

Chapter 7

A.R.I.5959

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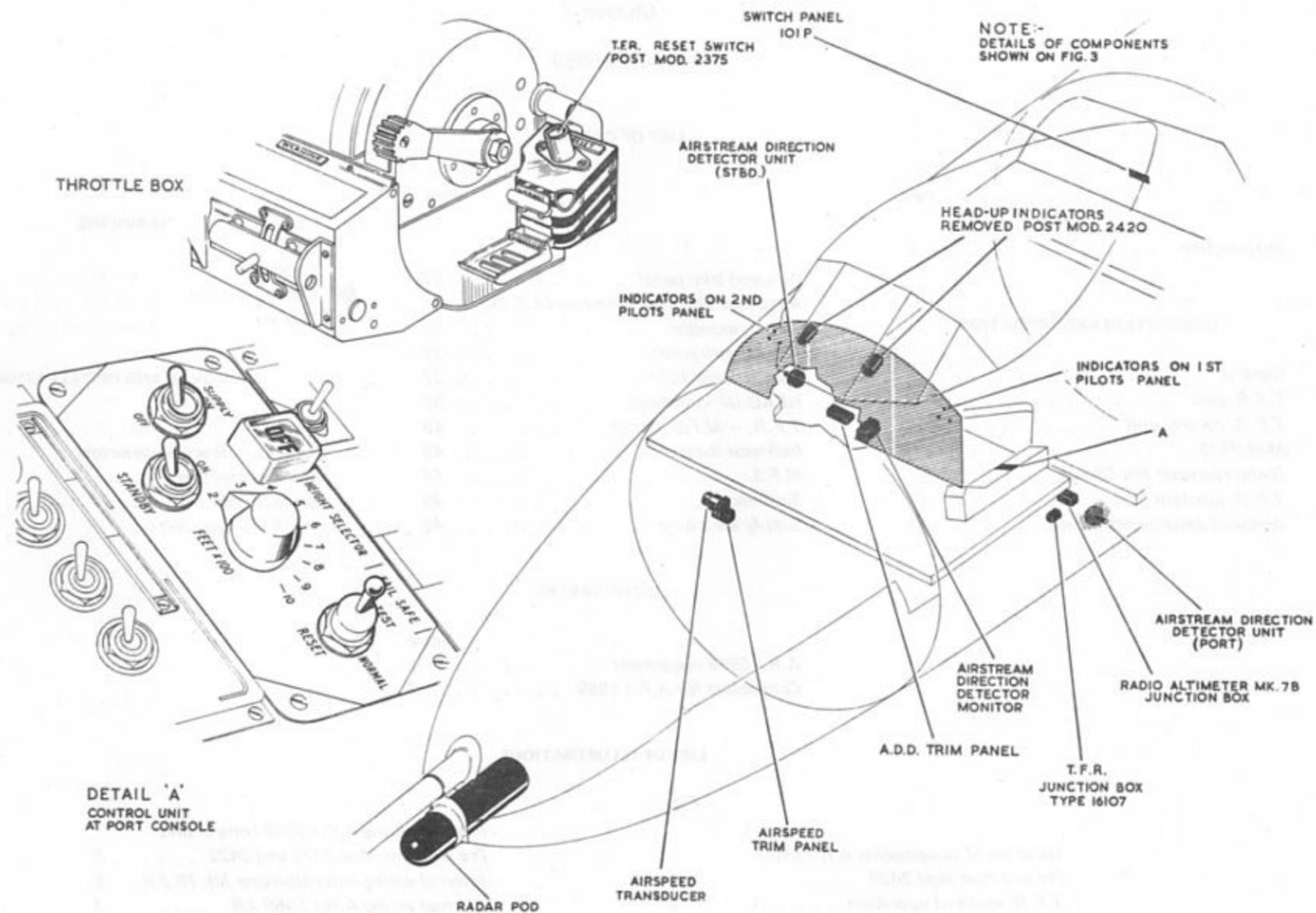


Fig. 1 Location of components A.R.I. 5959-Pre and Post Mod. 2420

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Introduction

1. This chapter contains information for the A.R.I.5959 introduced by Mod.2057.

2. The system comprises a terrain following radar (T.F.R.) which utilizes an elevation monopulse, 'on-boresight', non-scanning, technique to detect changes of terrain height immediately ahead of the aircraft flight path. The system operates in conjunction with the F.M. Mk.7B radio altimeter, the M.F.S. equipment and various aircraft sensors, indicating and control units to produce pitch command signals which assist pilot manual control during low level flight.

3. The F.M. Mk.7B radio altimeter (A.R.I.23172) is dealt with in Sect.8, Chap.7 and more detailed information will be found in A.P.116B-0203-1. The M.F.S. equipment is described in Sect.7, Chap.7. The aircraft sensors, which comprise an airspeed detector transducer and two airspeed direction detectors are described in this chapter, however, further information can be found by

General

5. The A.R.I. measures slant range to terrain ahead of the aircraft, receives inputs from other aircraft sensors, and computes pitch control signals for display at the pilots' head-up indicators. The displayed control signals assist manual control of the aircraft in the pitch plane to give a resultant flight path which follows the rise and fall of the terrain at the pre-selected altitude adjustable between 200 and 1 000 ft.

referring to A.P.114N-0101-1 and A.P.112G-0113-1 respectively.

4. A location illustration of the system major components is contained at fig.1 and additional equipment details provided at fig.3. A block diagram of the A.R.I. and its associated systems is given at fig.4 and this diagram should be used in conjunction with the descriptive text contained in the following paragraphs. The associated aircraft routing charts, and equipment and connector tables will be found at the end of this chapter. The associated 115-volt, 3-phase, 400 Hz a.c. and 28-volt d.c. power supplies are dealt with in Sect.6, Chap.3 and 6 of this publication.

4A. The following modifications are incorporated in this chapter:-

Mod.2188 - To provide for T.F. R/ADD monitor Part No. 3851/60071.

Mod.2313 - Introduction of connector assembly Part No. 887/T3434

in lieu of assembly 883/T3434.

Mod.2375 - Introduction of an additional 'T.F.R. RESET' switch to provide the 2nd pilot with an independent T.F.R. reset facility. (Comm. Mod/Vulcan/0247/STC).

Mod.2395 - T.F.R. To make provision for a modified radar assembly Part No. 3023000-4 in lieu of Ref. No. AN/APN/170. R.M.C. Mods. A3038/1 and A3039/1 which introduce a filter into the radar unit which extends its length.

Mod.2420 - To delete the HEAD-UP display indicators from the 1st and 2nd pilots' position.

Mod.2422 - To introduce T.F.R. control panel 8/T6654 in lieu of T.F.R. control panel 1/T6654.

► Mod.2480 Introduction of a new inlet duct to allow cabin exhaust air cooling of the T.F.R. in lieu of ram air cooling. ◀

DESCRIPTION AND OPERATION

6. The installation provides safe low level terrain following over land, water and man-made obstacles within specified limits. The limitations are more restricted at higher airspeeds and less restrictive at lower airspeeds, dependent on the selected altitude and flight characteristics of the aircraft. The aircraft sensors (Para.3) which are not limited by normal visibility, enable the T.F.R. to provide an all-weather, low-level terrain following capability.

7. The radar section of the installation measures 'range to terrain' (R) along the fixed depression angle of the radar beam, while the F.M. Mk.7B radio altimeter accurately measures height above terrain (H). This information, range (R) and height (H), is compared in the T.F.R. computer with a reference range (r) and a reference height (h). The reference range (r) is pre-programmed into the computer to suit the flying characteristics of the aircraft and the reference height (h) is

selected at a height selector switch on the T.F.R. control unit.

8. When the measured values of (H) or (R) deviate from the references (h) and (r), as a result of changes in terrain, a corresponding pitch-up or pitch-down signal is generated and displayed at the pilot's head-up display (HEAD-UP indicator) or head-down display (M.F.S. director horizon). The pilot is thus able to alter the altitude of the aircraft in the pitch plane to null the climb or dive indication and thereby cause the aircraft to follow the rise and fall of the terrain. This technique is illustrated at fig.2.

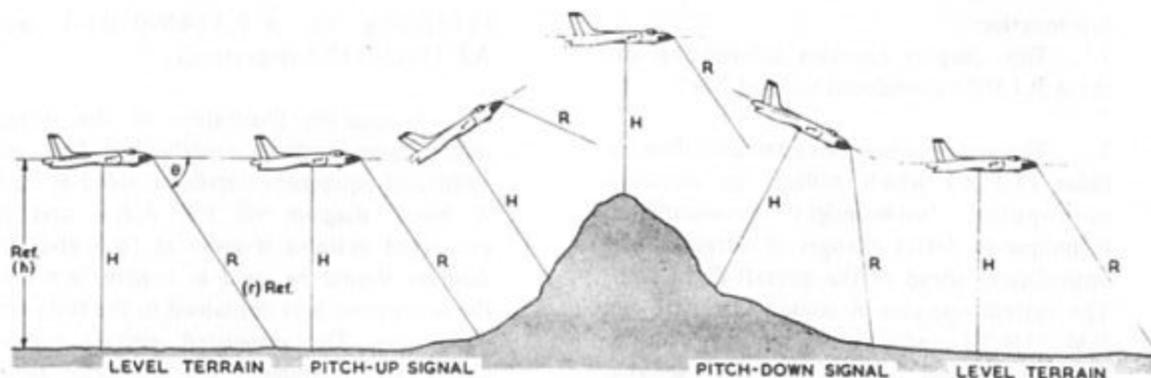


Fig.2 T.F.R. mode of operation

PCSR

T.F.R. pod

9. The T.F.R. pod, Ref. No. 110D/1161238, comprises an 8 in. diameter, 36 in. long pod fitted to the aircraft nose (fig.1) immediately below the flight refuelling probe. Post Mod.2395 the length of the pod is increased by 7.6 in. to accommodate a filter unit. The forward end of the pod which projects into the airstream houses a microwave aerial sub-assembly, while the rear end of the probe enclosed by the aircraft nose contains the associated transmitter-receiver, signal processing, computing and power pack sub-assemblies.

10. The aerial sub-assembly consists of a dual microwave feed and reflector assembly enclosed in a hemispherical radome cover. The reflector which is fixed in azimuth, is coupled to an elevation servo mechanism which maintains the reflector at a fixed depression angle relative to the aircraft flight velocity vector. The servo mechanism, and its associated circuits are controlled by reference signal inputs from the Mk.7B radio altimeter.

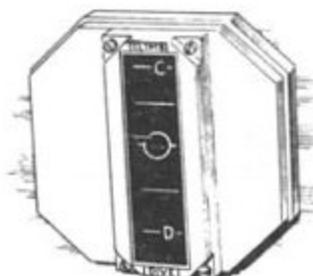
M.F.S. vertical reference gyro, control unit height selector switch (para.18) and the angle of attack transducers. During low level flight the reflector boresight range is maintained constant at 9 000 ft.

11. The transmitter-receiver, in conjunction with the signal processing circuits, produces accurate boresight range information which is used, together with signal inputs from the various aircraft sensors to compute (in the computer sub-assembly), pitch rate signals for display at the pilots' head-up indicators.

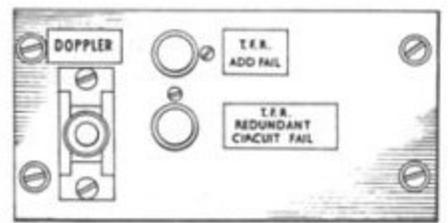
12. Fail-safe circuits in the T.F.R. pod generate internal test signals and monitor sub-assembly operation. In the event of a failure, the checking circuits generate a system fail signal which is displayed at the pilots' panels. When a system failure occurs, a climb command signal of 1.5 degs/sec. is displayed at the pilots' head-up indicators.

13. Several of the A.R.I. pod circuits (redundant circuits) are not monitored by the integral fail-safe circuits and separate comparator circuits check the redundant circuit output signals. Where signal discrepancies occur, a fail signal is generated and displayed at panel 101P in the rear crews compartment.

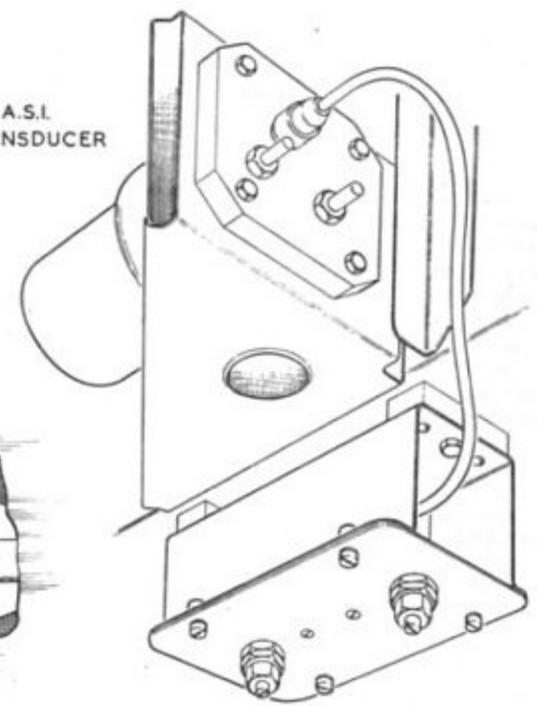
14. The power pack sub-assembly operates from the aircraft a.c. and d.c. supplies, and contains separate high voltage, low voltage and 'keep-alive' power supplies. The high voltage power supply, which includes a time delay circuit, provides +250V and -175V for the transmitter klystron while the low voltage power supply provides stabilized +30V, +15V, -15V and -22V for the T/R, signal processing and computer circuits. The 'keep-alive' power supply provides -800V for the T/R valves. The power pack also provides a.c. and d.c. reference supplies which are used at the T.F.R. control unit.



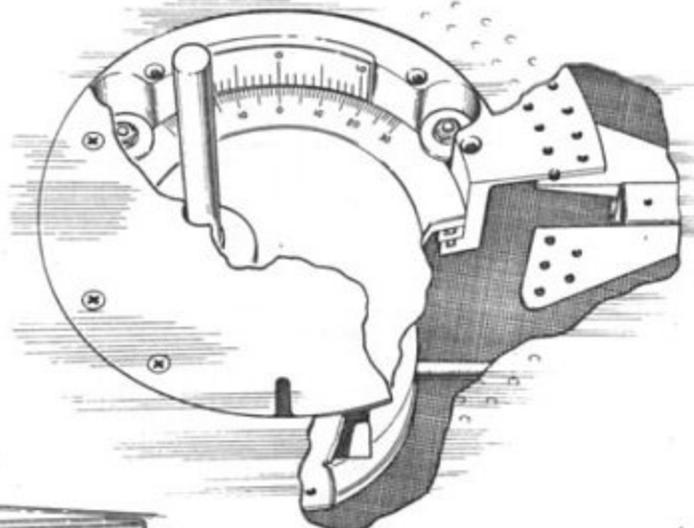
HEAD-UP INDICATOR
(REMOVED POST MOD.2420)



SWITCH PANEL IOIP



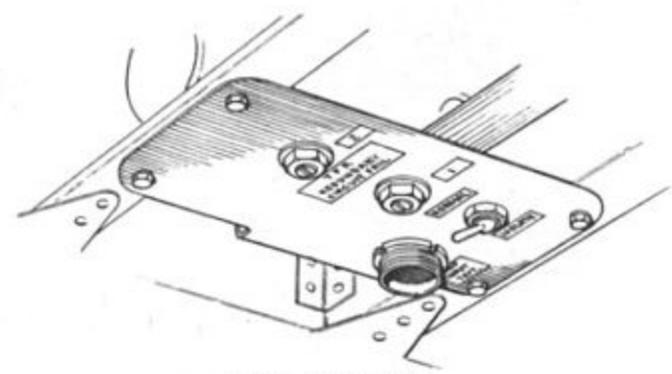
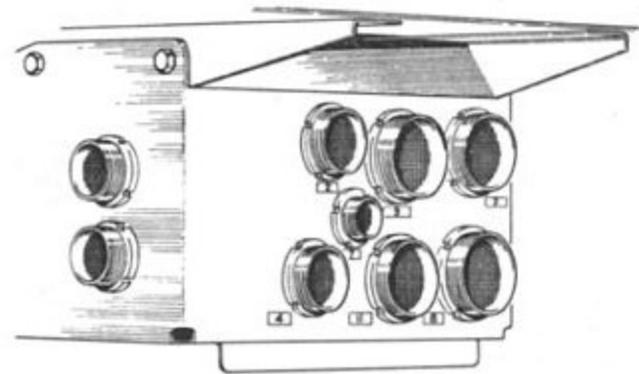
A.S.I.
TRANSDUCER



AIRSTREAM DIRECTION
DETECTOR UNIT

AIRSPED TRIM PANEL

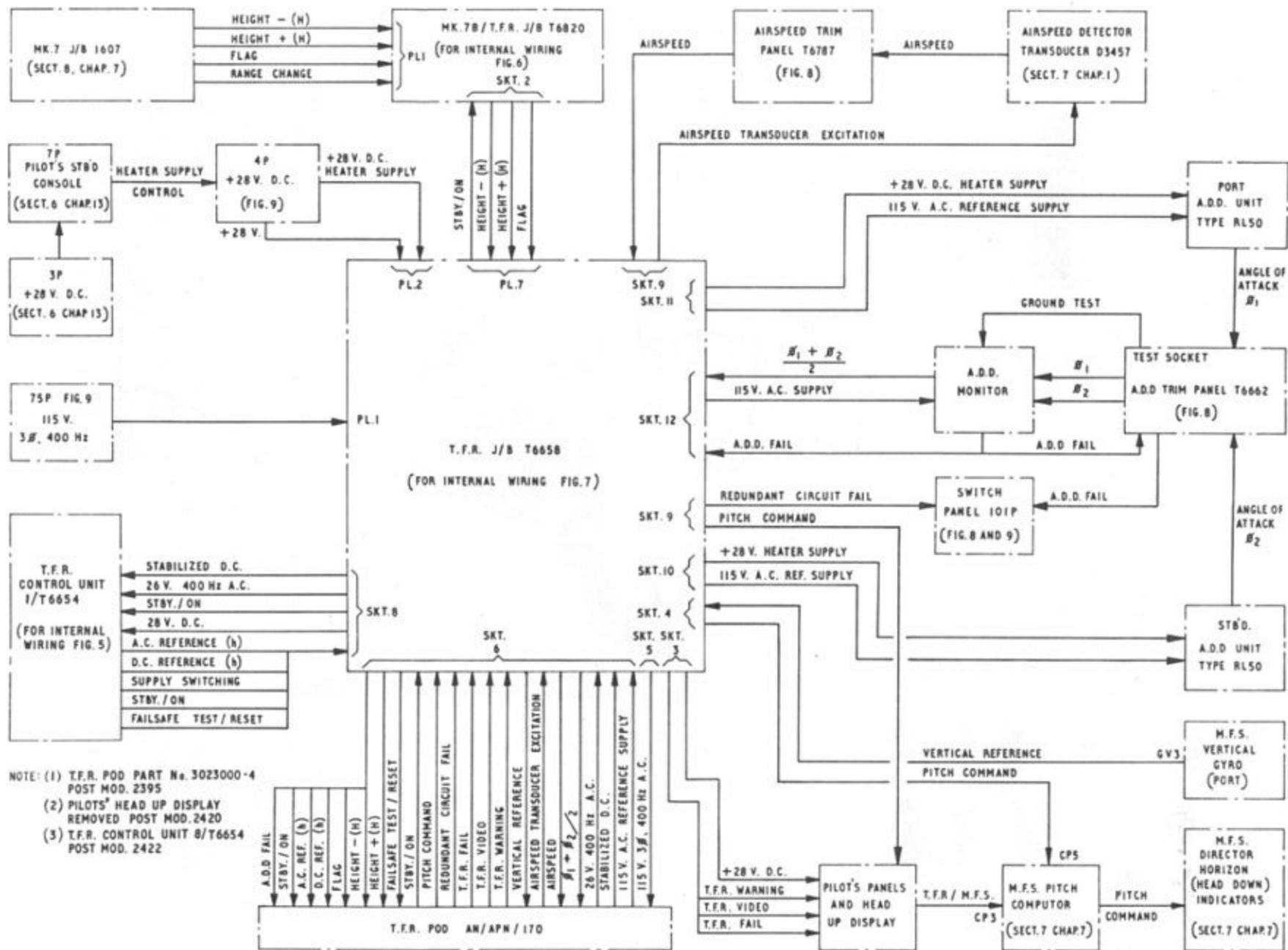
T.F.R. JUNCTION BOX



A.D.D. TRIM PANEL

Fig. 3 Component details-Pre and Post Mod. 2420





- NOTE: (1) T.F.R. POD PART No. 3023000-4 POST MOD. 2395
 (2) PILOTS' HEAD UP DISPLAY REMOVED POST MOD. 2420
 (3) T.F.R. CONTROL UNIT 8/T6654 POST MOD. 2422

Fig. 4 Block diagram of A.R.I. 5959 and associated systems - Pre and post Mod. 2395, 2420 and 2422

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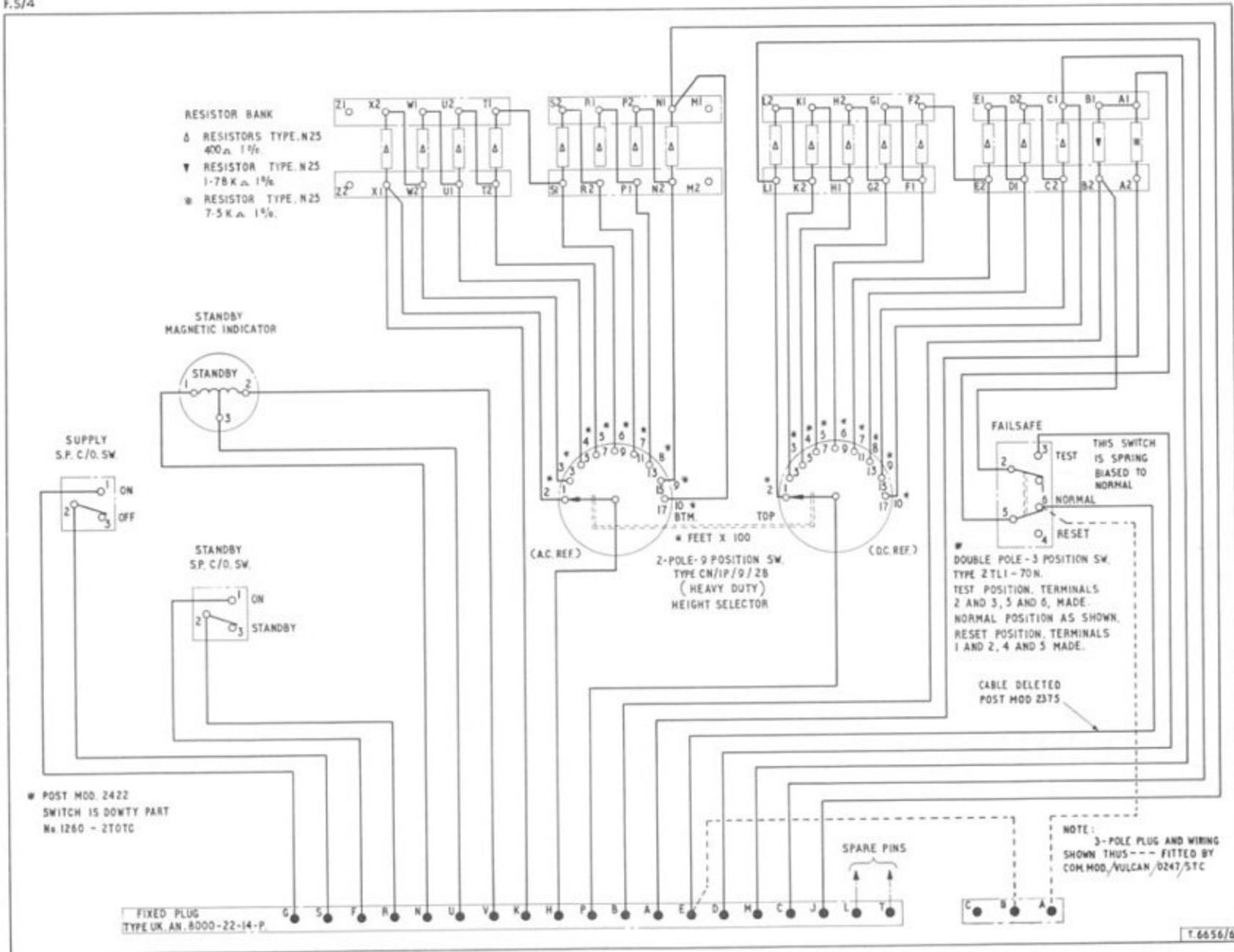


Fig. 5 Internal wiring A.R.I. 5959 control unit-Pre and Post Mod. 2375 and 2422

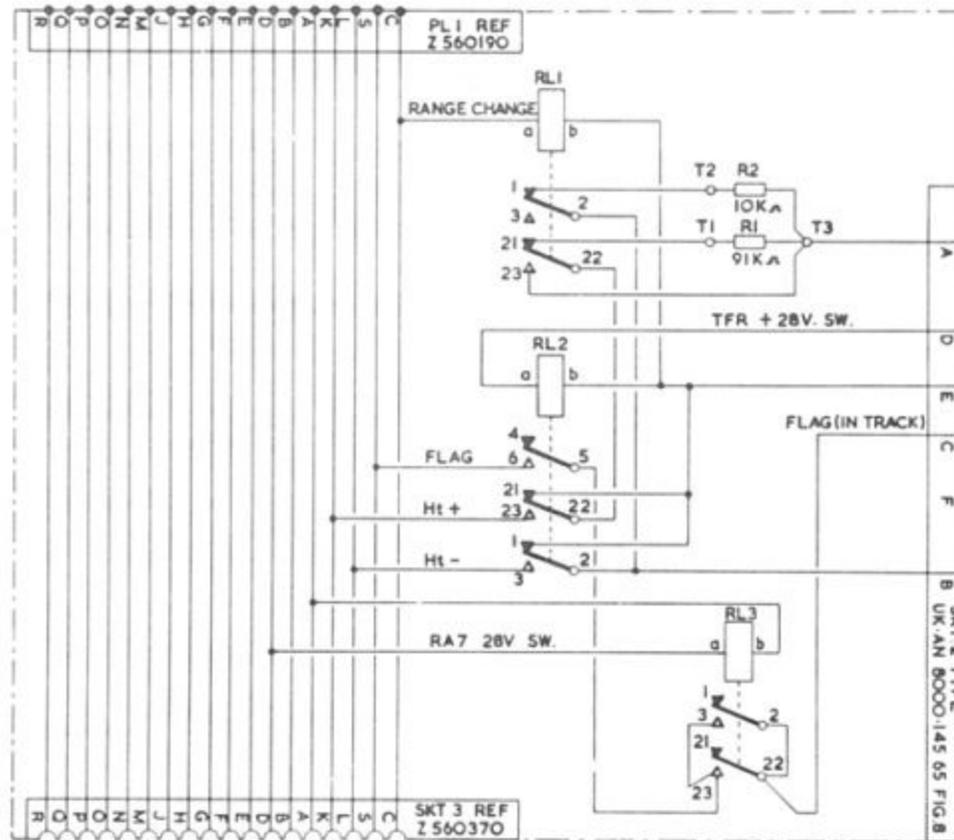
15. The radar pod is air cooled in flight by cabin exhaust air.

T.F.R. control unit

16. The control unit, Ref. No.10L/1948320 which is located at the pilot's port console (fig.1) is fitted with the following controls and indicators:-

- (1) Single-pole, two position SUPPLY toggle switch.
- (2) Single-pole, two-position STANDBY - ON toggle switch.
- (3) 3-position magnetic indicator.
- (4) Two-pole, 9-position rotary HEIGHT SELECTOR switch.
- (5) Two-pole, three-position FAIL-SAFE toggle switch.

17. The supply switch, which has two positions labelled ON and OFF, is used to connect the aircraft a.c. and d.c. supplies to the T.F.R. pod and is operated in conjunction with the STANDBY-ON switch. With the supply switch in the OFF position the magnetic indicator will show a black OFF on a white background; with the supply switch in the ON position the magnetic indicator will show a black STBY on a white background until the equipment warm-up period of one minute has elapsed and the STANDBY-ON switch is switched to ON; the magnetic indicator then shows black.



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Fig. 6 Internal wiring radio altimeter Mk. 7B J. B. (Post Mod 2421)

18. The HEIGHT SELECTOR switch which is calibrated from 200 to 1 000 ft. in steps of 100 ft. is used to select the desired operational low level reference altitude (para.7). Each position of the switch selects a.c. and d.c. reference voltages (h) which are derived from two resistor chains in the control-unit (fig.5). Supplies to the resistor chains are routed from a.c. and stabilized d.c. reference voltages in the T.F.R. pod power pack (fig.4).

19. With the desired altitude selected at the control unit, the a.c. and d.c. reference height signals (h) are connected via the appropriate selector switch contacts to the pod computer. The computer compares the reference height signals (h) with measured height above terrain (H) signals from the Mk.7B radio altimeter (para.7) and computes pitch-up or pitch-down signals accordingly.

20. The T.F.R. system can be checked for 'fail-safe' response using the FAIL-SAFE test switch. With the switch set to TEST, a system failure is simulated and the fail-safe circuits generate control signals which extinguish green T.F.R. VIDEO indicator lamps and light red T.F.R. FAIL indicator lamps at the pilots' panels. With the switch set to RESET, the simulated failure is removed and the fail-safe circuits are reset. This action extinguishes the red T.F.R. FAIL indicator lamps and lights the green T.F.R. VIDEO indicator lamps. The

switch is returned to the NORMAL position for normal equipment operation.

Mod.2375

20A. This modification introduces a press-to-break push-switch labelled T.F.R. RESET, fitted to a bracket mounted on the starboard side of the throttle box (fig.1). The switch provides the 2nd pilot with an independent facility to reset the T.F.R. system after a fail indication. Operation of the switch resets the fail-safe circuits, resulting in the red T.F.R. FAIL indicator lamps being extinguished and the green T.F.R. VIDEO indicator lamps being illuminated.

▶ Radio altimeter Mk.7B J.B.

21. The junction box (fig.6) is located as shown in fig.1 and forms a suitable interconnection point between the Mk.7B radio altimeter installation and the T.F.R. equipment. Three relays (Nos.1, 2 and 3) transfer information between the equipments.

22. Relays 2 and 3 are energized when the Mk.7B radio altimeter and the T.F.R. are operational, this allows a 'FLAG' signal to be fed from the Mk.7B radio altimeter to the T.F.R. as 'IN TRACK'.

23. The range switch in the radio altimeter controls the condition of relay 1; with the range switch in the 500' position relay 1 is de-energized and in the 5000' position relay 1 is energized, this allows either modified or unmodified height signals (H+ and H-) to be fed from the Mk.7B radio altimeter to the T.F.R.

T.F.R. junction box

24. The T.F.R. junction box, Part No. 1/T6658, located and illustrated as shown in fig.1 and 3, provides the main interconnection point between the T.F.R. pod, in the T.F.R. control unit, indicators, sensors, aircraft power supplies, the M.F.S. and the radio altimeter Mk.7B junction box. The junction box houses one relay which is used to connect the aircraft a.c. and d.c. supplies to the T.F.R. pod. An internal wiring diagram of the junction box is shown at fig.7, and the circuit operation of the relay is dealt with in para.46.

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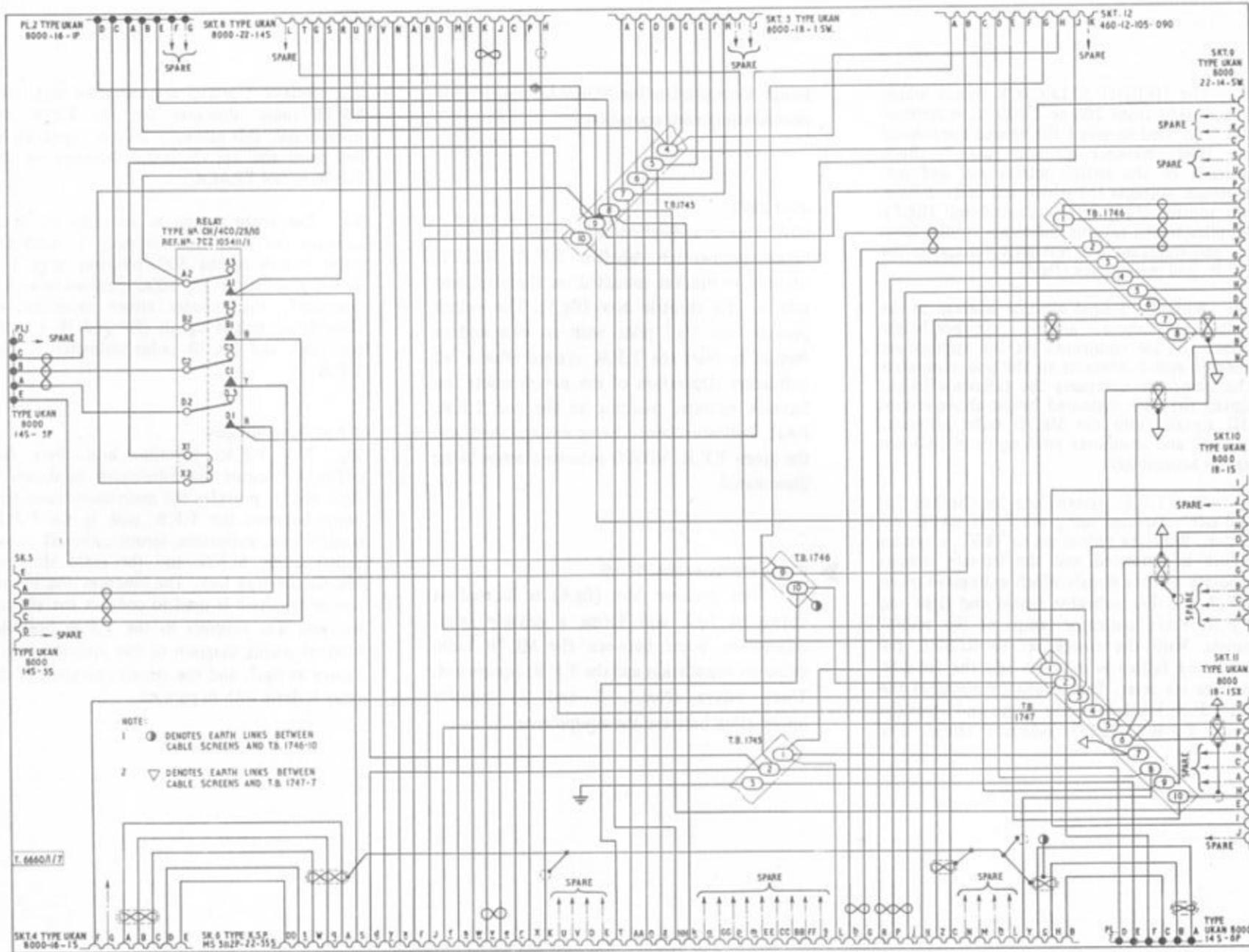


Fig.7 Internal wiring A.R.I. 5959 J/B

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Airspeed detector transducer

25. The transducer, Ref. No. 6A/10432, fitted under the pilots' floor (fig.1) is connected to a pitot tube located on the starboard side of the aircraft. The transducer and pitot tube form part of the pitot-static system which is described in Sect.7, Chap.1.

26. The transducer provides a signal proportional to airspeed which is used in the T.F.R. computer. The airspeed signal is routed from the transducer via an airspeed trim panel and the T.F.R. junction box socket 9 and 6 to the T.F.R. pod as shown in fig.4.

Airspeed trim panel

27. The trim panel, located adjacent to the transducer described in para.25, is fitted with two potentiometers which are used to trim out tolerance errors in the airspeed detector transducer potentiometer. The potentiometers are adjusted during system setting up procedures or when removal and re-installation of pitot-static major components is carried out.

Airstream direction detectors (A.D.D.)

28. Two detector units, Ref. No. 6A/6456, are installed horizontally one at each side of the aircraft. The units, which are designed to sense aircraft angle of attack, each comprise a probe, a paddle assembly enclosed in a differential pressure chamber and a potentiometer.

29. Each probe, which projects into the airstream, consists of a stainless steel cylinder approximately 4 in. long and 0.5 in. in diameter. The probe has two forward facing horizontal slots which transmit air pressure via two internal air passages to opposite sides of

the paddle blades. The paddle is directly coupled to the probe and a potentiometer wiper. A vernier calibration scale fitted to each unit permits the probe angles to be set coincident with the aircraft normal angle of attack during steady flight conditions.

30. During steady flight conditions with the aircraft angle of attack constant, the air pressure at each side of the paddle blades is equal. However, with an increase or decrease in the angle of attack, the air pressure at each side of the blades alters and the paddle tends to turn to equalize the pressures. The paddle turns the probe in such a direction that the pressures on either side of the blades equalize. The rotary paddle movement is transmitted to the transducer potentiometer wiper which turns to pick off a signal the amplitude of which is proportional to the aircraft angle of attack.

31. 115-volt a.c. supplies to the port and starboard A.D.D. units are routed from the T.F.R. pod and the a.c. analogue signal (proportional to angle of attack) picked off at each potentiometer wiper is routed via the A.D.D. Monitor to the T.F.R. computer for processing.

32. Each probe is provided with a 28-volt, 70 watt de-icing heater element which is controlled from a pitot-static heater control switch fitted to panel 7P at the starboard console (Sect.6, Chap.13 of this publication) and relay 815 at panel 4P (fig.9). With the pitot-static heater control switch set to ON, a 28-volt d.c. supply from fuse 608 in panel 3P is fed via closed switch contacts 2-1 to the coil of relay 815 which energizes. Relay 815 contacts A1-A2 close to connect a 28-volt d.c. supply from fuse 908 in panel 4P via T.F.R. junction

box plug 2 and sockets 10 and 11 to the port and starboard probe heater elements respectively.

A.D.D. monitor

33. The A.D.D. monitor which is mounted under the pilots' floor (fig.1), averages and compares the analogue signals from the A.D.D. units. The average A.D.D. unit analogue signal is routed to the T.F.R. computer for processing. Should a discrepancy between the two analogue signals occur, as a result of excessive aircraft yaw or A.D.D. unit failure, then the A.D.D. monitor initiates fail indications in the form of relay contact closures. The relay contacts close to complete 'fail' circuits which light the T.F.R. A.D.D. FAIL lamp located at panel 101P in the rear crews' compartment (para.37) and the T.F.R. FAIL lamps at the pilot's panels (para.42). The closed relay contacts also complete a fail circuit to the T.F.R. pod which generates a climb command of 1.5 deg./sec. The climb command is displayed at the pilots' HEAD-UP indicators. (Pre Mod.2420).

34. Supplies to the A.D.D. monitor are described in para.45.

A.D.D. trim panel

35. The panel, Part No. 1/T6662 (Post Mod.2188) located under the pilots' floor as shown in fig.1 is fitted with two potentiometers, a two-pole, two-position toggle switch and a 3-pole test socket.

36. The potentiometers labelled 1 and 2 are associated with the port and starboard A.D.D. units, and are used to trim out errors between

the two angle of attack analogue signals. The toggle switch which has two positions, NORMAL and ISOLATE, is used during ground servicing periods. With the switch set to ISOLATE, and A.D.D. monitor 'fail' indication (para.33) is isolated from the T.F.R. pod and the T.F.R. A.D.D. FAIL indicator lamp at switch panel 101P illuminates. The 3-pole test socket, labelled A.D.D. INPUT TEST is used to inject simulated A.D.D. unit analogue signals via the A.D.D. monitor to the T.F.R. pod for ground test purposes. The NORMAL-ISOLATE switch is returned to the NORMAL position before flight. Wiring details for the A.D.D. trim panel are contained in fig.8 and 9.

Switch panel 101P

37. Panel 101P, located at the Nav's/A.E.O.'s position, is fitted with two amber indicator lamps, one labelled T.F.R. REDUNDANT CIRCUIT FAIL and one labelled T.F.R. A.D.D. FAIL. The T.F.R. REDUNDANT CIRCUIT FAIL indicator, which is controlled from the T.F.R. pod, lights should any of the T.F.R. pod redundant circuits become unserviceable (para.13). The indicator is fitted with a press-to-test facility. The T.F.R. A.D.D. FAIL indicator lights whenever the A.D.D. monitor detects an error between the two analogue signals from the A.D.D. units (para.33), or when the NORMAL-ISOLATE switch at the A.D.D. trim panel is set to ISOLATE (para. 36). The indicator incorporates a press-to-reset facility which, when operated extinguishes the amber indication under no fault conditions e.g., temporary aircraft yaw. With a permanent A.D.D. unit fault the amber indication remains on and cannot be reset.

HEAD-UP indicators (Pre Mod.2420)

38. The HEAD-UP indicators, Ref. No. 6A/10471 are mounted on top of the pilots' coaming as shown in fig.1 and one indicator is shown in more detail in fig.3. The indicator comprises a vertical pitch scale with zero pitch at its centre. Pitch command signals from the T.F.R. computer drive a pointer vertically across the pitch scale in response to the detected changes in terrain. The pilot alters the aircraft attitude in pitch (climb or dive) to counteract the pointer movement and thus null the indication. This technique allows the pilot to maintain the aircraft at a selected height above terrain whilst following the rise and fall of the terrain.

39. The port and starboard HEAD-UP indicators are fitted with filament lamps which illuminate each indicator display. Associated 28-volt, lamp supplies, fuses and dimmer controls are found at panel 3P (port) and 4P (stbd.) respectively. For further information, reference should be made to Sect.6, Chap.17 of this publication. Note that Post Mod.2420 the head-up indicators are deleted.

T.F.R. - M.F.S. switch

40. The T.F.R. - M.F.S. switch located at the pilot's panel (fig.1) can be used to switch the pitch command signal from the HEAD-UP indicators to the first and second pilots' M.F.S. director horizon indicators (HEAD-DOWN indicators). The director horizon indicator glide path pointers are driven in pitch and the pilot can again null the pointers to keep the aircraft at a set height whilst following the rise and fall of the terrain.

41. With the T.F.R. - M.F.S. switch set to

T.F.R., the pod computer supplies the pitch command signal to the HEAD-UP indicators. With the switch set to M.F.S., switch contacts 1-2 open to disconnect a circuit from the M.F.S. pitch computer located under the pilots' floor (fig.9). A relay in the M.F.S. pitch computer energizes and its contacts close to connect the pitch command signal from the T.F.R. pod via the T.F.R. junction box socket 6, and socket 4 and the M.F.S. pitch computer connector CP5 to the director horizon indicator glide path pointer movement. Further details are given in A.P.112C-0600-1B. The M.F.S. system is dealt with in Sect.7 of this publication.

Indicator lamps

42. Three indicator lamps fitted to the first pilot's panel and duplicated at the second pilot's panel (fig.1) indicate the T.F.R. installation serviceability. The indicators, coloured red, green and amber are labelled T.F.R. FAIL, T.F.R. VIDEO and T.F.R. WARNING respectively. Each indicator incorporates a press-to-test facility which operates from a 28-volt d.c. supply fed from fuse 1317 at panel 4P.

43. The T.F.R. FAIL indicator shows red when the pod fail-safe circuits detect a malfunction in equipment operation. The fail-safe circuits generate a system fail signal (para.12) which is routed from the T.F.R. pod via T.F.R. junction box socket 6, pin n and socket 3 pins C and F to the first and second pilot's panels respectively to light the fail indicators. The T.F.R. VIDEO indicator, controlled from the T.F.R. pod, shows green to indicate that the system is operable and functioning correctly. The T.F.R. WARNING

indicator is again controlled from the T.F.R. pod, and when the pitch rate command signal exceeds one degree per second, the indicator flashes amber. For further details of the wiring between the T.F.R. pod and the indicator lamps reference should be made to fig.7, 8 and 9.

M.F.S

44. A vertical reference signal which is derived from the M.F.S. port vertical gyro, provides continuous information on the pitch attitude of the aircraft relative to a stable vertical axis. The reference signal is routed from the M.F.S. via the T.F.R. junction box socket 4 pins A, B, and C and socket 6, pins A, (q) and W (fig.7) to the T.F.R. pod. Further information concerning the M.F.S. vertical gyro is found in Sect.7, Chap.7 of this publication, and a more detailed description is in A.P.4685B, Vol.1, Book 2, Sect.4, Chap.2A.

General

49. All T.F.R. items of equipment should be checked for security of mounting and tightness of plug and socket connections. Before removing any items of equipment suspected of being defective, checks should be made for continuity and insulation on the associated cable assemblies. Comprehensive setting up, operating and servicing instructions for the T.F.R. are found in A.P.114N-0101-1.

Supplies

45. The A.R.I.5959 installation is provided with 115-volt, 400 Hz 3-phase a.c. and 28-volt d.c. supplies which are routed from the 200-volt sub-distribution panel 75P and the starboard fuse and relay panel 4P respectively. The a.c. supplies from panel 75P are taken from fuses 739 R, Y and B and routed to the T.F.R. junction box for distribution via the junction box internal relay contacts to the T.F.R. pod and the A.D.D. monitor. The d.c. supplies from panel 4P are taken from fuses 908, 1312 and 1317 and routed via the T.F.R. junction box for distribution to the A.D.D. heaters, the pilots' indicator lamps and HEAD-UP indicators, the REDUNDANT CIRCUIT FAIL indicator at panel 101P, the T.F.R. pod and via junction box relay contacts to the T.F.R. control unit.

Supply switching

46. Reference to fig.7, 8 and 9 will show

that with the T.F.R. control unit SUPPLY switch set to ON, a 28-volt d.c. supply is fed to the T.F.R. junction box internal relay which energizes. Relay contacts A1-A2, close to connect the 28-volt d.c. supply to the T.F.R. pod timer circuit. Relay contacts B1-B2, C1-C2 and D1-D2 close to connect the 115-volt, 400 Hz, 3-phase a.c. supplies to the T.F.R. pod and the A.D.D. monitor.

47. After a warm-up period of approximately 1 minute, the T.F.R. pod timer operates to connect the high voltage supplies to the pod transmitter-receiver circuits, the T.F.R. control unit magnetic indicator changes from an OFF indication to show STBY. When the T.F.R. control unit STANDBY-ON switch is set to ON, the 28 volt d.c. supply from fuse 1312 is routed to the T.F.R. timer circuit which controls the control unit magnetic indicator; the indicator changes from STBY to show black, signifying the equipment is now fully operational.

48. 28 volt d.c. supplies from starboard fuse and relay panel 4P (fuse 908) to the A.D.D. unit heater elements are described in para.32.

SERVICING

Ground cooling

50. If the T.F.R. is to be operated on the ground, cooling air must be introduced through the cabin exhaust air system, refer to A.P.101B-1902-1A Cover 2, Sect.3, Chap.8.

Test set

51. A special test set, Ref. No. 10S/1070309

is available for checking the aircraft T.F.R. installation with the T.F.R. pod removed from the aircraft. The test set is connected to the aircraft via a test lead and the T.F.R. pod connector plug.

52. The test set provides the necessary checks and supplies as follows:-

- (1) Connects an appropriate signal to

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the airstream direction detectors (A.D.D.) and A.S.I. transducer trimming potentiometers for accurate adjustment and setting.

- (2) Measures the average A.D.D. output from the A.D.D. monitor and the output from A.S.I. transducer potentiometers.
- (3) Checks the continuity and

functioning of the associated radio altimeter Mk.7B junction box circuit, M.F.S. pitch computer and vertical gyro pitch potentiometer.

- (4) Checks for correct functioning of circuits associated with the height selector, FAIL indication and RESET by injecting simulated T.F.R. pod signals into the system.

- (5) Checks all the associated T.F.R. cable forms for continuity and insulation.

53. A test procedure using the test set may be found in A.P.114N-0101-1. The Mk.7B radio altimeter installation may also require testing and details of these tests are found in Sect.8, Chap.7 of this publication.

REMOVAL AND INSTALLATION

General

54. Detailed instructions for removing and fitting the T.F.R. pod to the aircraft together with a special alignment technique are given in A.P.101B-1902-1A, Sect.3, Chap.1. Instructions for removing the airstream direction detector (A.D.D.) are given in para.55. Access to the remaining units in the T.F.R. system is straightforward and therefore special removal and installation procedures are not given.

Airstream direction detectors

55. When it is necessary to replace the port or starboard A.D.D. unit it is extremely important that the new unit should be fitted to the aircraft in exactly the same position originally occupied by the defective unit. With reference to fig.3 the following procedure should be carried out:-

- (1) Disconnect the associated A.D.D. cable from either the main junction box socket 10 (starboard unit) or the port plug break (port unit).

- (2) Remove the eight screws which secure the small circular external cover plate surrounding the probe. Withdraw the cover plate from the unit.
- (3) Carefully take note of the unit vernier setting (fig.3) and then remove the four self lock nuts and spacers which secure the unit to the airframe. Carefully withdraw the unit, complete with cable and socket, away from the aircraft skin.
- (4) To fit a serviceable unit reverse the procedure given in sub-para.(1), (2) and (3) ensuring that the unit is positioned and secured correctly with the vernier setting the same as in sub-para. (3).

CAUTION...

These instruments are extremely delicate and great care must be exercised when handling or servicing on the aircraft.

Cable connectors

56. Should any unit be removed from the aircraft, all loose connectors should be secured to the adjacent aircraft structure to prevent damage.

Blanking cap

57. When the T.F.R. pod is not being carried by the aircraft a blanking cap is fitted to cover the T.F.R. pod cut-out on the radome. Further information concerning the fitting of the blanking cap is available in A.P.101B-1902-1A, Sect.3, Chap.1.

T.F.R. control unit

58. On aircraft with Mod.2375 incorporated ensure that when replacing the T.F.R. control unit that a modified unit is fitted.

TABLE 1

A.R.I.5959 Equipment

Equipment	Part No.	Ref. No.	No. off
T.F.R. pod	AN/APN/170 (Pre Mod.2395) 3023000-4 (Post Mod.2395)	-	1
Control unit	1/T6654 (Pre Mod.2422) 8/T6654 (Post Mod.2422)	10L/1948320 -	1
Airstream direction detector, Type RL50	-	6A/6456	2
A.D.D. trim panel	1/T6662	-	1
Head-up indicator (Pre Mod.2420)	-	6A/10471	2
T.F.R. junction box	1/T6658	-	1
Radio altimeter Mk.7B junction box	1/T6820	-	1
Airspeed transducer	-	6A/10432	1
Airspeed trim panel	1/T6787	-	1
Switch panel 101P	-	-	1

TABLE 2

Connectors for A.R.I.5959

Part No.	Cableform	Connecting
6/T6653	Trinyvin 20 3-cores	Transducer to T.B.1753
7/T6653	Uninyvin 10 17-cores	T.F.R. control unit to T.F.R. J.B. socket 8 pin to pin
8/T6653	Min 2C	T.F.R. J.B. plug 7 to Radio altimeter Mk.7B J.B. socket 2 pin to pin

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TABLE 2 (Cont'd)

Connectors for A.R.I.5959

Part No.	Cableform	Connecting
9/T6653	Uninyvin 20 20-cores Trinyvin 20 3-cores Uninyvin twisted 4-cores Min 3C 3-cores Min 2C 4-cores Uninyvin met 20 2-cores	T.F.R. junction box socket 6 to plug break 1216 pin to pin
10/T6653	Trinyvin 20 3-cores Uninyvin 20 2-cores Min 2C 2-cores Uninyvin met 20 1-core	T.F.R. junction box socket 11 to A.D.D. probe port plug break pin to pin
12/T6653	Uninyvin 20 15-cores	Test plug A.D.D. Monitor Junction box socket 12 T.B.1844 Diode
13/T6653	Uninyvin 20 2-cores	T.F.R. reset control unit to T.B.767
14/T6653	Uninyvin 20 2-cores	T.B.767 to T.F.R. reset switch
FR861	Trinyvin 20 3-cores Uninyvin 20 1-core	T.F.R. junction box socket 5 to plug break 1215. (Trinyvin pin to pin, Uninyvin core pin E to pin D)
FR882	Uninyvin 20 3-cores Min 2C 4-cores	T.F.R. junction box socket 9 to A.D.D. trim panel plug break

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TABLE 2 (Cont'd)

Connectors for A.R.I.5959

Part No.	Cableform	Connecting
	Trinyvin 20 3-cores	T.F.R. junction box socket 9 to airspeed trim panel T.B.1753
	Uninyvin 20 Twisted 2-cores	T.F.R. junction box socket 9 to T.B.1743
	Uninyvin 20 Twisted 2-cores	T.F.R. junction box socket 9 to T.B.1744
FR884	Uninyvin 20 7-cores	A.D.D. trim panel to plug break
FR885	Uninyvin 20 3-cores	T.B.1754 to Press-to-Test indicator A.E.O.'s panel (101P)
FR887	Trinyvin 20 3-cores	T.F.R. pod plug to plug break 1215 (pin M to pin A, pin h to pin B and pin i to pin C)
	Uninyvin 20	T.F.R. pod plug to plug break 1215 (pin N to pin D)
	Uninyvin 20 20-cores Trinyvin 20 3-cores Uninyvin 20 Twisted 4-cores Uninyvin met 20 2-cores Min 2C 4-cores Min 3C 3-cores	T.F.R. pod plug to plug break 1216 pin to pin

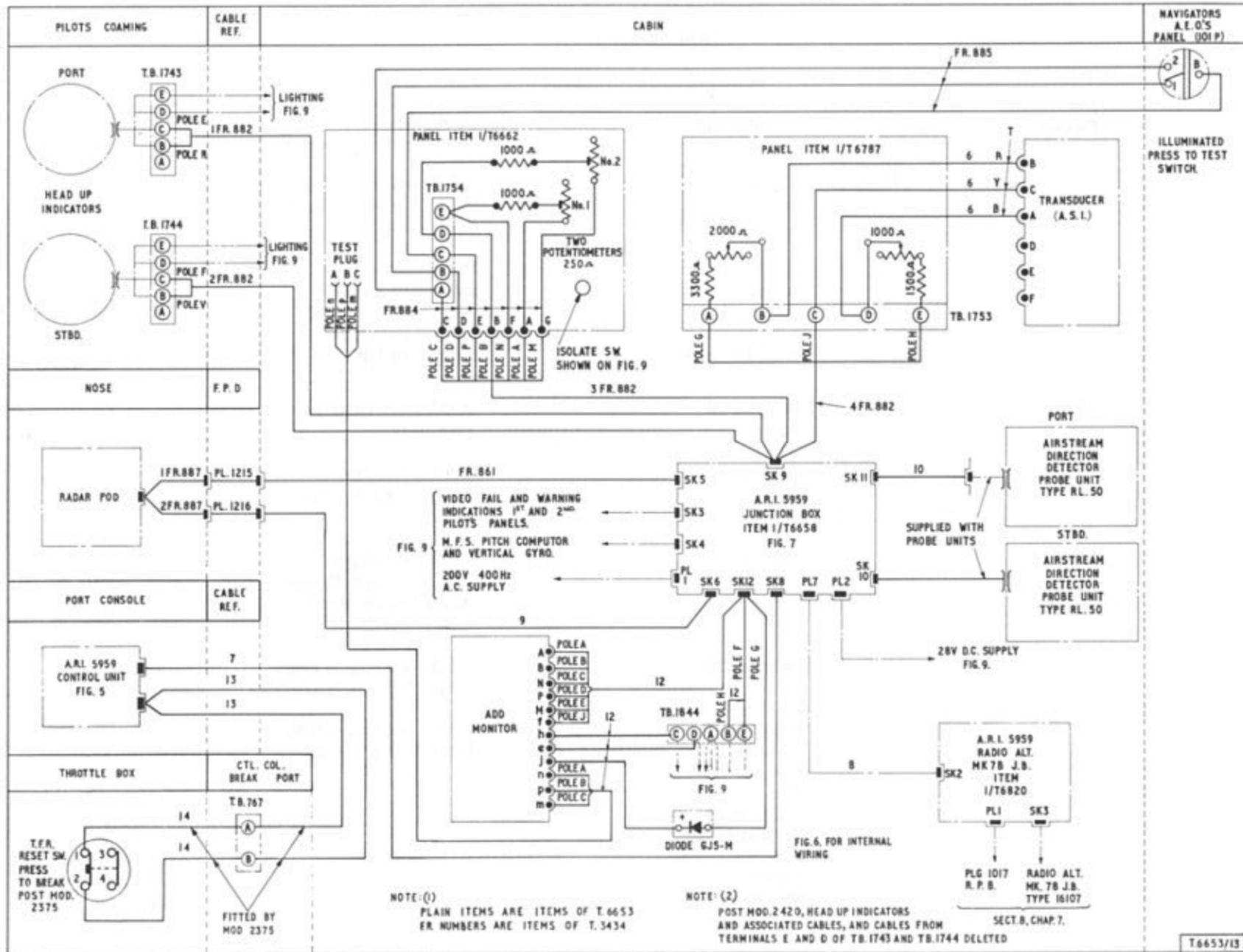


FIG. 8. A.R.I. 5959-Pre and Post Mod. 2375 and 2420

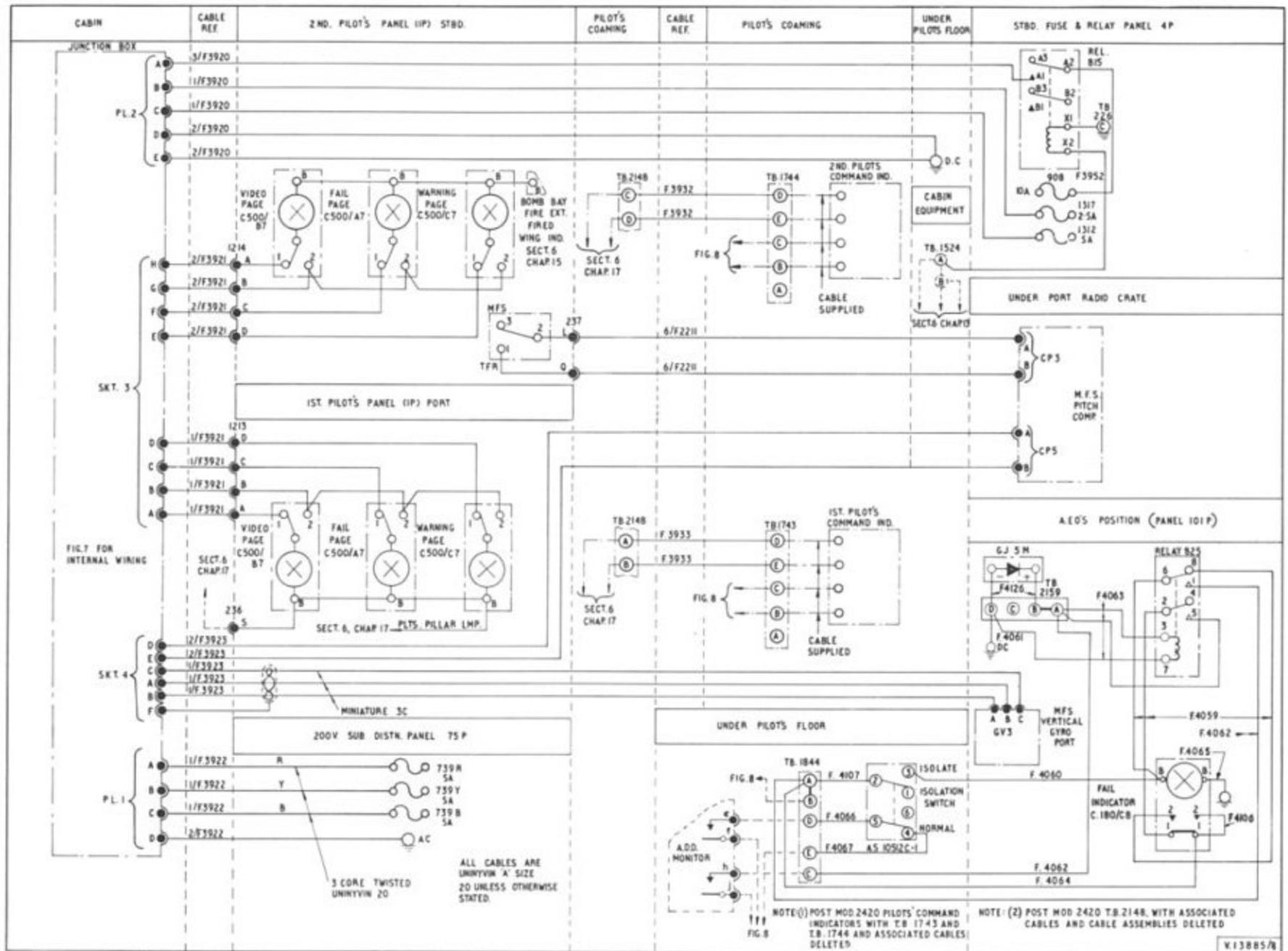


Fig.9 A.R.I. 5959 Power supplies-Pre and Post Mod. 2420

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