Chapter 2 I.F.F./S.S.R.1520

◀ *(completely revised)* ▶

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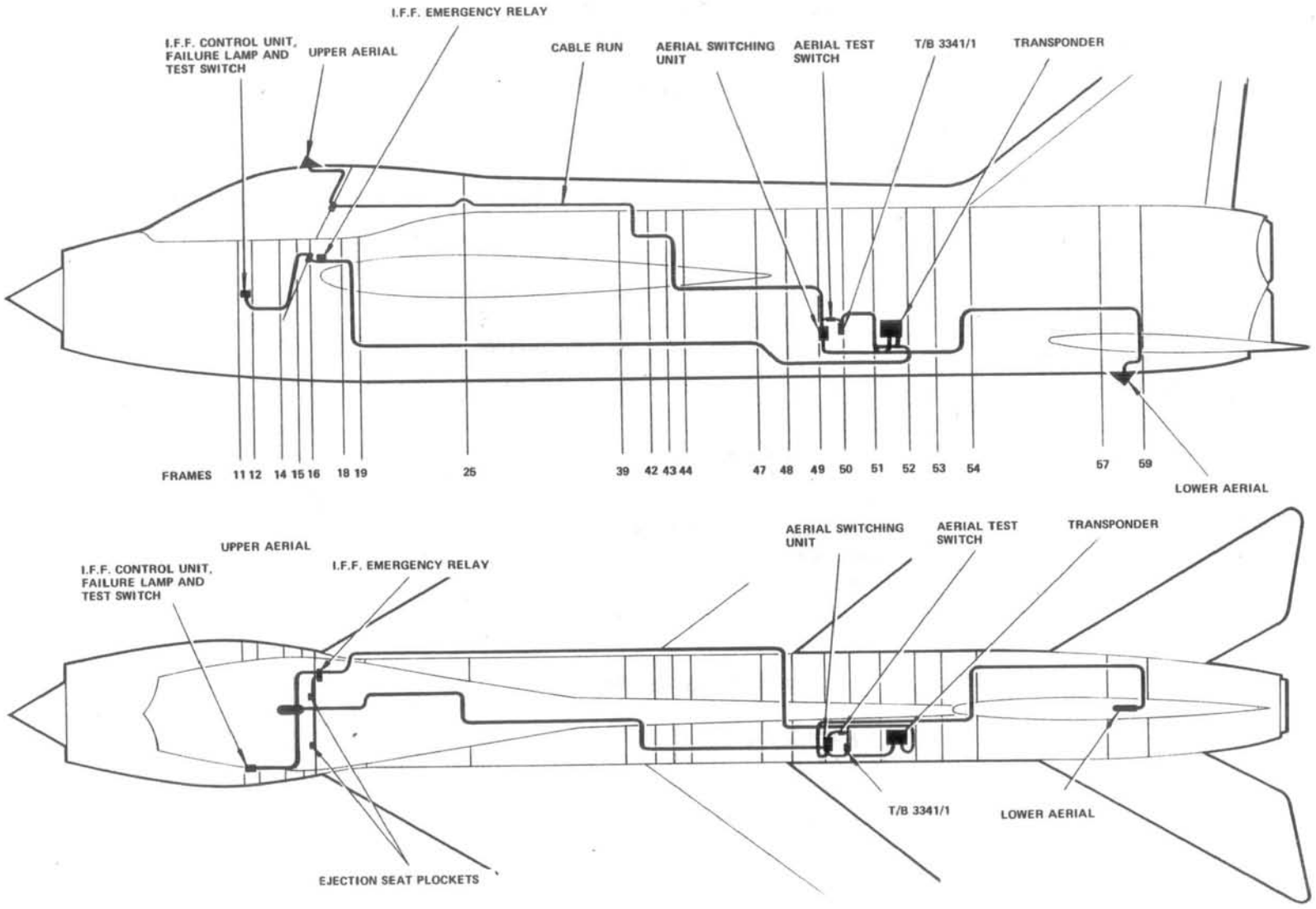

FIG. 1. I. F. F./S. S. R. 1520 INSTALLATION (A. R. I. 23134/3)

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DESCRIPTION

General

1. The I.F.F. secondary surveillance radar system (I.F.F./S.S.R.) identifies, as friendly or hostile, an aircraft detected by the interrogating ground radar. The I.F.F./S.S.R. 1520 installation (A.R.I.23134/3) is the airborne part of the system. The system incorporates a means of automatically switching the transponder to the emergency mode of operation when either of the crew ejects from the aircraft. The facility does not change the method of operation of the I.F.F./S.S.R. system. Information on the main units of the system plus the complete functioning and operating data will be found in A.P.114J-0101-16. Fig.1 shows the location of each unit in the aircraft and fig.3 shows the interconnection detail. Location access and the relevant Air Publication references can be found in Table 2. Illustrations of the main items can be found in fig.2.

Transponder

2. The transponder is secured to the aircraft by means of a mounting tray, equipped with anti-vibration mountings, located in the port equipment compartment between frames 51 and 52. It consists of transistorized printed circuit boards in a container normally pressurized to 4 lb/in ^{2} with dry air or nitrogen. Electrical connection to the transponder is made via a 98-way receptacle on the mounting tray. The front panel of the transponder contains four code selector switches for setting up a reply to mode 2 interrogations, an aerial socket and the pressurization charge purge valves.

Control unit

3. The control unit is located in the cockpit on the A2 extension panel on the port side, electrical connection being made via a 55-way receptacle at the rear of the unit. Edge lighting of the control unit is provided by two lamps, one on either side of the function switch. The lamps are fitted with red filters which cause the switch engravings to show red under low ambient lighting conditions. The switch engravings show white against a black background in bright ambient lighting conditions. A further eight lamps are mounted in the code selection switches assembly. The selected code numbers show up white against a black background. The lighting intensity is controlled by a dimmer switch *(Sect.6, Chap.8)*. Operation of the transponder is controlled by the following switches on the control unit front panel:-

(1) Four toggle switches providing on (down)/off(up) selection of modes 1,2,C or D.

(2) A toggle switch identified CIVIL/MIL.

(3) A spring-loaded switch identified 1/P.

(4) A three-position rotary switch for selection of mode 3/A or B, with a centre OFF position.

(5) A five-position function switch for the selection of OFF, SBY, LOW NORM. or EMGY.

(6) A push-to-test combined lamp and switch assembly, identified TEST, which initiates the operation of the internal self-test circuits in the transponder. If the transponder is serviceable, the green lamp (O.K. lamp) is illuminated.

(7) Two banks of code selection switches, four in each bank. One bank is identified MODE 1, the other MODE 3/A/B.

Aerials

4. Two omnidirectional, vertically polarized unipole aerials are utilized in the I.F.F. system. The forward (upper) aerial is fitted into the Perspex moulding of the canopy hatch and the aft (lower) aerial is located on the underside of the fuselage between frames 58 and 59. Both aerials are connected to the aerial switching unit by coaxial cable.

Aerial switching unit

5. The aerial switching unit is located in the port equipment compartment between frames 49 and 50. It is a solid state coaxial switch whose function is to connect the transponder to each aerial alternately. The switching rate is 40 ± 4 Hz. The three r.f. connectors of the unit are identified UPPER, LOWER and TRANSPONDER. If the +28V d.c. supply to the unit fails or the oscillator/amplifier fails, the transponder is connected automatically to the upper aerial. If either one or both of the switching

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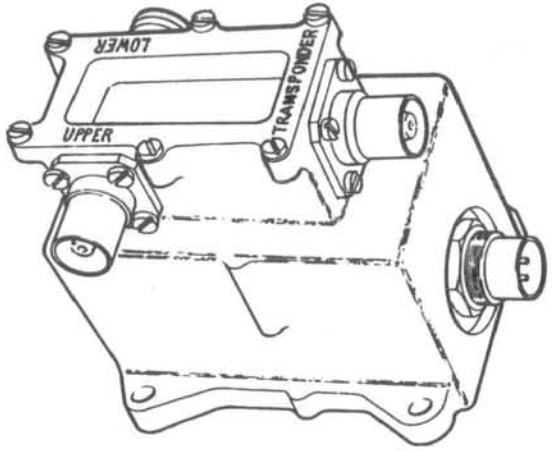
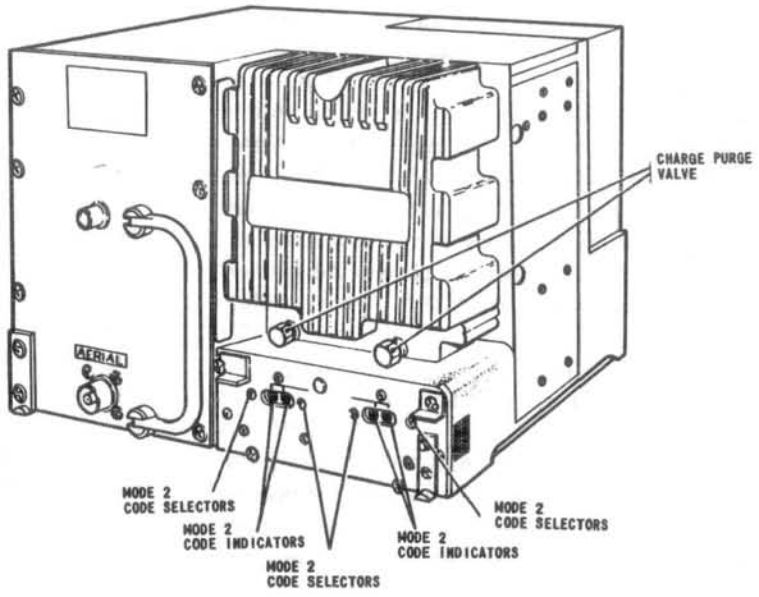
AERIAL SWITCHING UNIT



TRANSPONDER



CONTROL UNIT

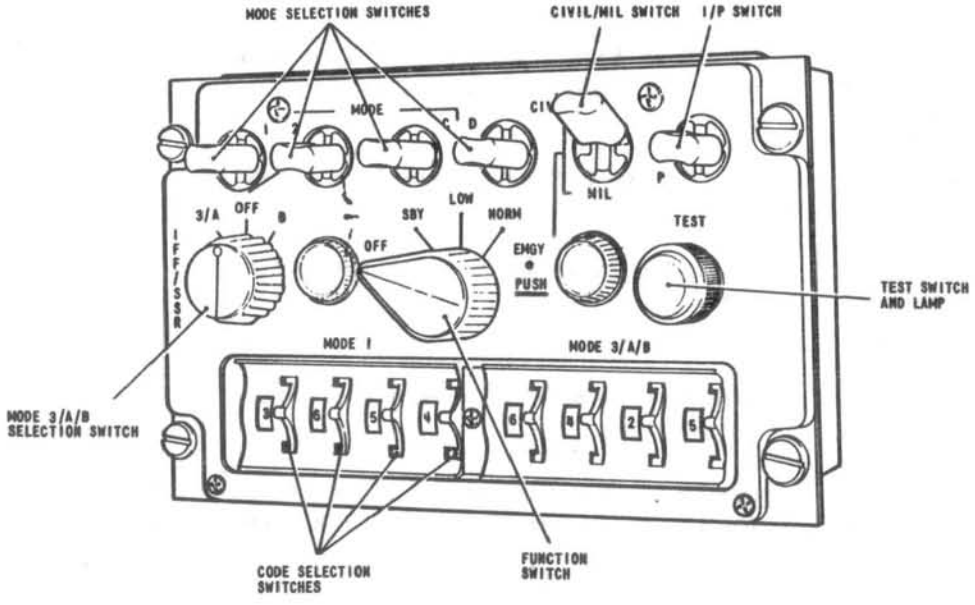


FIG. 2. MAIN UNITS

diodes fail, the transponder is connected automatically to the lower aerial.

Emergency relay

6. An emergency relay unit and interconnecting box is fitted to the aft face on the starboard side of the pressure bulkhead and a shorting plocket assembly is fitted to the lower rear left-hand corner of each ejection seat. A stowage shorting plocket assembly is fitted on the port floor panel for the port seat plocket, and on the aft panel between the ejection seats for the starboard seat plocket, for use when the seats are removed.

WARNING

It is essential that the aerial terminals of the switch are both correctly terminated by either a radiating aerial or a matched load whenever R.F. power is applied to the switch.

Aerial test switch

7. The aerial test switch is a guarded, three-position switch marked UPPER/FLIGHT/LOWER. It is located adjacent to the aerial switching unit *(para.6)*. The switch is used during functional tests of the installation and must be returned to the guarded FLIGHT position on completion of the tests.

I.F.F. failure warning lamp

8. The I.F.F. warning lamp and switch assembly, identified I.F.F. FAILURE is located adjacent to the control unit in the cockpit. The amber lamp flashes intermittently to indicate when the transmitter power output is below the reference level. This lamp and the green O.K. lamp on the control unit are tested for filament continuity by using the push-to-test facility of the lamp/switch assembly.

Power supplies *(Table 1)*

9. The I.F.F. system required both d.c. and a.c. power supplies for its operation. The d.c. is 28V and a.c. is 115V, 400 Hz, both fed from the a.c. and d.c. fuse and relay panel. A 28V d.c. supply is fed to the relay coil of the emergency relay unit, the other end of the coil being connected to earth via the contacts of the ejector seat shorting plocket. With the busbar energized, the relay operates to complete the 'low sensitivity' line from the control unit to the transponder. When either of the crew ejects, the plocket is disconnected; the relay de-energizes to open-circuit the 'low sensitivity' line and connect the transponder 'signal return' line to the 'emergency military' line. Provided the I.F.F. system is switched on, the transponder is automatically set to operate in the emergency mode at normal sensitivity. Further information on the power supplies, together with the associated routeing chart, can be found in Sect.6, Chap.11.

SERVICING

WARNING

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

General

10. All equipment and cables should be examined for security and damage at the intervals laid down in the Master Servicing Schedule. The upper I.F.F. aerial connector should be routed and secured as detailed in A.P.101B-1000-5A3A, Section 1, Chapter 1, S.P.4B, fig.2. Functional tests should be carried out at the prescribed intervals, if the serviceability of the installation is suspect, and after rectification of a defect. The instructions for setting up, servicing and testing of the installation, along with the test equipment required, can be found in A.P. 114J-0101-16.

Transponder

11. The pressure inside the unit should be checked periodically with a low-reading pressure gauge. The unit should be pressurized, with dry air or nitrogen, to 4 lb/in^2.

Connector and cable assemblies

12. Table 3 contains wiring and interconnection details of the cable assemblies used in the I.F.F./S.S.R. installation.

Power supplies

13. During fault diagnosis and servicing of the power supply system, refer to Sect.6, Chap.11.

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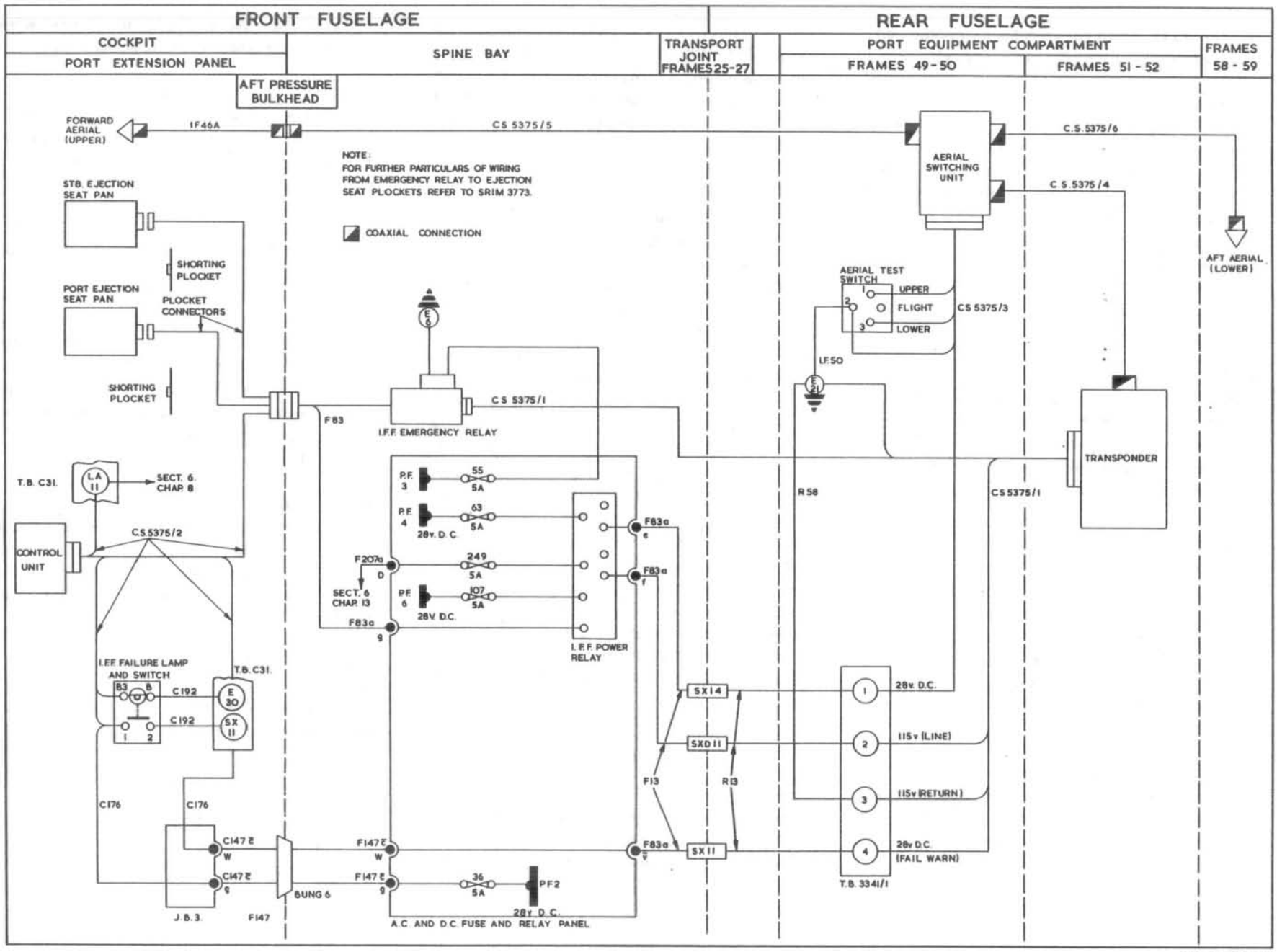

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FIG. 3. I.F.F./S.S.R. 1520 INSTALLATION (A.R.I. 23134/3)

TABLE 1

Fuses, circuit and location

Fuse No.	Circuit	Location
36	PF2, 28V, 5A, transponder supply	A.C. and D.C. fuse and relay panel
55	PF3, 28V, 5A, I.F.F. emergency relay unit	A.C. and D.C. fuse and relay panel
63	PF4, 28V, 5A, aerial switching unit	A.C. and D.C. fuse and relay panel
107	PF6, 28V, 5A, I.F.F. power relay	A.C. and D.C. fuse and relay panel
249	XD1, 115V single phase, 5A, transponder supply	A.C. and D.C. fuse and relay panel

TABLE 2

Equipment, location, access and air publication

Equipment	Location	Access	Air Publication
Transponder, Type 16928	Between fr.51-52 port side	87P	114J-0101-16 Part 1, Chap.2-4
Control unit, Type 16929	A2 extension panel on the port side	Via cockpit	114J-0101-16 Part 1, Chap.5
Aerial switching unit, Type 16941	Between fr.49-50 port side	69P	114J-0101-16 Part 1, Chap.7
Upper aerial	Part of cockpit canopy	Canopy	114J-0101-16 Part 1, Chap.6
Lower aerial	Underside of the aircraft between 57-59	Underside of aircraft	114J-0101-16 Part 1, Chap.6
Aerial test switch	Between fr.49-50 port side	69P	4343C Vol.1, Book 1, Sect.1 Chap.4
Failure lamp/switch assembly	Adjacent to the control unit	Via cockpit	114J-0101-16 Part 1, Chap.5
Emergency relay unit	Aft face, starboard side rear pressure bulkhead	Spine bay	–

TABLE 3

Connector details

CABLE ASSEMBLY CS5375/1 (10HB/21406)

TERMINATION	PIN	CABLE RATING	PIN	TERMINATION
Transponder 16928 (port equipment bay)	13	T22	B	CS5375/1 I.F.F. Emergency relay socket
	14	T22	C	
	15	T22	D	
	17	T22	E	
	18	T22	F	
	19	T22	G	
	24	T22	s	
	26	T22	H	
	27	T22	J	
	28	T22	K	
	29	T22	L	
	30	T22	M	
	31	T22	N	
	32	T22	P	
	33	T22	R	
	34	T22	S	
	35	T22	T	
	38	T22	U	
	39	T22	V	
	40	T22	W	
	41	T22	X	
	43	T22	Z	
	44	T22	AA	
	45	T22	b	
	46	T22	c	
	47	T22	d	
	48	T22	e	
	49	T22	f	
	50	T22	g	
	51	T22	h	
	52	T22	i	
	53	T22	j	
	54	T22	k	
	55	T22	m	

CABLE ASSEMBLY CS5375/1 (10HB/21406) - *continued*

TERMINATION	PIN	CABLE RATING	PIN	TERMINATION
Transponder 16928 (port equipment bay)	56	T22	n	CS5375/1 I.F.F. Emergency relay socket
	57	T22	p	
	70	T22	q	
	71	T22	r	
	88	T22	A	
	96	T22	BB	
	22	T22	TERM.2	T.B.3341/1 (port equipment bay)
	23	T22	TERM.3	
	42	T22	TERM.4	
	93	T22	TERM.3	

Connector F83

Plug 83 a (A.C./D.C. fuse and relay panel)	g	T22	v	CS5375/1 Aft pressure bulkhead plug break

Connector IF50

	E21	T22	TERM.2	Aerial test switch

Connector R58

	E21	T22	TERM.3	T.B.3341/1

CABLE ASSEMBLY CS5375/2 (10HB/21407)

Aft pressure bulkhead	A	T22	A	Control unit 16929 (cockpit port extension panel)
	B	T22	B	
	C	T22	C	
	D	T22	D	
	E	T22	E	
	F	T22	F	
	G	T22	G	
	H	T22	H	

continued. . .

Table 3 Connector details - *continued*

CABLE ASSEMBLY CS5375/2 (10HB/21407) - *continued*

TERMINATION	PIN	CABLE RATING	PIN	TERMINATION
Aft pressure bulkhead	J	T22	J	Control unit 16929 (cockpit port extension panel)
	K	T22	K	
	L	T22	L	
	M	T22	M	
	N	T22	N	
	P	T22	P	
	R	T22	R	
	S	T22	S	
	T	T22	T	
	U	T22	U	
	V	T22	V	
	W	T22	W	
	X	T22	X	
	Z	T22	Z	
	b	T22	b	
	c	T22	c	
	d	T22	d	
	e	T22	e	
	f	T22	f	
	g	T22	g	
	h	T22	h	
	i	T22	i	
	j	T22	j	
	k	T22	k	
	m	T22	m	
	n	T22	n	
	p	T22	p	
	q	T22	q	
	r	T22	r	
	s	T22	s	
	v	T22	v	
Control unit 16929	t	T22	E30	T.B. C31 (cockpit port extension panel)
	u	T22	E30	
	w	T22	LA11	
	x	T22	E30	

CABLE ASSEMBLY CS5375/2 (10HB/21407) - *continued*

TERMINATION	PIN	CABLE RATING	PIN	TERMINATION
IFF failure lamp/switch assembly (cockpit port extension panel)	TERM.B3	T22	AA	Aft pressure bulkhead
	TERM.1	T22	BB	

CABLE ASSEMBLY CS5375/3 (10HB/21408)

Aerial switching unit 16941	A	T22	TERM.2	Aerial test switch
	C	T22	TERM.3	
	D	T22	TERM.1	
	B	T22	TERM.1	T.B.3341/1

CABLE ASSEMBLY CS5375/4 (10HB/21409)

Aerial switching unit	UR102	Transponder 16928

CABLE ASSEMBLY CS5375/5

Aerial switching unit	UR102	Aft pressure bulkhead

CABLE ASSEMBLY CS5375/6

Aerial switching unit	UR102	Aft (lower) aerial

CABLE ASSEMBLY IF46A (10HB/14852)

Aft pressure bulkhead	UR102	Forward (upper) aerial

CABLE ASSEMBLY R13

T.B.3341/1	TERM.1	F20	SX 14	Transport joint (Frms.25-27)
	TERM.2	F20	SXD 11	
	TERM.4	F20	SX 11	

continued. . .

TABLE 3 Connector details - *continued*

CABLE ASSEMBLY F13

TERMINATION	PIN	CABLE RATING	PIN	TERMINATION
Transport joint (Frms 25-27)	SX 14	T20	e	Plug F83 A.C./D.C. fuse and relay panel
	ZXD 11	T20	f	
	SX 11	T20	v	

CABLE ASSEMBLY C147

Plug F147 c (A.C./D.C. fuse and relay panel)	W	T22	W	Plug C147 c (JB3 cockpit)
	g	T22	g	

CABLE ASSEMBLY C176

Plug C147 c	W	T22	TERM.SX 11	T.B.C31 I.F.F. failure lamp/switch
	g	T22	TERM.1	

CABLE ASSEMBLY C192

T.B.C31	TERM.SX 11	T22	TERM.2	I.F.F. failure lamp/switch
	TERM.E30	T22	TERM.B	

LOCAL WIRING

TERMINATION	PIN	CABLE RATING	PIN	TERMINATION
Fuse 55 (A.C./D.C. fuse and relay panel)		T22	TERM.1	J.B. I.F.F. Emergency relay

LOCAL WIRING

Earth point E6 Frame 21		T22	TERM.2	J.B. I.F.F. Emergency relay

PLOCKET CONNECTOR MBA 7931 (PORT)

Fwd pressure bulkhead I.F.F. connector 5375/2	DD	T22	Plug	Ejection seat plocket
	FF	T22	Socket	

PLOCKET CONNECTOR MBA 7931 (STB)

Fwd pressure bulkhead I.F.F. connector 5375/2	CC	T22	Plug	Ejection seat plocket
	EE	T22	Socket	

Note: For further cable information, refer to SRIM 3773

Appendix 1 MODIFICATION 4733

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LIST OF ILLUSTRATIONS

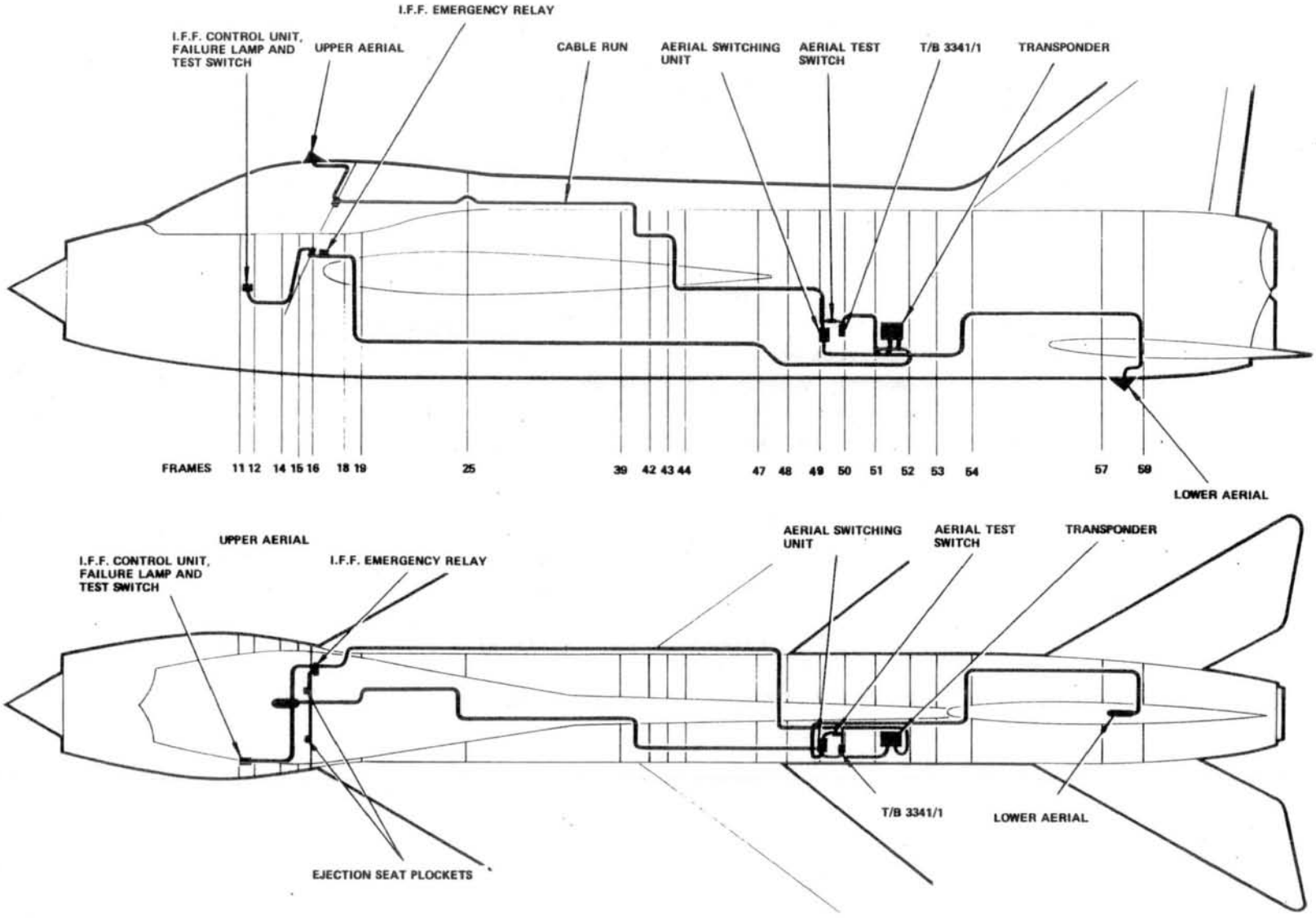

FIG. 1. I. F. F./S. S. R. 1520 INSTALLATION (A.R.I. 23134/3)(POST MOD. 4733)

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General

1. Modification 4733 introduces a means of automatically switching the I.F.F./S.S.R. transponder to the emergency mode of operation when either of the crew ejects from the aircraft. The modification does not change the method of operation of the I.F.F./.S.S.R.

2. An emergency relay unit and interconnecting box is fitted to the aft face on the starboard side of the pressure bulkhead and a shorting plocket assembly is fitted to the lower rear left-hand corner of each ejection seat. A stowage shorting plocket assembly is fitted on the port floor panel for the port seat plocket, and on the aft panel between the ejections seats or the starboard seat plocket, for use when the seats are removed. Fig.1 gives the locations of the main units, fig.2 gives the interconnection details of the modified system. Table 3 lists the alterations to the system connectors and must be used with Table 3, Chap.2 (main chapter).

Operation

3. A 28V d.c. supply to the relay coil of the emergency relay unit and interconnecting box is fed from busbar PF3 in the A.C./D.C. fuse and relay box via fuse No.55, the other end of the coil being connected to earth via the contacts of the ejector seat shorting plocket. With the busbar energized, the relay operates to complete the 'low sensitivity' line from the control unit to the transponder. When either of the crew ejects, the plocket is disconnected; the relay de-energizes to open-circuit the 'low sensitivity' line and connect the transponder 'signal return' line to the 'emergency military' line. Provided the I.F.F. system is switched on, the transponder is automatically set to operate in the emergency mode at normal sensitivity.

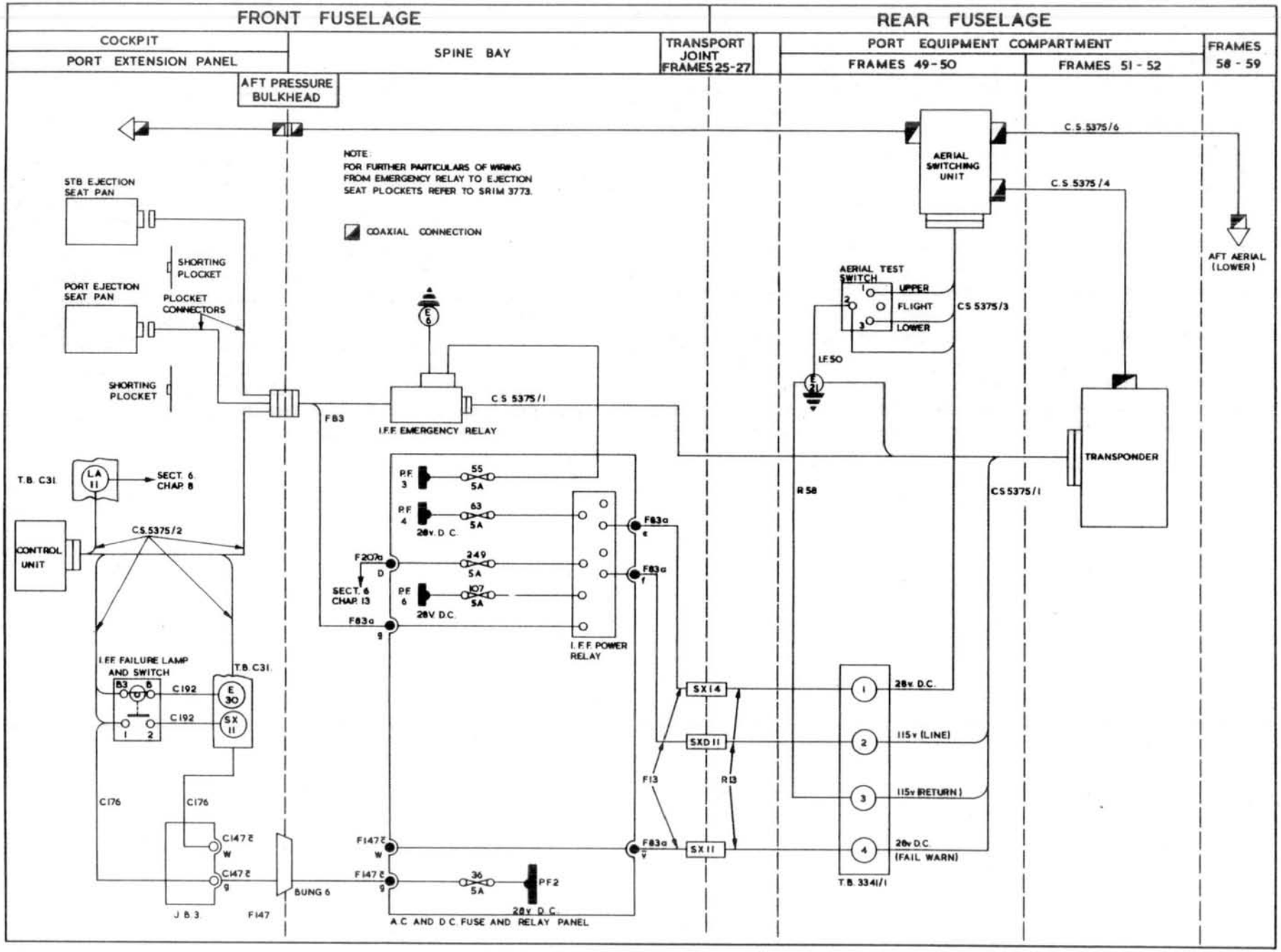

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FIG. 2 I.F.F./S.S.R. 1520 INSTALLATION (A.R.I. 23134/3)(POST MOD.4733)

TABLE 1

Fuses, circuit and location

Fuse No.	Circuit	Location
36	PF2, 28V, 5A, transponder supply	A.C. and D.C. fuse and relay panel
55	PF3, 28V, 5A, I.F.F. emergency relay unit	A.C. and D.C. fuse and relay panel
63	PF4, 28V, 5A, aerial switching unit	A.C. and D.C. fuse and relay panel
107	PF6, 28V, 5A, I.F.F. power relay	A.C. and D.C. fuse and relay panel
249	XD1, 115V single phase, 5A, transponder supply	A.C. and D.C. fuse and relay panel

TABLE 2

Equipment, location, access and air publication

Equipment	Location	Access	Air Publication
Transponder, Type 16928	Between fr.51-52 port side	87P	114J-0101-16 Part 1, Chap.2-4
Control unit, Type 16929	A2 extension panel on the port side	Via cockpit	114J-0101-16 Part 1, Chap.5
Aerial switching unit, Type 16941	Between fr.49-50 port side	69P	114J-0101-16 Part 1, Chap.7
Upper aerial	Part of cockpit canopy	Canopy	114J-0101-16 Part 1, Chap.6
Lower aerial	Underside of the aircraft between 57-59	Underside of aircraft	114J-0101-16 Part 1, Chap.6
Aerial test switch	Between fr.49-50 port side	69P	4343C Vol.1, Book 1, Sect.1 Chap.4
Failure lamp/switch assembly	Adjacent to the control unit	Via cockpit	114J-0101-16 Part 1, Chap.5
Emergency relay unit	Aft face, starboard side rear pressure bulkhead	Spine bay	–

TABLE 3

Alterations to Table 3, Chap.2 (main chapter)

CABLE ASSEMBLY CS5375/1 (10HB/21406)

Termination	Pin	Cable rating	Pin	Termination
Transponder 16928 (port equipment bay)	13	T22	B	CS5375/1 I.F.F. Emergency relay socket
	14	T22	C	
	15	T22	D	
	17	T22	E	
	18	T22	F	
	19	T22	G	
	24	T22	s	
	26	T22	H	
	27	T22	J	
	28	T22	K	
	29	T22	L	
	30	T22	M	
	31	T22	N	
	32	T22	P	
	33	T22	R	
	34	T22	S	
	35	T22	T	
	38	T22	U	
	39	T22	V	
	40	T22	W	
	41	T22	X	
	43	T22	Z	
	44	T22	AA	
	45	T22	b	
	46	T22	c	
	47	T22	d	
	48	T22	e	
	49	T22	f	
	50	T22	g	
	51	T22	h	
	52	T22	i	
	53	T22	j	
	54	T22	k	
	55	T22	m	

CABLE ASSEMBLY CS5375/1 (10HB/21406) – *continued*

Termination	Pin	Cable rating	Pin	Termination
Transponder 16928 (port equipment bay)	56	T22	n	CS5375/1 I.F.F. Emergency relay socket
	57	T22	p	
	70	T22	q	
	71	T22	r	
	88	T22	A	
	96	T22	BB	
	22	T22	TERM.2	T.B.3341/1 (port equipment bay)
	23	T22	TERM.3	
	42	T22	TERM.4	
	93	T22	TERM.3	

LOCAL WIRING

Fuse 55 (A.C./D.C. and relay panel)		T22	TERM.1	J.B. I.F.F. Emergency relay

LOCAL WIRING

Earth point E6 Frame 21		T22	TERM.2	J.B. I.F.F. Emergency relay

PLOCKET CONNECTOR MBA T931 (PORT)

Fwd pressure bulkhead I.F.F. connector 5375/2	DD	T22	Plug	Ejection seat plocket
	FF	T22	Socket	

PLOCKET CONNECTOR MBA 7931 (STB)

Fwd pressure bulkhead I.F.F. connector 5375/2	CC	T22	Plug	Ejection seat plocket
	EE	T22	Socket	

Note: For further cable information, refer to SRIM 3773