GROUP 4.A
GYRO GUNSIGHT AND CAMERA RECORDER

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LIST OF ILLUSTRATIONS

Introduction

1. This group contains a description of the Mk.8 gyro gunsight and camera recorder installed in this aircraft, with routeing and theoretical diagrams of the circuit. For a general description of the aircraft's instrument installation, refer to Group 1.A of this chapter.

Equipment employed

2. The equipment employed in the gyro gunsight and camera recorder installation is listed below, together with the appropriate Air Publications to which reference should be made for detailed descriptions and information on the servicing required to maintain the installation in an efficient condition.

Gyro gunsight Mk.8 Gyro gunsight junction box, Type B, Mk.11 Selector/dimmer, Type S, Mk.8 Ballistics units, Type BL, Mk.1 Anti topple units, Type AT, Mk.1 ◀ Radar/manual units, Type RM, Mk.3 or Mk.3A *(Mod.1339)* ▶ Manual ranging controls, Type T.1, Mk.2 Altitude units, Type AL, Mk.1 Relay amplifier units, Type RA, Mk.1	... ... A.P.1275E, Vol.1
Suppressors, Type F.2 and F.5	A.P.4343C, Vol.1, Book 3, Sect.5
Voltage regulators, Type 22 and 22A	A.P.4343B, Vol.1, Book 1, Sect.1
Gyro gunsight master switch, Rotax Type D.5404	A.P.4343C, Vol.1, Book 1, Sect.1
Camera recorder, Mk.3	A.P.1355D, Vol.1, Sect.3

DESCRIPTION

Gyro gunsight (Code GS)

3. The gyro gunsight in this aircraft is supported on a fixed gunsight mounting, and a camera recorder may be fitted when required. The installation includes an anti-topple unit, which automatically re-erects the gyro when it has been toppled by violent manoeuvring of the aircraft. This unit is mounted on a bracket attached to the cabin floor, on the port side. Manual ranging controls and control units are included in the equipment, and these, with the gunsight and camera recorder, are all interconnected by suitable cables to a junction box situated on the port side of the flying control casing.

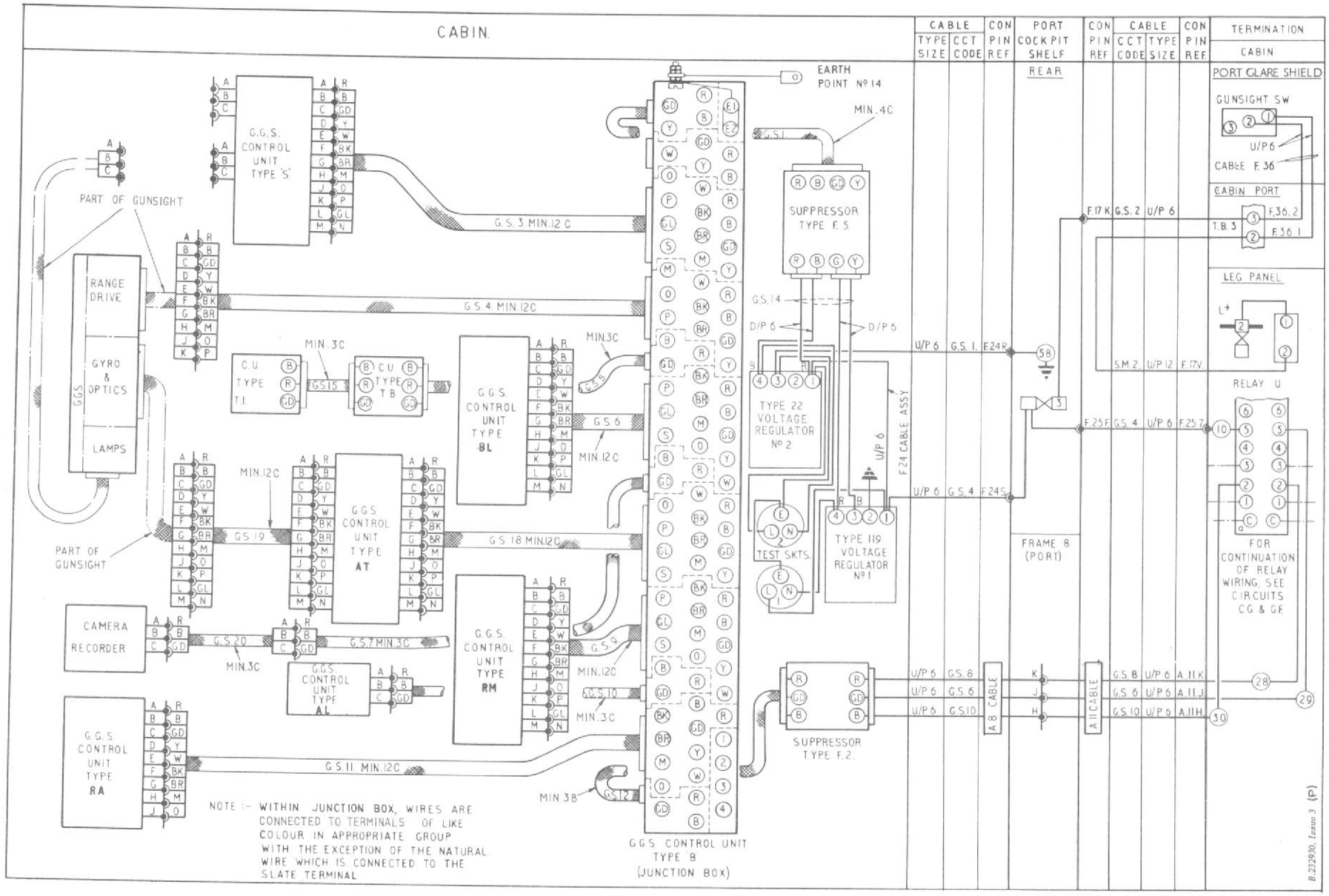

Fig. 1 Gyro gunsight and camera recorder (routeing)

Combat controls

4. A selector-dimmer, embodying a selector switch and a dimmer by which the pilot may control the degree of illumination and the type of graticule display of the sight, is mounted on the fixed portion of the cabin port shelf. When the selector-dimmer is set, manual ranging control may be effected by rotation of a twist grip at the top of the throttle lever. Operation of the twist grip, which incorporates a potentiometer, causes a varying voltage to be applied, via the junction box, to a range drive motor in the sighting head.

Pre-set controls

5. The electro-mechanical linkage between the twist grip control and the sight includes a radar/manual control unit, and a relay amplifier unit. By the switching action of high speed relays in the relay amplifier, the supply from the twist grip is fed, subject to automatic adjustment imposed by a feed-back circuit in the radar/manual control unit, to the range drive motor. The radar/manual control unit is mounted on a bracket attached to the starboard side of the flying control casing; the relay amplifier unit is mounted on a platform attached to the cabin floor, on the port side, behind the pilot's seat.

◀ **Note . . .**

Mod.1339 alters the feed back resistor in the radar/manual control unit from 4·7 kilohms to 10 kilohms. This makes the radar/manual control unit Type R.M. a Mk.3A. ▶

6. Also included in the installation is an altitude unit, and a ballistics unit. The altitude unit, which is connected to the aircraft's pressure head system, applies compensation for the effect of changes of atmospheric pressure to the computed aiming allowances; the ballistics unit applies allowances to suit the type of ammunition being used. Both these units are pre-set. The altitude unit is mounted on the port side of frame 14; the ballistics unit is mounted between frames 12 and 13, on the port side.

Power supply

7. The power supply is taken from a fuse in the leg panel which feeds the gunsight master switch; the master switch is on the top instrument panel, at the starboard side. Since the accuracy of the gunsight's computing system depends on the voltage of the supply remaining constant, the equipment is supplied through two voltage regulators. These are mounted, one above the other, on a structure attached to the cabin floor on the port side, behind the pilot's seat. One of the regulators incorporates a pre-set voltage control; the output of the other is set by a control in the ballistics unit.

8. To eliminate radio interference, the regulated supply is taken through a suppressor; this is mounted on a bracket situated adjacent to the voltage regulators. Fig.1 and 2 are routeing and theoretical diagrams of the circuits. Full descriptions of the gyro gunsight and its equipment will be found in A.P.1275E, Vol.1. Descriptions of the camera recorder, and of other equipment associated with the gunsight installation, will be found in the appropriate Air Publications listed in paragraph 2 of this group.

Gunsight mounting

9. The fixed mounting of the gunsight is a machined casting which projects aft near the centre line of the aircraft, above the instrument panel. At its forward end the casting is bolted to the cross beam of frame 8, and at its centre it is anchored to the instrument panel mounting tube which extends across the top of frame 8. A light alloy packing piece is interposed between the seating face and the gunsight for initial alignment.

Camera recorder

10. The camera recorder is secured in

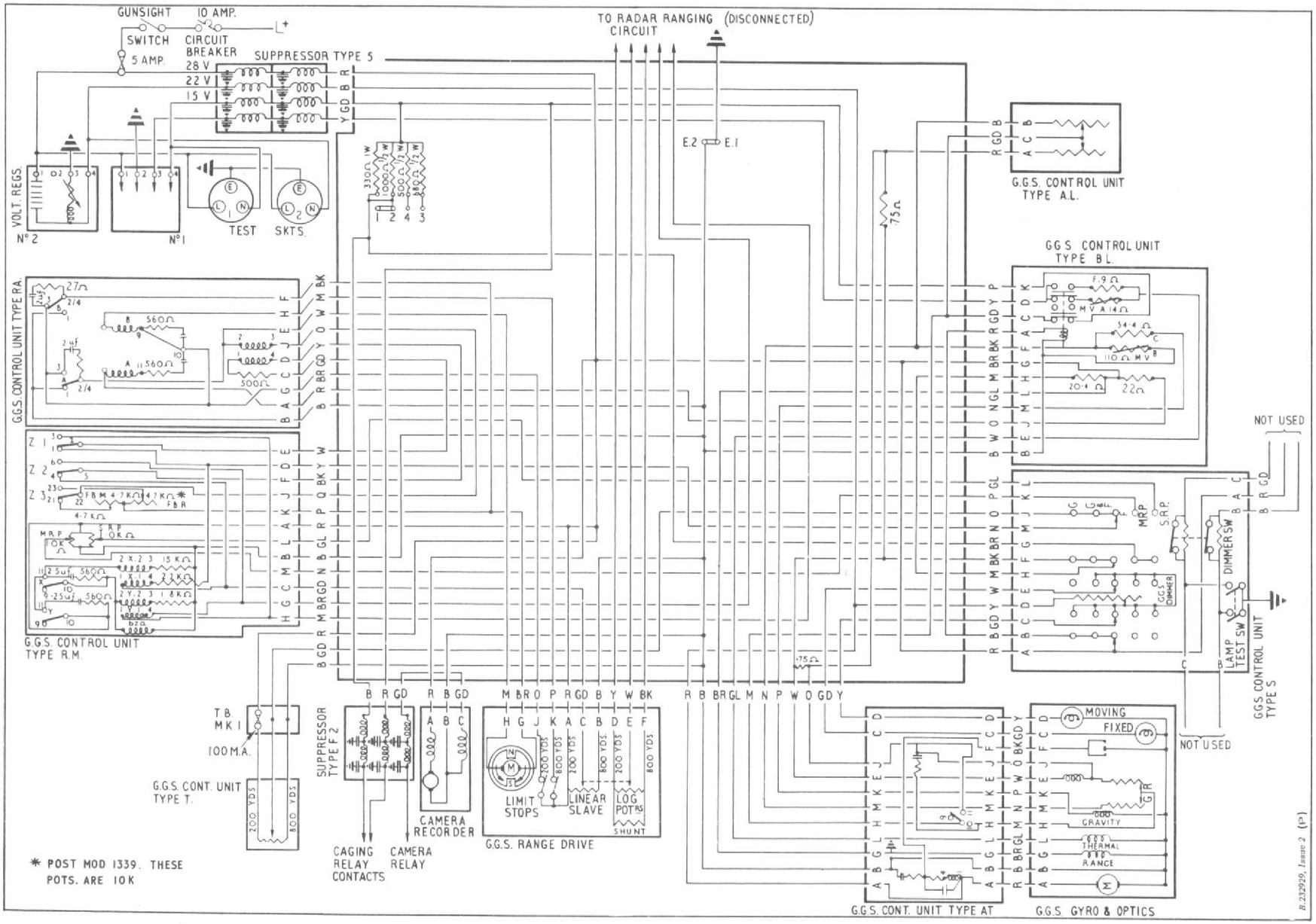

Fig. 2 Gyro gunsight and camera recorder (theoretical)

position on the gunsight by spring-loaded lugs. Its operation is controlled by the gyro caging and camera relay, in the camera gun circuit *(Group G.1 of Sect.5, Chap.1)*. When energized, this relay completes the supply circuit from the voltage regulators and suppressor to the solenoid of the camera recorder claw mechanism. The claw mechanism then draws the film across the lens. By this means, the target and graticule display on the gunsight reflector is recorded by the film. When not in use, the camera recorder is kept in a stowage compartment on the starboard side of the cabin.

SERVICING

General

11. Information on the standard testing and servicing procedure for the gyro gunsight and camera recorder is given in the Air Publications listed in paragraph 2. Before servicing or removing any item of equipment, the aircraft must be rendered electrically safe, as described in Sect.5, Chap.1, Group A.1.

REMOVAL AND ASSEMBLY

General

12. The method of removing the camera recorder will be self-evident, since this unit is secured to the gunsight by spring-loaded lugs. The recommended method of removing the gunsight from its mounting is described fully in A.P.1275E, Vol.1. The rest of the equipment may be removed without difficulty once access to it has been gained.

Appendix 1

SERVICING, TESTING AND HARMONIZATION OF GYRO GUN SIGHT

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LIST OF ILLUSTRATIONS

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SERVICING

General

1. This section describes the first line servicing which can be carried out on the G.G.S. Mk.8S installation. Servicing should be carried out in the sequence detailed below.

Clean glass surfaces *(sighting head)*

2. Ensure that the reflector, the sunscreen, and the exposed surfaces of the lenses are clean. Great care must be taken to avoid scratching the lenses during cleaning and for this operation a soft lint-free cloth is recommended.

Lubrication

3. Lubricate sparingly the pivot points and bearing surfaces of the sunscreen operating mechanism with oil, OX14 *(D.T.D. 822A) (Ref. No.34B/9100589).*

Drying cells

4. Ascertain whether the silica gel is due for renewal in the drying cells of the sighting head and control units, Types R.A. Mk.2 and R.M. Mk.3A. The crystals visible behind the inspection window will be pink in colour when the drying agent is saturated. Also inspect the condition of the desiccator *(8B/3759)* of the A.T. Mk.1S and replace if necessary.

5. It is necessary to remove the drying cell from the sighting head when the silica gel is due for removal. To do this, remove the four screws holding the drying cell, unscrew the inspection window *(do not lose the rubber washer)* and shake out the silica gel.

6. While the drying cell is detached, examine the gauze filters at the back of the cell and ensure that they have been making good contact with the rubber grommets on the sighting head body.

7. Re-charge the cell with fresh silica gel, screw home the inspection window *(8B/3514)* to make an air-tight seal on the rubber washer *(8B/3515)* and refit the drying cell to the sight body.

8. In the control units, Types R.A. Mk.2 and R.M. Mk.3A, the drying cell is secured to the mounting plate by four screws and the silica gel crystals are contained in a cellophane tube which is placed in a gauze tube. To re-charge the drying cell with fresh silica gel, unscrew the inspection window *(8B/3514)*, remove the saturated crystals and refill with a cellophane tube *(8B/3729 and 8B/3730 respectively)* containing fresh silica gel. Screw home the inspection window to make an air-tight seal.

SYSTEM TESTING

Test equipment

9. The following test equipment is required:—

(1) G.G.S. test set, Mk.5, Type 1 *(Ref. No.8B/3324)*

(2) Collimator, Type A *(Ref. No.8B/5215)*.

(3) Testmeter, Type D.

(4) G.G.S. test set, Mk.5, Type 3 *(Ref. No.8B/3326)*.

Tests to be carried out with the test set, Type 1

Preparation

10. (1) Disconnect the two sight plugs from the supply sockets in the aircraft.

(2) Connect the test set, Type 1, plugs to the installation sockets, and test set sockets to the corresponding sight plugs, using the appropriate connecting cables supplied with the test set. The test set plugs and sockets are marked GYRO AND OPTICS and RANGE DRIVE respectively.

Note...

When using the test set, Type 1 with the G.G.S. Mk.8R, the special Mk.8 cable adapters must be used for the GYRO AND OPTICS connections, since the plug orientation of the G.G.S. Mk.8R differs from that of other marks of gunsights. This is due to the incorporation of the anti-topple device in the G.G.S. Mk.8R.

Resistance tests

11. With the testmeter, Type D, perform resistance tests for the various ranges in Table 1.

TABLE 1

G.G.S. range resistances

Range control setting (yards)	Range: Resistance in ohms between sockets H and J on Gyro and optics	Gravity: Resistance in ohms between sockets H and M on Gyro and optics
200	Zero to 1.3	Zero to 1.4
300	7.4 to 12.6	11.46 to 17.08
400	16.7 ro 21.9	22.02 to 26.95
500	26.3 to 31.5	30.34 to 34.86
600	36.4 to 41.6	33.39 to 37.6
700	49.4 to 54.6	33.39 to 37.6
800	63.0 to 65.6	33.39 to 37.6

Performance tests

12. With the test set, Type 1 connected in the circuit as detailed in para.10, switch ON the G.G.S. installation and allow to operate for a period of approximately ten minutes. This warm-up period is to allow the output of the voltage regulators to become stable in operation.

Setting-up the Type 22 voltage regulator

13. (1) Check the aircraft d.c. supply voltage, this should be 28V ± 1V.

(2) Set the dimmer control RV1 on the G.G.S. control unit S Mk.13S to fully bright and check that the fixed and moving graticules on the sighting head are illuminated.

(3) Connect the test set, Type 1 wander plugs to the GYRO AND OPTICS sockets A *(red, positive)* and B *(blue, negative).*

(4) Adjust the output of the regulator to read 22V on the test set meter.

Setting-up the Type 22A or 119 voltage regulator

14. (1) Ensure the aircraft d.c. supply voltage is 28V ± 1V.

(2) Select G1 on the S Mk.13S.

(3) Set range to 550 yd.

(4) Connect the test set, Type 1 wander plugs to GYRO AND OPTICS sockets H *(red, positive)* and B *(blue negative).*

(5) Remove the blanking cap from RV1 on the B Mk.14S and adjust RV1 to read 17.6V on the test set meter. Replace the blanking cap.

Note...

If a voltage regulator, Type 119 is fitted, adjust the regulator to read 17.6V on the test set meter. On aircraft fitted with a Type 119 voltage regulator, the potentiometer RV1 on the B Mk.14S is disconnected and the flying leads insulated to prevent shorting.

(6) Select G2 on the S Mk.13S.

(7) Remove the blanking cap from RV2 on the S Mk.13S and adjust RV2 to read 18.5V on the test set meter. Replace the blanking cap.

To check range drive circuits

15. (1) Connect test set, Type 1, wander plugs to RANGE DRIVE sockets A *(red, positive)* and B *(blue, negative).* Test set meter should read aircraft supply voltage.

(2) Connect wander plugs to sockets C positive and B negative. As the range is varied from 200 yd to 800 yd in all modes the test set meter should read aircraft supply voltage at 200 yd decreasing smoothly to zero at 800 yd.

Note...

Range is varied in the 'Bombs' mode by the Bombs potentiometer RV3 on the S Mk.13S.

(3) Connect wander plugs to sockets J positive and B negative. As the range is varied from 800 yd to 200 yd in all modes, the test set meter should read aircraft supply voltage except when range is hard over on 200 yd when meter should read zero.

(4) Connect wander plugs to sockets K positive and B negative. As the range is varied from 200 yd to 800 yd in all modes, the test set meter should read aircraft supply voltage except when range is hard over on 800 yd when meter should read zero.

(5) Connect wander plugs to sockets H positive and G negative. As the range is varied from 200 yd to 800 yd in all modes, the test set meter should read an approximately constant voltage over the range till 800 yd when the meter will read zero. The voltage will depend on the rate of change of range.

(6) Connect wander plugs to sockets G positive and H negative. As the range is varied from 800 yd to 200 yd in all modes, the test set meter should read an approximately constant voltage over the range till 200 yd when the meter should read zero.

To check gyro range circuit

16. (1) Check that rotation of the dimmer control RV1 on the S Mk.13S. on both displays in all modes, gives smooth reduction in brightness.

(a) Connect test set, Type 1, wander plugs to GYRO AND OP-

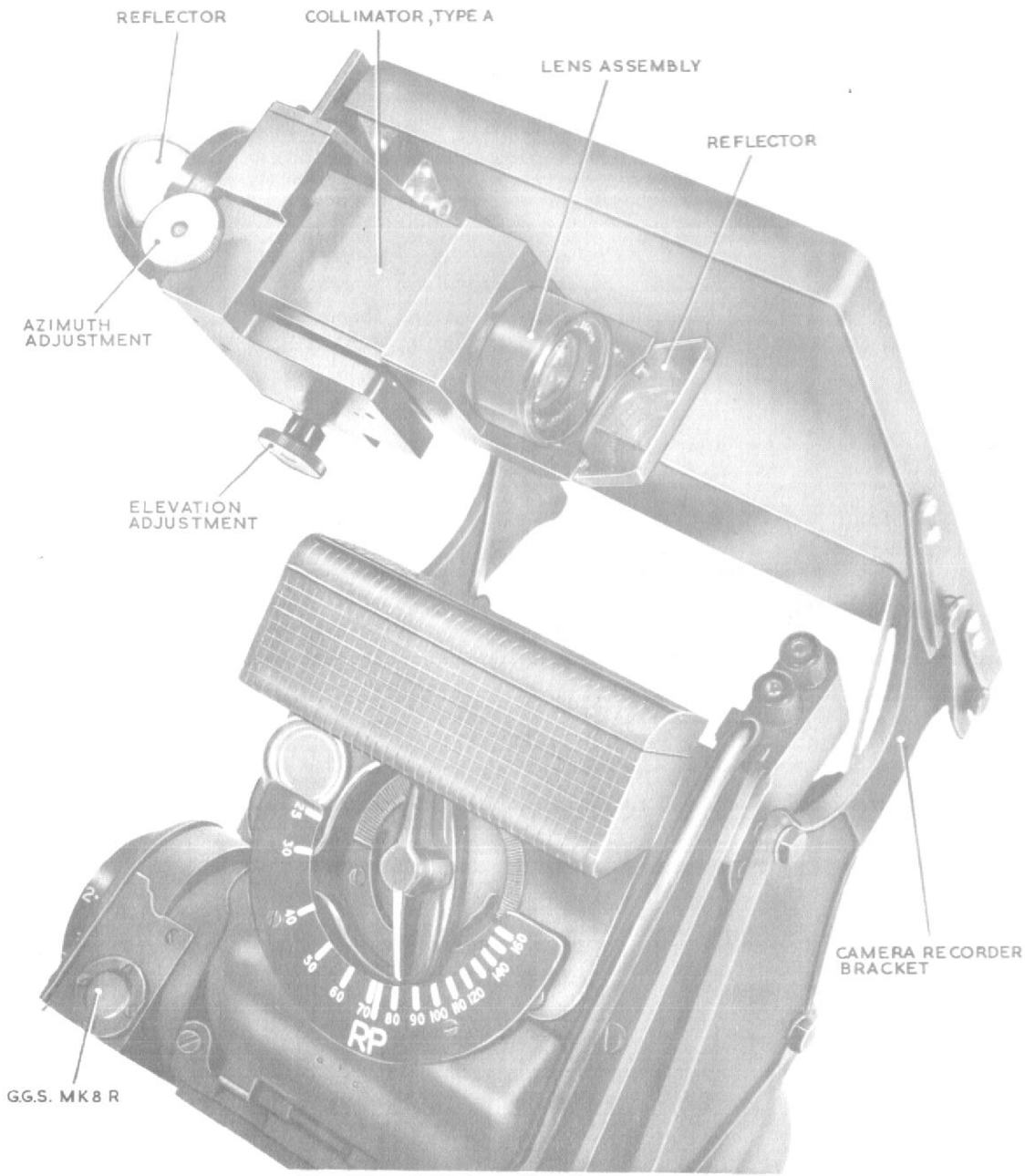

Fig.1 Collimator, Type A fixed to sighting head

TICS sockets G positive and B negative.

(2) (a) Select G1.

(b) Check voltage varies smoothly from 6.7V ± 1.3V at 200 yd, to 2.64V ± 0.5V at 800 yd.

(3) (a) Select G2.

(b) Check voltage varies smoothly from 7.07V ± 1.4V at 200 yd, to 2.78V ± 0.5V at 800 yd.

(4) (a) Select B.

(b) Check voltmeter reads 8V ± 1.6V and that voltage does not vary with range.

(5) (a) Select RP1.

(b) Check voltmeter reads 6.0V ± 1.5V and that voltage does not vary with range.

(6) (a) Select RP2.

(b) Check voltmeter reads 6.0V ± 1.5V and that voltage does not vary with range.

(7) (a) Select RP1.

(b) Uncage the sight by operation of the camera-button on the control column.

Note...

Check with armament personnel for the operation of the necessary armament switches and safety breaks.

(c) Check voltmeter reads 2.42V ± 0.5V with 1½ sec selected on the BL Mk.2S and 1.58V ± 0.3V with 3 sec selected on the BL Mk.2S. The voltages should not vary with range.

(8) (a) Select RP2.

(b) Check voltmeter reads 1.58V ± 0.3V and does not vary with range.

17. To check gyro gravity circuit.

Note...

The volts across the gravity coil is in the order of 0.3V. Because of the build-up in tolerances in resistors, lead resistance and meter accuracy, it is impractical to measure this voltage. The following functional check will, however, adequately check the system.

(1) Fit the collimator, Type A to the camera recorder brackets *(fig.1)*.

(2) (a) Select G1.

(b) Set the range to 200 yd and zero the collimator graticule to the centre spot.

(c) Slowly range from 200 yd to 800 yd. The centre spot should move up approximately 1.5 milliradians pass back through zero at 600 yd and then depress approximately 3 milliradians.

Note...

The centre spot is approximately 3 milliradians in diameter.

(3) (a) Select G2.

(b) Repeat (2) (b) and (2) (c).

(4) (a) Select B.

(b) Connect test set, Type 1, wander plugs to GYRO AND OPTICS sockets K positive and B negative.

(c) Voltmeter should read zero volts.

(5) (a) Select RP1.

(b) Voltmeter should read zero volts.

(6) (a) Select RP2.

(b) Voltmeter should read zero volts.

Note...

A small voltage may be obtained in tests (4), (5) and (6); this is due to the load in the common negative lead and is acceptable.

Sighting head (gyro and optics)

18. Using the Type D testmeter, check that the following interconnections exist between the pins:–

(1) Pin B to pin A through the gyro motor.

Pin B to pin D through the "fixed" lamp.

Pin B to pin D through the "gyro" lamp.

(2) Pin B to pin G through 13.5 ohms ± 0.5 ohms *(range coil).*

Pin B to pin K through 0.76 ohms ± 0.07 ohms *(gravity coil).*

Pin B to pin L through 15 ohms ± 0.14 ohms *(thermometer coil).*

(3) Pin E to pin C through 1.54 ohms ± 0.15 ohms *(azimuth coil).*

(4) Pin E to pin J through 1.54 ohms ± 0.15 ohms *(elevation coil).*

(5) Pin H to pin M through a resistance not exceeding 35.5 ohms *(gravity resistor).*

(6) Pin H to pin J through a resistance not exceeding 64.3 ohms *(range resistor).*

Sighting head (range drive)

19. Check that the following interconnections exist between the pins:–

(1) Pin A is connected to pin J and to K. *(When the range dial reads less than 200 yd, pin J is isolated. When the range dial reads more than 800 yd, pin K is isolated).*

(2) Pin A to pin B through approximately 500 ohms and pin A to pin C through a resistance not exceeding that across pins A and B.

(3) Pin D is connected to pin F through a resistance of 10,000 ohms ± 1 per cent and to pin E through a resistance not exceeding that across pins D and F.

(4) Pin H to pin G through the servo-motor.

20. Disconnect the test set, Type 1 and remove the collimator.

21. Reconnect the sighting head to the aircraft installation.

Tests to be carried out with the test set, Type 3

Range drive check

22. For this check, the test set, Type 3 is required for testing the range drive circuit on the ground, with the radar equipment switched off.

Note...

A long adapter lead is required to connect the test set into the circuit as detailed in para.24 so that the test set can be used in the cockpit.

23. The test set gives a check on the functioning and accuracy of the G.G.S. range drive system, and the simulated radar signal supplied by the test set enables adjustment to be made to the feedback pre-set resistance.

Preparation

24. (1) Connect the test set into the radar ranging circuit at the output connections of the radar ranging unit.

Note...

The test set supply replaces the normal radar supply.

(2) Ensure that the test set switch is OFF

(3) Connect the appropriate 2-core supply cable between the test set and the G.G.S. recorder supply connector.

(4) Switch on the G.G.S.

Manual range

25. With the test set OFF and the control unit, Type S, Mk.13S set at RP2, RP1, G1 or G2 check for manual operation by rotating the twist-grip throttle control. When the control is against its mechanical stop in the "wrist down" position, the reading on the G.G.S. range dial must be below 200 yd. Rotate the control smoothly in a clockwise direction *(as viewed from the end of the control)*; the range dial should show a smooth increase in range with a value of over 800 yd when the end of the traverse is reached.

26. Set the feedback manual resistance to instructions given in para.29 sub-para.(1).

Radar range

27. To check the radar range:–

(1) Set the throttle control to give 800 yd on the range dial. Switch the test set to MANUAL and select the appropriate sensitivity (A).

(2) Note the output reading given by the voltmeter. If this differs appreciably from 75 volts, adjust the VOLTAGE adjusting screw on the panel until 75 volts output is obtained.

(3) Rotate the manual indicator knob slowly from 200 to 800 yd and check that this causes a contraction of the moving graticule display. This rough check proves that there is no discontinuity in the range drive circuit under test.

(4) Set the manual indicator knob to 750 yd and note the reading on the milliammeter. To obtain a meter reading, press the PRESS TO READ M/A switch. The meter reading should not exceed ± 0.2mA. The meter pointer will be seen to vibrate and the mean position of the pointer is to be taken for all readings.

(5) Set the feedback radar resistance according to the instructions given under para.28 sub-para.(2).

Checking and setting feedback controls

28. A compromise value of feedback resistance is required which gives maximum servo response without appreciable graticule hunt.

29. The feedback pre-sets for both manual and radar marked F.B.M. and F.B.R. respectively, are housed in the R.M. Mk.3A control unit, and access to them is obtained by removing the respective cover plates on the front of the unit. Clockwise rotation of the screw adjuster increases damping and reduces the servo response.

(1) Feedback, manual – Set the test switch to OFF. Adjust the F.B.M. control until the G.G.S. range dial follows the throttle control smoothly and when moved rapidly stops with one overshoot only.

(2) Feedback, radar – Set the G.G.S. throttle control in the 800 yd position. Re-set the test switch to MANUAL and check that the output voltage is still 75 volts. Adjust if necessary. The servo response can be gauged by rotating the manual control knob at a uniform rate while viewing the graticule.

30. Adjust the F.B.R. control until the G.G.S. range dial smoothly follows a rapid movement of the test set manual indicator between 700 yd and 800 yd assuming its correct position with one overshoot only.

31. Set the selector switch to AUTO. The moving graticule should open from 800 to 200 yd range in approximately 12.4 sec., pause at the 200 yd setting and then close again to 800 yd in approximately 2.5 sec. The cycle is then repeated.

Note...

When the milliammeter is in circuit. the reading indicates the current passing through the control coil of the polarized relay in the Type R.A. Mk.2 control unit. Due to the transient times of the relay contacts, there may be a kick of the needle at the change-over at 200 yd.

32. Check that the graticule presentation and response are satisfactory. The response should be such that the velocity lag, as measured by the meter, does not give a reading variation of more than 0.3mA from that noted in para.26, sub-para.(4) when that range closes from 800 to 600 yd. If necessary, re-adjust the feedback resistance to bring the meter reading within the specified limit.

33. Refit the cover plate on the Type R.M. Mk.3A control unit.

Check on "take-over"

34. Set the test set selector to MANUAL and the MANUAL INDICATOR to 700 yd.

(1) Using the throttle control, slowly increase the range indicated on the G.G.S. range dial from 200 yd. The G.G.S. range dial reading should follow the throttle control movement smoothly with one overshoot only at 700 yd and any further movement of the throttle control in the same direction should not move the G.G.S. range dial.

(2) Using the throttle control, reduce the range to minimum; at first there should be no movement of the G.G.S. range dial, but below approximately 700 yd the throttle should control the G.G.S. range dial.

(3) Repeat (1) and (2) above for manual indicator settings of 550 and 400 yd. The results should be as above with, of course, 550-400 yd respectively replacing 700 yd.

35. Disconnect the test set, Type 3 from the installation and reconnect the radar supply connections which were disconnected when connecting the test set.

HARMONIZATION

General

36. (1) Before harmonizing is attempted ensure that the sighting system is switched on and allowed to run for 10 min. This warm-up period is to allow the output of the voltage regulators to stabilize.

Note...

The harmonization board and the sighting points are to be arranged according to Command Technical Staff Instructions.

(2) Select G1 on the selector dimmer control unit.

(3) Set the range to 550 yd.

(4) Harmonize the moving graticule centre spot to the appropriate point on the harmonization board by adjusting the reflector for errors in elevation and by moving the sighting head on the mounting for large errors in azimuth.

(5) Harmonize the fixed cross to the appropriate point on the board by means of the two flexible adjusters on the backplate.

(6) Select G2 on the selector dimmer control unit.

(7) Check that the moving graticule remains harmonized.

(8) Select RP1.

(9) Set 1½ or 3 sec, as instructed, on the BL. Mk.2S control unit.

(10) Uncage the gyro by pressing the camera button on the control column. Check with the armament personnel that the necessary armament switches are selected and the safety break is fitted.

(11) Depress the moving graticule centre spot to the appropriate point on the harmonization board by moving the slider of resistor RV1 (M) in the BL. Mk.2S.

(12) Remove any drift in azimuth by adjusting RV3 in the BL.Mk.2S.

(13) Cage the gyro by switching off the butt-test switch the centre spot should depress a further 5–10 milliradians approx.

(14) Select RP2.

(15) Uncage the gyro *(see operation (10))*.

(16) Depress the moving graticule centre spot to the appropriate point on the harmonization board by moving the slider of resistor RV2 (S) in the BL. Mk.2S.

(17) Remove any drift in azimuth by adjustment of RV4 in the BL.Mk.2S.

(18) Cage the gyro by switching off the butt-test switch. The centre spot should depress a further 5–10 milliradians.

Checking or changing the RP Harmonization at First Line

37. (1) Select G1 on the selector dimmer control unit.

(2) Set range to 550 yd.

(3) Attach the collimator, Type A to the camera recorder brackets.

(4) Zero the graticule of the collimator to the moving graticule centre spot.

(5) Carry out checks para.36, (8) to (18), setting the centre spot to the appropriate reading on the collimator, Type A.

Checking delay unit (post Mod. 1331)

Note . . .

Before commencing this check, ensure by liaison with armament personnel, that the aircraft is in a safe condition for the operation of the Bomb/R.P. release switch, and the Bomb and R.P. Master Switches.

Preparation

38. In the cabin check that the following switches are selected as shown.

Battery master
Bomb master
Camera master
R.P. master
G.G.S. master
Guns master
Pylons selectors
Fuzing selector
Butt test
} OFF

Rocket selector to Salvo
R.P. Salvo selector to 2
Guns selector to All
G.G.S. to G1 on C.U. Type S

Ensure that Jett 1, Jett 2 and Guns circuit breakers are Out and Bomb, G.G.S. and R.P. breakers are In.

Ensure G.G.S. recorder and G90 (without over-run setting) cameras are fitted.

Procedure

39.

(1) Connect armament safety plug. Connect and switch ON an external supply.

(2) Select G.G.S. and G90 camera master switches ON. G.G.S. recorder camera motor should run and gunsight illuminate.

(3) Select Butt test switch to ON position. Depress camera switch on control column. G90 camera should run and recorder camera shutter operate whilst switch is depressed.

(4) Select RP1 on G.G.S. C.U. Type S. Depress and hold camera switch. G.G.S. recorder and G90 cameras should operate. G.G.S. moving graticule should be seen to wander from the aligned position with the fixed graticule by approximately ½ deg. in elevation.

(5) Release camera switch. G.G.S. and G90 cameras should stop. G.G.S. moving graticule should return to the aligned position with the fixed graticule.

(6) Select R.P. master switch ON. Depress and release camera switch. G.G.S. recorder and G90 camera should operate and continue to do so after switch is released. G.G.S. moving graticule should be seen to wander from the aligned position with the fixed graticule by approximately ½ deg. in elevation.

(7) Depress and release Bomb/R.P. release switch. 1 second after depressing switch, G.G.S. and G90 cameras should stop and G.G.S. moving graticule return to the aligned position with the fixed graticule. Return R.P. master switch to OFF.

(8) Select B on G.G.S. C.U. Type S. Depress and hold camera switch. G.G.S. recorder and G90 cameras should operate.
G.G.S. moving graticule should remain in the aligned position with the fixed graticule.

(9) Release camera switch. G.G.S. recorder and G90 cameras should stop and G.G.S. moving graticule remain in the aligned position.

(10) Select bomb master switch ON. Depress and release camera switch. G.G.S. recorder and G90 cameras should operate and continue to do so after switch is released, G.G.S. moving graticule should remain in the aligned position.

(11) Depress and release Bomb/R.P. release switch. 1 second after depressing switch G.G.S. and G90 cameras should stop. G.G.S. moving graticule should remain in the aligned position.

(12) Return bomb master, G.G.S., camera and butt test switches to the OFF position and G.G.S. selector to G1.

On Completion

40.

Switch OFF and disconnect external supply.
Disconnect armament safety plug.
Re-set Jett 1, Jett 2 and Guns circuit breakers.

GROUP 5.A

GAUGES AND INDICATING INSTRUMENTS

(Including Mods.699, 951, 919, 521 and 1279)

LIST OF CONTENTS

Introduction

1. This group describes the miscellaneous gauges and indicating instruments installed in the aircraft which are not given in other groups of the chapter. A general description of the instrument installation is given in Group 1.A. The location of, and means of access to all the instruments and their associated equipment is described in Group 1.C.

Equipment employed

2. The miscellaneous gauges and indicating instruments, together with the appropriate Air Publications to which reference should be made for detailed descriptions and information on the servicing required to maintain them in an efficient condition, are listed in Table 1.

TABLE 1

Equipment Type and Air Publication reference

Equipment Type	Air Publication
Alighting gear indicator, Type D.1 Alighting gear warning lamp, Iris Type B Hydraulic failure warning lamp, Type B Oxygen flow indicator, Type C	A.P.4343E, Vol.1, Sect.18
Relay J, Type Q No.3	A.P.4343C, Vol.1, Book 2, Sect. 3
Microswitches, Type 1A, 4A and Pye 401/S *(Mod.521)*	A.P.4343C, Vol.1, Book 1, Sect. 2
Microswitches, Type Dowty 1322Z Mk.2 *(Mod.1279)*	A.P.4343C, Vol.1, Book 1, Sect. 2
Hydraulic failure audio warning cut-out switch C.W.C. Type XD.780 No.3	A.P.4343C, Vol.1, Book 1, Sect. 1
Brake and main hydraulic pressure gauge, Mk.2 Anti-G and emergency air pressure gauges, Mk.14KK Brake accumulator pressure gauge, Mk.14LL	A.P.1275A, Vol.1, Sect.15
Hydraulic pressure switch, Type T.P.5207	A.P.1275A, Vol.1, Sect.24
Oxygen pressure gauge, Mk.3	A.P.1275G, Vol.1, Sect. 1
Oxygen regulator, Type 17E	A.P.1275G, Vol.1, Sect. 2
Fatigue meter, Mk.15	A.P.1275A, Vol.1, Sect.12

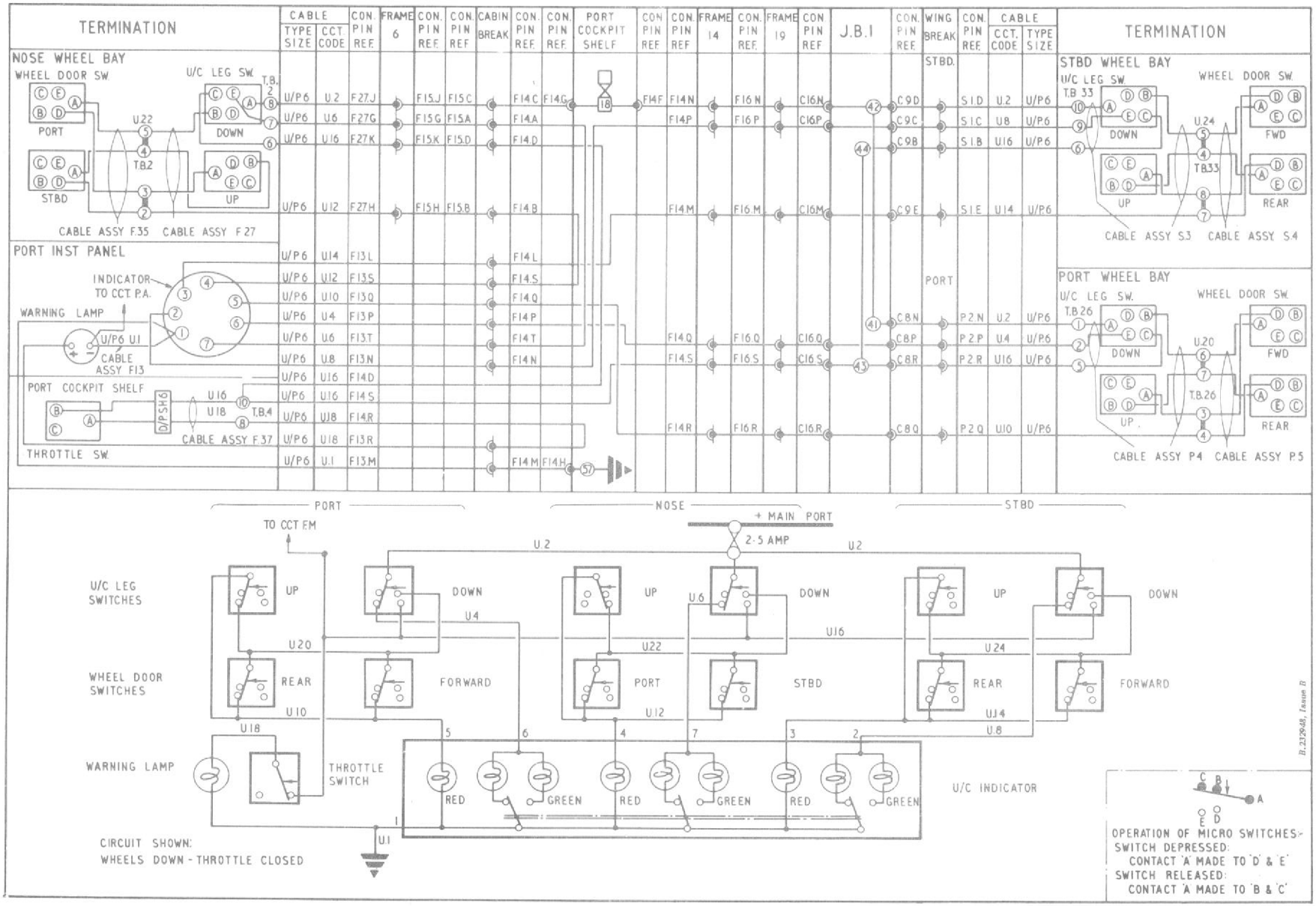

Fig. 1. Alighting gear indicator and warning lamp (routeing and theoretical)

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DESCRIPTION

Alighting gear indicator and warning lamp

3. The alighting gear position indicator is controlled by the alighting gear leg and wheel door micro switches. The instrument is mounted on the port instrument panel, and indicates the position of the alighting gear as follows:-

All units locked down ...Three green lamps
All intermediate
positions ... ... Three red lamps
All units retracted
and wheel doors
locked up ... ...All lamps out

The indicator is fitted with an anti-dazzle screen, and a changeover switch; by means of the latter, a spare set of green lamps may be switched into circuit. A red iris type warning lamp mounted on the port instrument panel is provided to remind the pilot to lower the undercarriage before landing. This lamp will be lit automatically during flight if the throttle is moved to less than approximately one third open while the alighting gear is not locked down. The switching of this lamp is effected by a micro switch in the throttle box; the supply is routed through micro switches in the undercarriage indicator circuit, which is fed from a fuse on the port cockpit shelf.

Operation

Alighting gear locked down

4. The circuit diagram on fig.1 illustrates the condition when the aircraft is standing on its alighting gear, with the throttle closed. In this condition, all the undercarriage micro switches except that of the nose 'leg up' are released, making contacts A-B-C, and the green lamps in the indicator will be lit, being supplied via contacts A-C of each of the three 'leg down' micro switches

Alighting gear between locks

5. Contact D on each of the 'leg down' micro switches is connected to the two micro switches of its associated nose wheel doors, and also to its 'leg up' switch; these switches providing three parallel supply paths to each red lamp. Hence, when the alighting gear is between locks, and the 'leg down' micro switches are depressed, the supply to the red lamps will be completed, via contacts A-D and the three paralleled micro switches. At the same time, contacts A-E of the 'leg down' micro switch supply the throttle micro switch; hence the warning lamp will light if the throttle is put to the nearly closed position described in paragraph 3.

Alighting gear locked up

6. In this condition, all the undercarriage micro switches, with the exception of the nose 'leg up' switch will be depressed, making contacts A-D-E. No lamps will be lit, but the release of any one of the wheel door micro switches, or the 'leg up' micro switches, will cause the appropriate red lamp to be supplied via contacts A-D of its associated 'leg down' micro switch. Contact E of this micro switch makes a supply available to the throttle micro switch hence if, while the alighting gear is locked up, the throttle is closed, the warning lamp will light. A full description of the alighting gear indicator, and details of the micro switches are given in the relevant Air Publications listed in paragraph 2.

Oxygen regulator and pressure gauge

7. The oxygen demand regulator is mounted at the forward end of the cabin starboard shelf. Its electrical supply is taken from a fuse on the supply panel. The manual controls incorporated in the regulator consists of an ON/OFF valve, an air inlet shutter, and an emergency button. Also, mounted on the panel of the indicator, is a pressure gauge, and an electro-magnetic flow indicator. In operation the regulator is fully automatic, and when turned on it supplies oxygen in accordance with the demand, from sea level to a cabin altitude of 50,000 feet. An additional electro-magnetic type flow indicator is mounted on the centre instrument panel. Routeing and theoretical diagrams of the electrical circuit are given on fig.2.

8. To provide the pilot with an indication of the contents of the oxygen cylinders, an oxygen pressure gauge is situated at the bottom of the starboard instrument panel just above the regulator. The oxygen system is described in detail in Section 3, Chapter 10 of this volume and a full description of the regulator and pressure gauge will be found in A.P.1275G, Vol.1, Sect.2.

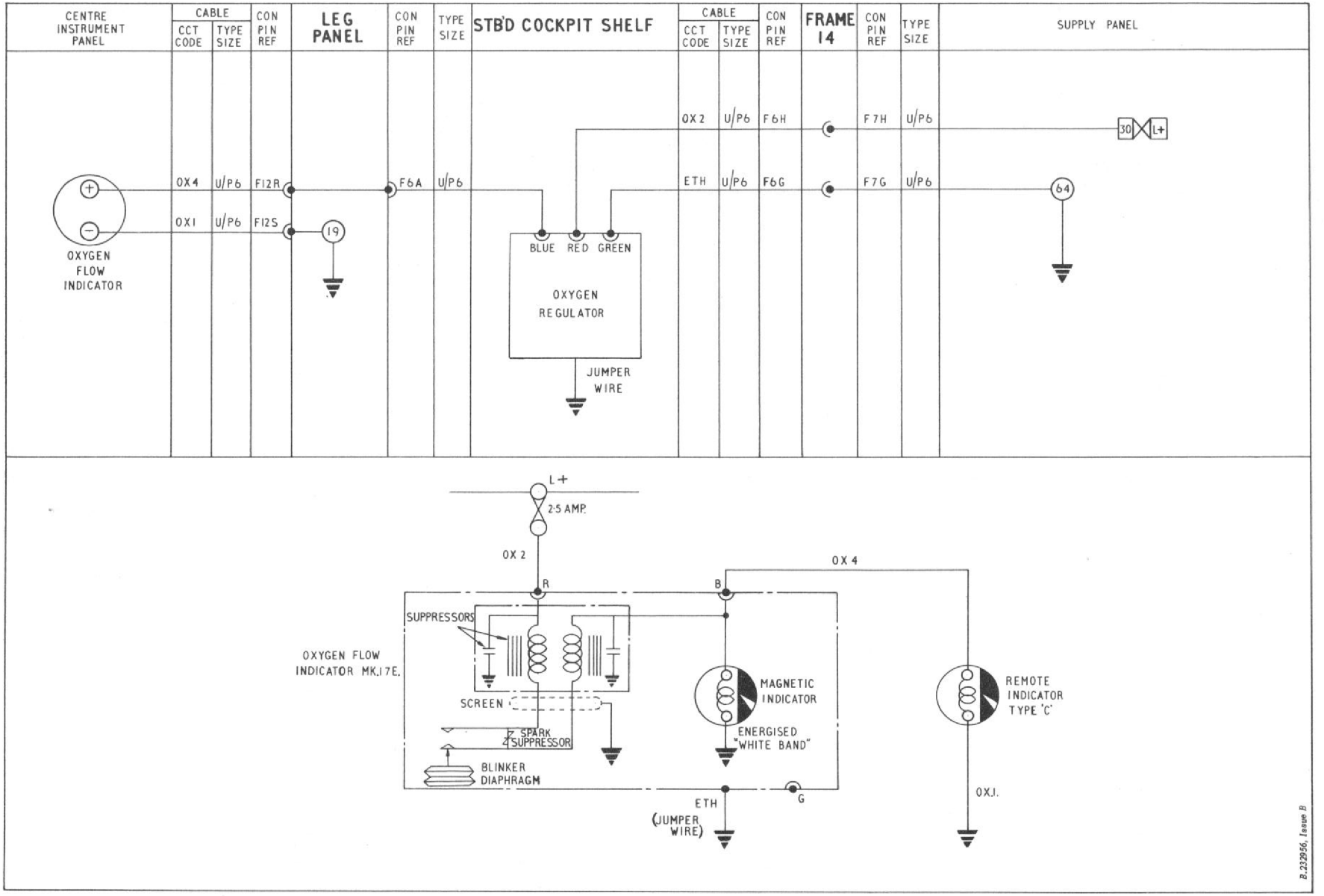

Fig.2. Oxygen flow indicator (routeing and theoretical)

Hydraulic pressure gauges and warning devices

9. The hydraulic pressure gauges in the cabin are all mounted on the cabin port shelf. They consist of a combined brake and hydraulic system pressure gauge, two air pressure gauges for the undercarriage and flap emergency system, and a gauge for the brake accumulator. The brake and the system pressure gauge is a triple unit, situated at the forward end of the port shelf; it indicates the pressure available in the hydraulic system and that applied to each brake. The undercarriage and flap emergency air pressure gauges are situated on the rear portion of the cabin port shelf. The brake accumulator pressure gauge is provided with a label indicating that the brakes will not operate at a pressure below 750 lb. per sq. in. The hydraulic system and the emergency air system are both described in Section 3, Chapter 6 of this volume. Information on the pressure gauges will be found in A.P.1275A, Vol.1, Sect.15.

10. Indication of failure in the hydraulic system is given when the hydraulic pressure drops below 600 lb. per sq. in. The warning is given by a lamp which is situated on the cabin port shelf, and also by an audio signal; this latter being effected by means of an interconnection with the U.H.F. installation.

11. Both these warning devices are supplied from a fuse on the supply panel, and the supply to their circuits is controlled by a pressure switch in the hydraulic pipeline, situated on the port side of the gun package bay. The supply to the audio warning circuit is taken through contacts on relay J, *(fig.3)*. Relay J is situated on the underside of the cabin port shelf.

12. To prevent the warning devices from being operated by transient pressure drops, such as may occur when the hydraulic services are functioning normally, the circuit includes a resistor-capacitor delay network.

Audio warning cut-out

13. A means of cutting out the audio warning circuit is provided by a switch on the starboard instrument panel. This switch, which is marked OUT and OFF, is a single-pole, centre off type, with spring return to centre from the OUT position. In operation, it cuts out the audio warning by causing relay J to be energized. Once relay J is energized, it is held on by a supply through its own contacts.

Operation

14. When the hydraulic pressure falls below 600 lb. per sq. in., the pressure switch closes, thereby allowing the supply current to pass through a delay resistor to the indicator lamp, and also to contacts 3 and 6 of relay J, and contact 2 of the cut-out switch. At relay J, contacts 3-4 pass the supply to the resistor-capacitor network of the audio warning circuit.

15. If the cut-out switch is held to OUT, a supply passes via its contacts 2-1, to contact 5 and contacts 1-2 of the relay, which is thereby energized, breaking the supply across contacts 3-4 to the audio warning network, and completing a hold-on supply across contacts 5-6. Thus, although the cut-out switch may be released, relay J will remain energized until the hydraulic pressure rises sufficiently to open the contacts of the pressure switch, thereby isolating relay J and the warning lamp from the supply.

16. The audio warning may be permanently cut-out by placing the cut-out switch in the 'OFF' position, thus closing contacts 3 and 2 of the switch. This side of the switch has no spring return to the centre position. Current will therefore flow to energize relay J continuously until the cut-out switch is manually replaced to its centre position.

Anti 'G' system pressure gauge

17. A gauge to indicate the pressure in the anti-'G' air bottles is located on a bracket attached to the fuselage structure above the cabin starboard shelf. The anti-'G' system is described in Section 3, Chapter 13. Details of the gauge will be found in A.P.1275A, Vol.1, Sect.15.

Warning lamps and indicators

18. Apart from the warning lamps and indicators described in the groups of this chapter, various other lamps and indicators are also provided; descriptions of these, and routeing and theoretical diagrams of the circuits, will be found in the appropriate groups of Section 5, Chapter 1 of this volume.

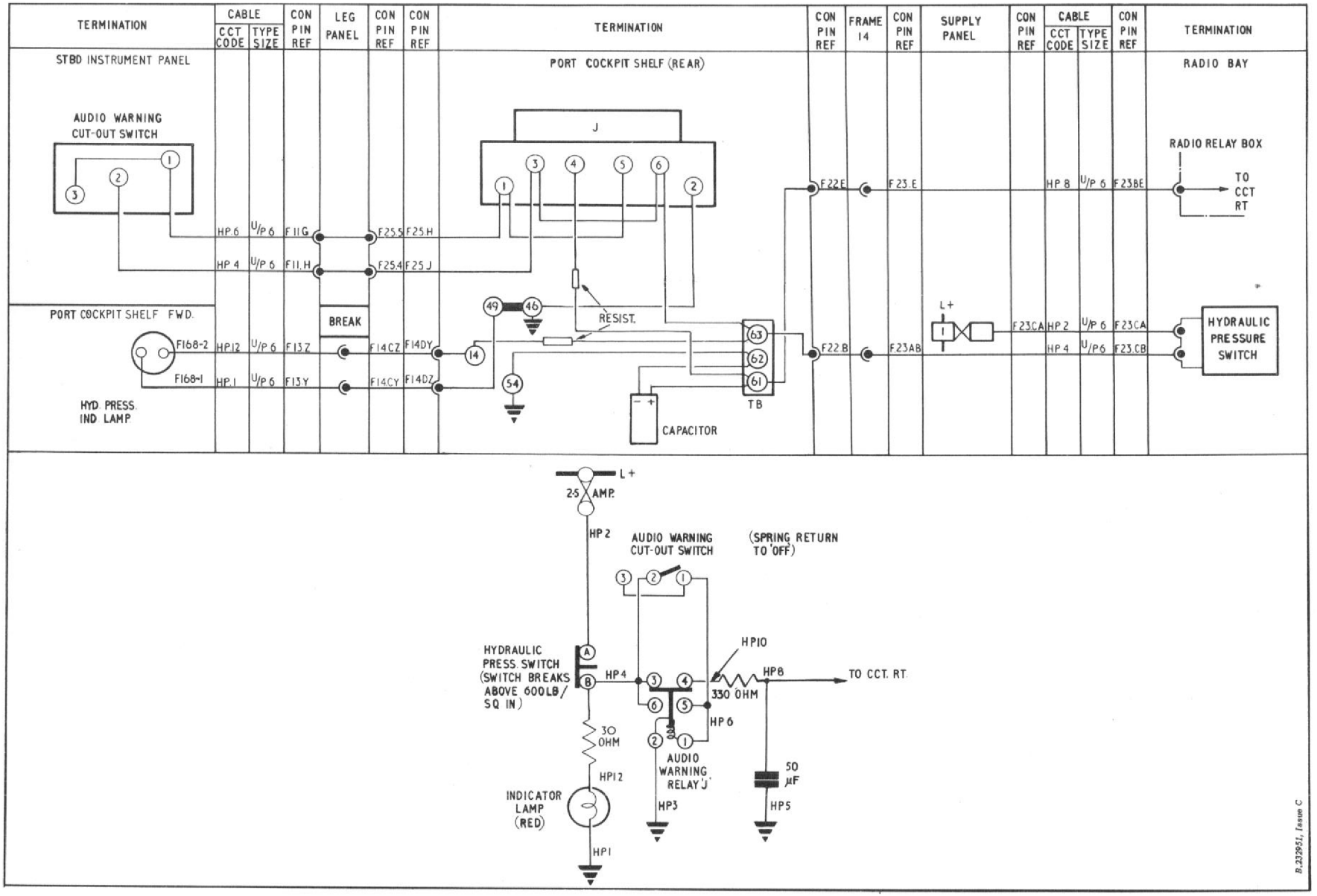

Fig. 3. Hydraulic pressure warning (routeing and theoretical)

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Fatigue meter

19. An electrically-operated fatigue meter is installed on a mounting plate attached to the starboard side of frame 27 in the centre fuselage. It is a counting accelerometer type instrument, whose primary function is to measure and record the vertical accelerations to which the aircraft is subjected during flight. The meter obtains its electrical supply from terminal 5 of T.B.26 mounted on interspar rib D in the port outer wing and is protected by a 1 amp. fuse also mounted on this rib. The supply to terminal 5 of T.B.26 is taken through the port undercarriage leg down micro switch so that the meter is energized only when the alighting gear is retracted. A description of the meter and its method of operation will be found in A.P.1275A, Vol.1, Section 12.

SERVICING

General

20. Information on the servicing required to maintain the oxygen regulator and pressure gauges described in this group in an efficient condition is given in the Air Publications listed in paragraph 2. These publications also contain information on the standard serviceability tests, the testing equipment used, and the method of conducting tests. The method of adjusting the micro switches of the alighting gear indicator circuit is described in the alighting gear adjustment procedure contained in Section 3, Chapter 5 of this volume.

REMOVAL AND ASSEMBLY

General

21. The removal of the components described in this group calls for no special instructions, but care must be taken to observe the safety recommendations given in Section 3, Chapters 6, 10 and 13 to ensure that no damage to the aircraft or injury to personnel occurs when carrying out these operations.

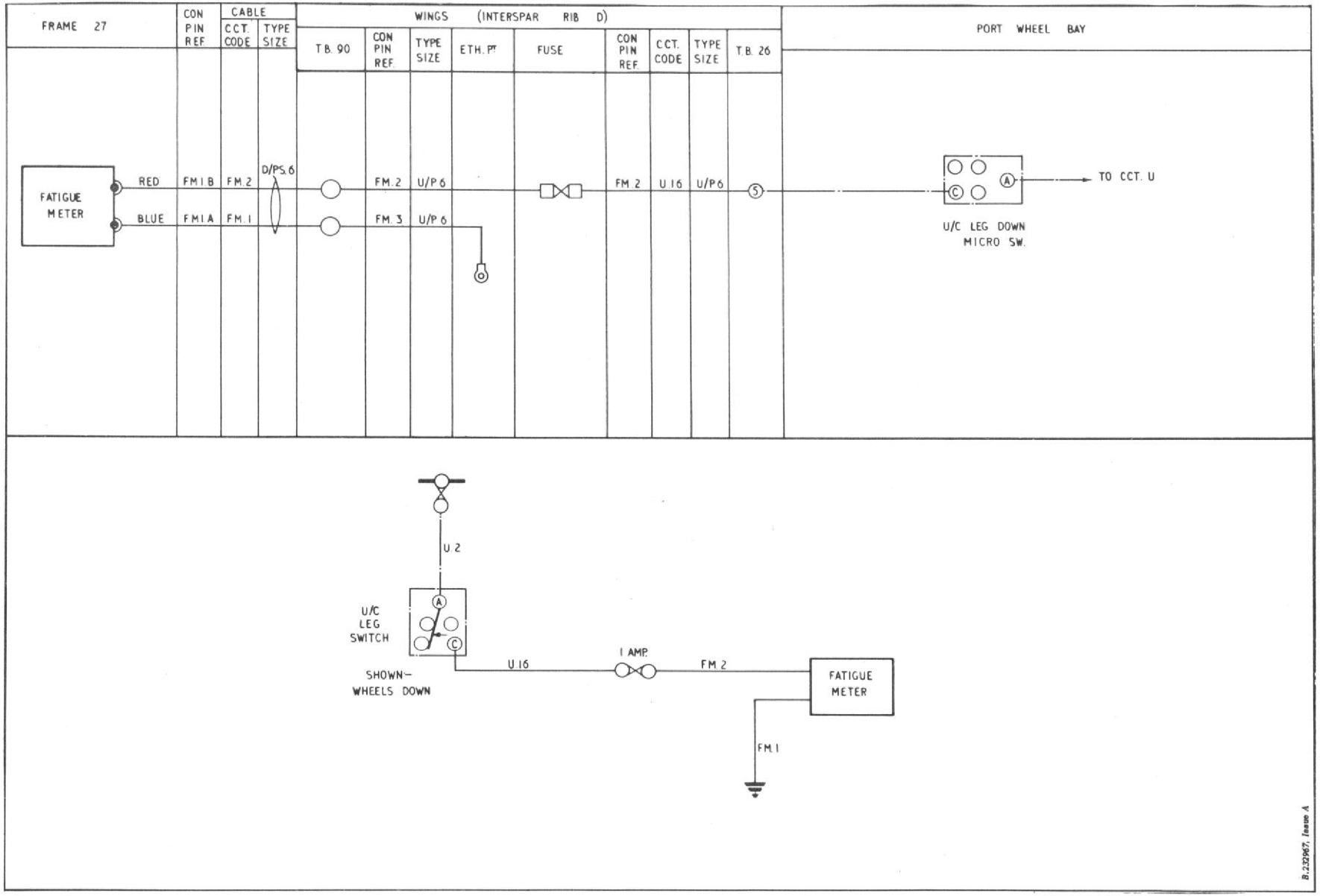

Fig. 4 Fatigue meter (routeing and theoretical)

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