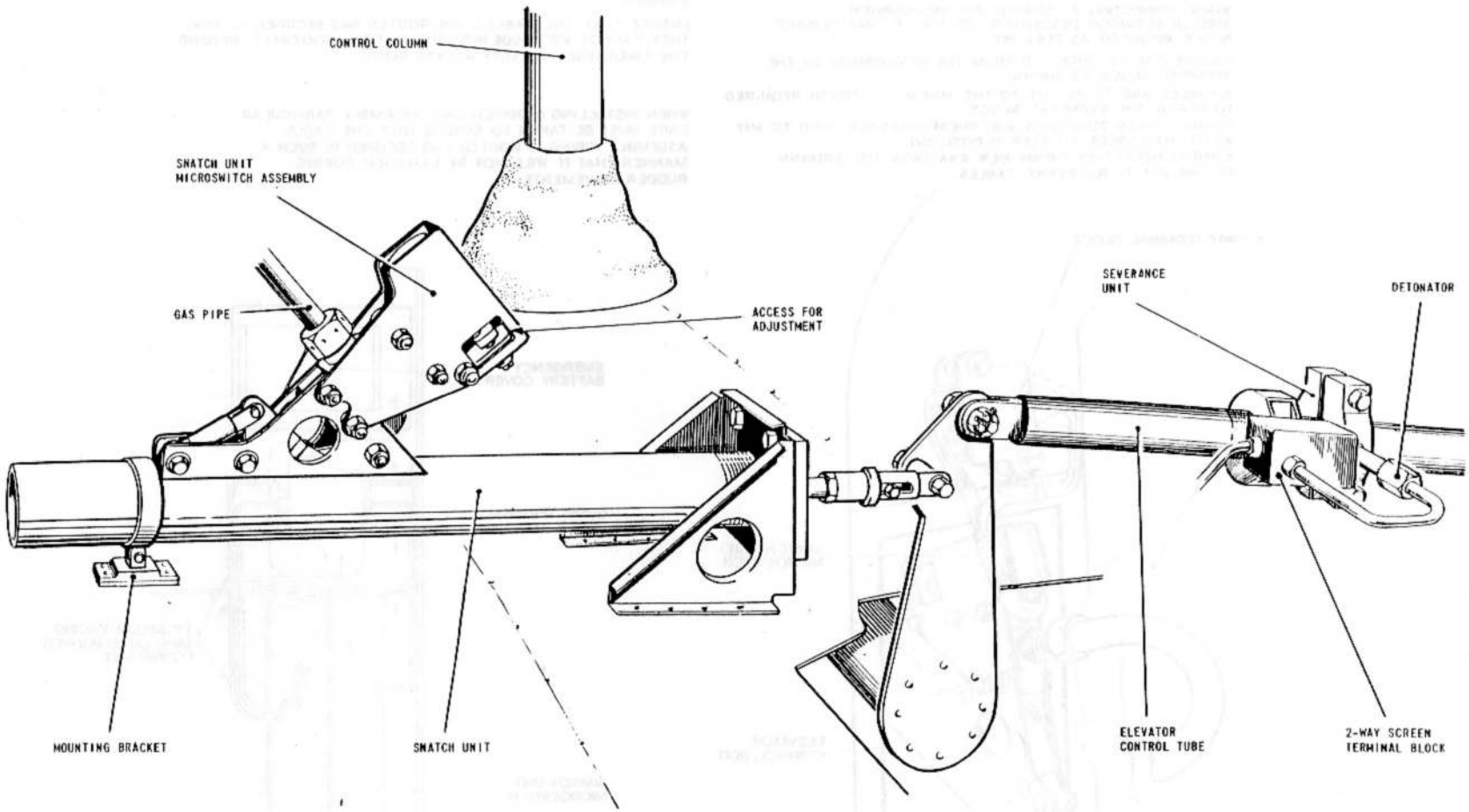


FIG. 1. SNATCH UNIT ASSEMBLY

◀ FIG RENUMBERED ▶

UK RESTRICTED

ASSEMBLY NOTES

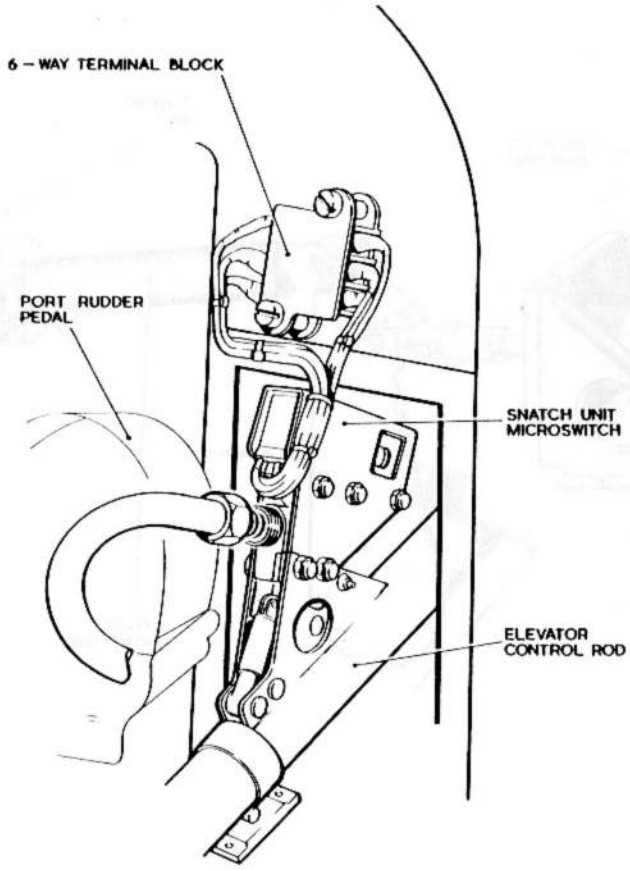
WHEN CONNECTING A SNATCH UNIT MICROSWITCH AND/OR ELEVATOR DETONATOR TO THE 6-WAY TERMINAL BLOCK PROCEED AS FOLLOWS:-

1. ROUTE CABLES OUTBOARD FROM THE MICROSWITCH TO THE TERMINAL BLOCK AS SHOWN.
2. CABLES ARE TO BE CUT TO THE MINIMUM LENGTH REQUIRED TO REACH THE TERMINAL BLOCK.
3. BIND CABLES TOGETHER AND WHERE POSSIBLE BIND TO ANY ADJACENT CABLES TO KEEP IN POSITION.
4. WHERE NECESSARY CRIMP NEW 4BA TAGS, HELLERMANN REF. HE.294 TO RELEVANT CABLES.

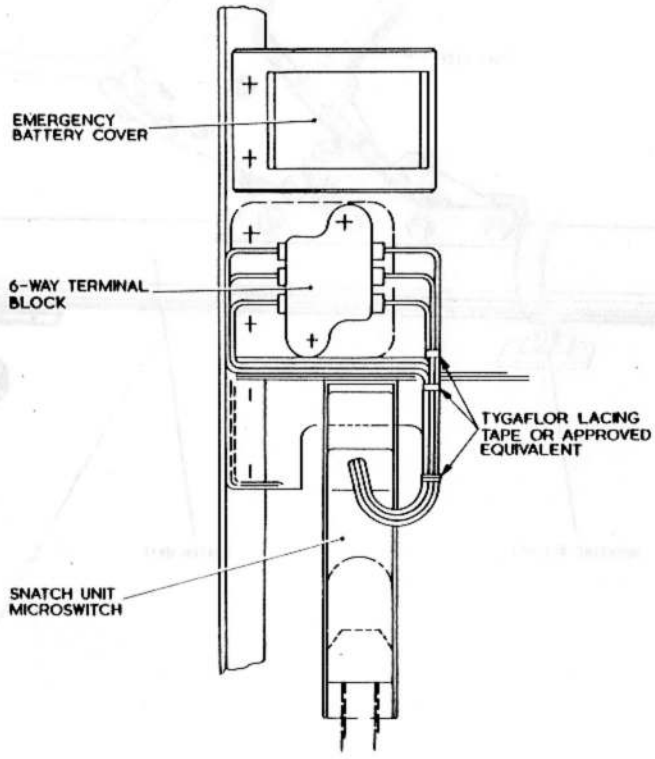
WARNING

ENSURE THAT THE CABLES ARE ROUTED AND SECURED SO THAT THEY CANNOT PROTRUDE INTO THE PILOT'S FOOTWELL BEYOND THE EMERGENCY BATTERY ACCESS PANEL.

WHEN INSTALLING A SNATCH UNIT ASSEMBLY PARTICULAR CARE MUST BE TAKEN TO ENSURE THAT THE CABLE ASSEMBLY WIRING IS ROUTED AND SECURED IN SUCH A MANNER THAT IT WILL NOT BE DAMAGED DURING RUDDER MOVEMENTS



ELEVATOR SNATCH UNIT MICROSWITCH WIRING
VIEW LOOKING AFT PORT SIDE



ROUTEING OF CABLES

FIG. 2. SNATCH UNIT - CABLE ROUTEING

◀ FIG RENUMBERED ▶

Canopy jettison and elevator snatch unit operation

12. The CANOPY/SNATCH MASTER switch, on the take-off panel, controls both the normal and emergency power supplies to the canopy jettison and elevator snatch unit circuits. With the CANOPY/SNATCH MASTER switch ON, the closing of the CANOPY JETTISON switch completes the circuit X52 and X54 to fire the canopy detonators. The operation of either the ejection seat face screen, or seat pan firing handle, operates a cartridge to initiate a gas pressure which closes the snatch unit switch to complete the circuits X53 and X55 to fire the elevator control tube detonator. In addition to closing the switch the snatch unit is operated *(Sect.3, Chap. 11)*, which results in the control column being jerked forward against the instrument panel to give the pilot ejection clearance.

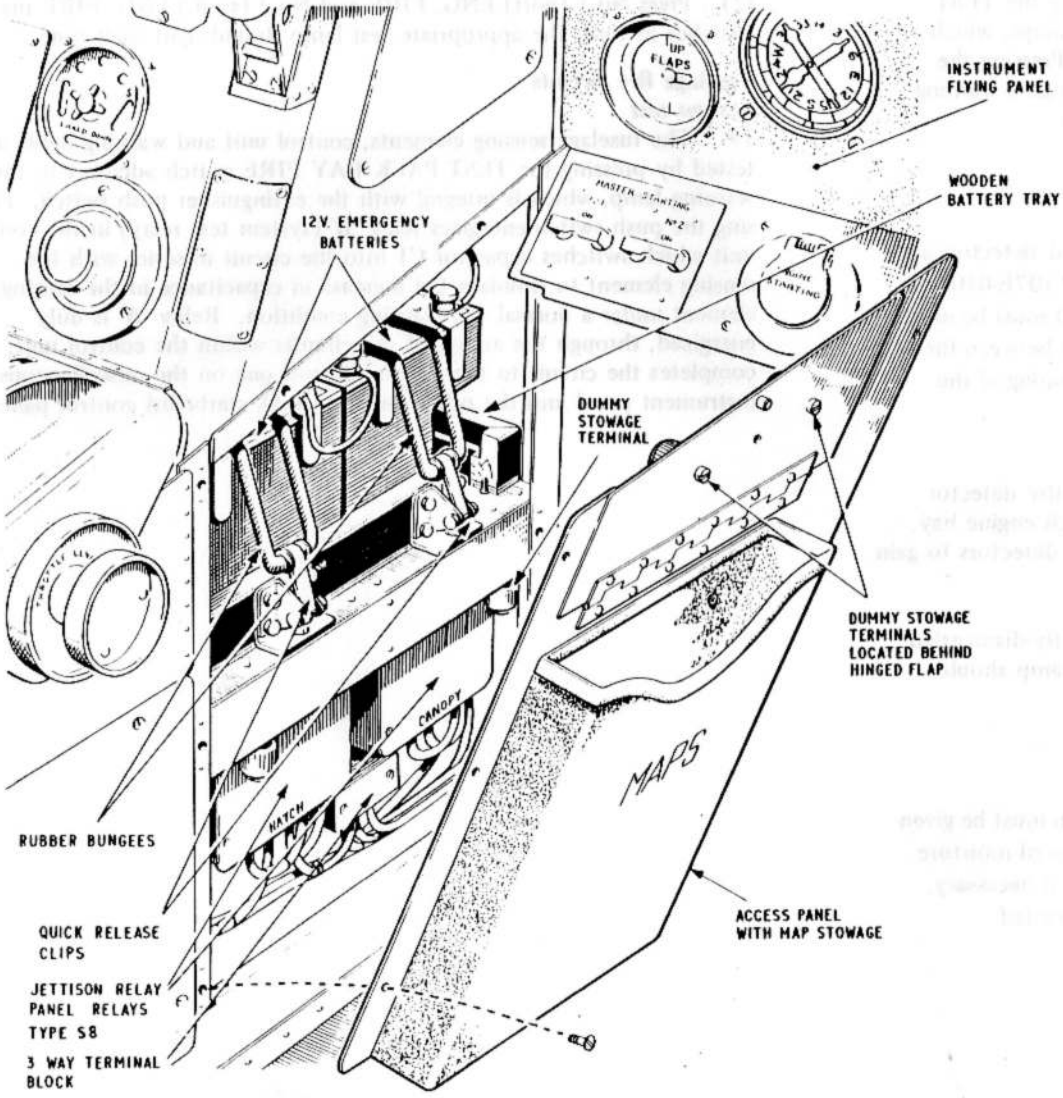


Fig.3. Jettison relay panel and emergency batteries

◀FIG RENUMBERED▶

Hatch jettison operation

13. Provided that the navigator's SAFETY switch is ON, selection of either JETTISON switch, or the operation of either ejection seat face-screen or seat-pan firing handle, completes the circuit X61 through X62 to X63 to fire the hatch detonators.

Wing tip pod/tank jettison operation

14. Pods or tanks carried at the wing tips, can be jettisoned when necessary by operating the shielded WING TIP JETTISON switch, fitted on the console top panel, which completes the power supply from busbar PP2 to the three detonators serving each tank. The pods and tanks are not normally expendable and are only jettisoned in emergency.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

FIRE EXTINGUISHERS

Preparation for circuit tests

15. Before making functional tests on

the fire extinguisher circuits, all extinguishers must be disconnected. Ensure that fuse 2 is fitted at the M.E.P. and fuses 43, 44, 76, 77, 188 and 189 are fitted in the E.C.P.

Engine fire circuits

Warning lights

16. The engine fire warning lights are tested by pressing the TEST ENG. FIRE WARNING switch adjacent to the warning lamps, which are integral with the respective extinguisher push switches. Pressing the switch completes the circuits X3 and X31 to the No.1 engine warning lamp, and X4 and X41 to the No.2 engine warning lamp.

Fire detectors

17. Prior to installation of the detectors, or if the installed detectors are suspect, they must be bay serviced in accordance with A.P.107E-0105-1, Chap.2/1. The following procedure can be followed, but it must be understood that this only checks the continuity of the cable run between the first and last switch in each circuit and does not test the functioning of the detector units.

(1) Remove the two attachment bolts of the lower centre detector fitted to each engine firewall and the top detector at each engine bay outboard rib. Remove the cover from the base of these detectors to gain access to their terminals.

(2) Connect together, in turn, the terminals of the partly-dismantled detectors in each engine bay. The appropriate warning lamp should light each time.

(3) Replace all covers and refit detectors.

(4) To prevent spurious fire warnings, particular attention must be given to the connector assemblies at J.B.11 and J.B.12 for ingress of moisture. All connectors must be checked for adequate sealing and if necessary, disconnected, stripped, cleaned, dried, resealed and reconnected.

Extinguishers

18. The following procedure checks the extinguisher circuits:-

(1) Connect a test lamp to pins A and B of the 2-pin Plessey socket on cables 7F and 8F in the port and starboard undercarriage bays respectively. (These cables connect the extinguisher operating head to the engine bays.)

(2) Press No.1 (port) ENG. FIRE and No.2 (stbd.) ENG. FIRE push switches in turn; the appropriate test lamp should light each time.

Fuselage fire circuits

System test

19. The fuselage sensing elements, control unit and warning lights are tested by pressing the TEST PACK BAY FIRE switch adjacent to the warning lamp, which is integral with the extinguisher push switch. Pressing the push switch energizes relay 'B' (system test relay) in the control unit which switches capacitor C1 into the circuit in series with the sensing element to simulate the increase in capacitance in the sensing element under a normal fire warning condition. Relay 'A' is duly energized, through the action of the circuits within the control unit, and completes the circuit to the warning lamps, one on the miscellaneous instrument panel and the other on the A.E.O. starboard control panel.

▶◀

Extinguishers

20. The following procedure checks the extinguishers and indicator fuse circuits:-

(1) Remove the indicator fuse.

(2) Connect a test lamp to the terminals on the indicator fuse housing and to pins A and B of the 2-pin Plessey socket on cables C476A, C476B, and 3B in the pack bay and tank bay respectively.

(3) Press the PACK BAY FIRE extinguisher push switch, the test lamps should light.

Firewire sensing elements

General

21.

(1) Whenever couplings or connections are broken it is essential that protective caps are fitted immediately to prevent ingress of moisture (5CZ/1039472 for element end fittings, and 5CZ/1039471 for bulkhead fittings and coupling units).

Note...

Grease is not to be used on gland nuts.

(2) Whenever a firewire is disconnected or replaced, a new copper 'S' washer (5CZ/5553) must be fitted.

(3) The only approved torque wrench is a Richmont LTC-0 (1C/0229786). This torque wrench requires the use of the following special adapters. Once the wrench has been set to a required torque value, it will remain correct for any of the adapters which can be fitted. The following adapters, including one with a square drive to fill a torque setting rig, will meet all firewire requirements.

1C/7910027 5/8 in. AF (7/16 in. unified)
1C/1358403 3/8 in. BSF (15 mm)
1C/1358404 17 mm
1C/1301286 Square drive

For more detailed information on the use and precautions to be observed when setting-up and ▶ using a torque wrench refer to A.P.119G-0128-1. ◀ For detailed information of firewire systems refer to A.P.107E-0102-1.

(4) The firewire gland nuts must be tightened to ▶ 10.17 NM ± 1.13 NM (90 lbf in. ± 10 lbf in.) ◀

Cleaning

22. To prevent a spurious fire warning, it is essential that connector and element end fittings are kept moisture free at all times. Care must be taken to ensure that the working area is kept clean and dry, when systems are being serviced or rectified. Should element end fittings or connections require cleaning, the following procedure must be carried out:-

(1) If the contaminating particles appear to be loose and show no sign of oily deposits, they are to be removed with a dry soft haired brush.

Note...

Ensure no brush hairs remain in the fittings/connectors.

(2) If only oily deposits are present, brush out the affected end fittings or connectors with ARDROX 551 (4X/2241603). No other cleaning solvent is permissible. Allow to dry for a minimum of ten minutes. If dry bottled air or nitrogen is available it should be used for a minimum period of 30 seconds.

(3) Any items showing signs of corrosion must be replaced.

Note...
Throughout the cleaning operations, it is essential that both ends of the connector are removed and that the amount of cleaning solvent used is kept to a minimum to lessen the risk of trapped solvent forming a moisture hazard.

(4) After cleaning carry out an insulation resistance test.

Continuity resistance check
23. Check that the continuity resistance value of the element is between 2 and 3 ohms per foot.

Insulation resistance check
24. Carry out an insulation resistance check using a 250V insulation resistance tester.

Caution...
To prevent polarization of the firewire elements, the maximum application of the insulation resistance tester must not exceed 5 seconds.

The minimum acceptable values are:-
(1) Individual elements - 20 megohm
(2) Completely connected system - 1 megohm

Continuity Test
25. Continuity of the system is to be proved by the Press-to-test facility.

Inertia switch circuit
26. Check this circuit as follows:-

(1) Connect test lamps as in para.18(1) and 20(2).

(2) After removing the four screws which secure the covers on the two inertia switches, short together the terminals on each switch at the same time. This action energizes No.1 relay through circuit X1-X16. The closing of the relay will complete all crash circuits and all six test lamps should light. On the conclusion of the tests remove the test lamps and replace the inertia switch covers.

Extinguisher fuze test
WARNING
During this test the extinguisher must be securely held in a fixed bracket with its nozzle so directed that its accidental discharge could not result in personal injury or damage to equipment.

27. The resistance of the extinguisher head fuzes should be periodically checked using a Mk.5 or 6 safety ohm-meter in accordance with the instructions laid down in A.P.110N-0700 series.

DETONATOR CIRCUITS

WARNING
During servicing involving any interference with the detonator circuits, fuses 15 and 16 at the M.E.P. and fuse 69 in the E.C.P. must be removed and the service batteries, emergency batteries, and any external power supply, disconnected.

General
28. Electrical tests on the system consist of:-

(1) A circuit test to ensure that a 28/24 volt supply is available at all points. Before

◀ commencing this test all detonators are to be removed.

(2) A resistance test to ensure continuity of supply through the detonators leads and fuzes. Before commencing this test ensure that all electrical power supplies are disconnected. The approved test instruments are the safety ohmmeter, photo-electric Mk.5 Ref.No.5/G/1006388, or the safety ohmmeter Mk.6 Ref.No.5G/9018429 and these instruments only are to be used for this test.

Note...
Test (1) is necessary before initial installation and at all subsequent detonator changes.

Test (2) is necessary when detonators are first installed and at each replacement.

Preparation for circuit tests
29. Before any tests are made on the detonator circuits the system should be prepared as follows:-

(1) Ensure that all safety devices are fitted to the ejection seats and that the cocking levers are fitted to the hatch jettison mechanism boxes and that they are in the locked position (A.P. 101B-0417-1A, Sect.3, Chap.11, Fig.2).

(2) Disconnect and remove the thirty-two canopy detonators at the four resistor boxes in the cabin.

(3) Disconnect and remove the thirty-four hatch detonators at the three resistor boxes in the rear of the cabin and the two boxes in the upper equipment compartment.

(4) Disconnect and remove the single detonator at the terminal block fitted to the elevator control tube below the console (fig.3).

(5) If fitted, disconnect the three detonators in each wing tip; these are connected to Plessey 2 and 3-way terminal blocks which are accessible after removing small detachable panels on the top side of the wings.

30. When the above preparations are completed carry out the following:-

(1) Replace fuses 15 and 16 at the M.E.P; fuse 69 in the E.C.P.

(2) Connect a 28V d.c. ground supply to the aircraft.

(3) Reconnect the emergency battery.

(4) Switch on the CANOPY/SNATCH MASTER switch.

Checking the canopy and elevator control tube detonator circuits
31.

Note...
To ensure that there is no cross connection between the canopy and hatch jettison circuits, it is required that a test lamp be fitted across the input terminals of a hatch jettison resistor box. It is important to ensure that this lamp does not light at any time during the following test procedure.

(1) Switch the CANOPY JETTISON switch to its ON position.

(2) The output currents at each pair of ▶

◀ detonator terminals are to be checked using a Type D testmeter connected in series with a 15-ohm, 15-watt resistor; when making these checks the circuit is not to be energized for more than 10 secs at any one period and the obtained readings should be between 0.85 and 1.00 amp at each position.

(3) Remove fuse 15 and disconnect cable N529 at the starboard resistance box and, using the testmeter only, check that the voltage existing between the two cores is 24 volts. Reconnect the cable and check the output currents, at the detonator terminals, with the same combination of resistor and testmeter as in operation (2). The currents should this time be between 0.70 and 0.85 amp.

Note...
When disconnecting or reconnecting cable N529 the CANOPY/SNATCH MASTER switch must be at the OFF position.

(4) Switch OFF the CANOPY JETTISON switch.

(5) Connect the testmeter and resistor combination across the elevator tube detonator terminal block.

(6) Manually select the microswitch on the snatch unit to the closed position. The testmeter should read between 0.70 and 0.85 amp.

(7) Replace fuse 15, the testmeter readings should now be between 0.85 and 1.00 amp.

(8) Return the snatch unit switch to the OFF position.

(9) Test the two poles of the snatch unit microswitch as follows:-

(a) Check the voltage at X55 to E27, the meter should read No volts.

(b) Close the microswitch, the reading should be 28 volts.

(c) Open the microswitch, reading should be No volts.

(d) Ensure all switches are OFF.

(e) Connect the ohmmeter to X55A and E27 and close the microswitch, the meter should read approximately zero.

(f) Open the microswitch and the meter should read approximately 4.7 megohms.

32. On completion of the circuit tests, ensure that the microswitch clearance is as detailed in A.P.101B-0417-1A, Sect.3, Chap.11, fig.1.

Checking the hatch detonator circuits
33.

Note...
To ensure that there is no cross connection between the canopy and hatch jettison circuits, it is required that a test lamp be fitted across the input terminals of a canopy jettison resistor box. It is important to ensure that this lamp does not light at any time during the following test procedure.

(1) Switch ON the HATCH SAFETY switch at the navigator's station.

(2) Hold the navigator's HATCH JETTISON switch to the ON position. ▶

◀ (3) Connect the testmeter and series resistor, in turn to each pair of terminals in the five resistor boxes serving the hatch circuit; a reading between 0.85 and 1.00 amp should be obtained at each position.

(4) Release the navigator's switch and hold the A.E.O.'s HATCH JETTISON switch to the ON position.

(5) Repeat operation (3) at any one pair of terminals only and check that the testmeter readings obtained are identical with those given in operation (3).

(6) Remove fuse 16 and disconnect cable N535 from the starboard rear resistance box; using the testmeter only, check that the voltage existing between the two cores is 24 volts. Reconnect the cable and check the output currents, at the detonator terminals, with the testmeter and series resistor. The currents should this time be between 0.70 and 0.85 amp.

Note...
When disconnecting or reconnecting cable N535 the navigator's HATCH SAFETY switch must be at the OFF position.

(7) Switch off the A.E.O.'s jettison switch and remove the cocking lever from the navigator's hatch jettison mechanism assembly. Operate the microswitches by removing the sear and check that the detonator terminals are energized.

(8) Re-cock the navigator's hatch jettison mechanism assembly and replace the sear. Ensure open end of hook is to starboard.

(9) Repeat operations (7) and (8) at the A.E.O.'s hatch jettison mechanism assembly.

(10) Switch OFF the HATCH SAFETY switch at the navigator's station; replace fuse 16 at the M.E.P.

Checking the wing tip pod/tank detonator circuits.
34.

(1) Connect the testmeter and resistor, in turn, across the three detonator terminal blocks in each wing tip.

(2) Operate the WING TIP JETTISON switch, and check that the testmeter reads between 0.85 and 1.00 amp at each position.

35. Upon completion of the circuit tests, ensure that all circuit switches are in the OFF position and that the guards for the pilot's and navigator's jettison switches are wire-locked with 32 s.w.g. copper wire. Before installing the detonators, ensure that the WARNING preceding para.28 has been complied with.

Detonator circuits resistance test
Precautions
36. This test is effected with the detonators installed, therefore, before commencing the test on any of the detonator circuits, the following precautions must be observed:-

(1) Ensure that the aircraft and emergency batteries together with any external power supply are disconnected.

(2) The batteries and external supply must remain disconnected whilst any part of a detonator circuit or its fitting is dismantled. ▶

◀ (3) The approved testmeters are the safety ohmmeter, photo-electric Mk.5, Ref.No.5G/1006388 and the safety ohmmeter Mk.6, Ref.No.5G/9018429. Before use the meters should be tested as detailed in A.P.120G-0712-1 (Mk.5) and A.P.120G-0708-1 (Mk.6).

(4) Whilst the detonators are installed, no test method other than the following is to be employed.

Pilot's canopy and navigator's hatch circuits
37. Check the resistance at each pair of detonator terminals in the resistor boxes. The ohmmeter should read between 0.8 and 1.6 ohms.

Elevator control tube detonator circuit
38. Check the resistance across the terminals of the detonator terminal block. The ohmmeter should read 0.85 to 1.7 ohms.

Wing tip pod/tank detonator circuits
39. Check the resistance across the terminals in the detonator terminal blocks in each wing tip. The ohmmeter should read between 0.85 and 1.7 ohms.

Detonator renewal
WARNING
Do not handle the tube of the detonator. All operations must be done holding the electrical leads near to where they enter the plug of the detonator assembly. THIS IS MOST IMPORTANT.

40. Detonators are lifed and must be changed at the intervals laid down in the current Servicing Schedule for this class of explosive store.

41. A full description of the canopy, hatch and snatch unit installations is given in A.P.101B-0417-1A Sect.3, Chap.11. The installation of the wing-tip tank detonators is described in A.P.101B-0417-1A Sect.4, Chap.2. ▶

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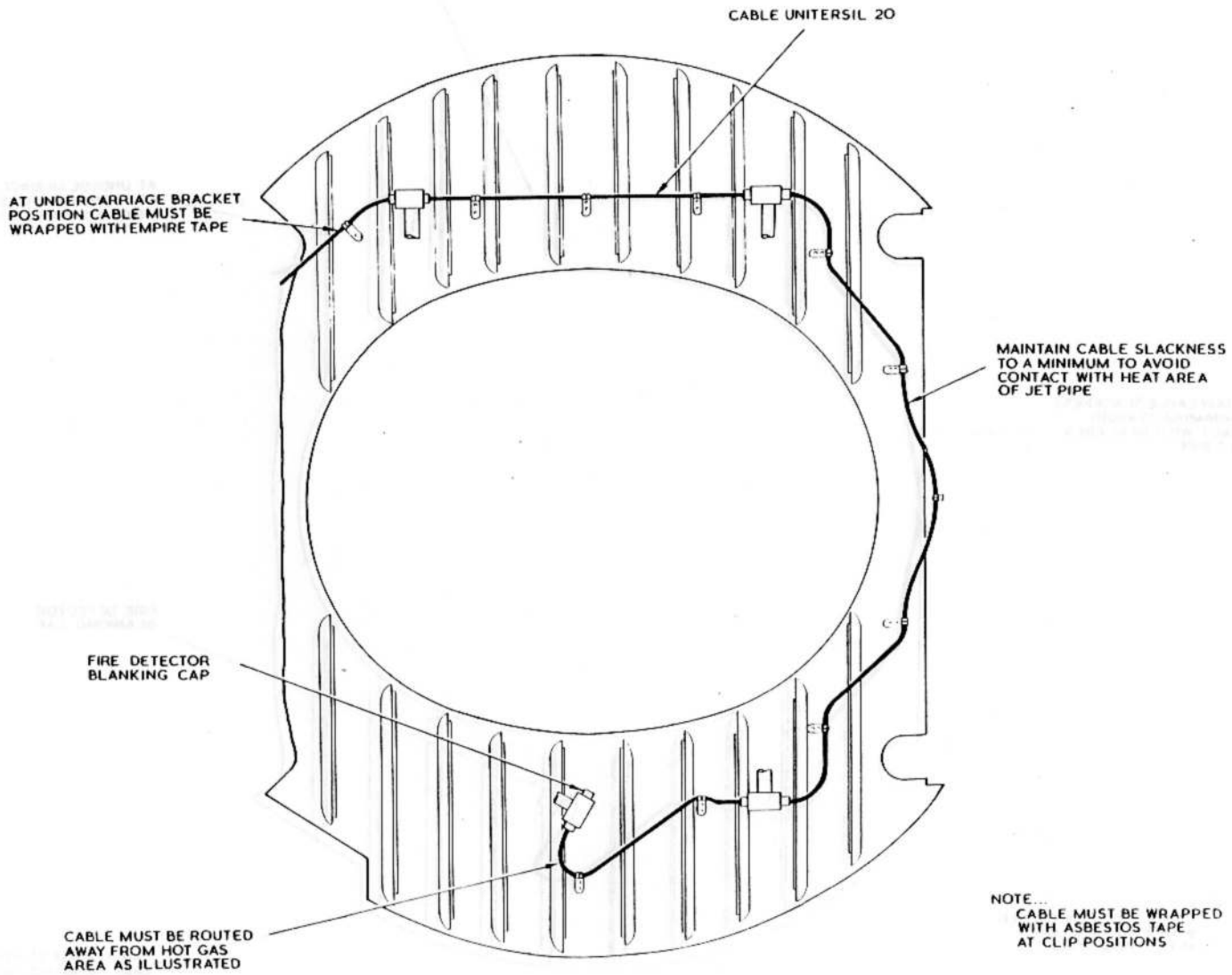

FIG. 4. FIRE DETECTOR CABLE ROUTEING - NO. 1 ENGINE FIREWALL

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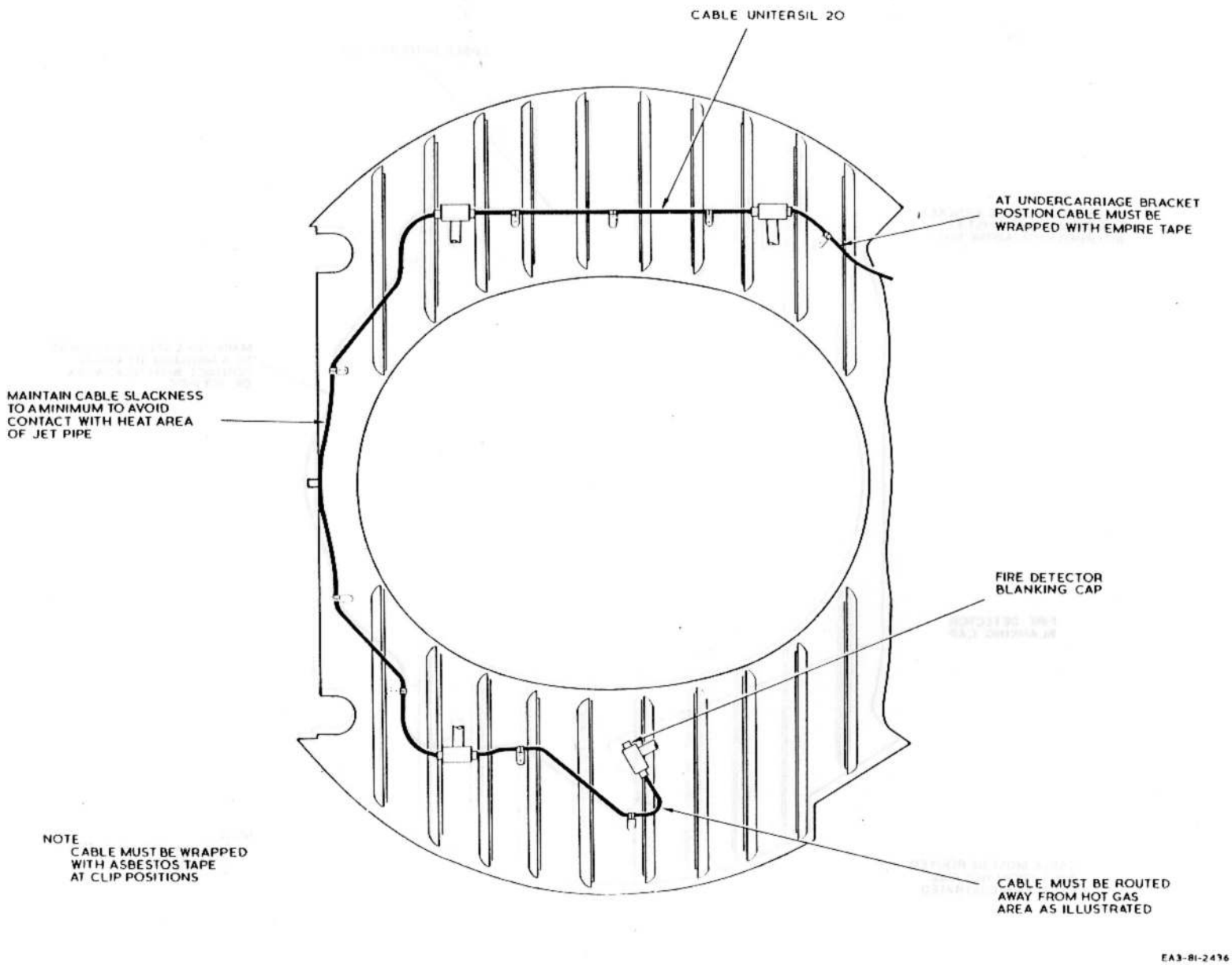

FIG. 5. FIRE DETECTOR CABLE ROUTEING - NO. 2 ENGINE FIREWALL

◀ FIG RENUMBERED ▶

TABLE 1

Equipment details

Ref. or Part No.	Equipment		Quantity	Relevant A.P.
5CW/4405748	Fire warning test switch		2	A.P. 113D series
5CW/9438526	Fire warning push switch		4	
27N/4526592	Fire detector		15	A.P. 107E-0105-1
27N/4526464	Inertia switch		2	A.P. 113D-1206-13A
27N/1119550	Fire extinguisher, Type 89A	alternatives	1	A.P. 107E-0400-1A
27N/4526467	Fire extinguisher, Type 12A			
27N/7185521	Fire extinguisher, Type 138A	alternatives	2	A.P. 107E-0400-1A
27N/4526468	Fire extinguisher, Type 14A			
27N/1454791	Fire extinguisher, Type 60A		2	A.P. 107E-0400-1A
12K/9635263	Cartridge No. 1, Mk. 3, Type A716-3		3	A.P. 110N series
12K/9231213	Cartridge No. 1, Mk. 3, Type A717-3		2	
12G/9635206	Detonator 108 Mk. 3	alternatives - Canopy & Hatch	66	
12G/9635204	Detonator 108 Mk. 4			
12G/9635205	Detonator 109 Mk. 2 - wing tip fuel tanks		6	
	elevator tube severance		1	
12G/9635203	Charges - CHEECS No. 1, Mk. 3 Elevator - explosive collar		1	
D2370/20	Sensing Firewire	main equipment bay	1	
D2370/120	Sensing Firewire		1	
D2475	Coupling Unit		1	
D3131	Coupling Unit		1	
D3170	Termination Unit		1	
D2370/60	Sensing Firewire	pack bay area	2	
D2370/89	Sensing Firewire		1	
D2370/120	Sensing Firewire		6	
D2475	Coupling Unit		5	
D3131	Coupling Unit		3	
D3170	Termination Unit		1	

Note . . . *All sensing elements are Mk. 2 medium temperature range.*

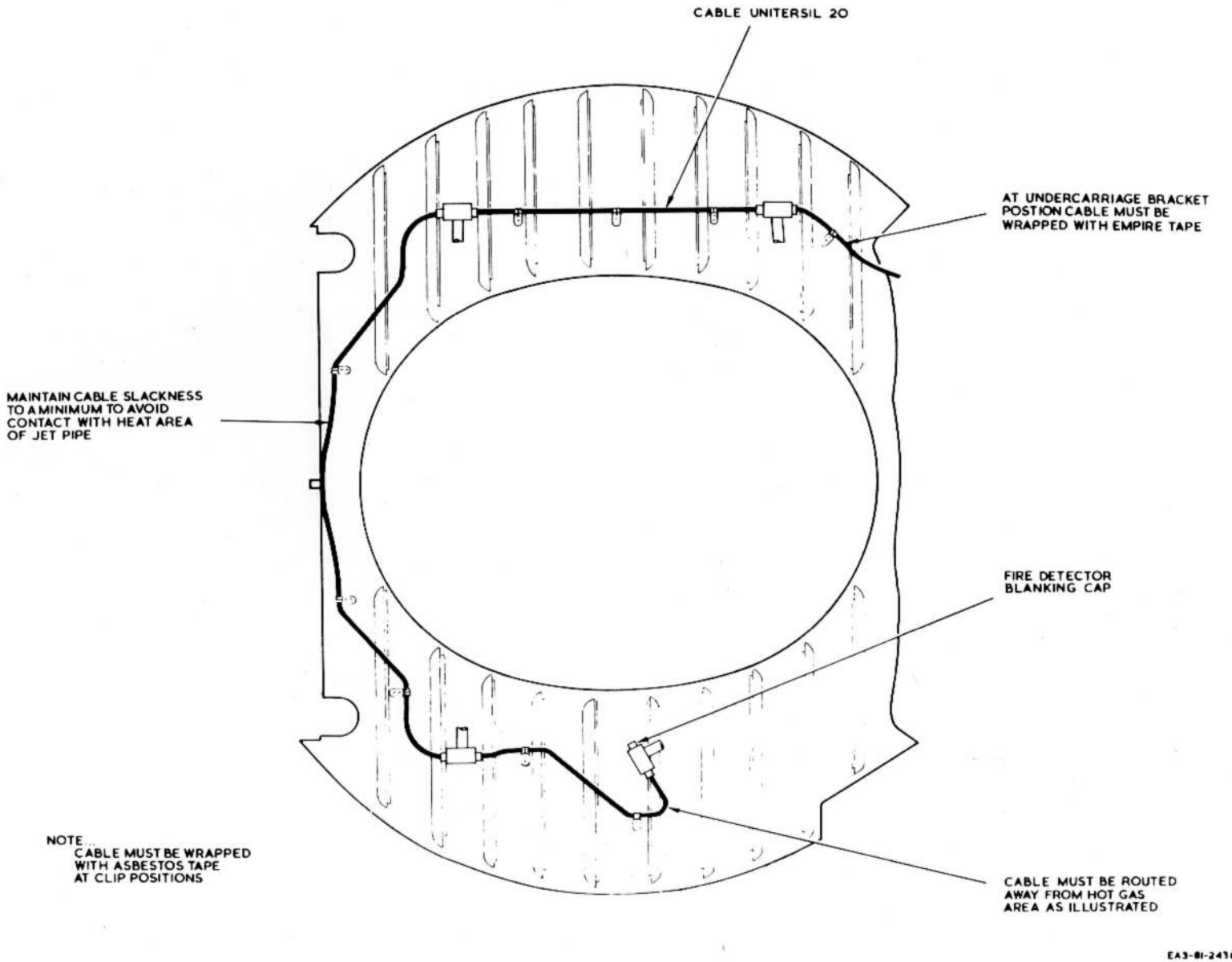

FIG. 8. FIRE DETECTOR CABLE ROUTEING - NO.2 ENGINE FIREWALL

Chapter 13 A.C. POWER SUPPLIES

◀PRE MOD. 5466 (SEE SUPPLEMENT FOR POST MOD. 5466)▶

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LIST OF ILLUSTRATIONS

▶◀

◀**Note**... *Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).*▶

DESCRIPTION

General

1. The main a.c. supplies for the special equipment *(Sect.9, Chap.4)*, the radio and radar equipment *(Chap.11)* and certain instruments *(Chap.4)* are obtained from two 30kVA, 3-phase, 400 Hz, 200V turbine-driven alternators controlled from a switch panel at the navigator's station. Control equipment within the alternator bay maintains the power supply within the specified limits and a busbar switching logic unit and contactors in the pack bay ensure correct distribution. The aircraft a.c. load is split between both alternators and each alternator supplies its part of the load through its associated busbar. A voltage or frequency discrepancy occurring in one channel causes the busbar switching logic unit to disconnect the busbar from the faulty alternator and connect it to the busbar of the serviceable channel via the busbar-tie-contactor (B.T.B.).

Frequency control

2. The turbo-alternator output frequency is controlled by a closed-loop servo system which consists of the following components:-

Frequency control unit, Type C.P.S.3, Mk.4.

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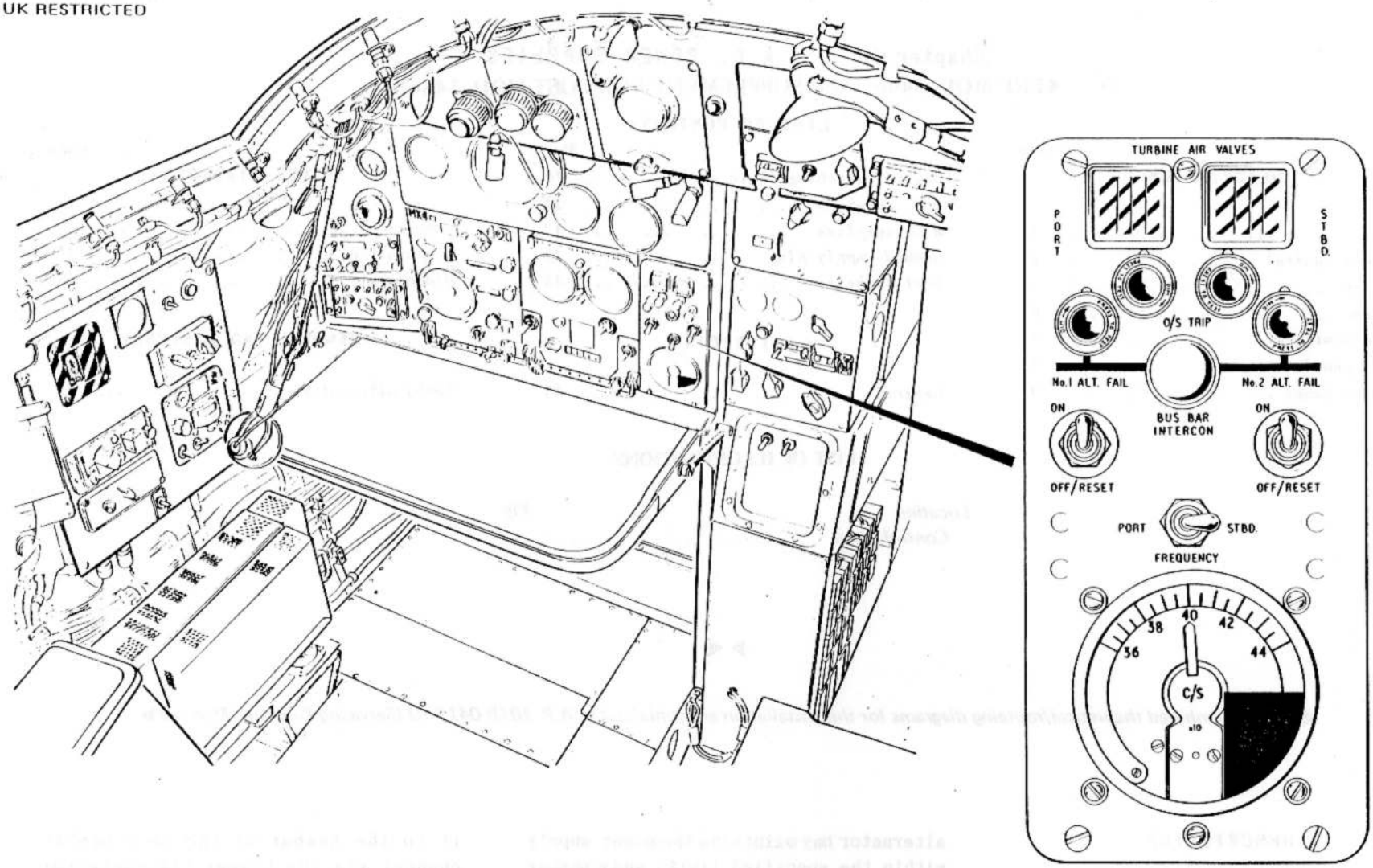

FIG. 1. CONTROL PANEL

10175

Torque motor.

Hydraulic servo.

Feedback potentiometers.

Flow control system.

The system controls the turbine speed and, in consequence, the output frequency at 400 Hz ± 2 per cent.

3. The frequency control unit is installed in a flexible mounting in the main-plane leading edge, forward of each alternator, between rib 2 and 3. The unit is self-contained and operates in conjunction with the torque motor and two feedback potentiometers both of which are components of the hydraulic servo system. A change-over switch, jack socket, and frequency and balance trimmers are accessible through a panel in the leading-edge skin. Descriptive, servicing, adjusting and testing details are given in A.P.4343B, Vol.1, Book 2, Sect.8, Chap.18.

Operation

4. When the alternator is running at the design frequency of 400 Hz, any change in load or in the airflow at the turbine inlet will cause a deviation from that frequency and the frequency selective circuit will provide a differential voltage signal which is proportional to the frequency deviation. This signal is amplified and, depending on whether the frequency is above or below normal is transmitted through one of the two coils of the torque motor. Thus an increase in current passes through one coil of the torque motor, and a decrease in current through the other, the effective difference causing proportional rotation of the motor spindle. The torque motor has linear characteristics, i.e. the movement of the motor armature is proportional to the input current applied.

5. Movement of the arm mounted on the armature spindle actuates a hydraulic servo pilot valve, which directs oil pressure to one side or the other of a servo piston incorporating a toothed rack and operating a pinioned shaft. The shaft controls the position of the air mass flow valve which opens or closes, depending on whether the deviation is below or above the design frequency. Simultaneously with movement of the piston, the wiper arms on the feedback potentiometers move to send out a differential voltage signal which is fed back into the frequency control unit. The polarity of the feedback signal is in opposition to the signal from the frequency controller, consequently the primary signal is progressively cancelled out as movement of the hydraulic servo continues. The frequency control system thus returns to a state of equilibrium at the new conditions of load and air flow. The feedback, therefore, prevents overcorrection which would cause hunting of the whole system.

Overspeed

6. Turbine overspeed conditions which could be caused by a failure in the frequency control system, are prevented by the inclusion of an overspeed shut-off valve incorporated in the throttle valve body. The overspeed valve is mechanically linked to a centrifugally-operated overspeed trip driven from the main reducing gears. The overspeed trip can be reset by selecting the turbo-alternator ON-OFF/RESET switch to OFF/RESET.

Voltage control

7. The output voltage of the alternator is maintained within the design limits by a voltage control and protection unit, Type U.7703 *(A.P.113P-0724-16)*, mounted in the main-plane leading edge adjacent to the frequency control unit. The unit incorporates transducers and transformer rectifier units for field current control, over and under voltage control, and also provides a control over the external loads circuits. A Merz-Price protection system is included to provide protection in case of line-to line or earth-to line faults.

Control panel

8. The turbo-alternator control panel, situated at the navigator's station, houses the following controls and warning indicators:-

PORT/STBD. TURBINE AIR VALVE position indicator.

No.1 ALT. FAIL and No.2 ALT. FAIL warning lamps.

O/S TRIP - PORT/STBD. warning lamps.

Turbo-alternator ON-OFF/RESET switch-PORT/STBD.

FREQUENCY meter.

FREQUENCY meter change-over switch.

Contactor panel

9. The contactor panel, situated between frame 22 and frame 25 in the roof of the pack bay houses the main circuit breakers, relays and fuses.

Busbar switching logic unit

10. A busbar switching logic unit, situated beside the contactor panel, provides automatic control of the contactors, ensuring that the a.c. supplies cannot connect to the aircraft busbars unless their phasing and voltage are correct.

D.C. supplies

11. 28-volt d.c. supplies for contactor control, alternator field initial excitation, and actuator operation are obtained from the aircraft busbars. The control fuses are contained within the Main Electrical Panel.

A.C. supplies

12. The output from the turbo-alternators is fed via the control and protection unit, frequency control unit, main actuator, Merz-Price current transformer to the distribution panel in the roof of the pack bay.

Ground supply plug

13. A ground supply plug is located on the main electrical panel in the starboard lower equipment compartment.

Test sockets

14. Test sockets for alternator and system checking are located in each alternator bay.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

General

15. All equipment cables and connectors associated with the a.c. system should be examined periodically for signs of damage, insecurity and overheating. Functional testing of the system is covered in A.P.101B-0417-5. Details of the busbar logic switching unit test set and the fault simulator test set used during functional testing are to be found in Appendix 1A and Appendix 1B of this chapter respectively.

FAULT DIAGNOSIS

General

16. As the turbine speed control uses the alternator output frequency as an indication of turbine speed, any fault which deprives the frequency controller of its a.c. supply, or occurs within the controller or governor system will result in turbine overspeed shut-down. The faults which deprive the frequency controller of its a.c. supply include:-

Overvoltage.

Short circuit on main feeders (line to line or line to neutral).

A signal from inertia switch circuit.

Loss of alternator field excitation.

The first three faults cause the alternator field to be short circuited, and therefore effectively de-excited. As the alternator field is short circuited when the system is at rest, the fault causing the shut-down cannot be readily diagnosed and so the following fault finding procedure should be carried out.

Preparation

17. Connect a voltmeter (0-150V) and a frequency meter in parallel to a Mk.4 plug and insert the plug into the alternator test socket. Select turbine control switch to ON. Start appropriate engine and run at slow idle.

Note. . .

Ground running instructions are provided in A.P.101B-0417-1A, Sect.2, Chap.2 and also given in the Ground Handling Notes (A.P.101B-0417-12).

Diagnosis

18. By slowly increasing the throttle opening and observing the indications on the meters, the diagnosis will be as follows:-

(1) If the voltage does not rise as the turbine runs up, this would indicate the presence of a signal from the inertia switch circuit, the absence of excitation current, a failure of the field shorting relay or its associated wiring, or a symmetrical 3-phase short circuit.

(2) If the voltage increases to some value less than 200 volts and then falls

to zero, the fault would be either a short circuit or an incorrect setting of the overvoltage relay.

(3) If the voltage rises to approximately 220 volts and then drops to zero, the cause would be a failure of the voltage regulator.

(4) If the voltage build up and control is correct, but the frequency progressively increases with throttle setting, the apparent fault would be speed control failure.

These tests are to be repeated with the voltmeter connected between each pair of lines, the voltmeter connections being interchanged at the Mk.4 plug, this is to ensure that no two lines are short circuited, i.e. the voltmeter should not read zero.

REMOVAL AND ASSEMBLY

Turbo alternators

19. For removal and assembly information refer to A.P.101B-0417-1A, Sect.4, Chap. 1.

Appendix 1A BUSBAR LOGIC SWITCHING UNIT TEST SET

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Test set, busbar logic switching unit ...	*Ref.No.5G/NIV*
Dimensions (in.)	*9¾ x 6¾ x 6¾*
Weight (lb)	*7*

Introduction

1. The busbar logic switching unit test set is a portable instrument designed for use with the a.c. generating system.

2. The test set, which simulates the input signals from the aircrafts' turbo-alternators and external a.c. supply, enables the busbar logic switching unit to be checked for correct operation in situ, without an engine ground run. By monitoring the output signals from the logic unit the test set checks that the sequence and preference of the power source supplied to the two a.c. busbars are correct.

3. Although the test set is primarily intended for testing the logic unit at the intervals set out in the servicing schedule, it can also be used for testing the logic unit during fault diagnosis.

Description

4. The test set components are housed in a varnished deal and plywood case fitted with a leather carrying handle and a hinged lid, in which stowage space has been provided for the test connector. A cooling grid is fitted to the underside of the case to provide suitable ventilation.

5. The front panel, which is of aluminium alloy and is secured to battens in the wooden case by six woodscrews, has the following components mounted on it:- three toggle switches, four magnetic indicators and a Mk.4 brass connecting plug. A mimic diagram which shows the interconnection between components and represents the aircraft circuit breaker and busbar lay-out, is presented on the upper surface of the front panel.

6. The test connector is made up from 10 cores of miniature cable, Type 12a. A Mk.4 brass connecting socket, which connects to the test set, terminates one

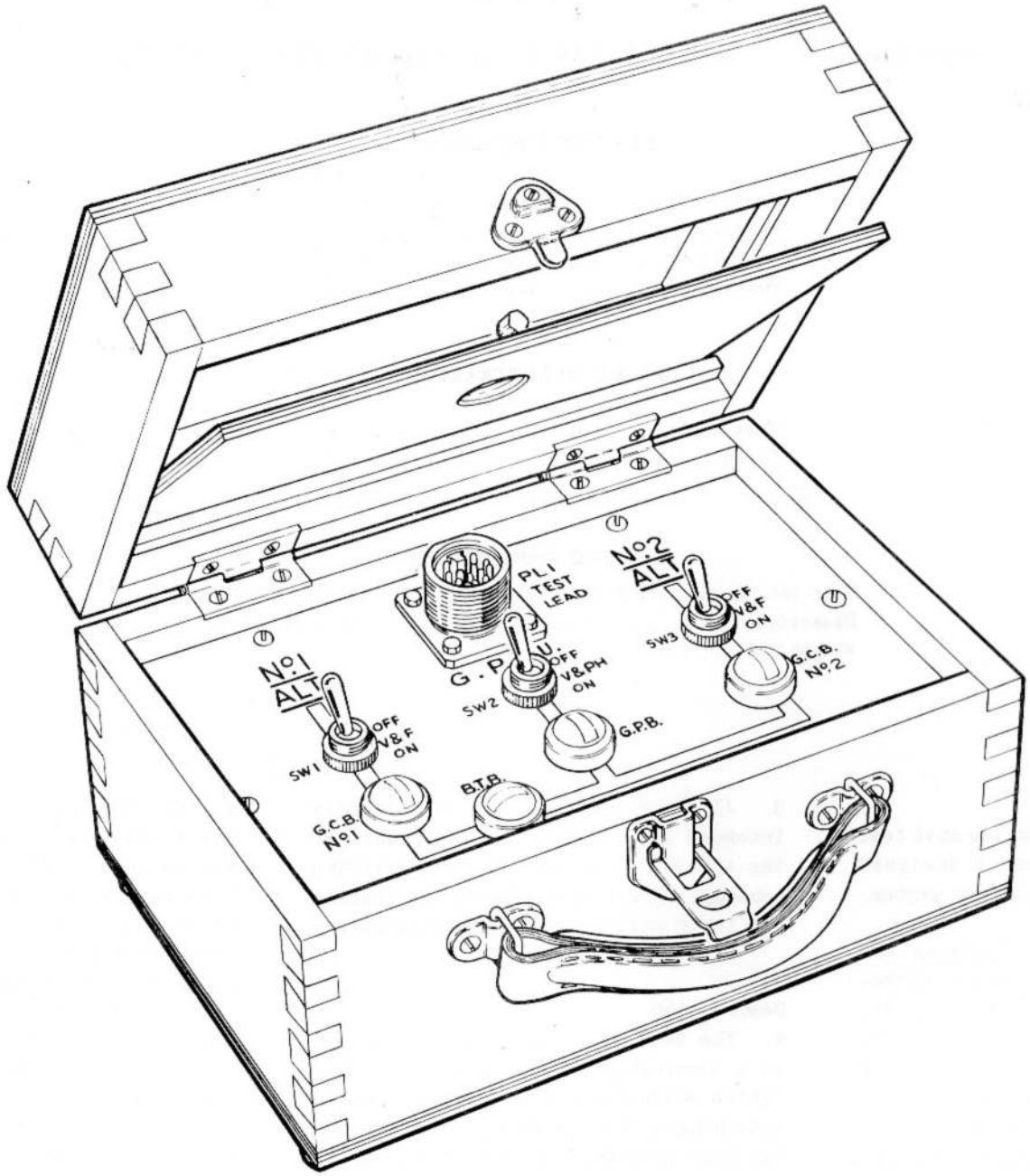

FIG.I. TEST SET

◀ MINOR ALTERATIONS ▶

end of the connector whilst the other end is terminated by a UK-AN plug, which connects to the busbar logic switching unit.

7. Attached to the lid of the test set is a label giving a theoretical wiring diagram and operating instructions.

Operation

8. The test set is connected to the busbar logic switching unit and an external d.c. supply applied to the aircraft. Then the toggle switches fitted to the front panel are operated in a set sequence *(i.e. as per the function test in Vol.5)* to simulate the input signals to the logic unit. The magnetic indicators are used to monitor the output signal from the logic unit after each simulation and thus assess whether or not the unit is functioning correctly. The mimic diagram assists in this assessment. On completion of the tests the external d.c. supply and the test set are disconnected from the aircraft.

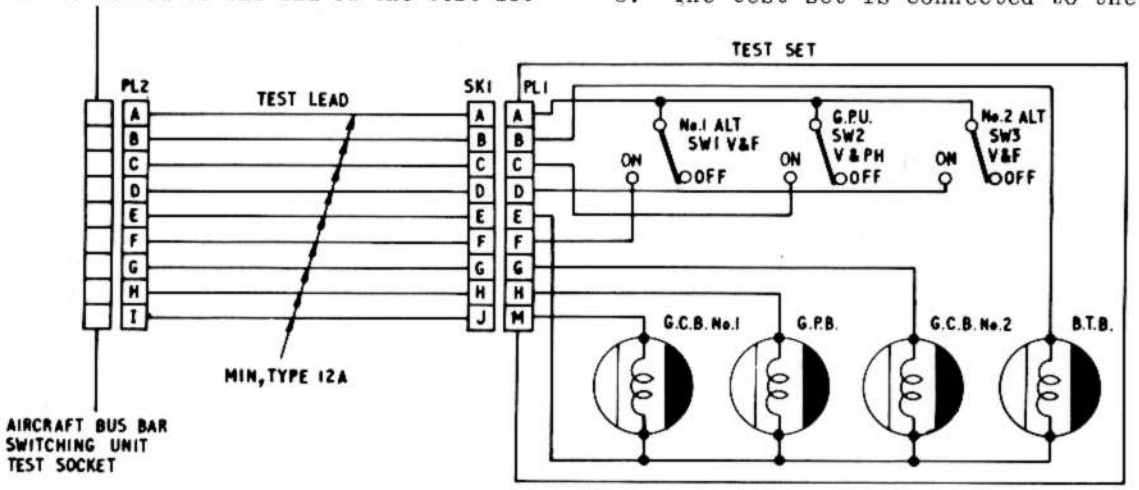

Fig. 2. Circuit diagram

◀ (MINOR ALTERATIONS) ▶

Servicing

9. Routine servicing consists of checking the test set for security of components, cleanliness and freedom from damage. The connectors should also be checked for deterioration.

Appendix 1B FAULT SIMULATOR TEST SET

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Test set, fault simulator	*Ref.No.5G/NIV*
Dimensions (in.)	*17½ x 13½ x 9 7/8*
Weight (lb)	25

Introduction

1. The fault simulator test set is a portable instrument designed for use with the a.c. generating system. The test set enables the appropriate line-to-line, overvoltage, undervoltage, overfrequency and overspeed circuits to be checked for correct operation, in situ, during an engine run.

Description

2. The test set components are housed in a varnished deal and plywood case fitted with a carrying handle and a hinged lid, which accommodates the connecting leads. Cooling grids are fitted to the right-hand side and the underside of the case to provide natural ventilation. On the left-hand side of the case a cut-out is provided to allow connection of the test leads.

3. The main features of the tinned steel sheet front panel are three meters, viz., a 0-250V rectifier voltmeter, a 0-20mA rectifier milliammeter and a 300-500 c/s frequency meter. There are also two fuse blocks, three rotary switches, four toggle switches, two indicator lamps and one test socket. Fitted to the underside of the front panel are two tinned steel brackets which support two UK-AN connectors and three fault resistors. The front panel assembly, which is secured to battens in the wooden case by four woodscrews, has two handles to facilitate the removal of the assembly for servicing.

4. Both connectors are made up from Unipren cables, one is terminated at each end by UK-AN type plugs, the other is terminated by a UK-AN type plug and a jack-plug.

5. Attached to the lid of the test set is a label giving operating instructions and a theoretical wiring diagram.

Operation

6. Prior to the engine associated with

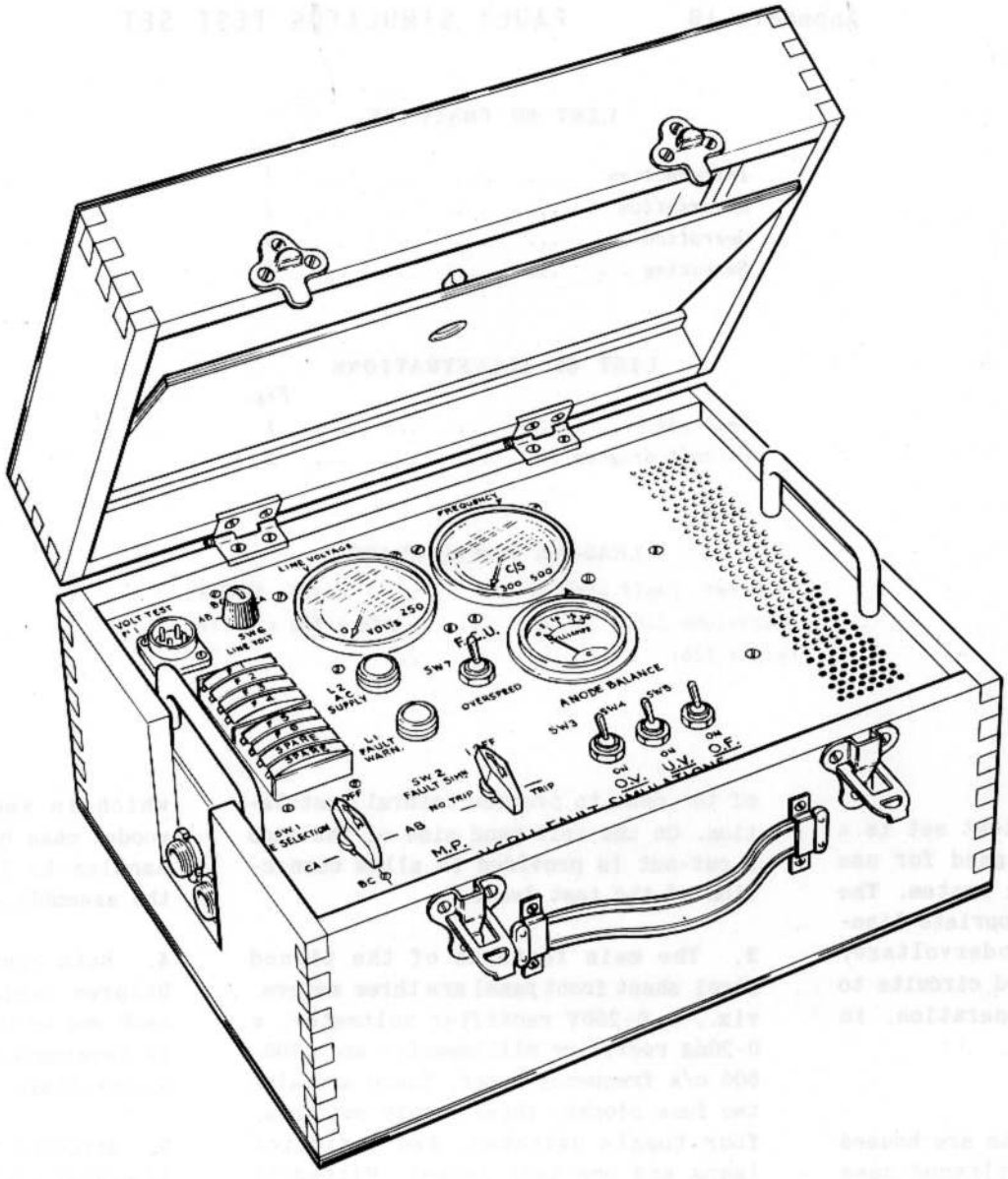

FIG.1. TEST SET

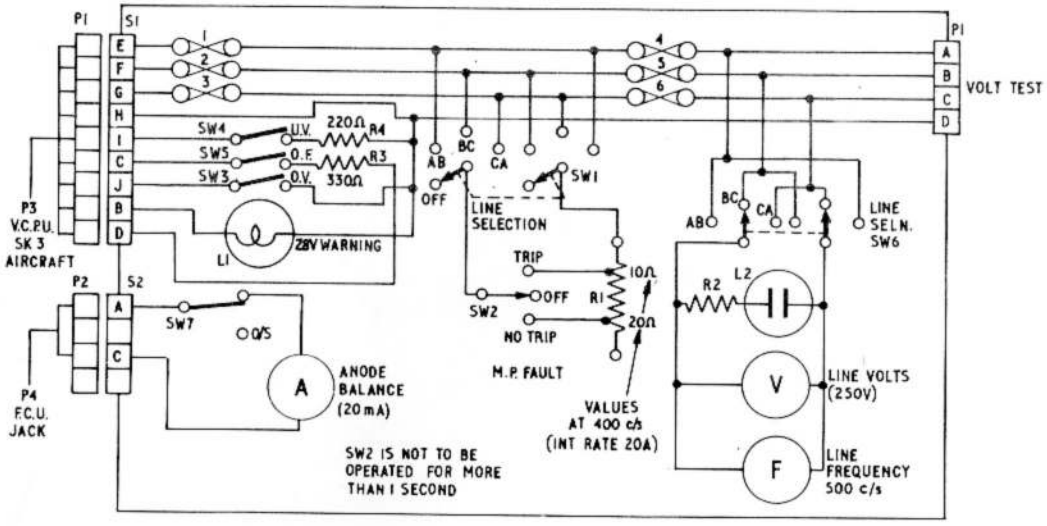

Fig.2. Circuit diagram

◀(MINOR ALTERATIONS)▶

the alternator on test being ground run the test set is connected to the dormant circuit test socket and the frequency control unit in the wing leading edge. When the alternator is on line, line-to-line, overvoltage, undervoltage, over-frequency and overspeed faults can be simulated by operation of the appropriate selector switches mounted on the front panel of the test set. As each fault is simulated, the system is observed for correct operation and indication.

Servicing

7. Routine servicing consists of checking the test set for security of components, cleanliness and freedom from damage. The connectors should also be checked for deterioration.