

## Chapter 3

## ENGINE INSTRUMENTS

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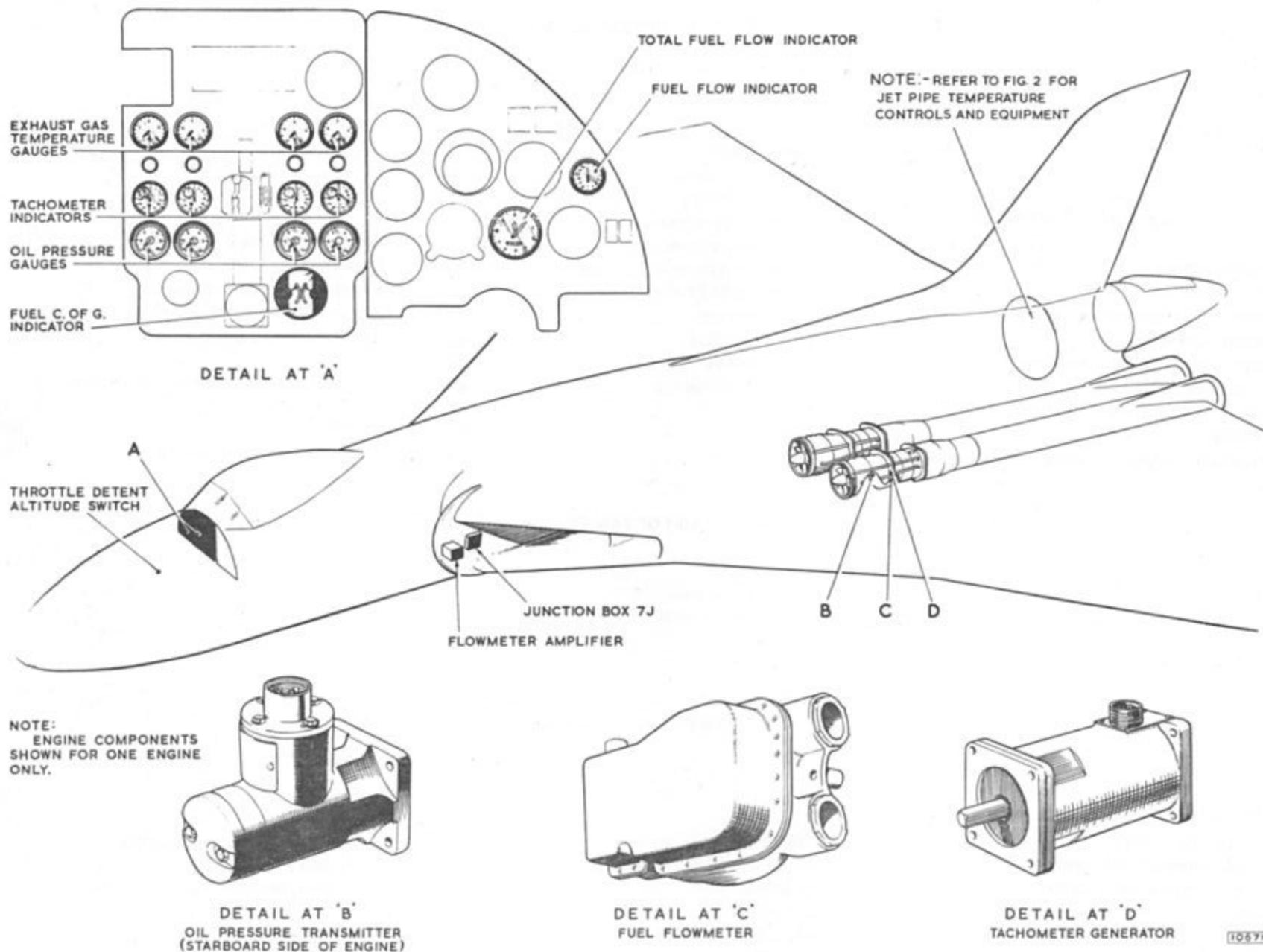


Fig.1 Location of engine instruments and associated equipment

◀Note added▶

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**Introduction**

1. This chapter contains descriptive and servicing information for the engine instruments and associated controls. The instruments fitted provide the pilot with essential information concerning the performance and condition of the engines during flight. The instruments fitted are as follows:-

- (1) Engine tachometers
- (2) Oil pressure indicators
- (3) Exhaust gas thermometers and jet pipe temperature limiting system
- (4) Fuel contents gauges
- (5) Fuel C of G indicator
- (6) Fuel flowmeters

Routing charts for the electrical circuits are provided at the end of the text and a general

**ENGINE TACHOMETERS**

5. Four Mk.II indicators are fitted in the pilots' centre panel to provide engine speed information for both pilots. The instruments are of the synchronous motor type and indication is by means of a main scale graduated in divisions of 10 per cent, and a subsidiary scale in divisions of 1 per cent, of the maximum engine speed.

6. Mounted on the port side of each engine, aft of the forward bulkhead is a Mk.II tachometer generator. Each of these generators is connected to its respective instrument on the pilots' panel by means of a self-contained circuit. When the engines are running, 3-phase a.c. is developed by the generators at a frequency proportional to the engine speed, and fed to the indicators which record the

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location diagram of the instruments is provided in fig.1.

2. Brief details of the fuel contents gauges including the C of G indicator are given but for more detailed information reference should be made to Sect.6, Chap.9.

3. A complete description on all the instruments described in this chapter will be found in the associated Air Publications listed in Table 1. Engine components are dealt with in the Olympus engine handbook (AP 102C-0403-1).

4. The following modifications are included in this chapter:-

**Mod.2253**

To introduce direct reading indicators Pt. No. S196.1.65 in lieu of servo potentiometers, Ref.6A/4724, for jet pipe temperature indication on pilots' panel.

**Mod.2258**

To alter the circuit of the R.P.M. governors, to feed fuses from the essential bus-bars, to

**DESCRIPTION AND OPERATION**

engine speed according to the rise and fall of the generator output frequencies. A full description of the tachometer and its associated generator will be found in the Air Publication listed in Table 1.

**OIL PRESSURE INDICATORS**

- ▶ 7. Oil pressure information from the four engines is provided by four inductor type oil pressure gauges, Pt. No. 11ACR, calibrated 0-100 lb/in<sup>2</sup>, mounted on the pilots' centre panel as shown in fig.1. These indicators are operated by four pressure transmitters, Pt. No. 741PG/SB, fitted one to the starboard side of each engine. The transmitters are fed from the aircraft 115-volt, 400 Hz a.c. supply via four individual auto-transformers which step down the supply to 26 volt-, 400 Hz. The auto-transformers and supply fuses for No.1

prevent increase in thrust on the two remaining engines, in the event of a two engine failure.

**Mod.2308**

To introduce new cable assemblies to the No.1, 2, 3 and 4 jet pipe thermocouple harnesses and to alter the routing and clipping to eliminate chafing.

**Mod.2449**

To introduce parallel cable assemblies to the Nos.1 and 4 J.P.T. circuits between rudder power unit compartment and terminal blocks 1593 and 1599 respectively.

**Mod.2477**

Changes Part No. of J.P.T. indicator resistors in rudder power unit compartment from 1/V16358 to 1/V19288.

▶ **Mod.2519**

To replace the spiral wrapping on the No.1, 2, 3 and 4 J.P.T. harnesses with asbestos tape, and to alter the routing and clipping to eliminate chafing. ◀

and 2 indicators are fitted in 27P and those for No.3 and 4 indicators in 28P. A routing chart is provided in fig.5 and a complete description of the indicators and their associated components will be found in the relevant Air Publications listed in Table 1.

**EXHAUST GAS THERMOMETERS  
AND  
JET PIPE TEMPERATURE SYSTEM****Exhaust gas thermometers, Type D**

8. In order that the engines may be operated at a safe and efficient temperature, four exhaust gas temperature indicators are mounted on the pilots' centre panel. Thermocouples are provided in each jet pipe, and the output from these is fed, via jet pipe temperature resistors, directly to the indicators.

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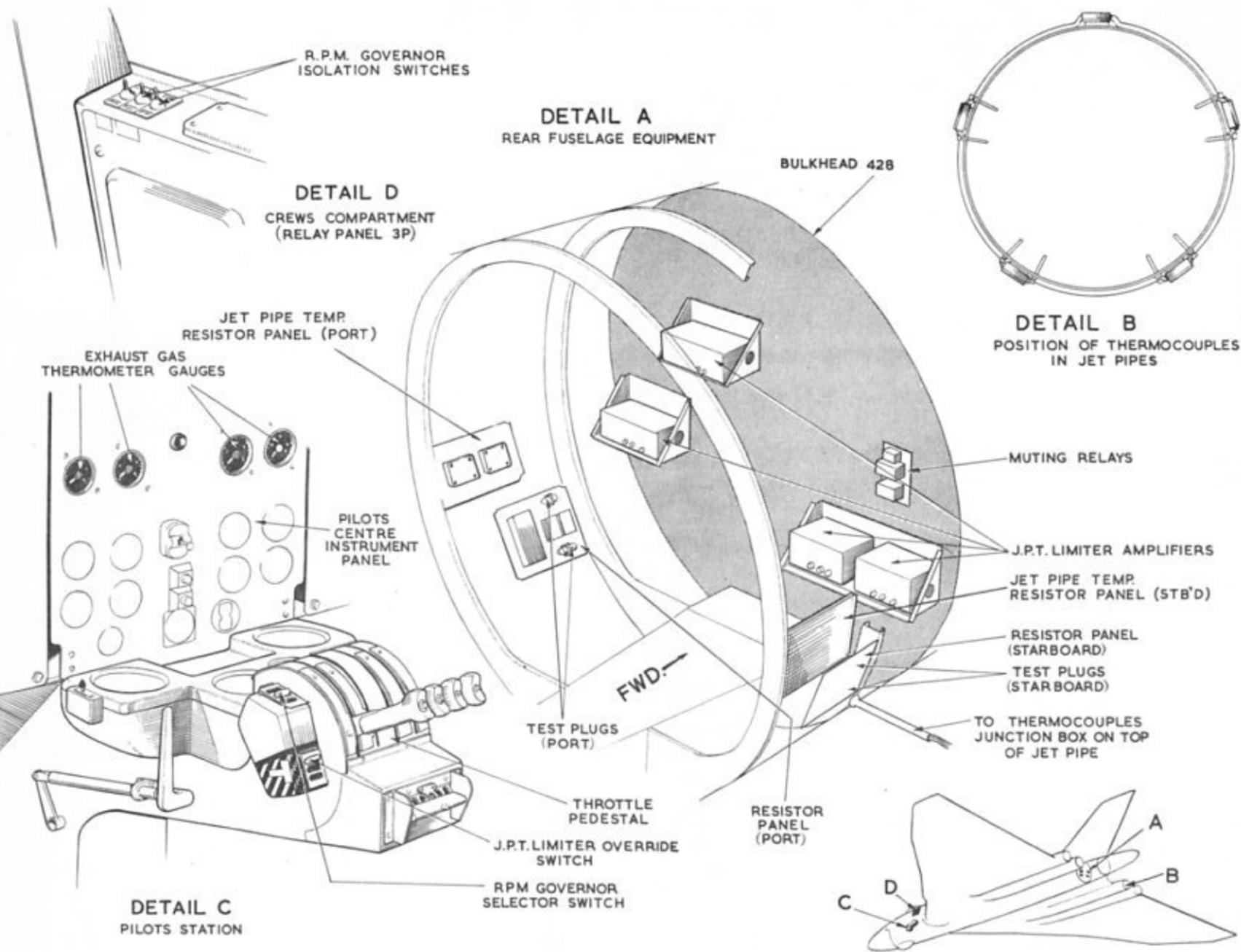


Fig.2 Jet pipe temperature equipment

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*Thermocouples*

9. Eight thermocouples, Type R.A.E. H70/19/1 are mounted in pairs at the rear end of each jet pipe and at right angles to the exhaust stream. Two pairs are located each side of the jet pipe, one above and the other below the horizontal centre line. Each pair of thermocouples is connected to a junction box and these in turn are connected by a metal harness to an engine junction box mounted on top of the jet pipe.

10. From the engine junction box glass braided chromel-alumel cables are taken, via conduits, to the compartment behind the aft power compartment in the rear fuselage. Here they connect to their respective jet pipe temperature resistors, limiting amplifiers and ground test plugs.

**CAUTION...**

- ▶ With Mods.2308 and 2519 incorporated the cables from the engine junction boxes should be checked for correct clipping and cable runs in accordance with fig.3A to ensure that the cables incorporate enough slack for jet pipe expansion and that they are held clear of the jet pipe harness to eliminate chafing. ◀

*Jet pipe temperature resistors*

11. The jet pipe temperature resistors are fitted to two panels located one on the port side and one on the starboard side of the rear fuselage equipment bay (fig.2). Two adjustable resistors are fitted in each jet pipe temperature circuit. One resistor, connected between the thermocouples and their associated junction box (figs.8, 9, 10 or 11) enables the resistance

of the thermocouple circuit up to the junction box to be set at  $6 \pm 0.1$  ohms. The other resistor is connected in the circuit between the junction box and its associated temperature indicator (fig.6) to enable the total circuit resistance external to the indicator to be set at  $25 \pm 0.1$  ohms.

*Indicators*

- ▶ 12. Four direct reading indicators, Type S 196/1/65 are fitted to the pilots' centre panel as shown on fig.2. They are moving coil type instruments operating as milliammeters suitably calibrated over a range of 0 to 800 deg.C. Craltersil Bk (Chromel Alumel) cables are used to connect the indicators to the jet pipe temperature resistors. ◀

13. A full description of the exhaust gas thermometers, Type D and the thermocouples will be found in the relevant Air Publications listed in Table 1.

*Jet pipe temperature limiting system*

14. The jet pipe temperature (j.p.t.) limiter and rev/min governor systems form a basic part of the Olympus engine fuel system, and the following paragraphs should be read in conjunction with A.P.102C-0402-1 and A.P.113F-0414-1.

15. To avoid making frequency throttle adjustments when maintaining the engine speed within the combined j.p.t. and rev/min limitations during cruising or take-off, a datum selector switch labelled CRUISE/TAKE-OFF is mounted on the engine control pedestal. The selector switch controls a solenoid-operated servo isolator in the lines between the two L.P.

compressor/governors on the engines. Thus when the throttles are open either a driven governor (take-off) or a static governor (cruise) may be selected.

16. In addition, the selector switch also selects the corresponding cruise or take-off datum for the J.P.T. limiter, so that regardless of the rev/min selected at the throttle, the actual engine speed will not increase above that point where the jet pipe temperature begins to exceed the selected datum.

17. Control of the j.p.t. is provided by electro-pressure control units mounted one on each engine. Each of these units is operated by a j.p.t. limiter amplifier, Type A206/1, which is controlled by the CRUISE/TAKE-OFF selector switch. Basically, the j.p.t. limiter system cuts down the fuel flow to the engine by the action of the electro-pressure solenoid operated ball valve, when the j.p.t. rises above the selected datum level.

18. The temperature signal obtained from the thermocouple cluster on the engine is passed to the amplifier where it is compared with a highly stabilized reference voltage in the amplifier. Should the thermocouple output prove to be the higher, the resultant error signal will leave the amplifier as a current to operate the solenoid controlled electro-pressure valve. Energizing the valve will reduce the fuel flow which will then bring about a corresponding reduction in j.p.t.

19. The level at which the error signal appears can be controlled within the ranges of adjustment, by altering the value of the reference voltage. By this means the desired j.p.t. datum level can be set inside the amplifier via relays and a datum setting resistor network. The amplifier has provision for triple datum

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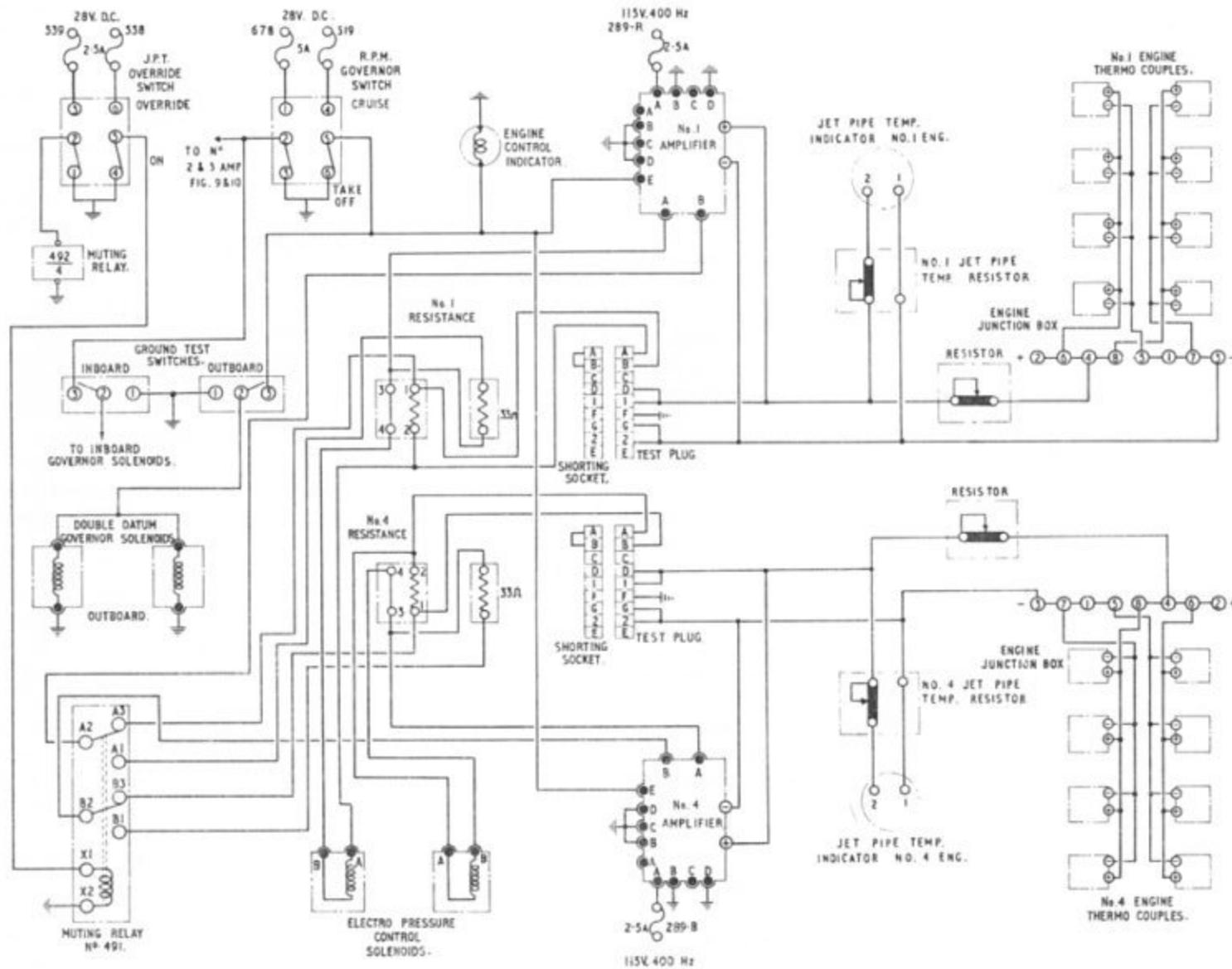


Fig. 3 Jet pipe temperature control

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settings but in the case of Olympus 201 engines as on Vulcan 2 aircraft, only the CRUISE and TAKE-OFF datums are used, consequently only one of the two relays in the amplifier is employed. Connections to the R.P.M. GOVERNOR switch are made via a five pin plug on the amplifier. Descriptive details for the j.p.t. limiter amplifier, Type A206/1, will be found in the relevant Air Publications listed in Table 1.

20. Mounted adjacent to the R.P.M. GOVERNOR switch is an OVERRIDE switch. The switch, which is guarded and labelled ON-OFF, is used during ground testing and also if the j.p.t. limiting system should fail during flight. The switch must be in the ON position for take-off.

21. In addition to the OVERRIDE switch two R.P.M. GOVERNOR ISOLATION switches, labelled ON-OUTBOARD and ON-INBOARD are situated on the top of the port fuse and relay panel 3P. These switches are used for ground testing the j.p.t. limiters independent of the rev/min governors. Instructions on the use of these switches will be found in Sect.1, Chap.2 of this publication.

#### Power supplies

22. A 115-volt, single phase, 400 Hz a.c. supply is fed to the amplifiers from the fuse panel 27P port and fuse panel 28P starboard. Amplifiers 1 and 4 are fed from 27P, fuses 289-R and 289-B respectively. Amplifiers 2 and 3 are fed from 28P, fuses 311-R and 311-B respectively.

#### Equipment location

23. The amplifiers, Type A206/1, together with the test plugs and resistances are installed

in the compartment aft of the power compartment in the rear fuselage as shown in fig.2. The OVERRIDE switch and the r.p.m. governor CRUISE/TAKE-OFF switches are fitted to the engine control pedestal in the pilots' cabin. Both these switches are of the double-pole change-over pattern. The R.P.M. GOVERNOR isolation switches, which are spring-loaded to their closed positions, are of the single-pole pattern and are installed on the top of panel 3P. The muting relays (No.491 and 492) are installed along with the amplifiers in the compartment aft of the power compartment.

#### Circuit operation

24. The circuit operation described in the following paragraphs should be read in conjunction with the theoretical diagram of the circuit fig.3. Only the outboard engines No.1 and 4, are described in the following paragraphs as the circuit operation for Nos.2 and 3 engines is similar.

25. With the J.P.T. OVERRIDE switch in the ON position, the muting relays (491 and 492) are completely isolated from the 28-volt supply and the feed side of the relay coils are shorted to earth via the linked contacts 1 and 4 of the switch. Also with the R.P.M. GOVERNOR switch at the TAKE-OFF position the double datum governor valve solenoids are isolated from their supply in a similar manner to the muting relays. In this condition the ENGINE CONTROL magnetic indicator is de-energized to show black and the datum, level relay within the amplifier (fed from pole E in the 5 pole plug) is isolated from its supply. The datum setting resistance will thus be set for take-off j.p.t. limitation.

26. On the output side of the amplifier

(two-pole plug, poles A and B) the operating current for the electro-pressure solenoid valve will be fed to pole A on the solenoid via (in the case of No.1 engine) relay contacts 491/4 and the shorting link across the No.1 resistance. The resistance is brought into circuit during ground test only. A return path is provided from pole B via the straight link on the resistance back to pole A on the amplifier.

27. With advancement of the throttle lever, engine speed and j.p.t. will increase. Should the required engine speed be attained without exceeding the pre-set temperature datum then the limiting system will remain neutral. However, should the j.p.t. exceed the datum before the desired engine speed is reached, then the current to the electro-pressure control solenoid will rise to operate the solenoid, thus reducing fuel flow to the engine. Further opening of the throttle will produce a slight additional rise in temperature and the fuel system will again be adjusted to reduce fuel flow. By throttling back, the system will return to neutral.

28. If the R.P.M. GOVERNOR switch is now moved to the CRUISE position with the OVERRIDE switch still at the ON position it will be seen that:-

- (1) A 28-volt d.c. supply from fuse 519 is fed via the R.P.M. GOVERNOR switch, and the GOVERNOR ISOLATION switches, to energize the solenoids of the engine double datum governor. This action will now provide a rev/min control in the engine fuel system which will ensure that the cruise rev/min is not exceeded.

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(2) At the same time, the same d.c. supply is fed to the datum level control relay within the amplifier (via pole E, 5 pole plug). The relay will be energized to complete the circuit to the CRUISE temperature setting datum resistor.

(3) In addition the d.c. supply will also energize the ENGINE CONTROL magnetic indicator to show white, to indicate to the pilot that CRUISE j.p.t. and rev/min control has been selected.

The engine rev/min and j.p.t. will now be automatically controlled to the engine CRUISE limitations.

29. If during flight, faults should develop or the system become suspect, muting conditions can be applied to the system by use of the J.P.T. OVERRIDE switch. With the switch selected to OVERRIDE, muting relays 491 and 492 will be energized from fuses 538 and 539 respectively, via now closed switch contacts 2-3 and 5-6.

30. In the case of the No.1 engine (operation of the other engines being similar) the following circuit action will take place:-

(1) Contacts 491/4 will open, isolating the amplifier output from the electro-pressure valve solenoid.

(2) Contacts 491/3 close connecting a 33-ohm resistor across the amplifier output. (This is a dummy resistance which represents the solenoid coil resistance).

This action will cause the j.p.t. limiter amplifier to be isolated and the electro-pressure valve will be inoperative. Under these conditions, j.p.t. limitation must be carried out manually by observation of the j.p.t. gauges and manual throttle adjustment.

### FUEL CONTENTS SYSTEM

31. The aircraft is equipped with fourteen fuel tanks, five in each wing and four in the front section. The fourteen tanks are divided into two groups, seven each side of the aircraft, port and starboard. Each of these groups is then divided into a further two groups for weight balancing purposes. Groups 1 and 2 comprise the port tanks numbered 1, 4, 5, 7 and 2, 3, 6 respectively. Groups 3 and 4 comprise the starboard tanks in the same sequence.

32. A Smith Waymouth type fuel contents system, operating from the 28-volt d.c. supply is installed in the aircraft. This system calculates, by the use of capacitor units integral with the tank, the quantity of fuel contained in a tank. The value (in pico-farads) of the capacitor units varies with the amount of fuel and air between the plates, and is thus proportional to the mass of fuel in the tank.

33. The capacitor units are fitted upright inside the tanks and connected via a co-axial cable to a trimmer box and amplifier in each case. The output from each amplifier will vary according to the tank capacitance, and this condition for each tank or tank group will be indicated on the associated fuel contents gauges. A description of the system including details of operation is contained in the Air Publications listed in Table 1. The complete system of fuel controls is dealt with in Sect.6, Chap.9.

### Pilot's fuel contents gauges

34. Four fuel contents gauges, one to each tank group, are fitted on the pilot's panel (2P) located forward of the throttle controls. The gauges, Type A.O.69 and 70 have an inner and outer scales calibrated in thousands of pounds of fuel.

35. The inner scale of each instrument automatically records the total amount of fuel contained in the respective tank group whilst the outer scale will record the contents of any tank in the group by means of associated selector switches. The selector switches are mounted on the retractable centre console (5P) and are labelled CONTENTS. When any one of the switches, which are of the push type, is pressed, the contents of that particular tank will be indicated on the outer scale of the associated instrument.

### Navigator's fuel contents gauges

36. Four gauges are also provided at the navigator's station and are fitted above the plotter's instrument panel. These four, single scale, instruments give indication of the tank group contents only. The indicators for No.1 and 4 engines are Type A.G.14 instruments. The other two indicators, for No.2 and 3 engines, are Type A.G.15.

### C.G. indicator S128-5

37. A Type S128-5 fuel C.G. indicator is fitted on the pilots' centre panel (1P). This indicator has two separate scale movements and is designed to give indication of fuel disposition relative to the centre of gravity for each side of the aircraft.

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38. The left-hand scale of the instrument provides indication of C.G. movement for the port tanks (1 to 7) while the right-hand scale provides a similar indication for the starboard tanks. The fuel C.G. lies between the fuselage tanks and the wing tanks.

39. Each scale is divided into three sections. A central green section marks the safe margin of fuel C.G. movement while either side of this are two red sections marked NOSE HEAVY and TAIL HEAVY respectively. With no supply to the indicators the pointers will lie in the bottom red sections.

40. The indicator movements are controlled by the fuel tanks amplifier outputs. These outputs can be switched out of the fuel contents gauge circuits by operating the push-switch labelled C.G., CHECK, fitted adjacent to the indicator. The amplifier will then be connected to the indicator via a resistance network, and, providing the fuel C.G. is being maintained, the instrument pointers will take up a centre scale position. Should NOSE HEAVY or TAIL HEAVY conditions develop the C.G. can be corrected by transferring fuel between No.1 and 7 tanks. Note that while the C.G. switch is pressed the fuel contents gauges will register zero.

4.1 The C.G. indicator will also be brought into operation during flight refuelling conditions, when the flight refuelling master switch on the starboard console (7P) will be on. A full description of the C.G. indicator, including the relevant routing charts will be found in Sect.6, Chap.9.

#### FUEL FLOWMETERS

42. The Mk.3 fuel flowmeter system

installed in the aircraft is designed to provide the following continuous indications:-

- (1) The rate at which fuel is being consumed by each engine.
- (2) The total rate at which fuel is being consumed by all engines.
- (3) The total amount of fuel consumed by all engines.

The installation is electrically operated and the main equipment consists of four engine transmitters, an amplifier, a flowmeter and a total fuel flow indicator. The instruments are installed on the second pilot's panel and a full description of the system, including operating details will be found in the relevant Air Publication listed in Table 1. A routing chart of the circuit (fig.7) is provided at the end of the text.

#### Control switches

43. Two main switches control the circuit. The first of these is an electrically-operated Ledex selector switch which provides individual selection of engine fuel flow on the flowmeter. This switch is mounted inside junction box 7J on the port side of the nose-wheel bay. The switch is operated by four selector push-switches mounted on the retractable centre console 5P.

44. The second switch is a toggle type switch and is mounted on the second pilots' panel adjacent to the total fuel flow indicator. This switch, which is spring-loaded to a central off position, is labelled RESET-NORMAL. The function of the switch is described in para.53.

#### Power supplies

45. Single phase, 400 Hz a.c. at 115-volts and 26-volts is required to operate the system. The 115-volt supply is fed direct to the amplifier from fuse 268-B in panel 25P. A second 115-volt supply is taken from fuse 268-R, also in 25P, to an Elliott Type 3B/933 transformer which is mounted adjacent to 25P. This transformer provides a 26-volt output which is fed to the four transmitters and the flowmeter.

46. In addition to the a.c. supplies a 28-volt d.c. supply is used for operation of the Ledex selector switch. The supply is fed to the switch from fuse 649 in 3P, via the associated selector push-switches.

#### Flowmeter transmitters

47. Four flowmeter transmitters, Type 3D/121, provide the necessary signal information for the indicators listed in para.42. The transmitters are mounted one on each engine and are directly connected into the engine fuel lines.

48. A measuring vane integral with each unit is moved against a calibrated spring by fuel flowing to the engine. Movement of the vane is proportional to the rate-of-flow and is transmitted by a mechanical coupling to two Autosyn transformers which provide the output signals to operate the indicators. The pilots' flowmeter is fed, via the Ledex switch, from one of the transformers. The signal from the other transformer is used to operate the total flow rate indicator and is fed to the indicator via the amplifier.

#### Amplifier

49. The amplifier Type 3D/122 is situated on the port side of the nose wheel bay and

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receives signals from one transformer in each transmitter for operation of the total flow rate indicator.

### Flowmeter

50. A fuel flowmeter Type 3D/123/1 is fitted on the second pilot's instrument panel. This instrument reproduces the movement of the flow measuring vane in any selected transmitter and thus provides indication of the rate at which fuel is being consumed by any one engine. An expanded type of scale is used, which is calibrated at 5 lb/min intervals on the compressed part, and at 50 lb/min intervals on the expanded part.

51. Indication of fuel flow rate for any one engine is obtained by operating the appropriate push-switch on the centre console. The instrument will continue to give indication for the engine last selected, until another push-switch is pressed.

### ENGINE TACHOMETERS

56. Servicing of the Mk.II indicators is limited to checking the instruments for signs of damage and security of attachment during the normal inspection periods. The generators Mk.II should be inspected for security and the outer cases kept clean.

57. Lubrication instructions for the instruments will be found in A.P.1275A, Vol.1, Sect.26, Chap.12, together with the Standard Serviceability Test. Defective components should be returned to stores and replaced by serviceable items.

### Total fuel flow

52. A total fuel flow indicator Type 3D/124/1, is fitted on the second pilot's instrument panel. This instrument provides indication of the total rate at which fuel is being consumed by all engines. The scale has two pointers and is calibrated to read in 10 lb/min at each major division.

53. An indication of the total weight of fuel consumed is given on a counter which is recessed into the indicator dial. The counter will register the fuel consumption continuously, and can be re-set to zero by using the switch labelled RESET-NORMAL, located alongside the instruments.

### Throttle detent solenoids (Mod.1649)

54. Aircraft fitted with Olympus Mk.301 engines have two throttle detent solenoids which provide additional flight idling stops on

the No.2 and 3 inboard engines, and are brought into use when flying at 15 000 ft. and above. The detent solenoids are automatically energized at 15 000 ft. via an ambient altitude switch Type PAD/A/0/18 fitted in the nose cone of the aircraft. More details concerning the mechanical aspects of the system will be found in Sect.4, Chap.1A. ▶▶

55. To check that the system is functioning correctly when the aircraft is on the ground, a test switch is provided adjacent to the starboard console 7P. The test switch when operated by-passes the altitude switch contacts to energize the internal relay of the altitude switch. By this action the internal relay contacts are closed to energize the throttle detent solenoids which in turn push out stops to limit the throttle linkage movement for No.2 and 3 inboard engines, thus allowing the No.2 and 3 inboard engines to idle 5 per cent faster than the No.1 and 4 outboard engines. A routing chart is contained in fig.14. ◀▶

## SERVICING

### OIL PRESSURE INDICATORS

58. The indicators and transmitters should be checked externally for security of connections and freedom from damage. The transmitters should also be examined for signs of oil leakage. Very little else can be done in the way of routine servicing and defective items should be removed and new ones fitted.

59. Before removing any suspect component the 115-volt supply fuse and the output from the associated auto-transformer should first be checked. For details of the Standard Serviceability Tests reference should be made to the relevant Air Publication listed in Table 1. ◀▶

60. Testing of the indicators can also be carried out (in situ) by connecting a portable calibrator to the transmitter, when this has been removed from the engine. Descriptive details and full instructions for the operation of the calibrators are contained in A.P.1275T, Vol.1, Sect.3, Chap.8.

### JET PIPE TEMPERATURE SYSTEM

61. To maintain the jet pipe temperature system at a high degree of serviceability it is essential that the greatest co-operation be encouraged between the instrument, electrical and engine tradesmen, especially during

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servicing periods and whenever the system is not functioning correctly.

62. Provided that the system is operating satisfactorily, servicing is restricted to normal routine inspection of the components as laid down in A.P.101B-1902-4. Serviceability tests of the exhaust gas thermometers are given in the relevant Air Publication listed in Table 1.

#### Test equipment and procedure

63. The equipment required when carrying out tests on the jet pipe temperature system using the Ultra QT223 test set are as follows:-

- (1) Ultra test set, Type QT223.
- (2) Four core test cable, Type QY2212.
- (3) Nine core test cable, Type QY2212.

Items (2) and (3) are provided with the test set which is described in A.P.113F-0414-1.

#### General

69. Removal of the various engine instruments and associated components is reasonably straightforward and no detailed instructions are required. Instructions for removing the instrument panels, prior to removing engine instrument indicators, will be found in Chap.1 of this section. Every precaution should be taken during removal and replacement of the instruments to prevent damage from shock or jarring.

64. Before use, the test set must be calibrated by using the calibration unit Type QZ2211, as described in A.P.113F-0414-1. If the test set internal supply is to be used, withdraw the battery compartment and ensure that the six cells are connected in series between the positive and negative tags.

65. Ensure that the J.P.T. OVERRIDE switch on the aircraft engine control pedestal is in the ON position.

66. Connect up the appropriate ground supplies and carry out the following tests on each engine in turn:-

- (1) Remove the blanking cap from the 9-pole test plug located in the rudder compartment aft of the power compartment and insert the 9-pole socket on the test cable QY2212 into the test plug. Connect the other end of the test cable into the plug on the test set marked TEST LEAD.

- (2) Next, carry out test procedure laid down in A.P.113F-0414-1 using position 'A' on the T.C. harness selector switch.

67. Should it be necessary to carry out ground running checks on the j.p.t. limiter system, the correct procedure, using the test set QT223 is laid down in A.P.113F-0414-1. Following an engine or amplifier change, the j.p.t. limiting system must be tested and re-calibrated.

#### Amplifier datum selector unit

68. The four amplifiers, Type A206/1, when used in conjunction with Olympus 201 and 301 jet pipe temperature systems, are fitted with a datum selector unit (para.19). The type of datum selector units employed is dependent upon the type of engine used and its modification state. Table 2 contains details of the type of datum selector unit employed on particular installation. When fitting a replacement amplifier, checks should be made to ensure that the correct datum selector unit is fitted. For further details of the datum selector units refer to Table 1.

## REMOVAL AND INSTALLATION

70. Access to those components fitted on the engines is gained by lowering the hinged access panels below the engines. Instructions for the removal of engine components will be found in the Olympus engine handbook A.P.102C-0403-1.

#### JET PIPE TEMPERATURE SYSTEM

71. The major components of the jet pipe

temperature system are all easily removed when necessary. Instructions for the removal of those components fitted on the engine including the jet pipe thermocouples will be found in A.P.102C-0403-6A. Panels are fitted on the upper surface of jet pipe tunnel structure to provide access to the J.P.T. thermocouple junction boxes. Before removing an engine jet pipe, the chromel-alumel leads to the thermocouple should be disconnected at the junction box.

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TABLE 1

Major items of equipment

Equipment	Type	Ref.No.	A.P. Reference
Tachometer generator	-	-	1275A, Vol.1, Sect.26, Chap.12
Tachometer indicator	-	6A/3251	
Oil pressure transmitter	741 PG/SB	6A/5598	1275A, Vol.1, Sect.16
Oil pressure indicator	11/ACR	6A/6161	
Exhaust gas thermometer	-	-	112G-0608-1
Thermocouples	RAEH70/19/1	-	
Jet pipe temp. indicator	-	6A/1105456	
J.P.T. limiter amplifier	A206/1	-	113F-0414-1
Datum selector units	Refer to Table 2	-	
Fuel flow transmitter	3D/121	6A/4251	112G-0719-1B
Amplifier	3D/122	6A/4253	
Flowmeter	3D/123/1	6A/4252	
Total fuel flow indicator	3D/124/1	6A/4254	
Ambient altitude switch	PAD/A/018		112G-1128-1

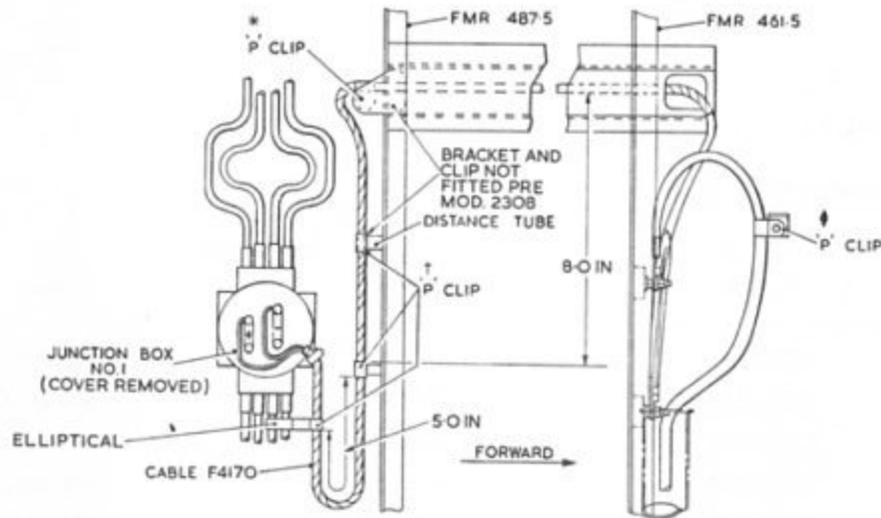
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TABLE 2

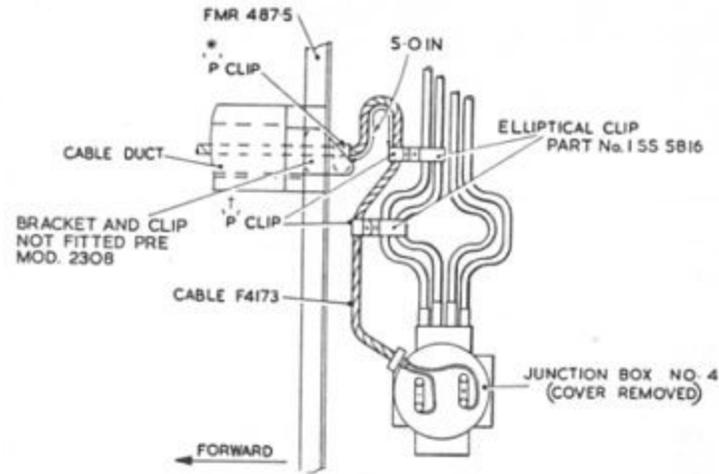
## Datum Selector Units

A/C Mod.	Engine (Olympus) Type No. and Mod. State	Type No. (Ultra)	Take-off	J.P.T.	Cruise
Mod.853	201 (Mod.AF/854)	ZR/76/AH	670 deg.C		600 deg.C
Mod.1478	201 (Mod.AF/1239)	ZR/86/BR	665 deg.C		605 deg.C
Mod.906	302 (Mod.AF/1072)	ZR/86/BP	625 deg.C		560 deg.C
Mod.1695	301 (Mod.AF/1335)	ZR/86/BW	620 deg.C		565 deg.C
Mod.2145	201 (Mod.AF/1535)	ZA/86/CM	670 deg.C		605 deg.C
Mod.2145	202 (Mod.AF/1535)	ZA/86/CM	670 deg.C		605 deg.C
Mod.2145	203 (Mod.AF/1535)	ZA/86/CM	670 deg.C		605 deg.C
Mod.2145	301 (Mod.AF/1535)	ZR/86/CP	625 deg.C		565 deg.C

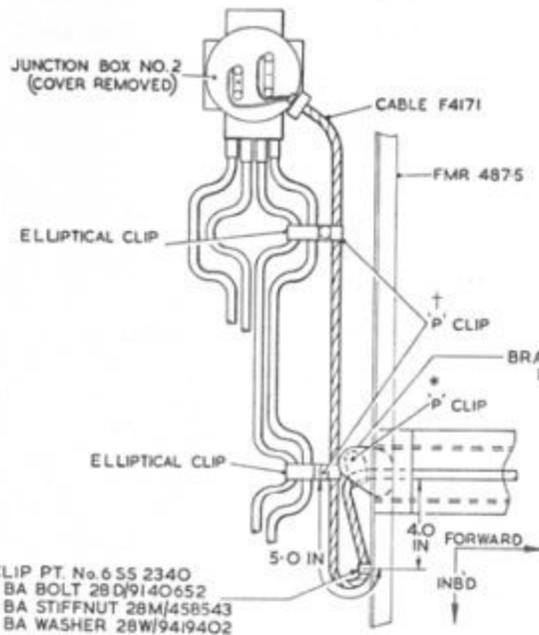
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No. 1 ENGINE PORT OUTBOARD



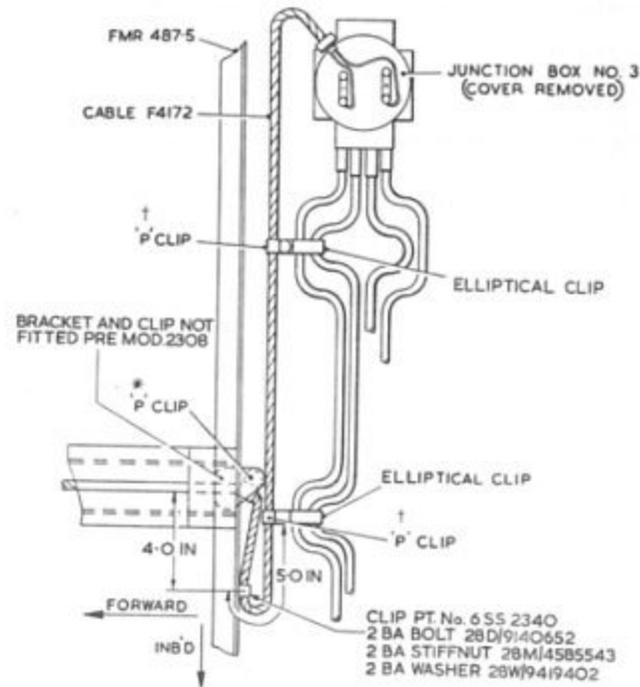
No. 4 ENGINE STARBOARD OUTBOARD



No. 2 ENGINE PORT INBOARD

NOTE  
 ► CABLES TO BE WRAPPED WITH ASBESTOS TAPE (REF. No. 32B/1250371) SECURED AT EACH END WITH SELF-ADHESIVE TAPE (REF. No. 5F/1981532) ◀

ITEM	PART NO.
† P CLIP	5-55-3264
* P CLIP	21-55-2340
† P CLIP	6-55-2340
ELLIPTICAL CLIP	1-55-5816
DISTANCE TUBE	AS-2808-5/0/75



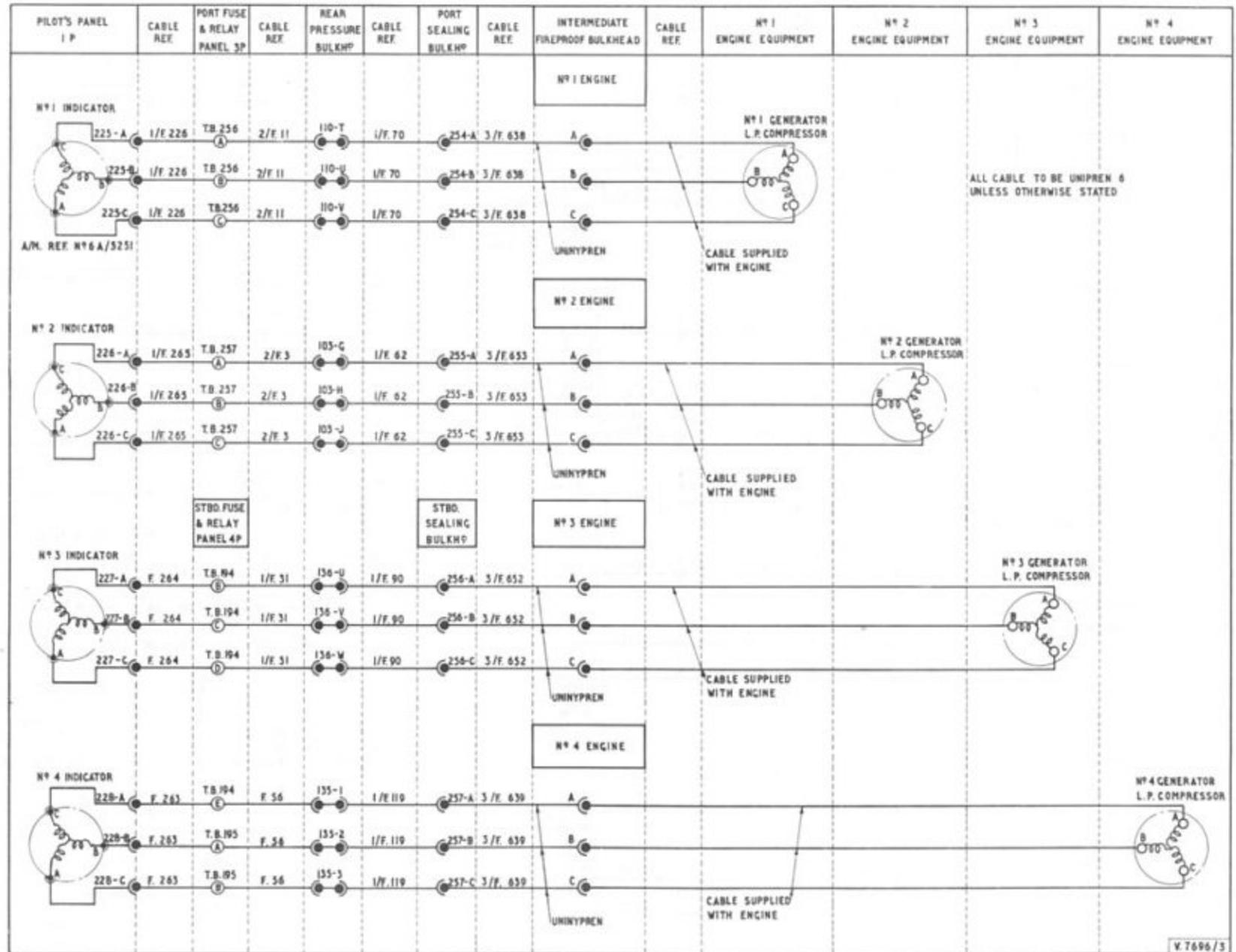
No. 3 ENGINE STARBOARD INBOARD

Fig. 3 A Wiring and clipping of engine J. Bs

Mod. 2519

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(AW-21)



V. 7696/3

Fig. 4. Engine tachometers.

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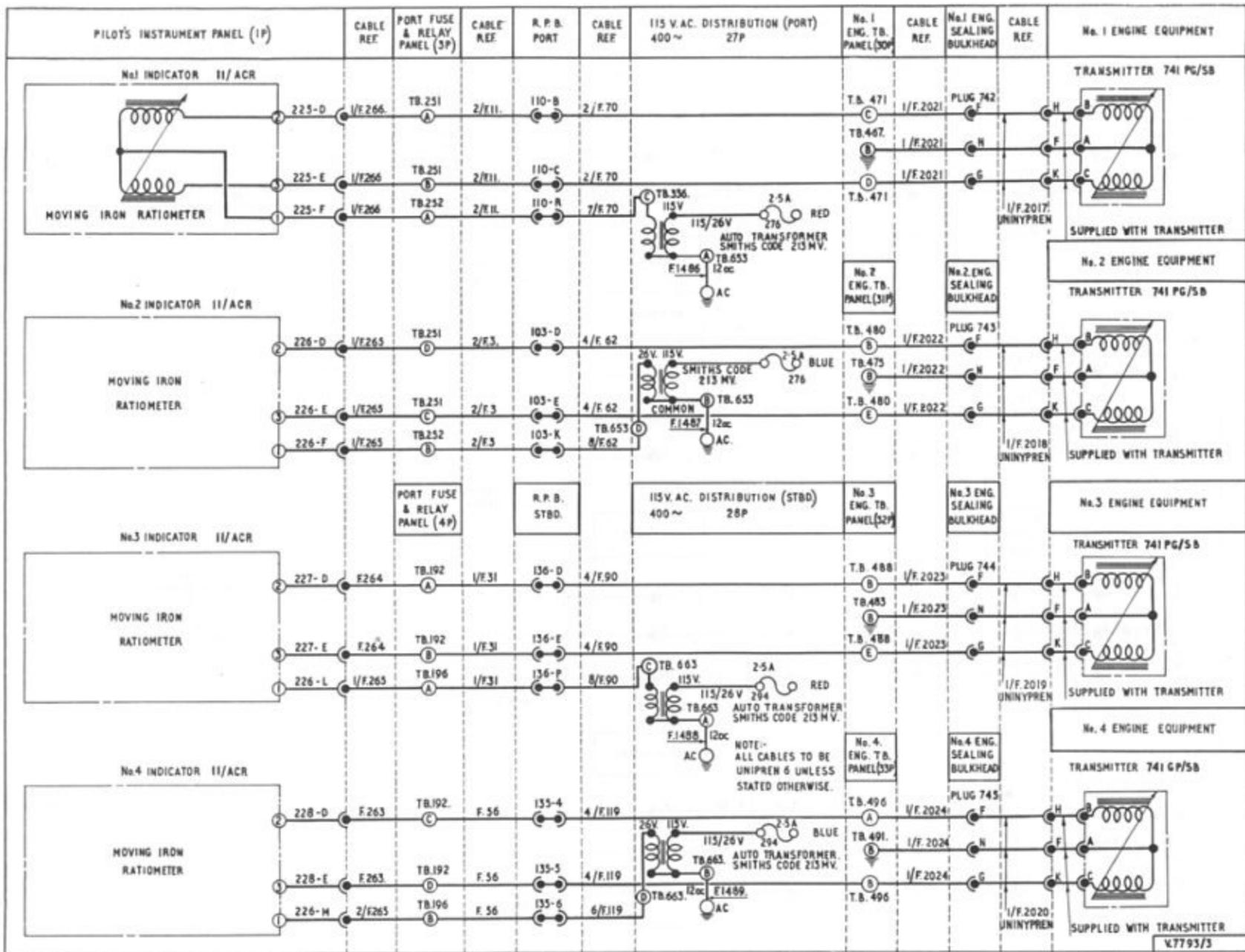


Fig.5 Oil pressure indicators

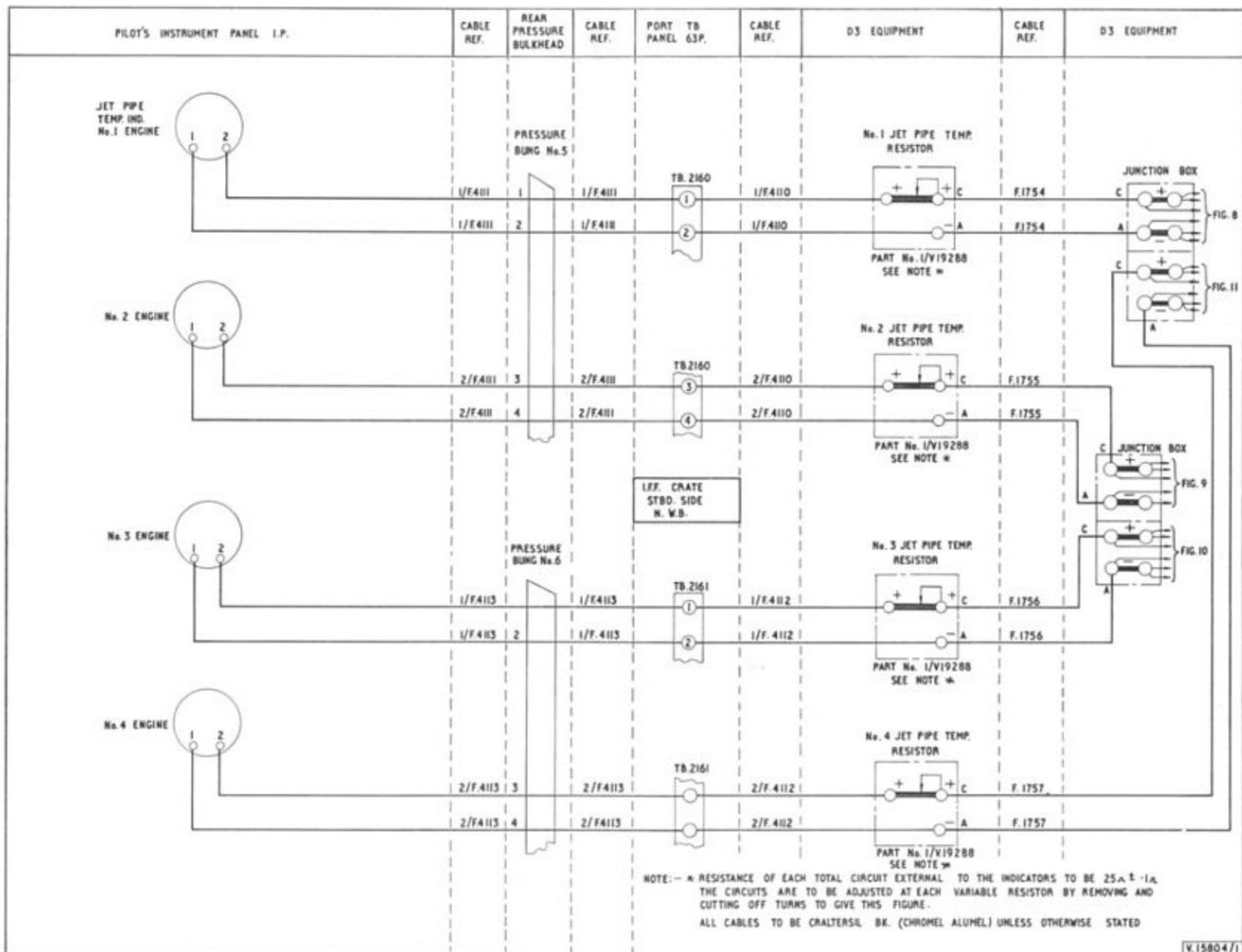


Fig.6 Exhaust gas thermometers

Mod 2477 4



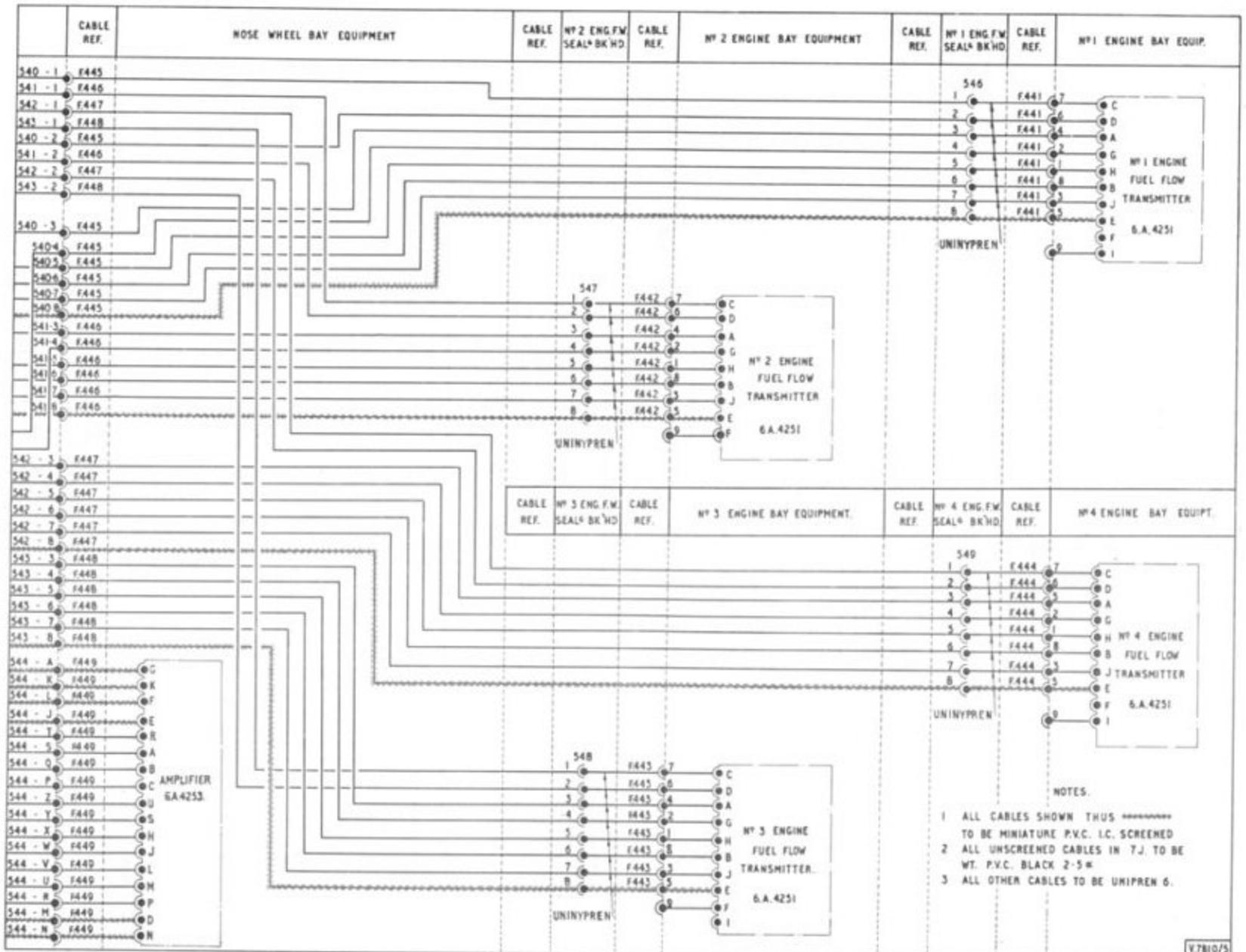


Fig 7 (2) Fuel flowmeters

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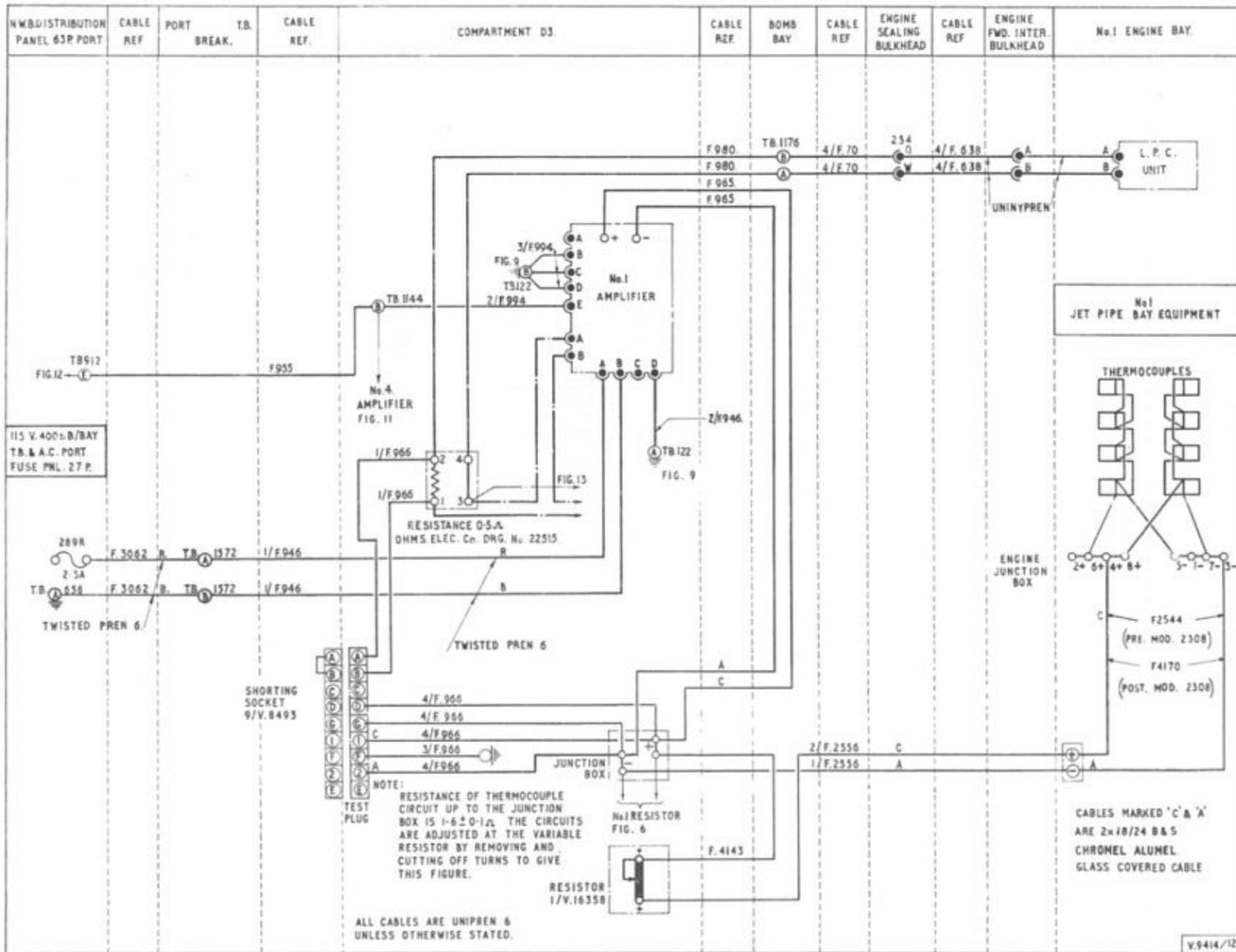


Fig. 8 Jet pipe temperature limiters No. 1 (Pre. and Post Mod. 2308)

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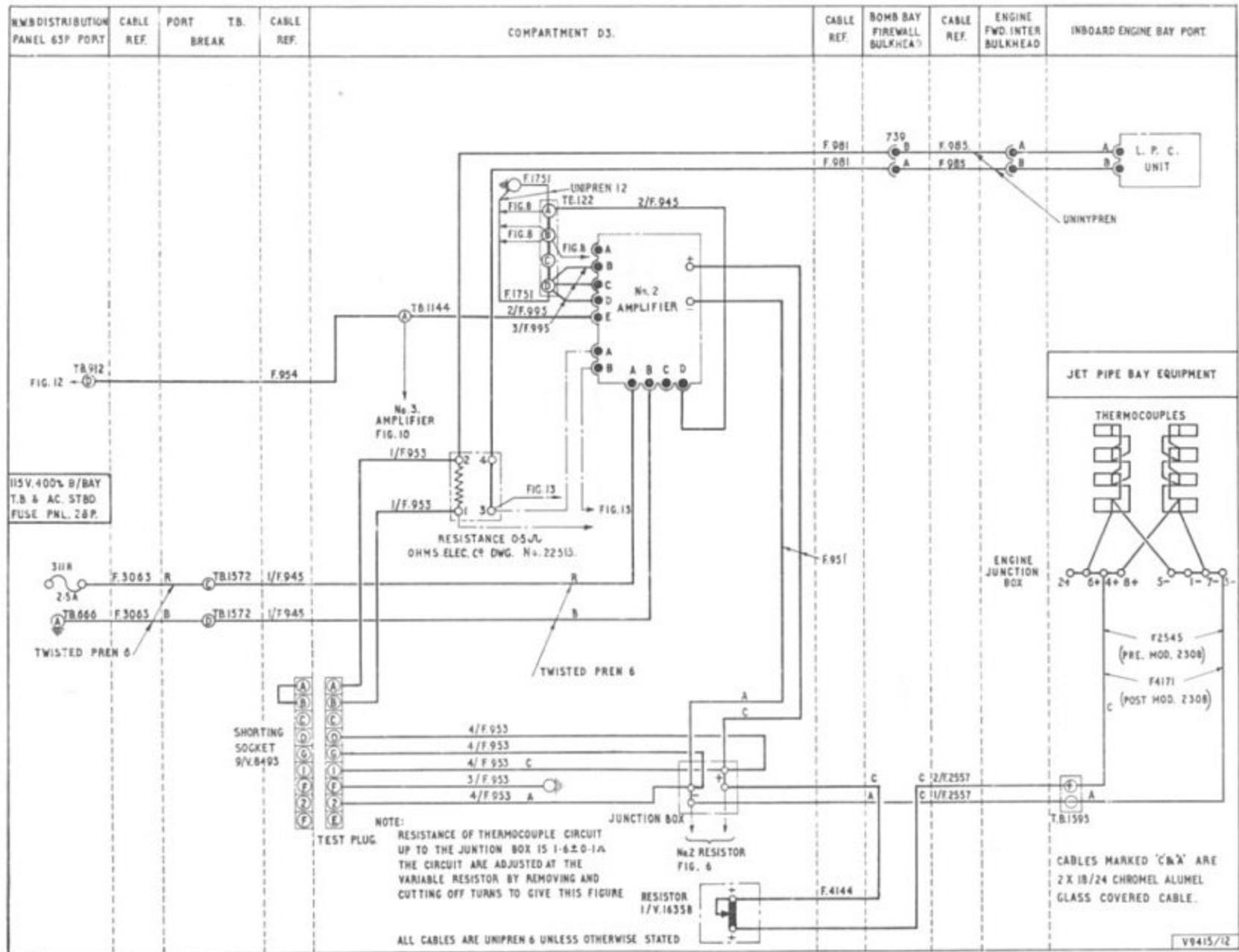


Fig. 9 Jet pipe temperature limiters No 2 (Pre. and Post Mod. 2308)

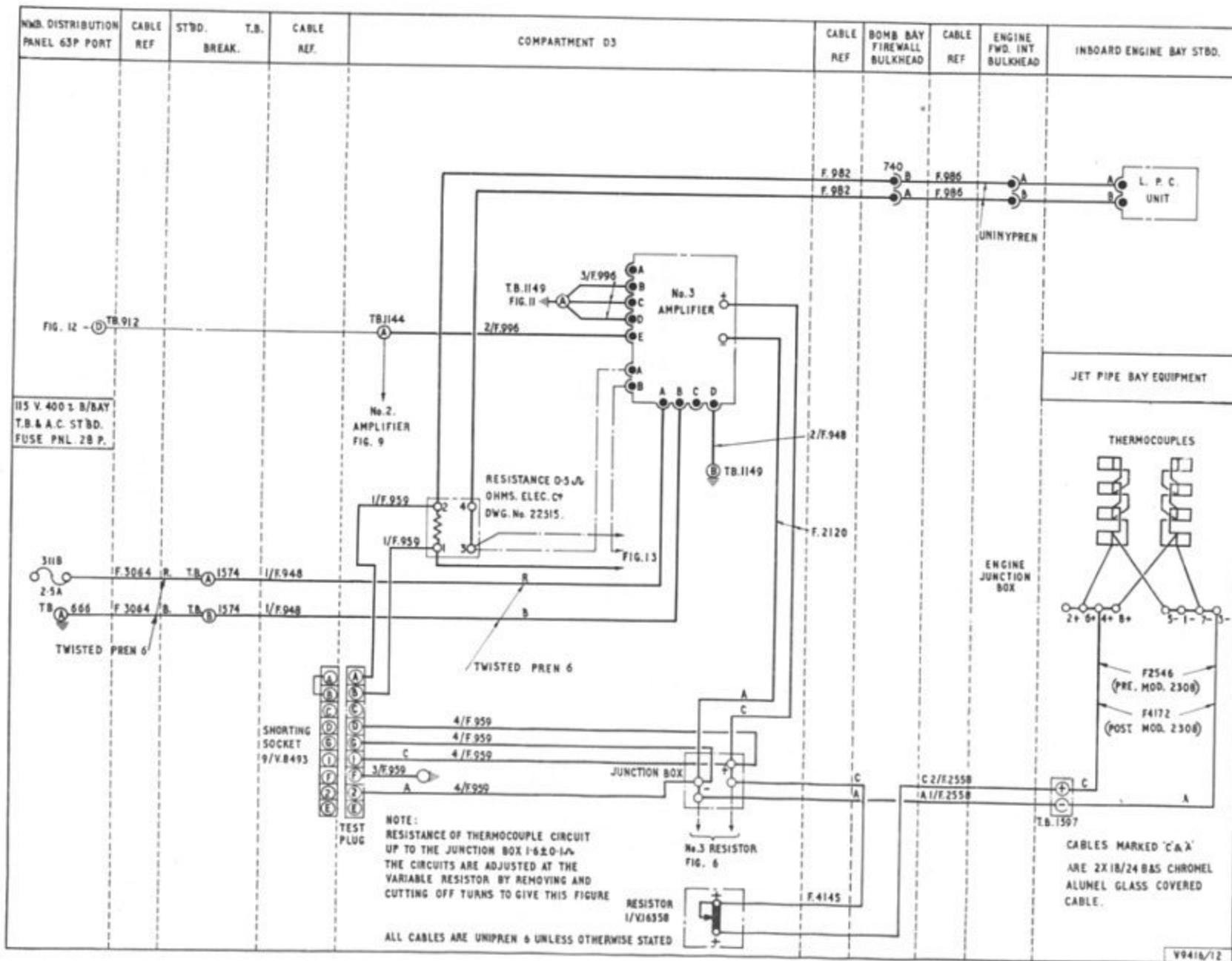


Fig.10 Jet pipe temperature limiters No.3. (Pre. and Post Mod.2308)

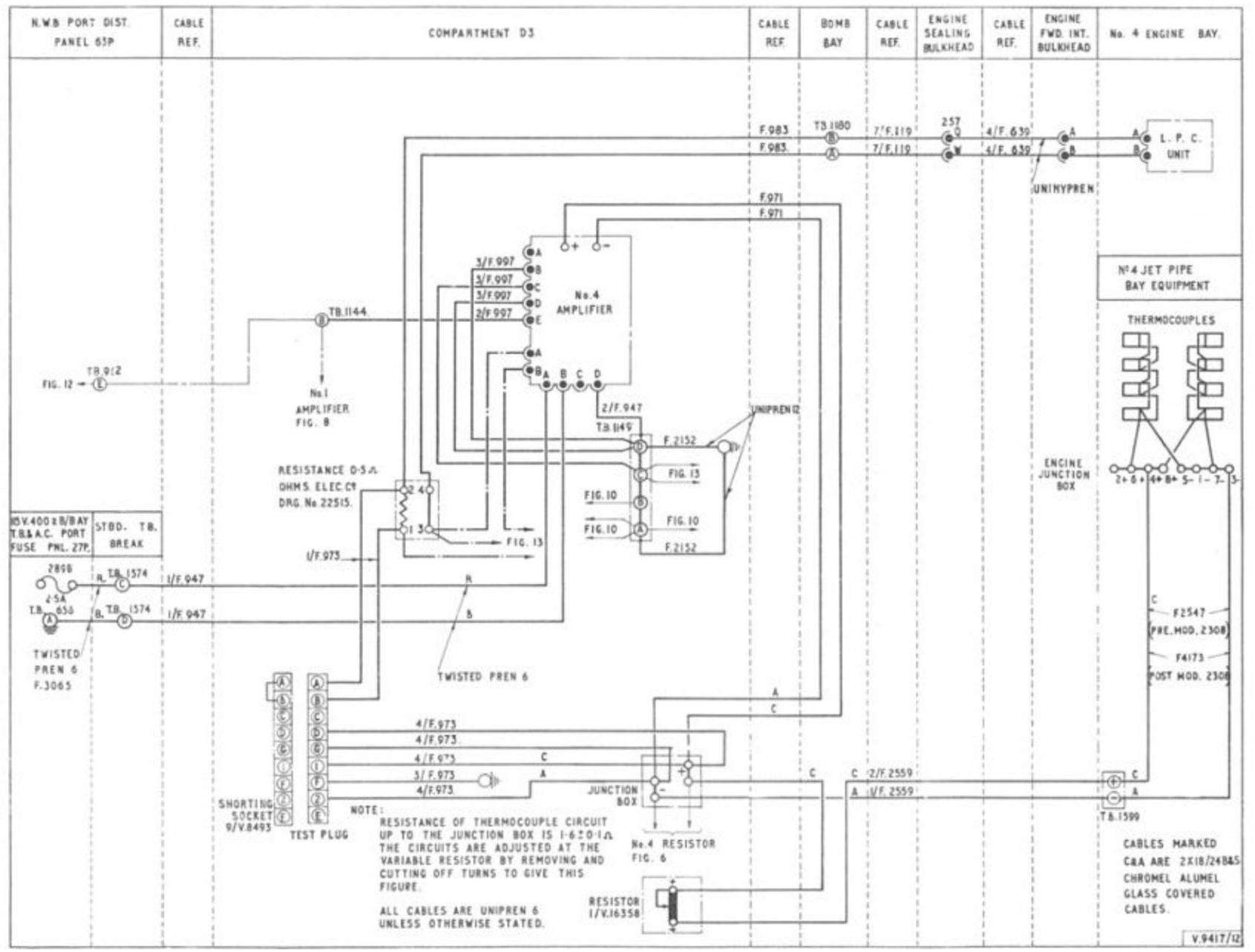


Fig. 11 Jet pipe temperature limiters No. 4 (Pre. and Post Mod. 230B)

► Cable refs added ◀

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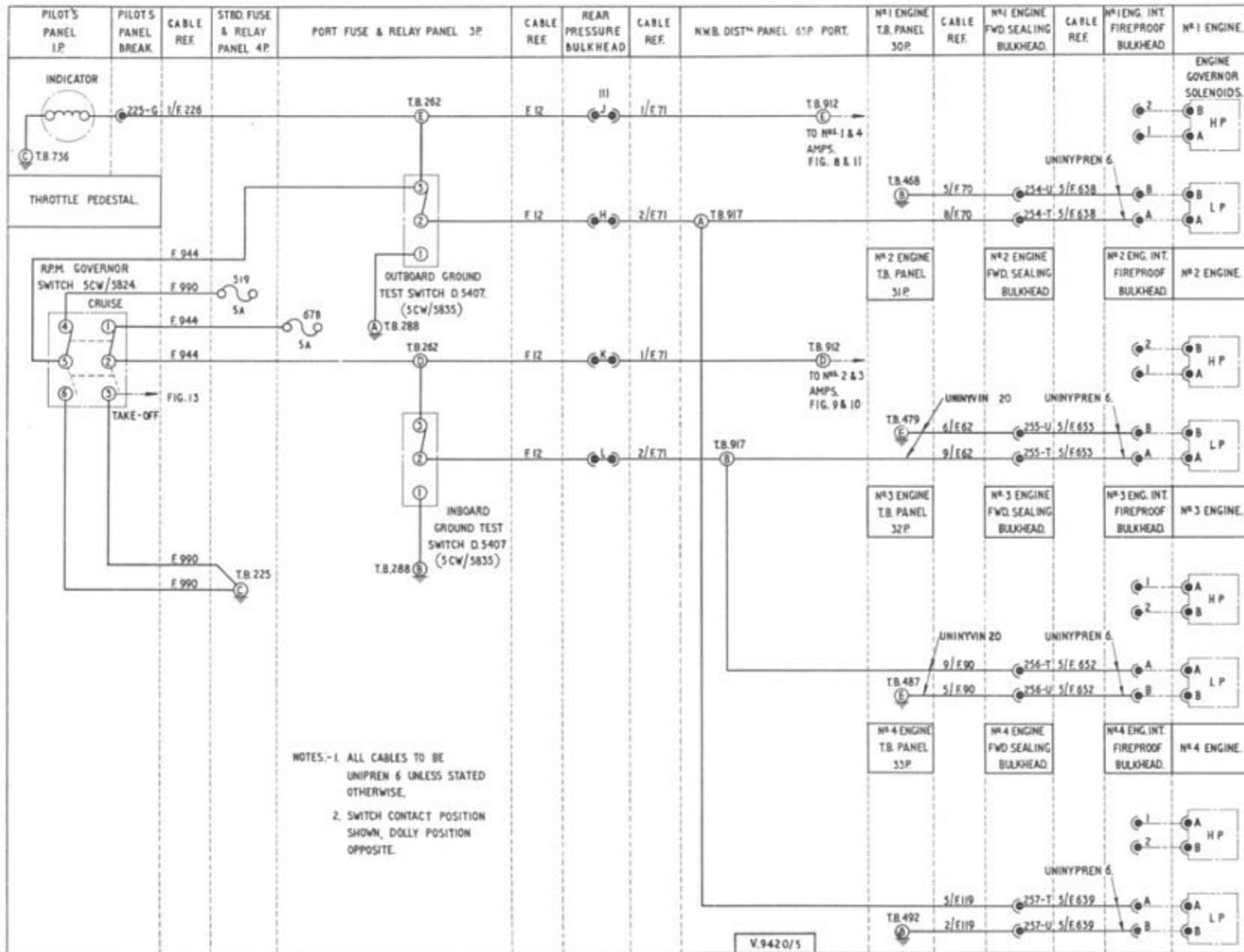


FIG. 12 R.P.M. governors

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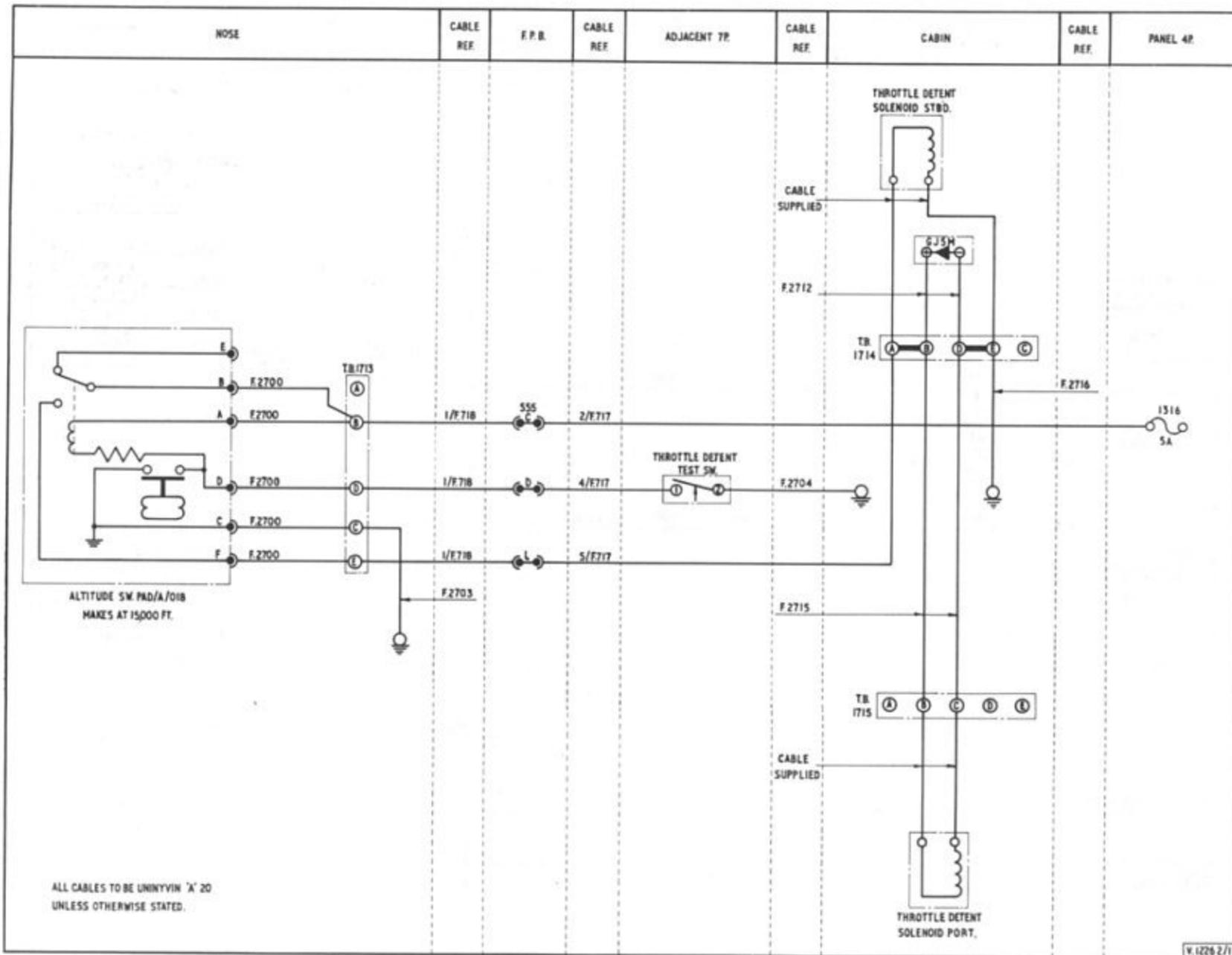


Fig. 14. Throttle detent solenoids.

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COVER PITOT HEAD  
EB2-88-5111