Group 3—NAVIGATION INSTRUMENTS

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WARNING . . .

Voltages in excess of 100 volts a.c. or d.c. can be dangerous under certain circumstances. Personnel should therefore ensure that the electrical system is electrically safe before any servicing is attempted. Where it is essential that tests or adjustments are to be carried out with the electrical power switched on, the greatest care must be exercised.

DESCRIPTION AND OPERATION

Introduction

1. This Group contains brief descriptive and servicing notes on the Navigation instrument installations. For detailed information on all items of equipment reference should be made to the relevant Air Publications.

2. Information on the layout and interpretation of the schematic wiring diagrams can be obtained from the General Information group contained in Book 2 immediately after Section 5 marker card. Reference should be made to the General Information group for information on all the general modifications applicable to all types of Valiant aircraft.

AIR MILEAGE UNIT (*fig.* 1)

3. The air mileage unit Mk. 4, mounted with its base flush with the outer skin of the fuselage in the air spoiler compartment, is provided with pitot and static and a 28V supply from a fuse on panel G, mounted on the radio crate. Contained in the unit is a high speed contactor which is geared to the shaft of a centrifugal fan motor. This contactor supplies a series of electrical pulses, which are proportional to the true air speed of the aircraft, to the N.B.S. Mk. 1 system, via the N.B.S. junction box, Type 343, mounted in the radio crate. The supply to the air mileage unit is taken via a radio interference suppressor.

3A. Mod. 1957 introduces an air mileage indicator at the 1st Navigator's station. Signals are fed via a suppressor and an ON/OFF switch from the control panel. A cooling air inlet is provided in the undersurface of the aircraft to port of the A.M.U. Air is ducted via a small bore pipe to the A.M.U.; the cooling air is exhausted via a similar pipe on starboard side venting through the air spoiler bulkhead.

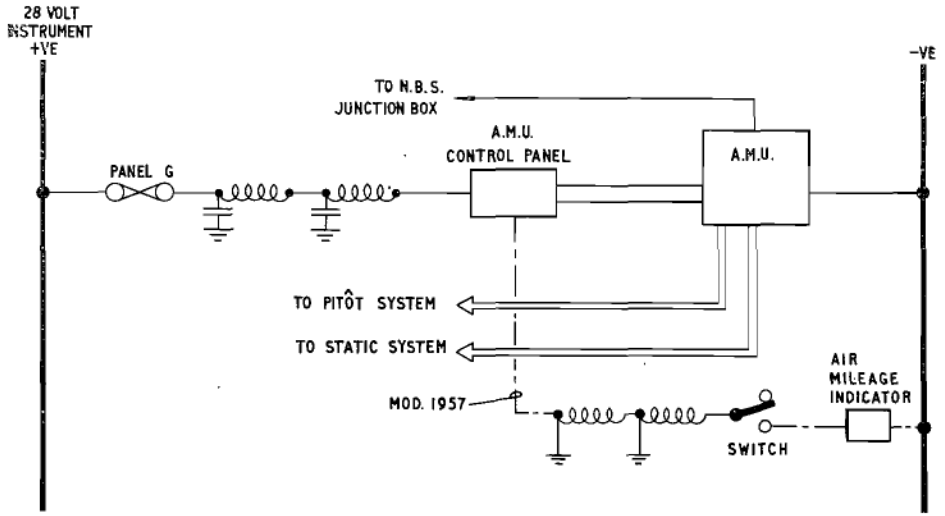

Fig. 1. Air mileage unit

PERISCOPIC SEXTANT

4. The periscopic sextant Mk. 2 is designed to be used without an astrodome in high speed pressurized aircraft. A pressure seal mounting for the sextant is attached to the roof of the aircraft forming an integral part of the structure. The mounting embodies an interlocking system which prevents the sealing hatch being opened before the sextant is in place, and an electrical heater to prevent the sextant being frozen in the mounting. A drain cock on the underside of the mounting, operated by a No. 3 compass key, allows any moisture, which may have collected inside the mounting, to be drained off. The necessary supply, to operate the heating and lighting circuits of the sextant, is obtained by plugging the sextant plug into a 2-pin socket provided at the navigator's position. When the sextent is not in use it is to be stowed in its box.

5. To insert the sextant into its mounting proceed as follows:—

(1) Slide the sextant into the mounting carrier tube until the finger catches engage. It will then be held in the retracted position.
(2) Connect the plug into the supply socket.
(3) Pull the mounting control lever down to its lower position to open the sealing plate.
(4) Press the finger catches on the mounting and slide the sextant upwards. Release the finger catches and continue the upward movement of the sextant until the finger catches engage. The sextant will then be held in the operating position.

WARNING . . .

In pressurized aircraft it is necessary to restrain the movement of the sextant, otherwise, owing to the pressure difference, the instrument may strike the mounting with sufficient force to cause damage.

6. To remove the sextant from its mounting proceed as follows:—

(1) Disconnect the supply socket.

(2) Press the finger catches together, withdraw the sextant slightly from the operating position, release the catches and withdraw the sextant to the retracted position.

(3) Push the mounting control lever upwards to close the sealing hatch.

(4) Holding the sextant, press the finger catches, withdraw the sextant from its mounting and stow it in the case provided.

PERISCOPE (Mod. 664)

7. Mod. 664 introduces a periscope Ref. No. 6B/2799 to detect the formation of condensation trails. The supply for the periscope is obtained by plugging the periscope into the sextant supply socket. When the periscope is not in use it is stored behind the N.B.S. crate aft of the starboard console.

GYRO COMPASS Mk. 4B

8. The aircraft is fitted with a gyro compass Mk. 4B which equipment combines the functions of the directional gyro and the magnetic compass. The indications shown by the master indicator, mounted on the radio crate, are stabilized by means of one of two gyro units, mounted on the instrument port and starboard blind flying panels. They are synchronized with the earth's magnetic field by a remote detector unit mounted on the port wing tip, so that a steady and accurate directional reference is always obtained. One gyro unit only is required to stabilize the master indicator and either unit may be selected by means of the gyro control panel on the port console; the other unit acts as an electrically driven directional gyro. For details of the bomb aimer's compass repeater see Chap. 8.

9. It is possible to have both gyro units disconnected from the master indicator system and acting as directional gyros. A monitoring signal to the auto-pilot Mk. 10 is taken from the master indicator direct, there being a special knob marked AUTO-PILOT provided to enable fine adjustments to the aircraft heading to be made when the auto-pilot is engaged. A further control knob provided on the master indicator, enables magnetic variation to be set on the compass so that all indicators and monitored equipment are automatically corrected. There are two transmission links with the N.B.S. equipment, one magnetic variation from the master indicator and one synchronizing signal from the compass amplifier unit.

10. A 115-volt, 3-phase a.c. supply to the installation is fed into the amplifier from the a.c. supplies power distribution box. A 28-volt d.c. supply is taken via the gyro compass junction box from panel G to supply the deviation corrector on the detector unit.

◄ **10a.** Mod. 2841 introduces a supply phase-failure indicator across the a.c. supply lines to the equipment. This indicator is mounted on the a.c. manual change-over switch box on the radio crate at the A.E.O.'s position. If the indicator shows failure of the supply, the No. 2 radar inverter (Type 350) output has probably failed and the No. 3 inverter should be switched in to take its place. ►

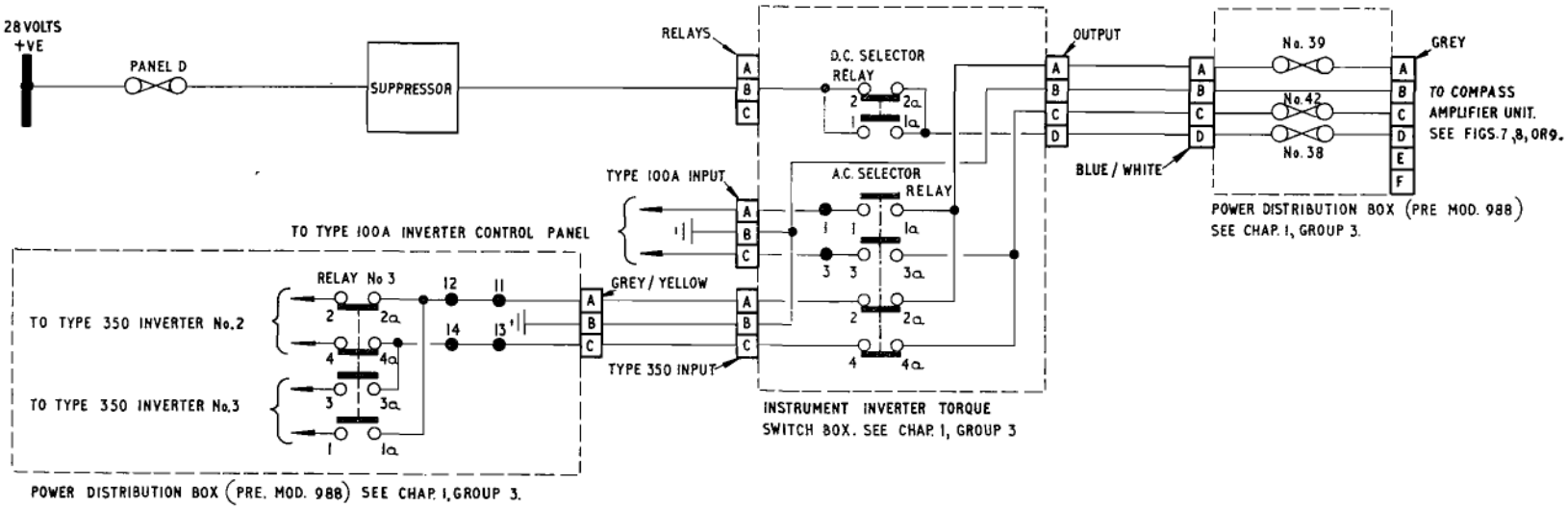

Fig. 2. Gyro compass Mk. 4B power supplies (pre-Mods. 988 and 2040)

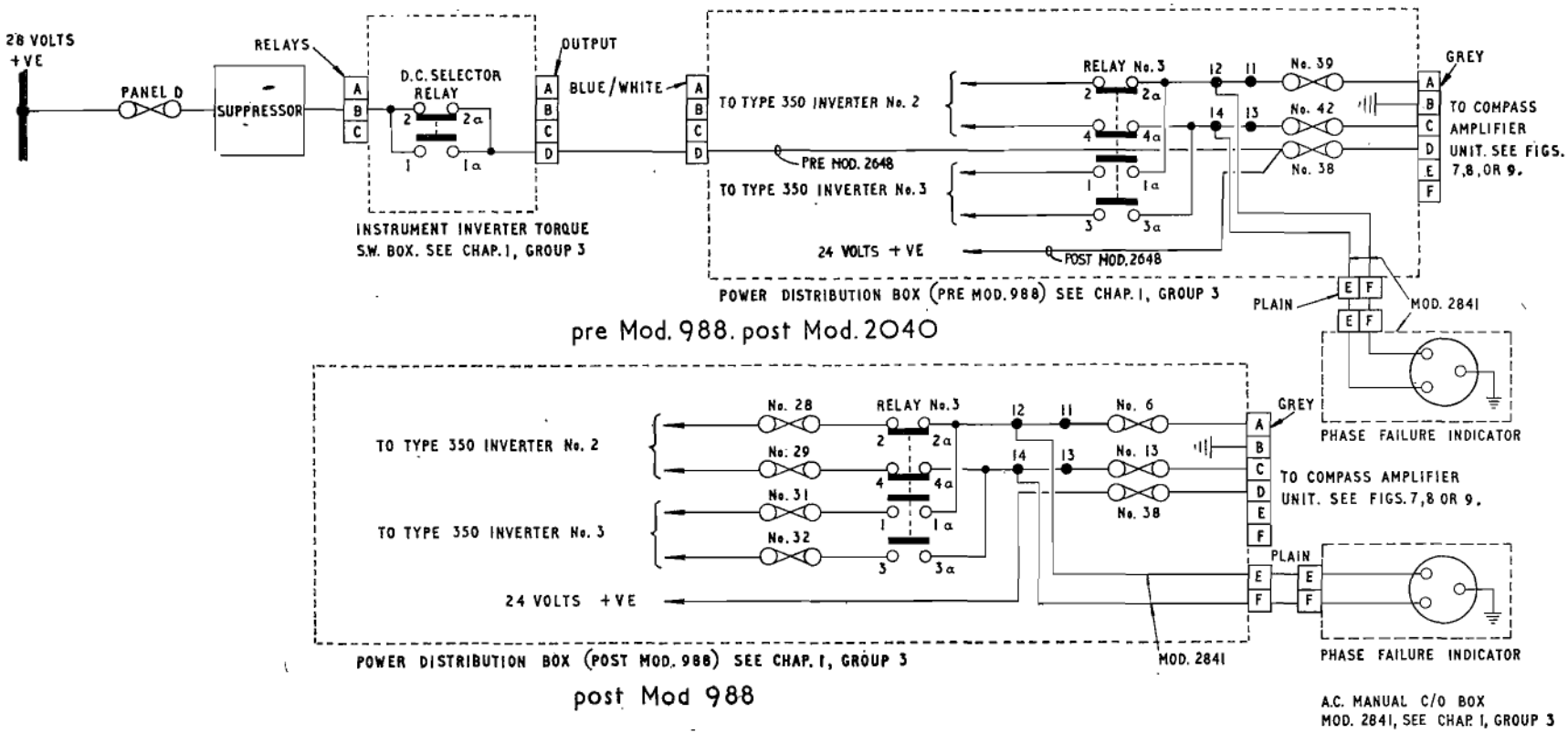

Fig. 3. Gyro compass Mk. 4B power supplies (post Mods. 988 and 2040)

Gyro compass Mk. 4B cut-out (Mod. 2190 (*fig.* 4)

11. Mod. 2190 introduces facilities for switching to directional gyro in lieu of magnetic monitoring to reduce errors in the compass during turns when using the N.B.S. system. The magnetic monitoring can be cut-out manually by using the D.G. switch on the compass control panel or automatically from the H2S system. A switch is provided on the radio crate to isolate or select this automatic facility as required.

12. Automatic cut-out is achieved by connecting the cut-out system, to the 6 deg. roll error cut-out on the scanner platform. The connection is made at the ST-BY terminal B3 of the SCANNER STABILIZE switch. When the aircraft angle of bank exceeds 6 deg. either way, the supply to the coil of ◄ the cut-out relay R1 (Ref. Z.530453 and ► mounted in the power distribution box) is broken by the 6 deg. contacts in the roll limit box on the scanner platform. Contacts ◄ R1/1 and R1/2, connected in parallel, ► close to connect a 28-volt supply from the H2S switch at ON to the manually operated compass cut-out switch on the radio crate. If this switch is at D.G. automatic cut-out is selected, the 28-volt supply is connected to a relay in the G4B compass amplifier; this relay breaks the magnetic monitoring circuit and puts the compass on directional gyro. If the switch is at G4B, automatic cut-out is isolated, the compass will be continuously on magnetic monitoring irrespective of the angle of bank of the aircraft, unless D.G. has been selected on the Compass Control Panel.

Note . . .

(1) *During erection of the scanner gyro, with the SCANNER STABILIZE switch at ST-BY the 6 deg. roll limit cut-out will be overrode and the compass cut-out, relay* ◄ *R1 will remain energized irrespective* ► *of the position of the angle of bank of the aircraft or the position of the scanner platform in roll.*

(2) *On introduction of Mod.* 2190 *the* ◄ 28-*volt supply to the contacts R1/1 and R1/2 of the compass cut-out relay was* ► *erroneously obtained from the N.B.C. switch. This error was corrected by Mod* 2533 *which obtains the supply from the H2S switch. All aircraft fitted with Mod.* 2190 *should also have Mod.* 2533 *incorporated.*

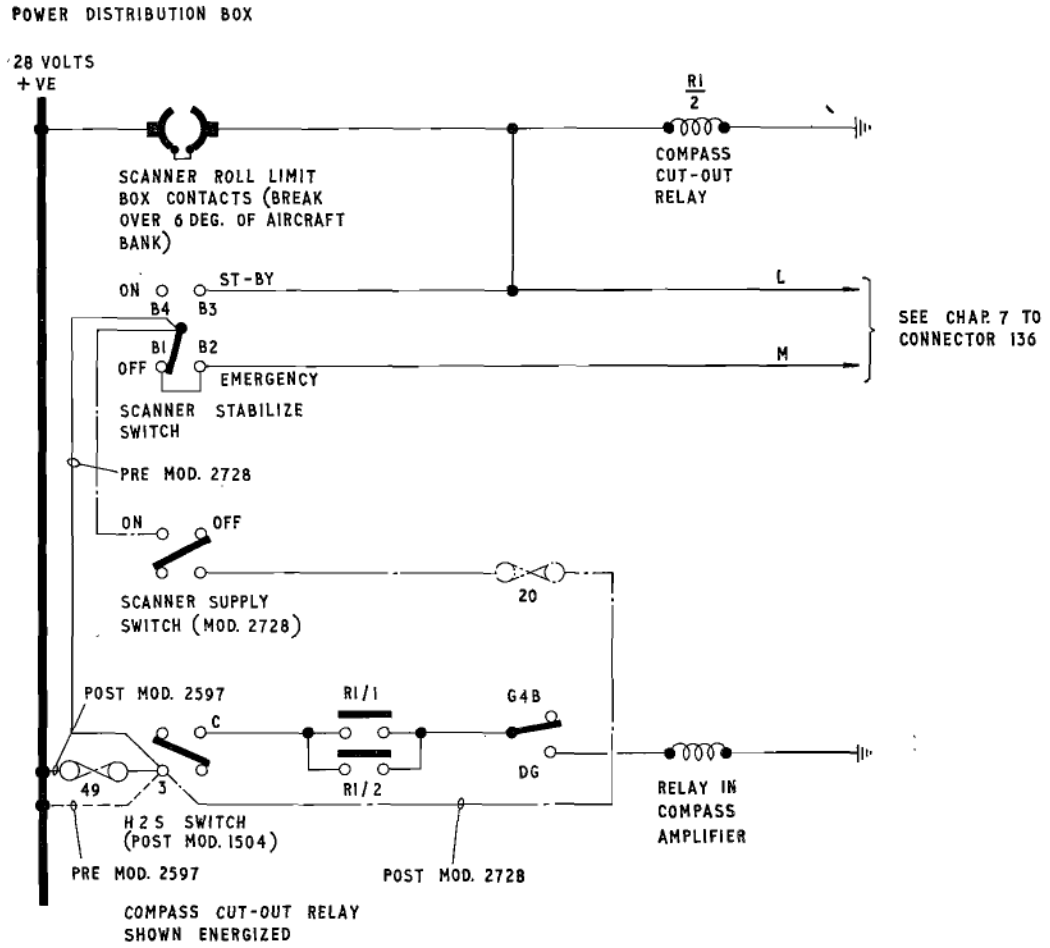

Fig. 4. Gyro compass Mk. 4B cut-out (Mod. 2190)

Table 1

List of equipment

Instrument	No. off	Type, Mk. or Ref. No.	Location
Altimeter	1	Mk. 19A (post Mod. 1171, pre-Mod. 2683) Mk. 19B (post Mod. 2683)	Centre of radio crate
Cabin altimeter	1	Mk. 18 (pre-Mod. 1171)	Centre of radio crate
Cabin altimeter	2	Mk. 21, 6A/4245 (post Mod. 1972, pre-Mod. 2607) Mk. 21A, 6A/5463 (post Mod. 2607)	Each blind flying panel
Air mileage unit:—			
Control panel	1	6B/471	Radio crate
A.M.U.	1	Mk. 4, 6B/555	Air spoiler compartment at forward end of bomb bay
Suppressor	1	5C/2866, Type B4	Radio crate
Air mileage indicator (post Mod. 1957)	1	6B/293	Navigator's crate
Gyro compass:—		G4B	
◄ Detector unit	1	6B/1993 { Type B (pre-Mod. 2888) Type C (post Mod. 2888)	Port wing tip ►
Amplifier	1	6B/562	Starboard side of cabin
Amplifier mounting tray	1	Type A. 6B/437	Starboard side of cabin
Control panel	1	6B/408	Port console
Gyro unit	2	6B/561	Port and starboard blind flying panels
Master indicator	1	6B/634 Type B (pre-Mod. 2250) 6B/2644 Type C (post Mod. 2250)	Radio crate
Suppressor	1	Type G5, 5CY/5151	Radio crate
Junction box	1	Vickers 66036-Sht. 37	Port wing tip
Junction box (pre-Mod. 785) (post Mod. 785)	1 2	Vickers 67399-Sht. 111	Radio crate
Periscopic sextant	1	6B/559 (pre-Mod. 1648) 6B/2838 (post Mod. 1648)	Cabin roof
Periscope	1	6B/2799	Cabin roof

SERVICING

Introduction

13. For detailed information on the servicing of all items of equipment reference should be made to the relevant Air Publications.

14. A detailed description of all the general tests to be applied to all aircraft electrical circuits can be found in the General Information group contained in Book 2 immediately after Section 5 marker card.

AIR MILEAGE UNIT

15.

(1) Connect a 28-volt d.c. supply to the external connection.

(2) Disconnect the plug and socket at the control unit.

(3) Connect a 20-volt test lamp across pins A and B.

(4) Select the flight instrument master switch to ON and check that the test lamp comes on, and goes off when the switch is selected to OFF.

◄(5) Check that cooling air inlet and outlet are free from obstruction.►

PERISCOPIC SEXTANT

16.

(1) Connect a 28-volt d.c. supply to the external connection.

(2) Connect a 28-volt test lamp across pins L and N of the sextant supply socket and check that the lamp comes on.

GYRO COMPASS Mk. 4B

Setting-up

Note . . .

ON NO ACCOUNT MUST A D.C. SUPPLY OR 'MEGGER' BE CONNECTED TO THE DETECTOR UNIT.

17. To carry out a functional test on the compass system proceed as follows:—

(1) Connect 28-volt and 112-volt (post Mod. 2040) (28-volt only pre-Mod. 2040) d.c. supplies to the external connections.

(2) Post Mod. 2040 select No. 2 inverter switch to ON. Pre-Mod. 2040 select the flight instrument master switch to ON. Post Mod. 2841, check that the phase failure indicator indicates normal working conditions.

(3) Post Mod. 2190 select the compass cut-out switch to G4B.

(4) Allow the equipment to run for 20 mins. before making any adjustments.

(5) Check that both compensator lamps in the amplifier are glowing.

(6) Select the port compass and check that a dot or cross appears in the annunciator windows of the port compass and master indicator. Check that the letters DG appear in the starboard compass window.

(7) Rotate the port compass synchronizing knob until a dot and cross appear alternately, or the annunciator window appears black.

(8) Check that the heading on the compass card is approximately correct with the position of the aircraft.

(9) Set the compass card to 10 deg. to port from the indicated heading by means of the synchronizing knob. Check the time taken for the compass to return to the heading, within $\frac{1}{2}$ deg. This time should not be longer than 5 minutes.

(10) Check that the master indicator pointer follows the indication of the port compass and agrees within ± 1 deg.

(11) Repeat items (9) and (10) with the compass card set to 10 deg. to starboard.

(12) Select the compass selector switch to OFF and check that D.G. appears in the annunciator window.

(13) Repeat the above test for the starboard compass.

◄(14) Switch No. 2 inverter OFF (Post Mod. 2040) or select instrument master switch OFF (Pre Mod. 2040); check, post Mod. 2841, that the phase failure indicator indicates supply failure.►

Compass swinging

18. The compass 'swinging' is to be carried out as stated in A.P.1234B, Vol. 2, Sect. 5, Chap. 4, using the Watts' Datum Compass. The compass is to be 'swung' on 12 headings.

◄**19.** To align the aircraft, fore and aft; compass sighting posts are provided. The forward sighting post (25SR/95472) is to be fitted to the nose jacking pad at Stn. 370 and the aft sighting post (upper section 26SR/95470, lower section 26SR/95471) is to be fitted to Stn. 1013.►

The aft sighting post is fitted to the aircraft by inserting it into the stowage provided just rear of the rear fuselage access. The forward sighting post is fitted with four bolts for attaching the sight to the jacking pad. A spirit level is fitted to the sighting post to enable the sighting post to be positioned vertically. When the two sighting posts are fitted, they are to be lined up by adjusting the aft sighting post.

BLIND-FLYING PANELS

20. Provision is made for the setting-up of the blind-flying panels with the aircraft axis, the frame work, to which the blind-flying panels are fitted, being adjustable. An adjusting screw is fitted, behind the instruments centre panel, to the top member of the frame work. Movement of this adjustment enables the blind-flying panels to be tilted forward or to the rear. The blind-flying panels are to be set-up in accordance with the instructions given in A.P.4377A, Vol. 1, Book 1, Sect. 1, Chap. 1.

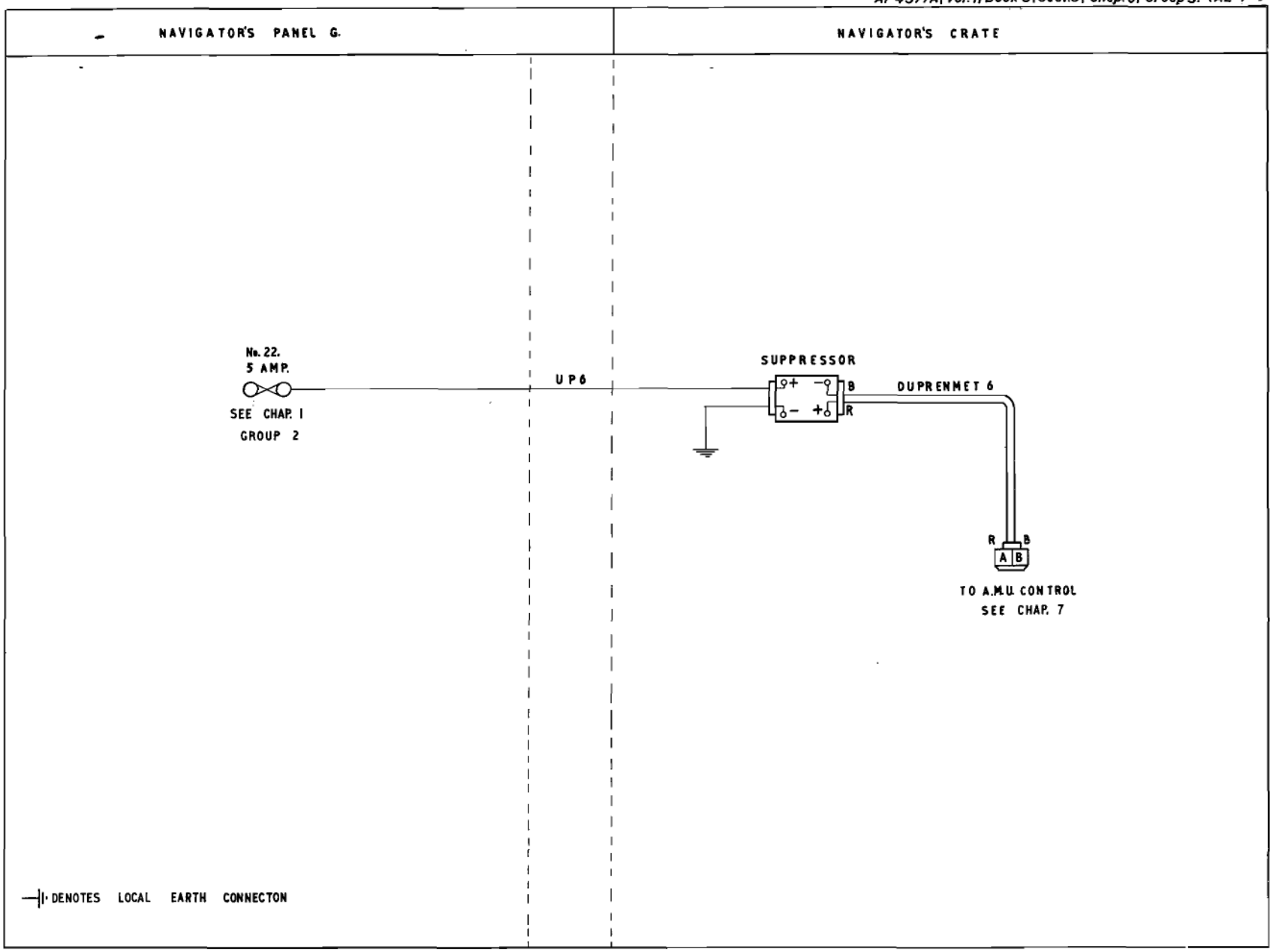

Fig. 5. Air mileage unit supply

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8541 355132 2/59 631 C.B.&S.LTD. GP.924

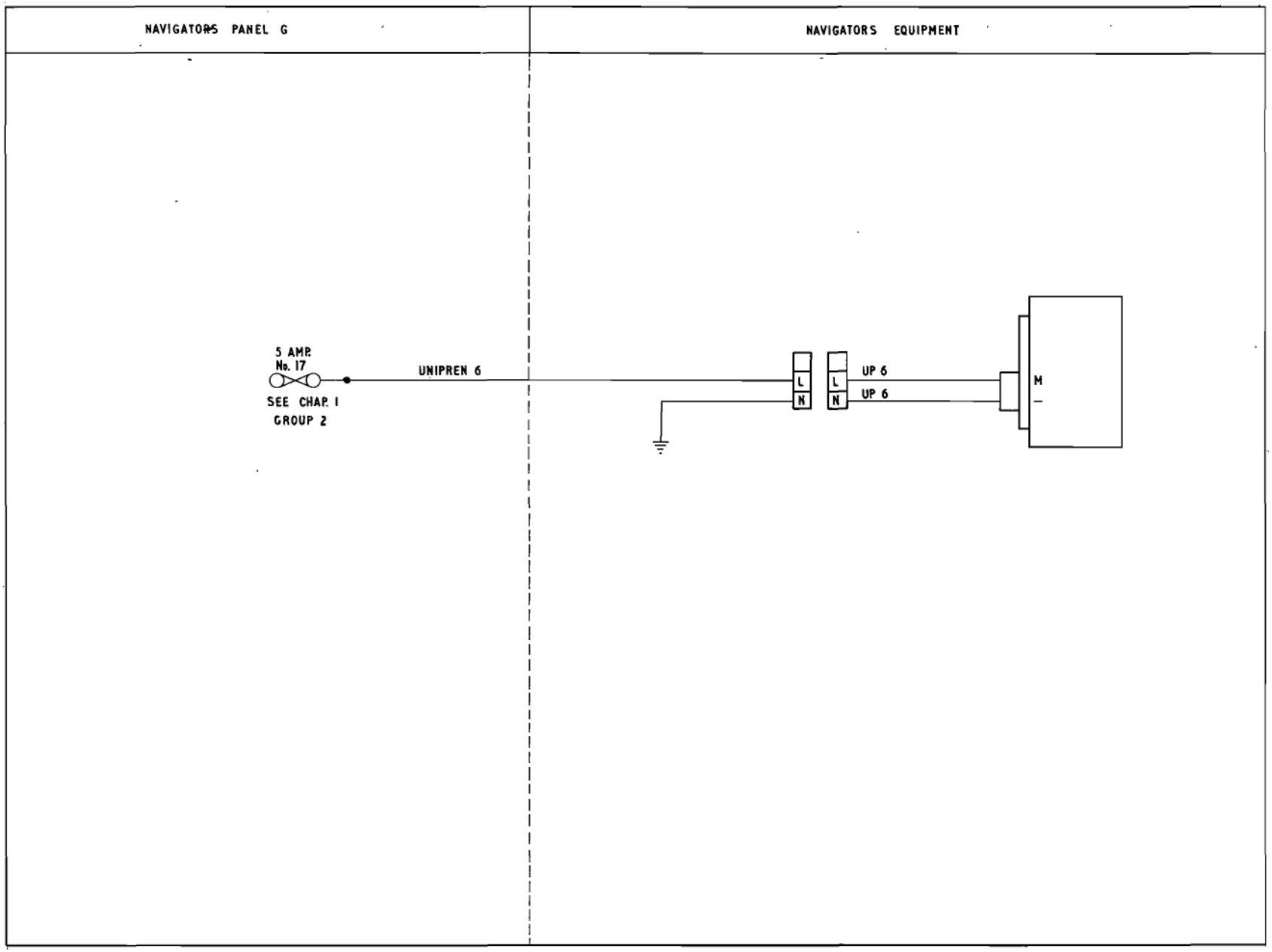

Fig. 6. Periscopic sextant

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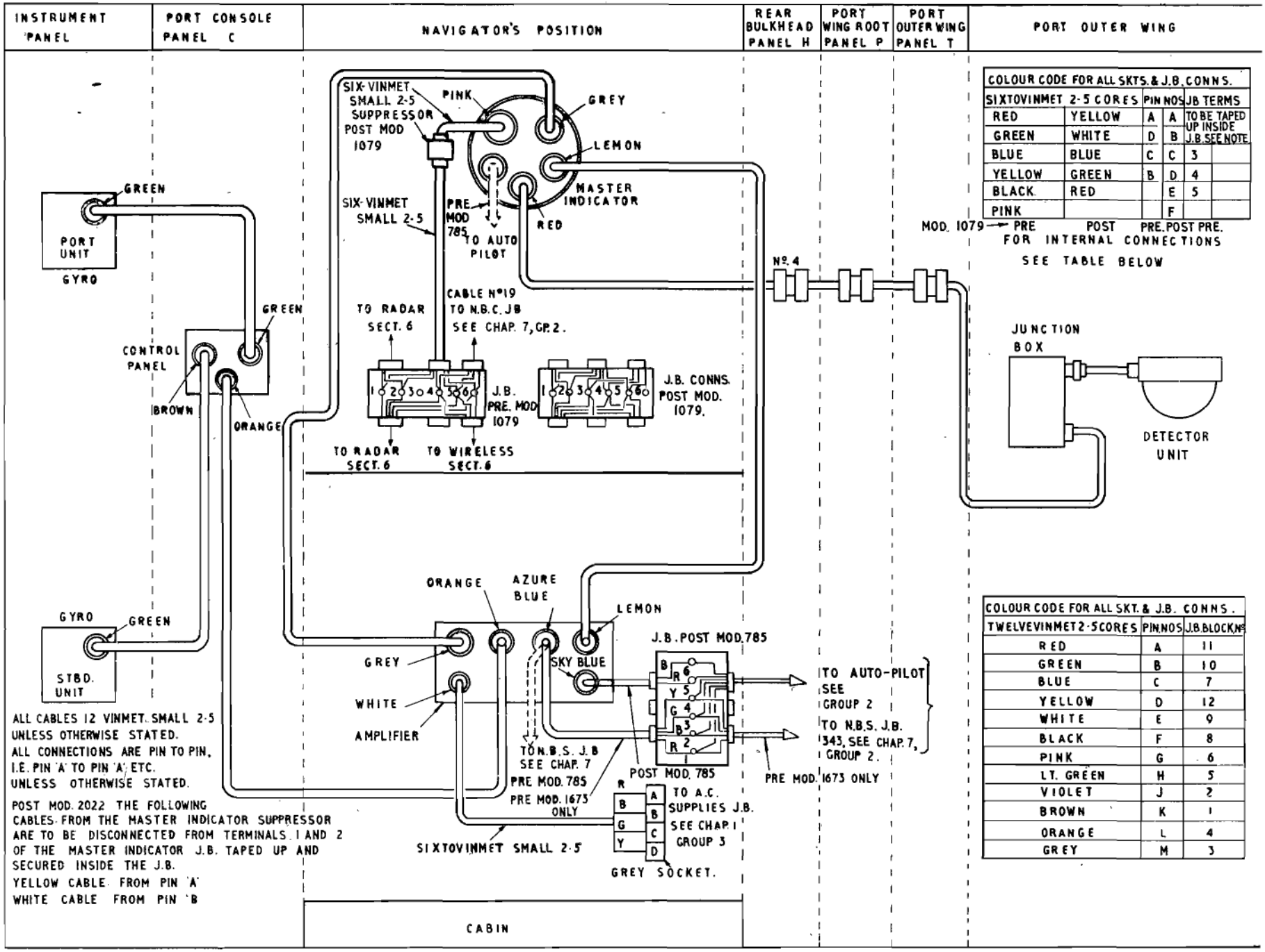
67436 SHT. 152-D
75836 SHT. 152-B



COLOUR CODE FOR ALL SKTS. & J.B. CONNS.					
SIXTOVINMET 2-5 CORES		PIN NOS		J.B TERMS	
RED	YELLOW	A	A	TO BE TAPED UP INSIDE J.B. SEE NOTE	
GREEN	WHITE	D	B		
BLUE	BLUE	C	C	3	
YELLOW	GREEN	B	D	4	
BLACK	RED		E	5	
PINK			F		

COLOUR CODE FOR ALL SKT. & J.B. CONNS.		
TWELVEVINMET 2-5 CORES	PIN NOS	J.B. BLOCK N°S
RED	A	11
GREEN	B	10
BLUE	C	7
YELLOW	D	12
WHITE	E	9
BLACK	F	8
PINK	G	6
LT. GREEN	H	5
VIOLET	J	2
BROWN	K	1
ORANGE	L	4
GREY	M	3

Fig. 7. Gyro-compass (pre Mods. 2022, 2190)

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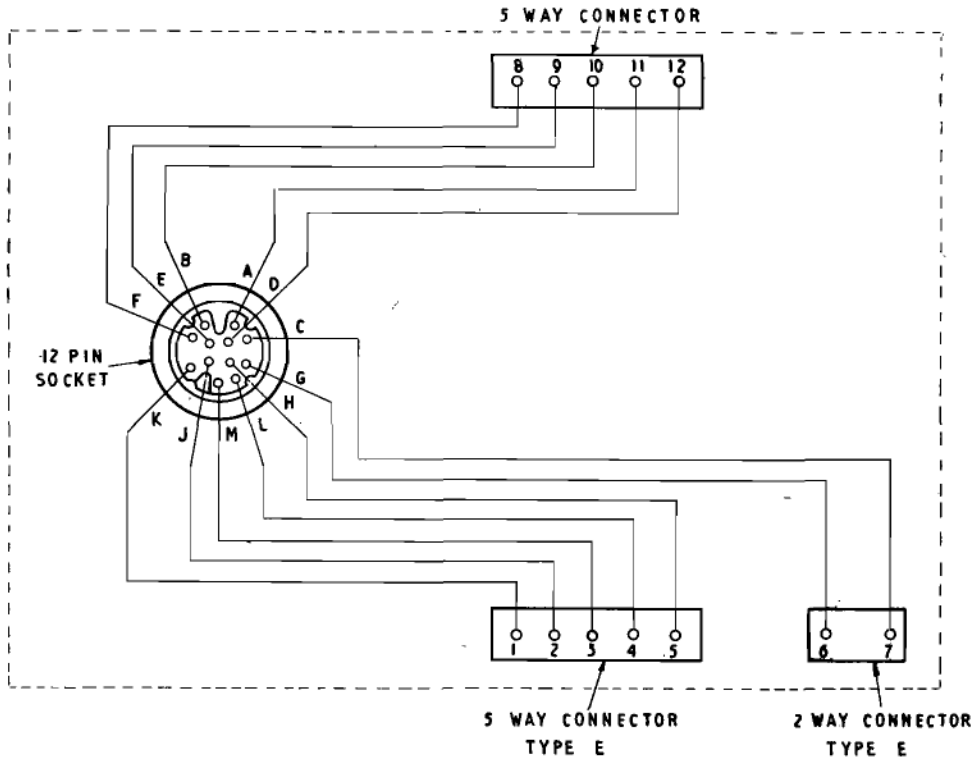
CONNECTIONS MADE FROM THE TWELVE CORES REMOVED FROM A LENGTH OF TWELVEVINMENT SMALL 2·5 CABLE (SEE TABLE)



PIN	TERMINAL	COLOUR
A	11	RED
B	10	GREEN
C	7	BLUE
D	12	YELLOW
E	9	WHITE
F	8	BLACK
G	6	PINK
H	5	L.T. GREEN
J	2	VIOLET
K	1	BROWN
L	4	ORANGE
M	3	GREY

Fig. 10. Gyro-compass outer plane terminal box

RESTRICTED

LIST OF APPENDICES

Appendix 1

NAVIGATION INSTRUMENTS (POST MOD. 3140)

Introduction

1. Mod. 3140 introduces a periscopic sextant mounting Mk. 1F (Ref. 6B/3469) in lieu of the Mk. 1A (Ref. 6B/2586). The Mk. 1F mounting has two 40-watt heaters to prevent the sextant being frozen in the mounting, the Mk. 1A mounting has only one heater. An improved system of drainage is incorporated in the Mk. 1F mounting.

Operation

2. The operation and servicing of the sextant is not affected by this modification and is as described in paras. 4 and 16 of this group.