Chapter 1

MISCELLANEOUS SYSTEMS TEST CONSOLE

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LEADING PARTICULARS

Type	*Part No. U.*1340
Ref. No.	26DC/95216
DIMENSIONS	
Length	4 *ft.* 6 *in.*
Width	2 *ft.* 9 *in.*
Height (on castors)	4 *ft.* 3 *in.*
(without castors)	3 *ft.* 8 *in.*
Weight	460 *lbs.*
Supply voltages	28 *volts, d.c. via external supply plug*
	112 *volts, d.c.* ,, ,, ,, ,,
	115 *volts*, 3 *phase*, 400 *c/s from integral Type* 100*A inverter*

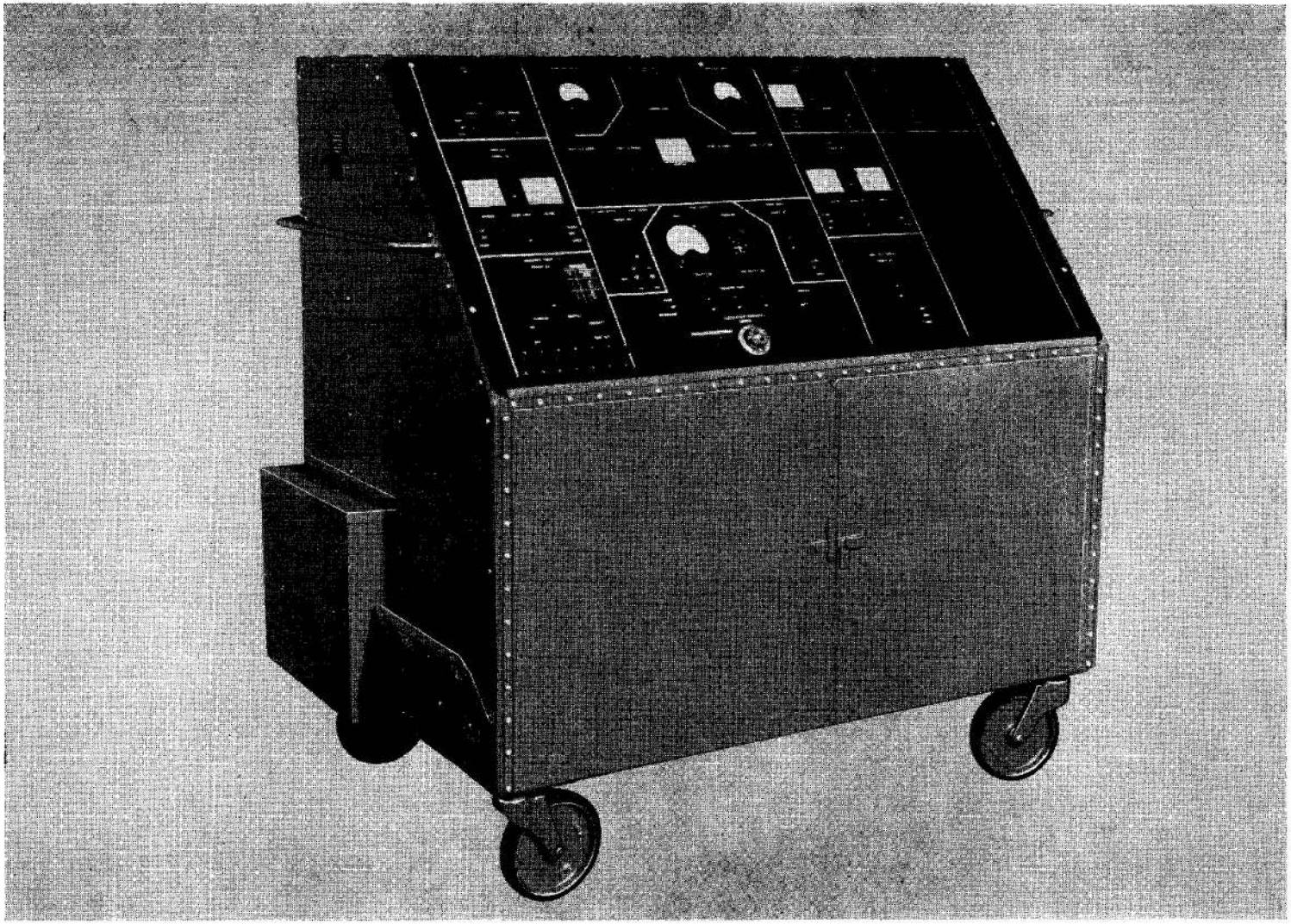


Fig. 1. General view

Introduction

1. The miscellaneous systems test console is designed to facilitate ground servicing on the Vulcan Mk. 1 aircraft. It embodies eleven test circuits, each of which is concerned with the function testing of a specified section of the aircraft's electrical system.

2. In the following text the test console will be described in some detail, and illustrations have been included as necessary. Each test circuit is fully described, and a theoretical wiring diagram and a circuit connection drawing are included to simplify the rectification of any faults that may occur during its service life.

3. At the end of the chapter will be found full operating instructions. These are similar to the instructions that accompany the test console.

Warning

No attempt should be made to use the test console until the operating instructions have been read and are clearly understood.

DESCRIPTION

CONSTRUCTION

4. The test console (*fig.* 1) is a framework of aluminium alloy angle covered by panels of aluminium alloy sheet. This stands on four castor wheels. The provision of two ' towel rail ' handles, one at each end, enable the test set to be manoeuvred in confined spaces.

5. The body of the test set is divided physically into two sections by an inner panel. The front section can be regarded as serving a dual function. An instrument panel, sloping back from the vertical, occupies the upper portion; the space between the back of the instrument panel and the front of the inner panel houses the components and the wiring associated with the controls. The instrument panel, which is hinged at its lower end, is normally secured to the main frame by seven R.H. screws.

6. On a shelf below the instrument panel is fitted a Type 100A inverter, which is used for testing the aircraft fuel system's sequence timers. A stowage is also provided alongside the inverter for a fuel pump test attachment (*fig.* 2), while ample space is available below the shelf to store the protective cover of balloon fabric that is fitted over the test console when not in use. Two doors, hinged at the side of the console, give access to the lower portion of the forward section.

7. At the bottom left-hand side of the forward section, and accessible from the hinged flap at the side of the test console, are mounted two standard type ground supply plugs, one for a 28-volt d.c. supply, and the other for a 112-volt d.c. supply. The outside of the flap is stencilled EXTERNAL SUPPLY. The voltages appropriate to the plugs are stencilled on the inside of the flap.

8. Access to the rear section (*fig.* 3) is by means of double doors similar to those at the front of the test console. The section is divided by partitions into three vertical compartments, each of which is further divided by means of detachable trays to give a total of twenty-one extension cable stowages. A further stowage, for the P.F.C. test circuit extension cables, is fitted to the left-hand side panel.

9. Except for the control panel, which is anodised black, the test rig is finished in blue paint.

Control panel

10. The control panel (*fig.* 4) is an aluminium alloy sheet suitably stiffened by means of angle brackets and stiffeners attached to the reverse side. The panel is finished in anodised black, and carries all switches, fuses, indicator lamps and meters associated with the test circuits. White lines painted on its face divide the panel into a number of sections, each of which represents a particular test function, identified by a label affixed to the top end of the section.

11. At the bottom of the panel is fitted a main switch by means of which the 28-volt external supply is connected to or removed from the panel bus-bar. In an emergency, the striking of this switch renders the console

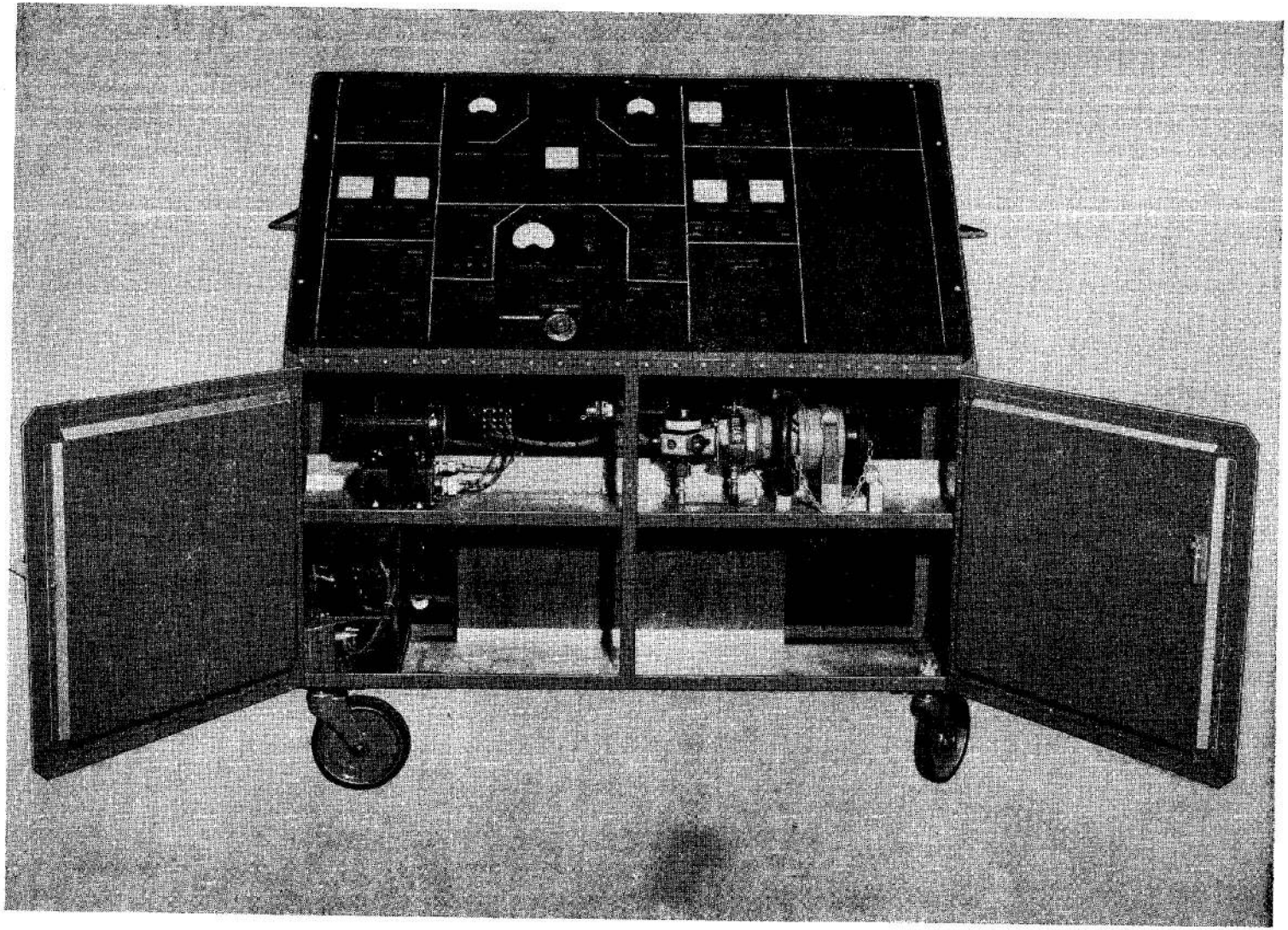


Fig. 2. Front compartments

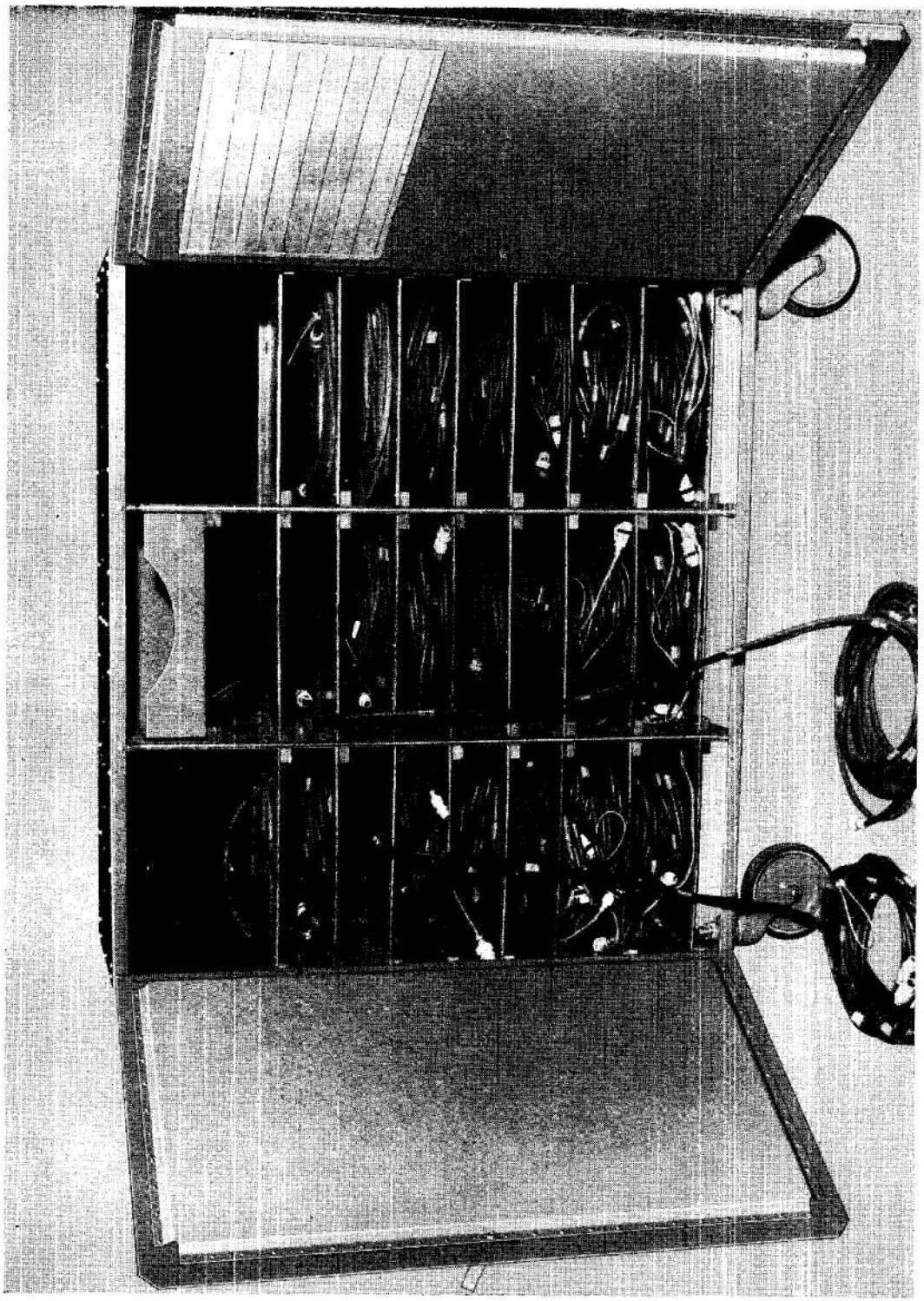


Fig. 3. Rear compartments

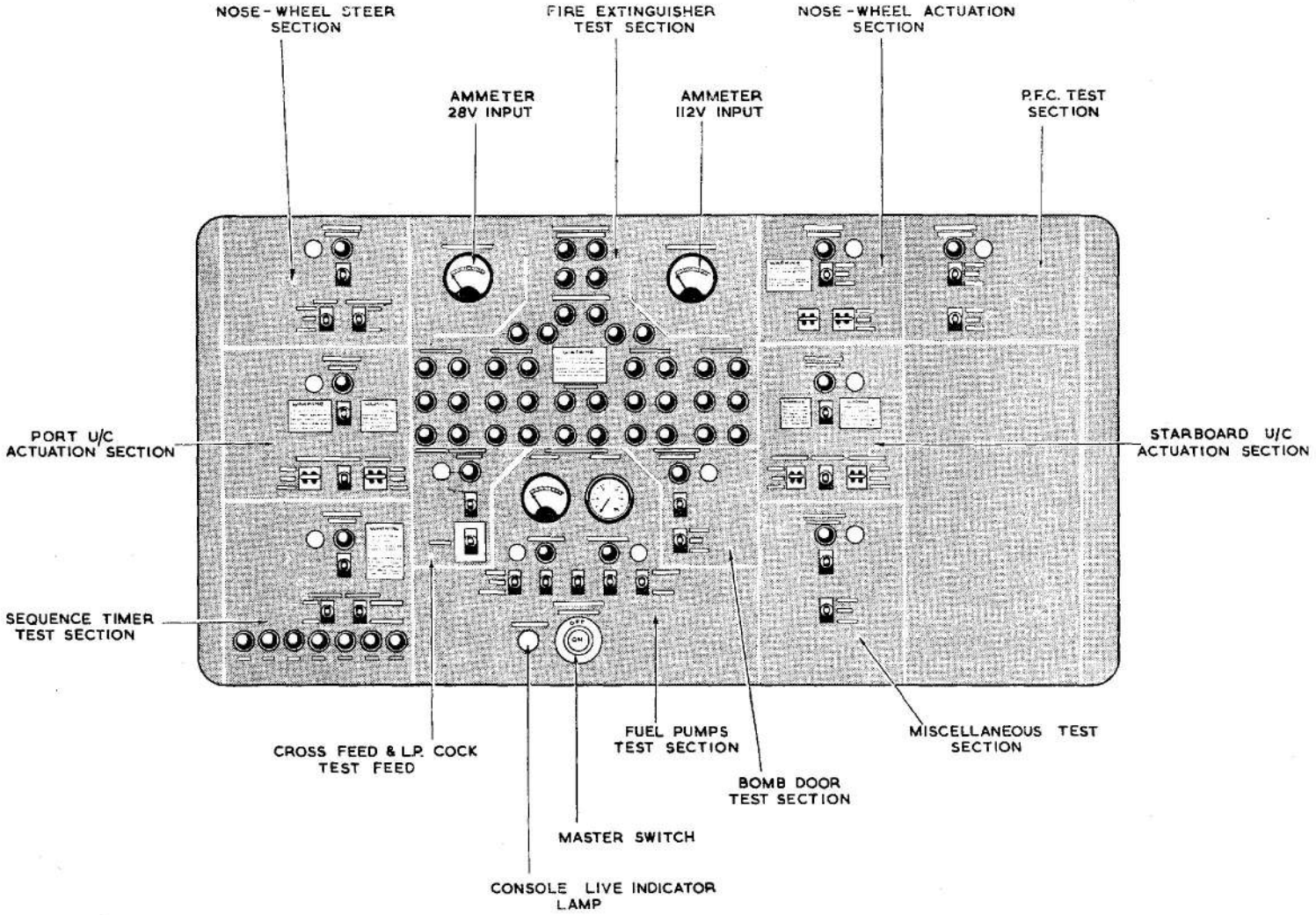


Fig. 4. Control panel

inoperative, and cancels any selection that may have been made.

12. Except for the main switch, which is a commercial grade item, all the components used for the control panel are of standard pattern and of the type employed to fulfil similar functions in aircraft.

13. On the reverse side of the panel is mounted a series of 10-way connector blocks. The blocks are individually identified by means of identification letters painted adjacent to the blocks, while each of the ten terminals on each block is identified by a numbered Helvyn sleeve. Also mounted on the back of the panel are the various relays and resistors associated with the test circuits (*fig.* 5).

Inner panel

14. Mounted on the inner panel are a number of bulkhead type plugs. These connect at the forward end to the connector blocks at the back of the control panel and, at the rear end, to the extension cables by means of which the test set is linked to the aircraft systems. The plugs are suitably identified to simplify fault finding.

FUEL PRESSURE TEST RIG ASSEMBLY

15. This consists of a hose unit adaptor which is connected to the aircraft fuel system through an Avery Hardoll refuelling hose fitted to one end of the adaptor (*fig.* 6). A Palmer flexible hose assembly connects the adaptor to a Smiths Desynn fuel pressure transmitter, which is mounted on an A.V. mounting, Smiths 420 P.G., attached to the side of the adaptor. A $\frac{1}{8}$-in. gas tap is fitted to the underside of the adaptor to vent to atmosphere any pressure built up in the adaptor.

16. From the fuel pressure transmitter a cable loom is taken to a 5-pin plug. CZ.50356. This will mate with a socket at the end of an extension cable connected to the test console. The internal wiring is taken to the fuel pressure indicator on the instrument panel.

17. When not in use, the pressure test rig is stowed on the mounting provided on the shelf at the front of the test console, accessible on opening the front doors. The mounting consists of hard wood block supports faced with felt to prevent damage to the test rig. A hole is cut in the shelf to accommodate the flexible hose.

CABLE STOWAGE

18. Except for the P.F.C. test circuit extension cables, which are stowed in a compartment attached to the outside of the left-hand side panel, all extension cables are stowed in compartments in the rear section of the test console. The cables carry breeze couplings at each end for connecting to the inner panel bulkhead plugs and to the aircraft systems respectively. In their stowed positions, the cables rest on detachable plywood partitions (*fig.* 3). A label indicating the disposition of the stowage is attached to the inside of one of the doors.

OPERATING INSTRUCTIONS STORAGE

19. Printed cards giving the operation instructions for the test console are stowed in the drawer occupying the upper mid-section of the rear compartment. The instructions are reproductions of those given in Appendix I of this chapter.

TEST CIRCUITS

Nose-wheel steering

20. The nose-wheel can be displaced to port or to starboard of the fore and aft line of the aircraft by a hydraulic jack, the sense of the displacement being determined by an electrically controlled selector valve, or steering valve. The hydraulic lines to the steering valve embody a further valve, also electrically operated, and the latter must be opened before the former can be brought into use. Thus the test circuit must give facilities for the control of the two valves, whilst a source of hydraulic power will have to be introduced into the aircraft hydraulic system if displacement as well as selection are to be achieved.

21. At the top left-hand corner of the control panel will be found the controls for testing nose-wheel steering. These comprise a 5-amp. end-on H.R.C. fuse, a single-pole on-off switch labelled POWER ON, a filament lamp, a single-pole on-off switch labelled STEER ENGAGE and a single-pole, 3-position switch labelled PORT-OFF-STBD.

22. A 28-volt supply is taken from the console bus-bar via the 5-amp. fuse and

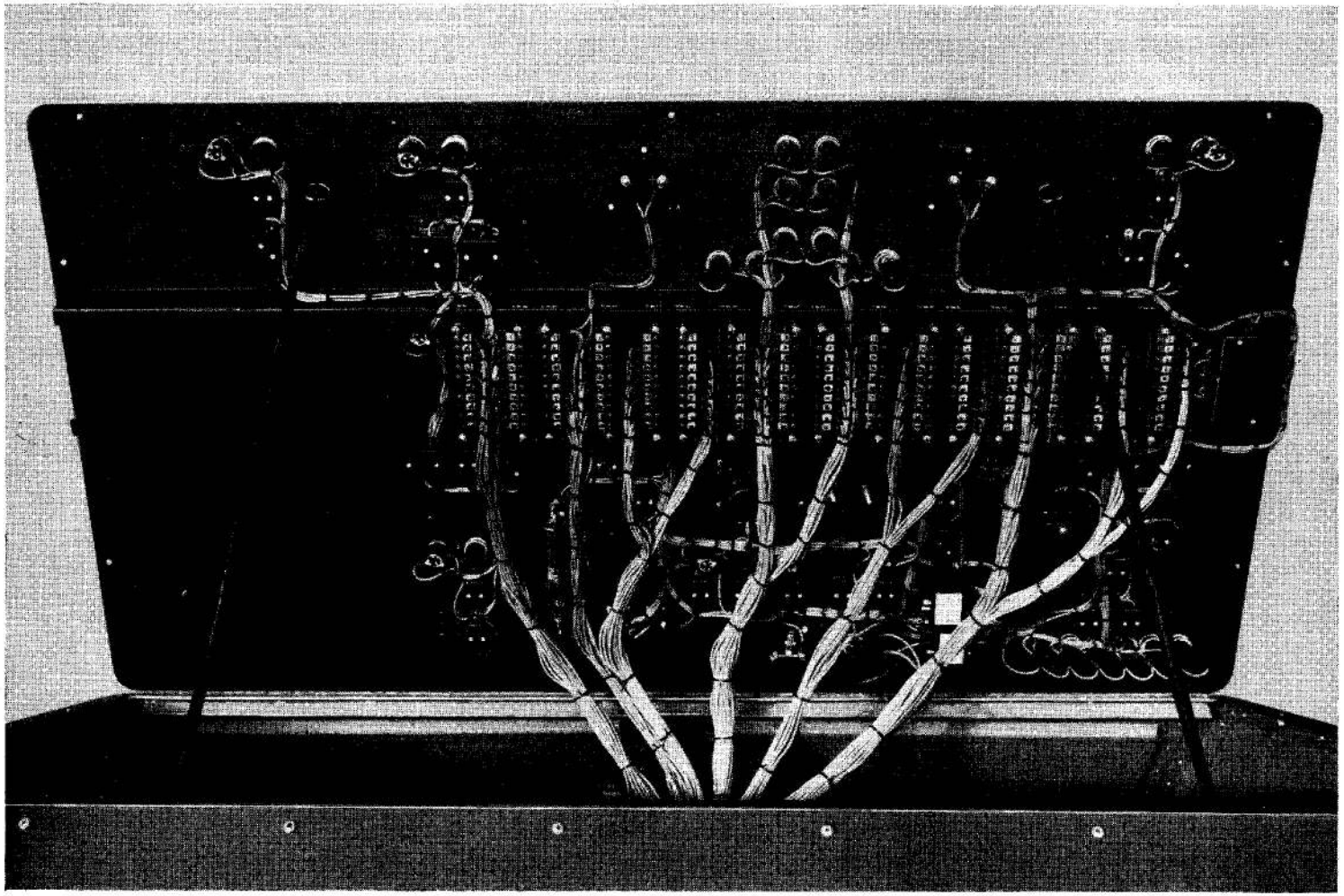


Fig. 5. Arrangement behind control panel

connected to the power-on switch, and from this switch feeders are taken to the two control switches. Distribution cables from the control switches are taken, via the connector blocks, to plugs on the inner panel and thence to the extension cables at the back of the console. Two extension cables are supplied and are labelled STEER and STEER ENGAGE respectively. A 4-pin socket is connected to the end of the former, and a 2-pin socket to the end of the latter.

23. Full instructions for the use of this test circuit are contained in Test Schedule No. 1.

Undercarriage actuation

24. In considering the undercarriage systems on the Vulcan aircraft, account must be taken of the undercarriage doors, the operation of which is complementary to the operation of their associated wheels and oleo legs.

25. Both the wheels and the doors are displaced by means of hydraulic jacks, the sense of the displacement being determined by the position taken by electrically controlled hydraulic selector valves. During normal selections, the wheels and doors will be moved in a definite sequence, for which sequence switches have been introduced into the system. When the test console is used for checking the system, however, the sequence switches are by-passed, since to have used the full system would have made the test set unwieldy. A compromise has been achieved by introducing a switching arrangement which gives an approximation to the normal conditions, whilst attention is drawn to its limitations by affixing a warning label at each of the sections concerned with undercarriage actuation.

26. Whilst complete safety of operation is afforded if the test console is used in the manner outlined in the test schedule, it is emphasised that serious damage could result were an attempt made to operate the system in a manner contrary to the recommended procedure. For example, it will be seen from the operating schedule that the operator is required to satisfy himself that the wheels are fully retracted before selecting DOORS-UP. The reason for this condition is that door movement is considerably faster than wheel movement, so that if the doors are selected UP when the wheels are in some intermediate position, there is every possibility that the doors will run into the wheels. This would certainly occur if the wheels were in the early stages of retraction when the DOORS-UP selection was made.

27. A feature common to the port and the starboard undercarriage systems, but not included in the nose-wheel, is bogie trim, which is the re-aligning of the main-wheel bogie to an attitude suitable for stowage into the main plane during retraction. Although the function is automatic with normal retraction using the aircraft undercarriage selector switch, it is possible, using the test console, to operate bogie trim as a function apart from wheel retraction. No special controls are included for this test.

28. Three sections of the control panel are allocated for the control of the undercarriage systems, one for the port undercarriage, one for the nose-wheel, and one for the starboard undercarriage. The three sections are similar except that no down lock switch is provided in the nose-wheel section.

29. Each section is provided with a 5-amp. end-on H.R.C. fuse, a power on control switch and indicator, a 2-pole, 3-position switch for wheels control, and a 2-pole, 3-position switch for doors control. The port and starboard sections each has a single-pole on-off switch for down-lock control.

30. The control panel components are wired to terminal blocks on the inner panel, and thence to the bulkhead plugs. Extension cables in the rear compartment are coupled to the bulkhead plugs.

31. A cable loom is provided for each of the three sections. For the port and starboard section the looms consist of three lengths of sheath-ground cable. These cables are connected to a 9-pin socket at the console end, the socket being coupled to the appropriate plug on the inner panel. At the aircraft end the cables are connected to individual sockets suitable for mating with their associated components on the aircraft system. A 4-pin socket is connected to each of the wheels and the doors control cables, whilst the down lock cable is connected to a 2-pin socket. The doors and wheels cables are identified by cable markers adjacent to the sockets.

32. The nose-wheel loom contains two lengths of grondsheath cables which terminate, at the console end, in a 9-pin socket suitable for mating with the inner panel plug, and, at the aircraft end, in two 4-pin sockets, suitably identified, for connecting into the aircraft components.

33. Operating instructions for the undercarriage systems are given in Schedules 2, 5 and 6.

Sequence timer

34. The Vulcan aircraft is provided with two sequence timers, each of which is associated with seven of the fourteen tanks which comprise the fuel storage system. The sequence timer is a constant speed motor geared to a cam-shaft, which carries seven cams. The profile of each cam is calibrated to fine limits and controls the operation of a pair of electrical contacts. The seven sets of contacts are divided into two groups, one of three and the other of four contacts, each being associated with a group of fuel tanks.

35. An alternating current supply at constant frequency is required to satisfy the constant speed requirement of the motors, and the continued operation of the cam operated contacts within the specified limits is necessary if the system is to function correctly.

36. Deterioration of the mechanical parts of the sequence timers will have the effect of increasing the load on the driving motor. The consequent increase in slip will reduce the cam-shaft speed, and the system will no longer be stable. Similarly, any wear in the cams or cam-followers will affect the system. It is necessary, therefore, to carry out periodic checks on the sequence timers to ensure that their behaviour allows the fuel system to function within permissible limits.

37. Two methods of testing the sequence timers are possible using the test console. The first requires an input supply to the motors from the aircraft electrical system, while the second method gives a supply to the motors from the test console.

38. The controls for the sequence timer test circuit occupy the bottom left-hand section of the test console. These consist of a supply fuse, a power on switch and indicator, a single-pole on-off control switch for the Type 100A inverter, a single-pole on-off switch labelled AIRCRAFT-TEST-SET, by means of which the supply for the sequence timer can be selected. Seven lamps are fitted below the control switches. A label showing the times during which the sequence timer switches should be closed, is placed alongside the power on switch.

39. On the shelf inside the front section of the console are mounted the Type 100A inverter and the control unit, the former being mounted on the latter, which is secured to the shelf by four bolts.

40. The change-over of the sequence timer input supply from the aircraft system to the test set is effected by means of a Type S4 relay. This relay is de-energised when the supply control switch is at AIRCRAFT, and energised when the control switch is at TEST SET. The relay is mounted behind the control panel.

41. Two looms are provided for connecting the test console to the aircraft. Of these, one will be required only when the sequence timer is to be supplied from the Type 100A inverter in the console. The other, the indicator loom, will be required whichever method of testing is selected.

42. The sequence timer supply loom is a length of sheath-ground cable, at the test console end of which is connected a 5-pin socket for connecting the control panel via the plug on the inner panel. To the aircraft end of the loom is connected a special connector assembly, designed to provide a quick method of connecting to the sequence timer.

43. The indicator loom is provided with a 9-pin plug and a 9-pin socket at the aircraft end, and with a 9-pin socket and a 5-pin socket at the test set end.

44. Details in respect of the testing of sequence times are given in Schedule 3 of the Operating Schedules shown under Method of Operation.

Fire extinguishers

45. The Vulcan aircraft is fitted with twenty-six methyl bromide fire extinguisher bottles. Of these twelve are of the dual operating head type, the remainder being of the single operating head type. With the introduction of Mod. 568 the dual operating head type serve a single function, i.e., to protect the inboard fuel tank areas.

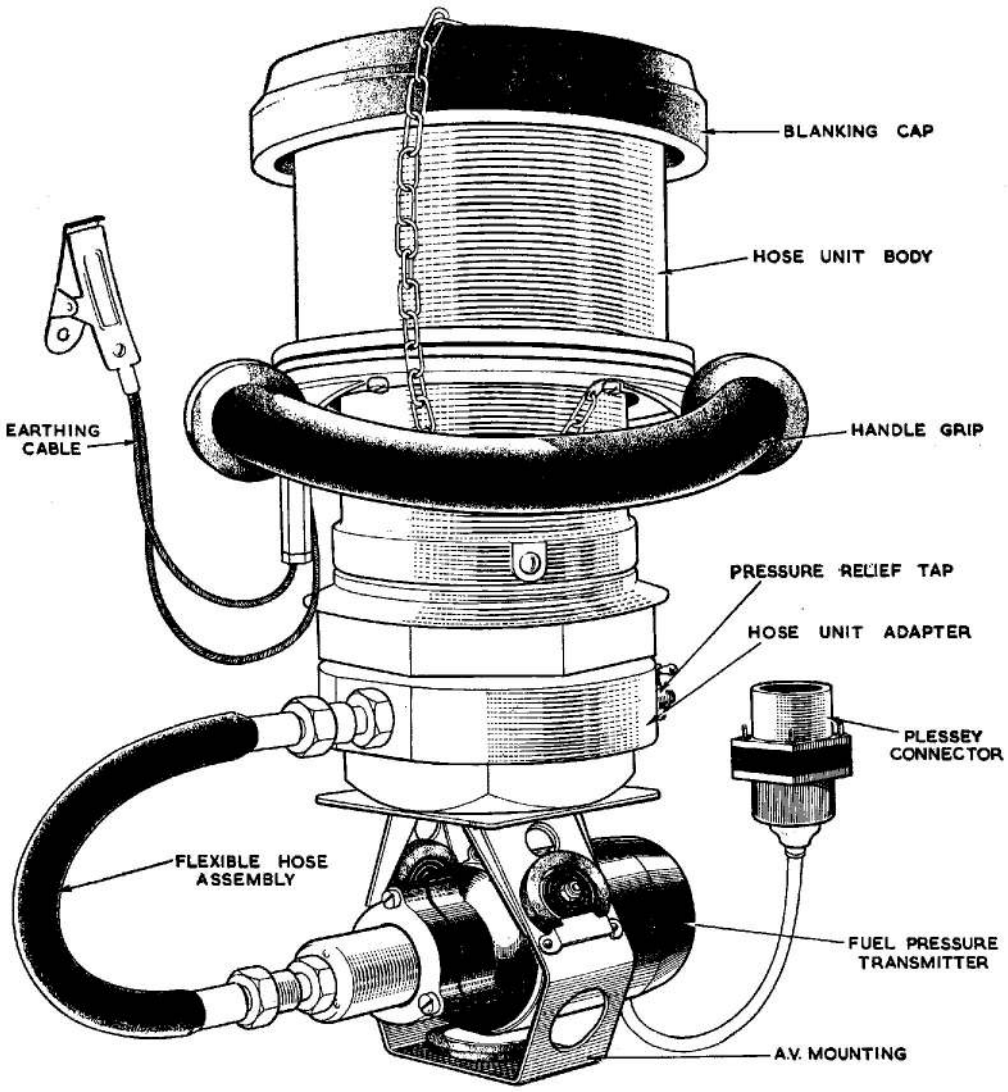


Fig. 6. Fuel pump pressure test adapter

46. Each of the aircraft's four engines is provided with a fire extinguisher bottle which will be discharged either individually on operating the associated manual switch, or simultaneously on operation of the crash switches. The four extinguishers are mounted in the bomb bay.

47. Of the remaining twenty-two bottles, four are fitted in the nose-wheel bay and serve to protect the fuselage tanks, and three are fitted in each wing leading edge. These, in conjunction with the six extinguishers in each wing, are intended to protect the inboard wing fuel tank areas. All bottles will be operated only when the two crash switches are operated.

48. When it is required to test the extinguisher system it should be borne in mind that the operation of the crash switches, or any simulation of their operation, will result in supplies being connected to all the circuits serving all fire extinguishers and that it will therefore be necessary to disconnect ALL extinguishers.

49. For the purpose of function testing of the fire extinguisher control system the extinguishers are represented by twenty-six lamps fitted on the control panel of the test console. These are connected in the usual manner to extension cables at the rear of the console, the cables being fitted with sockets for connecting into the aircraft system.

50. The method of operating the test console fire extinguisher test circuit is given in Test Schedule 4.

Fuel pumps

51. Fourteen fuel storage tanks are provided on the aircraft, seven on each side. The delivery of fuel from tanks to engines is by means of fuel booster pumps of which one is fitted for each tank. These pumps are designed to run either at full speed, when they will be delivering fuel to an engine, or at a reduced speed, when they will be idling. In the aircraft system the change in speed is effected automatically as a function of sequence timer operation.

52. All wing tanks are further supplied with single speed secondary pumps which will continue to run as long as the main pumps are switched ON.

53. The trim of the aircraft may be adjusted by transferring fuel from the rear-most tanks (No. 7) to the forward tanks (No. 1) or vice versa, a transfer pump in each of the four tanks being included for this purpose.

54. All pumps operate on 112 volt d.c. whilst their control circuit is supplied at 28 volts d.c. Thus any test equipment intended to check the fuel pumps must include supplies at these two voltages.

55. The method of testing fuel pumps using the test console is to connect 112 volts d.c. to the pump and, by means of a fuel pressure gauge indicator, measure the stall pressure developed by the pump. For the main pump two readings will be required, one for the full speed operation, and the other for the reduced speed operation. For all other pumps, one indication only will be necessary.

56. For the purpose of obtaining a pressure indication, use is made of the Avery Hardoll adaptor, which when not in use is stored in its stowage adjacent to the Type 100A inverter in the front section of the console. This adaptor (*fig.* 6) is introduced into the fuel system so that any pressure created will react on a Desynn fuel pressure transmitter which is connected, by means of an extension loom, to an indicator on the control panel.

57. The section of the control panel devoted to the testing of the fuel pumps is situated at the bottom centre of the panel and includes a d.c. ammeter for indicating the 112-volt input current to the motor, a fuel pressure indicator, a supply fuse, a power on switch and associated lamp for each of the 28-volt d.c. and 112-volt d.c. supplies, a single-pole, 3-position switch, labelled MAIN-OFF-SECONDARY for pump selection, a single-pole on-off switch, labelled MANUAL-AUTO for main pump speed selection, and a single-pole on-off switch for transfer pump selection. The switches are wired to the plugs on the inner panel to which extension looms are connected for interconnection with the aircraft system.

58. For changing the speed of main pumps use is made of a Type S.1 relay, which is energised when the manual-auto switch is set at AUTO and de-energised when the manual-auto switch is set at MANUAL. A 23-ohm Berco resistor, used in conjunction with the relay for speed control, is inserted in series with the fuel pump motor armature when the relay is energised. The resistor and the relay are mounted behind the control panel (*fig.* 5).

59. Three extension cable looms are supplied as follows:—

Main fuel pump loom
Transfer and secondary fuel pump loom
Fuel pressure loom.

Main fuel pump loom

60. This consists of a single length of Trisheath-ground 7 cable having a 5-pin socket at each end.

Transfer and secondary fuel pump loom

61. This consists of two lengths of Dusheath-ground 7 cable, each of which has a 2-pin socket at the test set end, and a modified version of the socket at the aircraft end.

Fuel pressure loom

62. This consists of two lengths of Trisheath-ground 7 cable which terminates at a 5-pin socket at the test-set end and in

2 sockets, one a 5-pin and the other a 2-pin, at the aircraft end.

63. Detailed information on the cable looms is given in Table 1.

64. Any tests carried out on the aircraft fuel pumps section, for which the test console is to be employed, should be strictly in accordance with the instructions given in Test Schedule 9.

Bomb doors

65. The bomb doors on the Vulcan aircraft are hydraulically operated and electrically controlled. Hydraulic jacks are employed to actuate the doors, whilst hydraulic selector valves in the supply pipelines determine the direction of displacement.

66. The operation of the selector valves is solenoid controlled and supplies to the solenoids are made through selector switches fitted in the cabin.

67. Two sets of selector valves are provided on the aircraft. One set, located on the port side of the bomb bay, is associated with the normal control of the bomb doors. The other set, located on the starboard side of the bomb bay, is associated with the emergency control of the doors. The test console circuit and its associated equipment must enable both systems of door control to be used.

68. Positioned beneath the fire extinguisher section on the control panel, the bomb door control section consists of a single-pole on-off switch and an associated power on indicator lamp, and a single-pole, 3-position switch labelled CLOSE-OFF-OPEN. The latter switch is connected via the connector blocks to a plug on the inner panel.

69. A cable loom, consisting of two lengths of Trisheath-ground 7 cable, stowed at the rear of the console, has a 9-pin socket at one end for connecting to the inner panel plug. Two 4-pin sockets at the other end of the cables are for connecting direct to the selector valves in the bomb bay.

70. For the method of testing the bomb door system, see Schedule 9.

P.F.C. test circuit

71. The P.F.C. motors on the Vulcan are normally started in groups of two in the case of the rudder system, and of four in the case of each of the elevator and aileron systems. The need may arise for the individual testing of a P.F.C. pump, for which the starting of only one motor will be required and a supply extraneous to the aircraft system will be necessary. A section of the test console is included to meet the need.

72. It is desirable that the test circuit shal resemble as closely as possible the conditions that govern the operation of the P.F.C. motors during normal operating conditions, and is provided, therefore, with a starting resistor and two contactors of the type used on the aircraft. The contactors are situated on a mounting panel over the ground supply plugs, and are accessible from the front access doors. A 100-amp. cartridge type H.R.C. fuse for the 112-volt supply is also fitted at the panel.

73. The controls and indicators are situated in the section of the panel immediately below the starboard undercarriage controls, and consist of a 5-amp. fuse, a power on switch and its associated indicator lamp and a single-pole, 3-position switch labelled START and STOP, the centre position being the off switch position. These controls are wired via the connector blocks to a plug on the side of the panel, so that the loom housed in that stowage on the L.H. side of the test set can be connected into the control circuit. The loom is provided with lugs at the aircraft end. These enable connection to be made in the P.F.C. motor.

74. Schedule 10 gives the method of using the P.F.C. test circuit.

L.P. and C.F. cocks

75. This circuit is intended to provide a controlled 28-volt d.c. supply for testing the actuators of the fuel system's low pressure and cross-feed cocks. Connection to these actuators is effected via 6-pin miniature plugs; three of the pins, viz., A, B and C are used. Pin A is connected to the 28-volt negative in all cases. Pins B and C, however, serve different functions on the two types of actuator. On the L.P. cock actuator pin B

serves the close coil, and pin C the open coil of the split series field windings, whereas on the C.F. cock actuator pin B serves the open coil, and pin C the close coil of the windings.

76. The controls occupy a position on the panel to the left of the fuel pump controls, and consist of a 5-amp. fuse, a power on switch with its associated indicator lamp, and a single-pole, centre-off control switch, suitably labelled for the two types of fuel cock to be tested. The switches are wired via the connector blocks and the inner panel plug to the extension cable, on the aircraft end of which is connected a 6-pin miniature socket.

77. The method of using this test circuit is given in Schedule 7.

Miscellaneous test circuit

78. This section occupies the top right-hand portion of the panel, and consists of a 5-amp. fuse, a power on switch with its associated indicator lamp, and a 3-way, centre-off single-pole control switch. The latter is connected to a 3-core extension cable via the connector blocks and an inner panel plug. No fittings are provided on the aircraft end of the cable, it being left to the user to connect a fitting appropriate to the equipment to be tested.

79. Specific instructions are not possible for a test circuit the use of which is intended to be elastic, and it is left to the user to ensure that precautions consistent with the potential hazards of a proposed test are observed at all times.

OPERATION

General

80. For normal use, the test console takes up a position between the nose-wheel bay and the bomb-bay, and it will be found that the cable lengths, whilst satisfactory for this position, may be too short if the console is placed in some alternative position.

81. Direct current supplies at 28 volts and 112 volts from suitable ground sources should be connected to the appropriate ground supply plugs on the left-hand side of the console. Before proceeding with any tests, check that the console main switch is functioning satisfactorily by pressing the centre (green) push switch, when the console live indicator lamp will come on, and then pressing the outer (red) push switch, when the indicator lamp should go out.

82. Serious damage could result from the improper use of the test console. It is important, therefore, that the operating instructions should be fully understood before any test is carried out. It is of particular importance that tests affecting moving parts should be carried out strictly in accordance with the instruction schedules (*Appendix* 1).

SERVICING

General

83. Apart from the periodic checks on the Type A inverter, the contactors and relays, the voltmeter and ammeters and the Desynn fuel pressure gauge, as laid down in the appropriate sections of the relevant Air Publications, the test console should require little servicing.

Extension cables

84. The extension cables will be subjected to a certain amount of rough handling and will require particular attention. It is recommended that they are wiped free of oil, grease and dirt after use, and that they are properly coiled before stowing in their stowage compartments. They should be examined periodically for damage to the outer cover, and any damage made good without delay.

85. Plugs and sockets fitted to the aircraft end of extension cables will suffer damage unless care is exercised in their handling. The shells have been machined to remove the threads for ease of connection into the aircraft systems, and are less robust in consequence than their standard counterparts.

Note . . .

The strain wires provided should be used at all times so as not to subject pin connections to excessive tensions.

CONSOLE PROVING

86. The console circuits can be proved using the following tests, which should also be used for checking for correct performance of the console before it is issued to the service:—

Test No. 1 (*Safety switch*)

(1) Connect a 28-volt ground supply to the ground supply plug.

(2) Switch on any of the systems power on switches. The associated power on lamps should not light.

(3) Press the centre (green) push of the console main switch. The console live and the lamps in (2) above should now light.

(4) Press the outer (red) push of the console main switch. The lamps mentioned in (3) above should go out.

Test No. 2 (*Nose-wheel steering*)

(1) Switch on console main switch. The console live indicator lamp should light.

(2) Switch on nose-wheel steering power on switch. The power on indicator lamp should light.

(3) Switch on the steer engage switch. A test lamp connected between pins A and B of the 2-pin socket on the extension cable (steer engage) should light.

(4) Switch steer switch to STARBOARD. A test lamp connected between pins A and C of the 4-pin socket on the extension cable (steer) should light.

(5) Switch steer switch to PORT. A test lamp connected between pins B and C of the 4-pin socket on the extension cable (steer) should light.

(6) Switch off all switches. All indicator lamps should go out.

Test No. 3 (*Port undercarriage*)

(1) Switch on console main switch. The console live indicator lamp should light.

(2) Switch on port undercarriage power on switch. The power on indicator lamps should light.

(3) Select wheels up. A test lamp connected between pins B and C of the socket on the extension cable (wheels) should light.

(4) Select down lock switch ON. A test lamp connected between pins A and B of the socket on the extension cable (down lock) should light.

(5) Select doors UP. A test lamp connected between pins B and C of the socket on the extension cable (doors) should light.

(6) Select wheels switch OFF, and re-select doors UP. The test lamp connected as in (5) above should not light.

(7) With doors switch OFF, select wheels DOWN. A test lamp connected between pins A and C of the socket on the extension cable (wheels) should not light.

(8) Select door DOWN. The test lamp connected as in (7) above should light. A test lamp connected between pins A and C of the socket on the extension cable (doors) should light.

(9) Switch off all switches. All indicator lamps should go out.

Test No. 4 (*Starboard undercarriage*)

(1) Switch on console main switch. The console live indicator lamp should light.

(2) Switch on starboard undercarriage power on switch. The power on indicator lamp should light.

(3) Select wheels UP. A test lamp connected between pins A and C of the socket on this extension cable (wheels) should light.

(4) Select down lock switch ON. A test lamp connected between pins A and B of the socket on the extension cable (down lock) should light.

(5) Select doors UP. A test lamp connected between pins A and C of the socket on the extension cable (doors) should light.

(6) Select wheels switch OFF, and re-select doors up. The lamp connected as in (5) above should not light.

(7) With doors switch off, select wheels down. A test lamp connected between pins B and C of the socket on the extension cable (wheels) should not light.

(8) Select doors down. The test lamp connected as in (7) above should light. A test lamp connected between pins B and C of the socket on the extension cable (doors) should light.

(9) Switch off all switches. All indicator lamps should go out.

Test No. 5 (*Nose-wheel undercarriage*)

(1) Switch on console main switch. The console live indicator lamp should light.

(2) Switch on nose-wheel undercarriage power on switch. The power on indicator lamp should light.

(3) Select wheels up. A test lamp connected between pins A and C of the socket on the extension cable (wheels) should light.

(4) Select doors up. A test lamp connected between pins B and C of the socket on the extension cable (doors) should light.

(5) Select wheels off, and re-select doors up. The test lamp connected as in (4) above should not light.

(6) With doors switch off, select wheels down. A test lamp connected between pins B and C of the socket on the extension cable (wheels) should not light.

(7) Select doors down. The test lamp connected as in (6) above should light. A test lamp connected between pins A and C of the socket on the extension cable (doors) should light.

(8) Switch off all switches. All indicator lamps should go out.

Test No. 6 (*Bomb doors*)

(1) Switch on console main switch. The console live indicator lamp should light.

(2) Switch on bomb doors power on switch. The power on indicator lamp should light.

(3) Select doors open. A test lamp connected between pins B and C of the sockets on the extension cables should light.

(4) Select doors closed. A test lamp connected between pins A and C of the sockets on the extension cables should light.

(5) Switch off all switches. All indicator lamps should go out.

Test No. 7 (*L.P. and C.F. cocks*)

(1) Switch on console main switch. The console live indicator lamp should light.

(2) Switch on L.P. and C.F. power on switch. The power on indicator lamp should light.

(3) Select switch up. A test lamp connected between pins B and A of the socket on the extension cable should light.

(4) Select switch down. A test lamp connected between pins C and A of the socket on the extension cable should light.

(5) Switch off all switches. All indicator lamps should be dark.

Note . . .

Switch UP for { *C.F. cock OPEN*; *L.P. cock CLOSED*

Switch DOWN for { *C.F. cock CLOSED*; *L.P. cock OPEN*

Test No. 8 (*Sequence timer*)

Two separate tests are required on this section:—

(a) to prove the system for use with aircraft supplies;

(b) to prove the system for use with test set supplies.

Test (*a*)

(1) Switch on console main switch. The console live indicator lamp should light.

(2) Switch on sequence timer power on switch. The power on indicator lamp should light.

(3) Switch supplies selector switch to AIRCRAFT.

(4) Connect a wandering lead between ground supply (28 volts) and pin 8 of the extension lead 9-pin socket.

Bridge pins 8 and 1, 8 and 4, 8 and 5, 8 and 7 } of extension loom 9-pin plug.

Check that the appropriate indicator lamp on the panel lights.

(5) Connect a wandering lead between ground supply (28 volts) and pin 9 of the extension lead 9-pin socket.

Bridge pins 9 and 2, 9 and 3, 9 and 6 } of extension loom 9-pin plug.

Check that the appropriate indicator lamp on the panel lights.

Test (*b*)

(1) Switch supplies selector switch to TEST SET.

(2) Bridge pins 8 and 1, 8 and 4, 8 and 5, 8 and 7 } of extension loom 9-pin plug.

Check that the appropriate indicator lamp on the panel lights.

(3) Bridge pins 9 and 2, 9 and 3, 9 and 6 } of extension loom 9-pin plug.

Check that the appropriate indicator lamp on the panel lights.

Note . . .

The wander lead is NOT to be used for these two tests.

(4) Switch on the Type 100A inverter. Check for voltage and frequency between:—

Red and blue
Red and green
Blue and green

on the sequence timer connector assembly fitted to the end of the supply extension cable.

(5) Switch off all switches. All indicator lamps should go out.

Test No. 9 (*Fuel pumps*)

(1) Switch on console main switch. The console live indicator lamp should light.

(2) Switch on 28-volt power on switch. The power on indicator lamp should light. A test lamp connected between pins D and E of the socket on the extension cable should light.

(3) Connect the 5-pin socket on extension cable to a Desynn Test Set, Ref. No. 6C/437. Observe movement of indicator in reference to test set adjustments.

(4) Short-circuit the 680-ohm resistor in series with the 112-volt power on indicator lamp.

(5) Switch on 112-volt power on switch. The power on indicator lamp should light.

(6) Select main pump. With a temporary link connected between 28-volt +ve and 112-volt +ve a test lamp connected between pins C and E of the socket on the extension cable (main pump) should light. A lamp connected between B and E will be dim with selector switch set at AUTO and bright with selector switch set at MANUAL.

(7) Select secondary pump. A lamp connected between pins A and B of the socket on the extension cable (secondary pump) should light.

(8) Select transfer switch ON. A lamp connected between pins 1 and 2 of the socket on the extension cable (transfer pump) should light.

(9) Switch off all switches. All indicator lamps should go out.

Test No. 10 (*Fire extinguishers*)

Apply 28 volts to sockets on extension cables as follows:—

Across pins A and B of 2-pin plugs.

Between pins B and C of 4-pin plugs. (Inboard.)

Appropriate indicator lamps on console should light.

Test No. 11 (*Miscellaneous test circuit*)

(1) Switch on console main switch. The console live indicator lamp should light.

(2) Switch on miscellaneous test power on switch. The power on indicator lamp should light.

(3) Switch selector switch up. A test lamp connected between the red and green cores of the extension cable should light.

(4) Switch selector switch down. A test lamp connected between the blue and green cores of the extension cable should light.

(5) Switch off all switches. All indicator lamps should go out.

Test No. 12 (*P.F.C. test circuit*)

Two alternative methods of testing this circuit are offered, one using a 112-volt d.c. motor of suitable type, and the other using an Avometer or similar instrument for resistance measurement.

Test (*a*)

Using a suitable motor connected to the terminal ends of the extension cables.

(1) Switch on console main switch. The console live indicator lamp should light.

(2) Switch on P.F.C. test power on switch. The power on indicator lamp should light.

(3) Select P.F.C. ON. The motor should start and continue to run whilst the switch remains in the ON position.

(4) Select P.F.C. OFF. The motor should stop.

(5) Switch off all switches. All indicator lamps should go out.

Test (*b*)

(1) With all switches off, balance the resistance between terminals F and ARM+ on the P.F.C. extension cables. This should give a reading of 0·7 ohm (approx.), the value of the starting resistance in series with the armature line.

(2) Switch on console main switch. The console live indicator lamp should light.

(3) Switch on P.F.C. test power on switch. The power on indicator lamp should light.

(4) Select P.F.C. ON and check for 112 volts between A +ve and A −ve. The Type D.9211 contactor will close. As soon as this contactor closes, the Type D.9241 contactor will be closed by energising current from the 112-volt supply via the starting resistance.

(5) Remove the 112-volt external supply, and switch off all switches. All indicator lamps should go out.

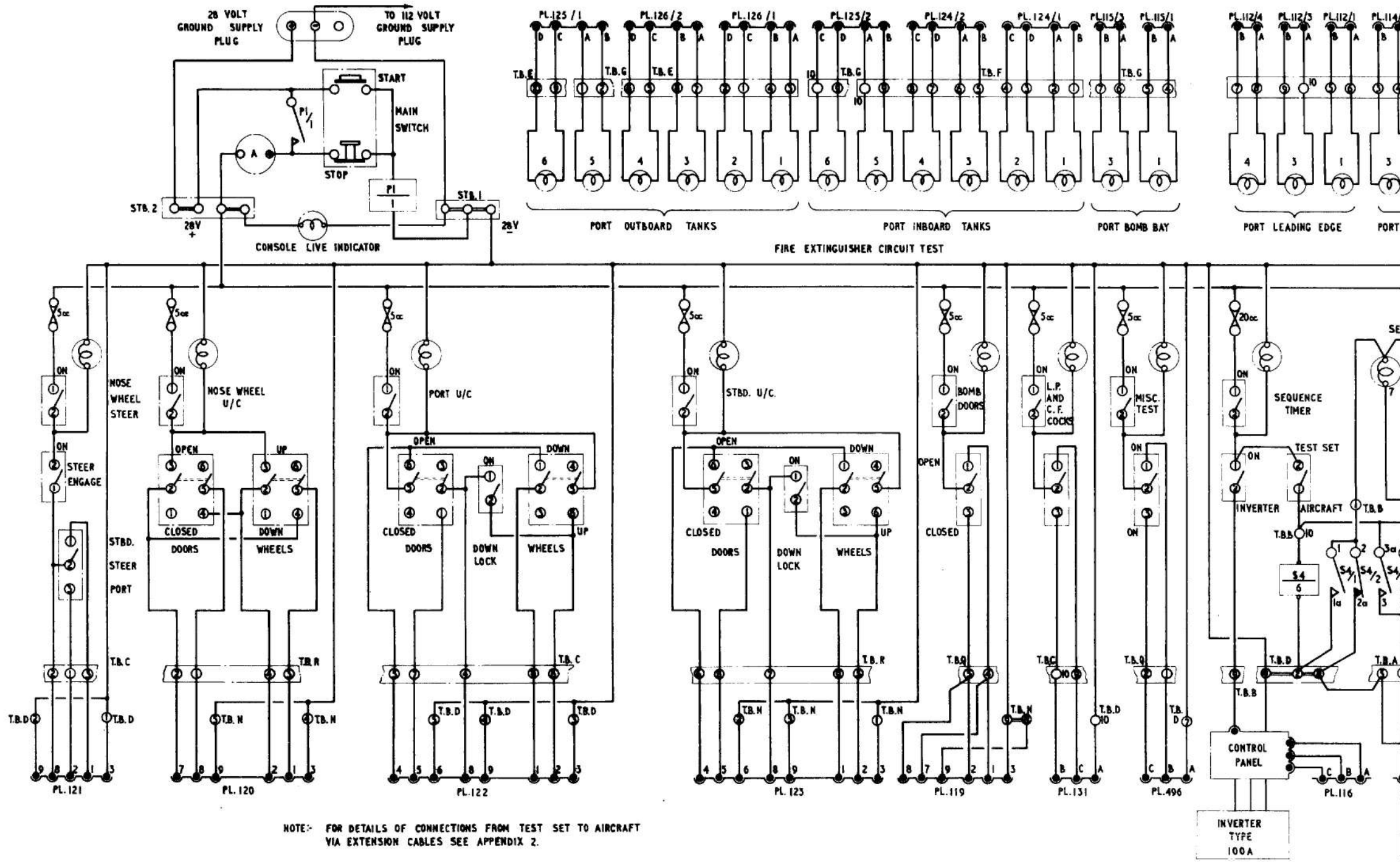
(6) Balance the resistance between terminals F and ARM+ of the P.F.C. extension cable. Zero ohms should now register, since the starting resistance is short-circuited by the contacts of contactor D.9241.

(7) Leaving the 112-volt supply disconnected, switch on console main switch and P.F.C. test power on switches. The console

live and the P.F.C. power on indicator lamps should light.

(8) Switch off by selecting STOP. The original resistance value (0.7) should now be obtained on measuring between terminals F and ARM+ of the P.F.C. extension cables.

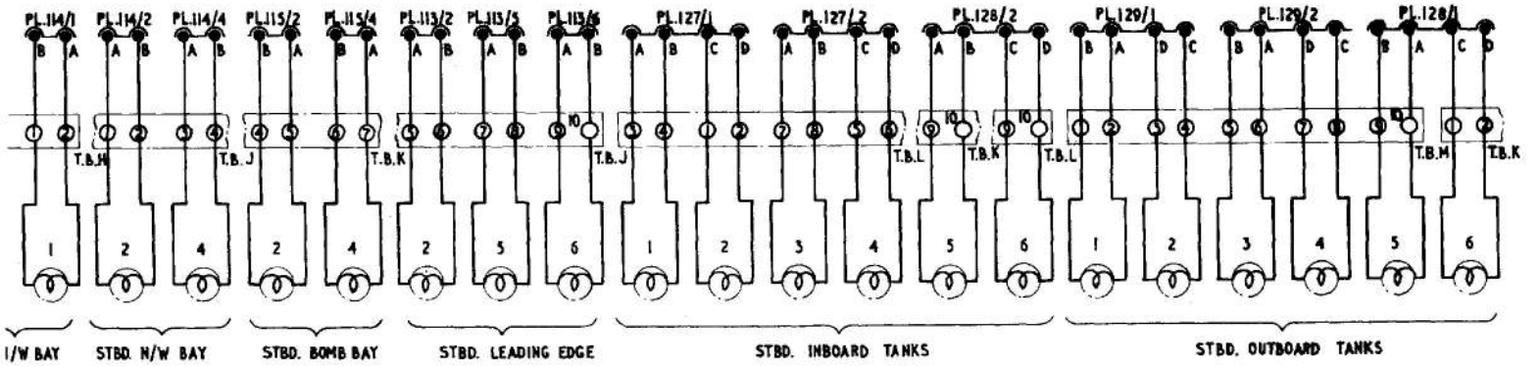
(9) Switch off all switches. All indicator lamps should go out.

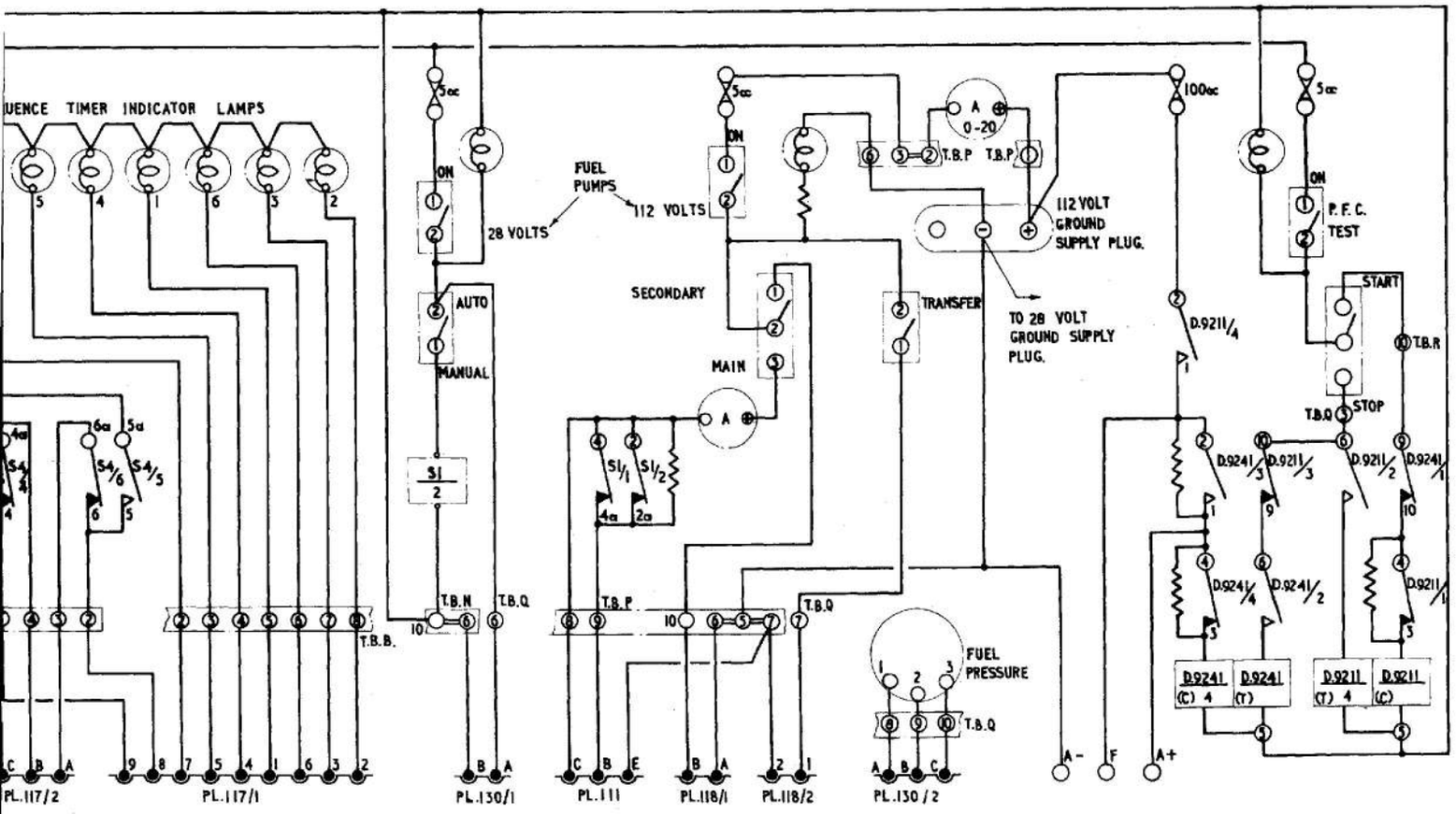


NOTE:- FOR DETAILS OF CONNECTIONS FROM TEST SET TO AIRCRAFT VIA EXTENSION CABLES SEE APPENDIX 2.

FIG. 7 CONSOLE WIRING DIAGRAM.

4296 345367 12/58 25E C B 85 LT 6P924





NOTE:- FOR DETAILS OF CONNECTIONS FROM TEST SET TO AIRCRAFT VIA EXTENSION CABLES SEE APPENDIX 2.

Appendix 1 — SCHEDULE OF TESTS — AIRCRAFT SYSTEMS

LIST OF CONTENTS

SCHEDULE 1—NOSE-WHEEL STEERING

(a) Introduction

The controls for the testing of the nose-wheel steering system occupy the top left-hand corner of the control panel and comprise three switches labelled POWER ON, STEER ENGAGE and STEER. The first is an on-off switch and is placed up for ON, when the indicator lamp situated above the switch should light. The second is also an on-off switch, up for ON to connect the 28-volt supply to the steering valve, The third switch is a 3-position switch, centre OFF, up for PORT and down for STBD and is used to select the direction in which it is desired to move the nose-wheel. An end-on, H.R.C. 5-amp. fuse is located in the fuse holder to the left of the lamp.

(b) Pre-test requirements

(The console is positioned between nose-wheel bay and bomb bay).

(1) The aircraft is to be jacked up.

(2) The nose-wheel is to be clear of obstruction.

(3) An external 28-volt supply is to be plugged in at the ground supply plug located on the left-hand side panel.

(4) The main steering valve situated at the aft end of the nose-wheel bay is to be disconnected. The extension cable marked STEER ENGAGE is to be run out from the console and plugged into the main steering valve.

(5) The nose-wheel steering valve at the forward end of the nose-wheel bay is to be disconnected. The extension cable marked STEER is to be plugged into the steering valve.

(6) Ensure that the extension cables are adequately supported and clear of moving parts.

(7) Connect an external hydraulic rig to the aircraft.

(c) Test procedure

(1) Switch on 28-volt supply by pressing the green ON button on the safety switch.

(2) Switch on the power on switch and note that the indicator lamp is bright.

(3) Switch the steer engage switch to ON.

(4) Select PORT on the steer switch. The nose-wheel will be turned to port. Similarly, by selecting STBD, the nose-wheel will be turned to starboard.

(5) Return nose-wheel to central position.

(6) Switch off all control switches.

(d) After test

(1) Switch off electrical and hydraulic supplies.

(2) Disconnect extension cables and stow in the console.

(3) Re-connect aircraft services.

SCHEDULE 2—PORT UNDERCARRIAGE ACTUATION

(a) Introduction

Immediately below the nose-wheel steering controls are fitted the control switches for the port undercarriage. These consist of a power on switch, an on-off switch for the down lock, a 3-way switch labelled UP-DOWN for the wheels and a 3-way switch labelled CLOSE-OFF-OPEN for the doors. An indicator lamp, which operates in conjunction with the power on switch, is fitted above the switch and the 5-amp fuse adjoins the lamp. The doors switch is spring loaded to OFF from the CLOSE position. A label is also fitted, giving warning against operating the wheels to up at the same time as operating the doors to close. The aircraft circuit is sequenced such that the wheels must be retracted before the doors close. Such conditions cannot be simulated on the console and it is important that the warning conditions are observed.

(b) Pre-test requirements

(1) The aircraft is to be jacked up.

(2) The main wheel and door is to be clear of obstruction.

(3) An external 28-volt d.c. supply is to be connected to the ground supply plug on the left-hand side panel of the console.

(4) The down-lock, undercarriage, and door selector valves are to be disconnected from the aircraft electrical system. The port undercarriage extension cables are to be run out and connected to their respective selector valves in the port undercarriage bay.

(5) Ensure that the extension cables are adequately supported and clear of moving parts.

Warning

It is essential that the extension cables are so routed that there will be no danger of fouling the undercarriage or doors. Allow for the fact that the doors are to be closed during the test.

(6) Connect an external hydraulic rig to the aircraft.

(7) Switch on main (safety) switch.

(c) Test procedure

To check bogie trim

(1) Switch on the power on switch and note that the indicator lamp lights.

(2) With down lock switch at OFF. Select wheels up. The wheel bogie will take up the attidude for the wheels up condition.

(3) Select wheels down. The wheel bogie will take up the attitude normal for landing.

To check wheels and doors

(1) Switch on down lock.
(2) Select wheels up.
(3) When the wheels are *fully retracted*, select doors close.
(4) Switch off down lock.
(5) Select doors open.
(6) Select wheels down.
(7) Switch off all control switches.

(d) After test

(1) Disconnect electrical and hydraulic supplies.
(2) Disconnect extension cables and stow in console.
(3) Re-connect aircraft services.

SCHEDULE 3—SEQUENCE TIMER

(a) Introduction

Two tests are possible, the first using the aircraft supply, and the second using an external supply via the test console. The control switches occupy the bottom left-hand corner of the panel and comprise a power on switch with the usual indicator lamp and fuse, a single-pole switch for the control of the Type 100A inverter, and a two-position switch labelled AIRCRAFT-TEST SET which is used in conjunction with a Type S4 relay, fitted behind the panel, to set the circuit conditions necessary for each of the two tests. At the bottom of the panel is a row of seven lamps, each of which is identified with one of the fuel tanks on one side of the aircraft. The tank numbers are shown on labels below the lamps.

Any test of the sequence timer would be incomplete without a check on the operating times of the cam-operated switches. A

label showing the times during which the contacts are open is fitted adjacent to the power on switch.

(b) Pre-test requirements (Test on aircraft supply)

(1) An external 112-volt supply is to be connected to the aircraft.

(2) An external 28-volt supply is to be connected to the aircraft.

(3) Disconnect the 9-pin plug at the sequence timer in main-wheel bay.

(4) Run out sequence timer extension cables from the console and connect the plug to the socket which was previously connected to he sequence timer, and the socket to the sequence timer. DO NOT DISTURB THE 115-VOLT, 3-PHASE CONNECTIONS FOR THIS TEST.

(5) Switch on aircraft 24-volt and 96-volt isolation switches and start up No. 3 inverter to provide the 115-volt, 3-phase supply for the sequence timer motor.

(c) Test procedure

With the aircraft-test set switch set to AIRCRAFT, no further action is necessary. The sequence timer will be driven as soon as the a.c. supply is made available. The d.c. supply for the indicator lamps will be available if the auto-manual switches on the aircraft centre console are at AUTO. Using a stop-watch, the times of the cam sequences can then be compared against the table provided for this purpose.

(d) After test

(1) Switch off all supplies.

(2) Disconnect extension cables from aircraft services and stow in console.

(3) Re-connect aircraft services.

(e) Pre-test requirements (Test on test set supply)

(1) Disconnect the 9-pin plug at the sequence timer in the main wheel undercarriage bay.

(2) Run out sequence timer extension cables from the console and connect the socket to the sequence timer.
THE PLUG IS NOT TO BE CONNECTED

(3) Remove cover from the 115-volt, 3-phase connector block on the sequence timer. IT IS NOT NECESSARY TO DISCONNECT THE SUPPLY.

(4) Fit connector block cover adaptor. This has spring-loaded connectors which will bear down on connecting screws in the connector block.

(5) Connect an external 28-volt supply to the aircraft-type ground supply plug on the left-hand side of the test console.

(6) Switch on 28-volt supply at main safety switch.

(f) Test procedure

(1) Select power on switch to ON and check that indicator lamp lights.

(2) Select aircraft-test set switch to TEST SET.

(3) Select inverter switch to ON.

(4) Proceed as under (c).

(g) After test

(1) Switch off all supplies.

(2) Remove external supply plug from console.

(3) Disconnect extension cables from aircraft services and stow in console.

(4) Re-connect aircraft services.

SCHEDULE 4—FIRE EXTINGUISHERS

(a) Introduction

The aircraft is fitted with twenty-six Methyl Bromide fire extinguisher bottles of which twelve are of the dual operating head type and the remainder single operating head. The dual operating head type are fitted in the vicinity of the main-wheel undercarriage bay in earlier machines, but outboard of the bays in later aircraft and those in current production. Three single operating head bottles are fitted in each wing leading edge at a position forward of the main-wheel undercarriage bay. Four further bottles are located in the bomb bay; two on the port side for No. 1 and No. 2 engines, and two on the starboard side for No. 3 and No. 4 engines. Finally, four bottles of similar type are fitted in the nose-wheel bay.

Before any test is carried out on the fire extinguisher system, remember:—

(1) The operation of one test switch either in the outboard or in the inboard fuel tank areas will set off *all six dual operating head bottles* and *three leading edge bottles* on that side of the aircraft.

(2) The operation of crash switches will set off *all bottles in both wings, in the bomb bay, and in the nose-wheel bay.*

In this test, the aircraft electrical system is tested. This means that a 28-volt supply will have to be connected to the aircraft, and that precautions should be taken to ensure that the aircraft is in an electrically safe condition before the battery supply is connected.

(b) Pre-test requirements

(1) Disconnect ALL extinguisher bottles.

(2) Run out extension cables from console and connect to the appropriate sockets in the wings, leading edges, bomb-bay and nose-wheel bay. Ensure that positive contact between plugs and sockets is made and that the extension cables are adequately supported to prevent strain on the connections.

(c) Test procedure

Note . . .

At least two men are required to satisfactorily undertake the testing of the fire extinguisher system, one to operate the switches in the system, and the other to observe results as registered on the indicator lamps on the test console.

(1) Operate a fire detector test switch in the outboard fuel tank area of the port wing. The six lamps labelled OUTBOARD and three labelled LEADING EDGE will light.

(2) Operate a fire detector test switch in the inboard fuel tank area of the port wing. The six lamps labelled INBOARD and three labelled LEADING EDGE will light.

(3) Repeat as for (1) and (2) in the starboard wing.

(4) Operate a fire detector test switch in the forward area of the nose-wheel bay. Two lamps will light.

(5) Operate a fire detector test switch in the aft area of the nose-wheel bay. Two lamps will light.

(6) Operate, either singly or concurrently, the four engine fire push-switches on the coaming in the pilots' position in the cabin. The lamps labelled BOMB BAY will light.

(7) If crash switch sequence is to be checked, operate crash switches No. 1 and No. 6.

Six port inboard lamps
Three leading edge port lamps
Three leading edge starboard lamps
Four nose-wheel bay lamps
Four bomb bay (engine) lamps
} will light.

(d) After test

(1) Disconnect extension cables from aircraft and stow in console.

(2) CHECK THAT CRASH SWITCHES HAVE BEEN RESET AND THAT AIRCRAFT CIRCUITS ARE SAFE.

(3) Re-connect aircraft services.

SCHEDULE 5—NOSE-WHEEL ACTUATION

(a) Introduction

The nose-wheel differs from the main wheel in two respects. There is no bogie, and no electro-hydraulic down lock. In other respects it is similar, from the electrical viewpoint, to the main wheel. When carrying out tests on the nose-wheel section of the undercarriage, therefore, it is essential that the safety precautions are observed. In particular, attention is again drawn to the warning label adjoining the control switches on the test console. IF THE DOORS ARE SELECTED TO CLOSE AT THE SAME TIME AS THE UNDERCARRIAGE WHEELS ARE SELECTED UP THERE IS EVERY DANGER OF THE TWO COLLIDING, OR OF THE DOORS CLOSING BEFORE THE WHEELS ARE FULLY RETRACTED.

(b) Pre-test requirements

(1) The aircraft is to be jacked up.

(2) The nose-wheel and doors are to be clear of any obstruction.

(3) An external 28-volt supply is to be connected to the ground supply plug on the left-hand side panel of the console.

(4) The undercarriage and the doors selector-valves are to be disconnected from the aircraft electrical system. The nose-wheel actuation extension cables are to be run out and connected to their respective selector valves. (The terminal ends of the extension cables are given identification labels appropriate to their functions.)

(5) Ensure that the extension cables are so routed and secured that they are given freedom of movement consistent with the amount of angular movement of the doors, through which the cables are passed, while permitting free movement of wheels and doors without fouling the cables.

(6) Connect an external hydraulic supply to the aircraft.

(7) Switch on main (safety) switch.

(c) Test procedure

(1) Switch power on switch to ON and observe that the indicator lamp lights.

(2) Check safety switch. Strike the switch, when the indicator lamp should go out, signifying the absence of 28 volts on the control panel. Re-set by pressing the green button on the safety switch. The indicator lamp will light.

(3) Select WHEELS UP.

(4) *With wheels fully retracted*, select DOORS CLOSE.

(5) Select DOORS OPEN.

(6) Select WHEELS DOWN.

(7) Switch off all control switches. (Lamp out.)

(d) After test

(1) Disconnect electrical and hydraulic supplies.

(2) Disconnect extension cables and stow in console.

(3) Re-connect aircraft services.

SCHEDULE 6—STARBOARD UNDERCARRIAGE ACTUATION

See Schedule 2 (port undercarriage actuation).

SCHEDULE 7—L.P. AND CROSS-FEED COCKS

(a) Introduction

This test circuit is provided to enable cross-feed cocks or L.P. cocks to be tested. Two switches are provided, one serving as a power on, or main, switch and the other giving bi-lateral control over the component under test. The switch is a 3-position, centre off switch, and it will be noted that the CLOSE position for the L.P. cock is also the OPEN position for the C.F. cock. This is necessary in view of the different connection arrangements at the connecting plugs (see sect. 5, Chap. 1, Group 7, Fig. 31 and 32 of A.P.4505A, Vol. 1, Book 2). An indicator lamp, associated with the power on switch, and a fuse carrier are also fitted in this section of the panel.

(b) Pre-test requirements

(1) The external 28-volt supply is to be connected into the test console.

(2) The low pressure/cross feed cock to be tested is to be disconnected from the aircraft electrical system.

(3) The L.P./C.F. extension cable is to be run out from the console and connected to the selected actuator.

(4) The main (safety) switch is to be switched ON.

(c) Test procedure

(1) Switch on power on switch.

(2) Select control switch to OPEN. Observe 28-volt ammeter at the top left-hand of panel. This will register actuator consumption. When the limit of actuator movement is reached the internal limit switch will cut off the supply. At this point the ammeter pointer returns to zero.

(3) Select control switch to CLOSE. The ammeter will register the consumption up to the point when the internal limit switch again cuts off the supply with the cock fully closed.

(4) Switch off all switches.

(d) After test

(1) Disconnect 28-volt supply from test console.

(2) Disconnect extension cable and stow in console.

(3) Re-connect aircraft services.

SCHEDULE 8—BOMB DOORS

(a) Introduction

The two electro-hydraulic selector valves associated with normal bomb door operation are fitted on the port side of the bomb bay, while on the starboard side is fitted the selector valve which, in conjunction with the Hydraulic Power Pack, is used for emergency bomb doors operation.

When testing bomb doors from the test console it will be necessary to run cables into the bomb bay, where they will be connected to the selector valves. At the same time the doors have to be closed and opened, therefore the cables must be run so that fouling of the cables cannot occur.

The controls consists of a power on switch with indicator lamp and fuse, and a 2-way, centre-off, control switch labelled OPEN and CLOSE.

(b) Pre-test requirements

(1) Ensure that the bomb doors are clear of obstruction and that all personnel have been warned clear of the bomb bay.

(2) Disconnect the selector valves from the aircraft electrical services.

(3) Run out and connect bomb doors extension cables.

(4) Connect an external hydraulic supply to the aircraft.

(5) Connect an external 28-volt supply to test console.

(c) Test procedure

(1) Switch on main (safety) switch.

(2) Switch on power on switch and check indicator lamp.

(3) Check and re-set main (safety) switch.

(4) Select DOORS CLOSE.

(5) Select DOORS OPEN.

(6) All switches to OFF.

(d) After test

(1) Disconnect electrical and hydraulic supplies.

(2) Disconnect extension cables and stow in console.

(3) Re-connect aircraft services.

SCHEDULE 9—FUEL PUMPS

(a) Introduction

Three types of fuel pump are fitted on the Vulcan aircraft. First there is the main fuel pump, one of which is fitted in each tank. This pump is required to run at one of two speeds, governed by the sequence timer. The second type is the secondary fuel pump, one of which is fitted in each of the wing tanks. The third type is a transfer pump, one in each of the No. 1 and No. 7 tanks. The test console provides for the testing of each of the three types.

The controls occupy the lower centre portion of the panel and consist of a 112-volt power on switch, a 28-volt power on switch, a 2-position, centre-off selector switch labelled MAIN and SECONDARY, a transfer pump on-off switch, and a switch labelled MANUAL and AUTO. Associated with each of the power on switches is an indicator lamp and an end-on fuse holder. An ammeter is fitted to give an indication of the power consumption of the pump under test, and a pressure indicator registers the stall pressure developed by the pump.

Fitted behind the panel, and operating in conjunction with the manual-auto switch, is a relay unit which determines the speed of the pump by switching in or out of circuit a resistance in the pump armature circuit, in a manner similar to that achieved automatically by the sequence timer in the aircraft system. The resistor is fitted adjacent to the relay unit.

For the satisfactory check on the efficiency of a fuel pump it is essential that the pump shall do work. In other words, fuel must be moved by the pump so that a measure of the pressure in the system consequent on the pump's operation can be obtained. For this function an adaptor is connected into the fuel system. The adaptor is fitted with a Desynn type fuel pressure transmitter which is connected to the indicator on the test panel. When not in use the adaptor is stored within the console.

(b) Pre-test requirements

(1) The adaptor is to be fitted into the re-

fuelling line at the refuelling point in the main undercarriage wheel-bay.

(2) The pump to be tested is to be disconnected from the aircraft electrical system.

(3) The appropriate extension cable (main, secondary or transfer) is to be run out and connected to the fuel pump.

(4) A complete fuel circuit is to be made available between pump and adaptor by opening the appropriate cocks. This task is to be undertaken only by a ground-crew member who is fully conversant with the fuel system lay-out.

(5) A 112-volt ground supply is to be made available to the console.

(6) A 28-volt ground supply is to be made available to the console.

(c) Test procedure

(1) Switch on 28-volt main (safety) switch.

(2) Switch on 28-volt power on switch and check that indicator lamp is bright.

(3) Switch on 112-volt power on switch and check that indicator lamp is bright.

(4) Check that manual/auto switch is at AUTO. In this position the pump will run at reduced speed.

(5) Select main-secondary switch to MAIN. Observe the pump intake on the 112-volt ammeter. Observe pump stall pressure on the pressure indicator.

(6) select manual/auto switch to MANUAL. Observe pump intake. Observe increased pressure as registered on pressure indicator.

(7) All switches to OFF.

Note . . .

Where a secondary fuel pump is to be tested the main-secondary switch should be at SECONDARY. *This pump runs at constant speed.*

Where a transfer pump is to be tested, the the procedure is similar except that only the transfer pump and power on switches need be operated.

(d) After test

(1) Disconnect 112-volt and 28-volt supplies from test console.

(2) Remove adaptor. The Crew Chief should check that fuel system is consistent with normal conditions by inspecting manual fuel cocks.

(3) Disconnect extension cable and stow in console.

(4) Re-connect aircraft services.

SCHEDULE 10—P.F.C. TEST CIRCUIT

(a) Introduction

This test circuit is intended for the function testing of individual P.F.C. pump motors, and embodies the starting contactor and the full-speed contactor with its associated starting resistance, so as to reproduce the conditions normal to the aircraft installation.

Two switches are provided. One is a power on switch, serving as a master switch for the test circuit. A power on indicator lamp operates in conjunction with this switch. The second switch is a 3-position, centre-off switch controlling the P.F.C. pump motor. The two selections are labelled START and STOP respectively.

The control switches, indicator lamp and fuse occupy a section on the right-hand side of the control panel.

(b) Pre-test requirements

(1) The pump motor to be tested is to be disconnected from the aircraft electrical system.

(2) If it is intended to load the motor by displacking the aircraft control services, ensure that such displacements can be effected safely.

(3) Run out extension cables and connect to terminal blocks adjacent to P.F.C. motor (Refer to routing charts in A.P.4505A, Vol. 1, Book 2, Sect. 5, Chap. 1, Group 6).

(c) Test procedure

(1) Switch on 28-volt d.c. by pressing main switch (green button).

(2) Switch on P.F.C. power on switch and note that the indicator lamp lights.

(3) Select START on start-off-stop control switch.

(4) On completion of test, select STOP on control switch.

(5) Switch off power on switch.

(d) After test

(1) Disconnect extension cables and stow in console.

(2) Re-connect aircraft systems.

Warning

It should be remembered that a P.F.C. motor, once started, will continue to run even though the 28-volt d.c. supply is cut off at the main switch. To stop the motor the control switch must be put to OFF.

SCHEDULE 11—MISCELLANEOUS TEST

(a) Introduction

This test circuit has been included to provide a controlled and protected 28-volt supply for the testing of miscellaneous systems or components and consists of a power on master switch with its associated indicator lamp, and 3-way, centre-off control switch. These switches control the supply to a 3-core cable, the aircraft end of which is free. The type of plug or socket to be fitted to the free end will depend on the type of mating connection provided on the component or system to be tested.

A 28-volt supply will appear across the red and green cores of the cable with the selector switch up. and across the blue and green cores with the switch down.

(b) Pre-test requirements

These will be consistent with the safety requirements for the test, and should be agreed with a responsible person, e.g., Crew Chief.

APPENDIX 2

Table 1

EXTENSION CABLE LOOMS

Designation	Cable	Terminations		Connections		Overall length	Part No.
		A Test set	B Aircraft	A	B		
Main fuel pump	Trisheathground 7	5-pin socket CZ.50092	5-pin socket 137U/1340 (CZ56092 modified)	Red — C Blue — B Green — E	Red — C Blue — B Green — E	30′	111 U.1340
Fuel pressure	2 off Trisheathground 7	5-pin socket CZ.56092 2-pin socket CZ.56084	5-pin socket CZ.56092	A B C A B	Red, Blue, Green } A, B, C Red, Blue } D, E	24′	130 U.1340
Transfer and secondary pump	2 off Dusheathground 7	2-pin socket CZ.56084 (A1) 2-pin socket CZ.71749 (Z.5)	2-pin socket A-1 (modified) 2-pin socket Z.5 (modified)	Red — B Black — A Red — 1 Black — 2	B A 1 2	30′	118 U.1340
Nosewheel wheels and doors	2 off Trisheathground 7	9-pin socket CZ.56100	4-pin socket A-2 (modified) 4-pin socket A-2 (modified)	B A C A B C	Red, Blue, Green } 1, 2, 3 Red, Blue, Green } 7, 8, 9	20′	120 U.1340
Nosewheel (Steer)	1 off Trisheathground 7 1 off Dusheathground 7	9-pin socket CZ.56100	4-pin socket A-2 (modified) 2-pin socket A-1 (modified)	A B C A B	Red, Blue, Green } 1, 2, 3 Red, Black } 8, 9	29′ 6″ 20′ 6″	121 U.1340
Port undercarriage Starboard undercarriage	2 off Trisheathground 7 1 off Dusheathground 7 Similar	9-pin socket CZ.56100	4-pin socket A-2 (modified) 4-pin socket A-2 (modified) 2-pin socket A-1 (modified)	A B C A B C A B	Red, Blue, Green } 1, 2, 3 Red, Blue, Green } 4, 5, 6 Red, Black } 8, 9	30′	122 U.1340 (Port) 123 U.1340 (Stbd)
L.P. and C.F. Cocks	 Trisheathground 7	5-pin socket CZ.56092	6-pin Mk. 4 miniature CZ.49017	C B A	Red C Blue B Green A	20′	131 U.1340
Bomb door port and starboard	2 off Trisheathground 7	9-pin socket CZ.56100	4-pin socket A-2 (modified) 4-pin socket A-2 (modified)	B A C B, A, C	Red 1 Blue 2 Green 3 Red 7 Blue 8 Green 9	32′	119 U.1340

TABLE 1—*cont.*

Designation	Cable	Terminations		Connections		Overall length	Part No.
		A Test set	B Aircraft	A	B		
Fire extinguisher tanks port	2 off Quadrasheathground 7	2 off 5-pin socket CZ.56092	4 off 4-pin plug A-2 (modified)	A, B A, B B, C B, C	Blue A Red B Green C Yellow D Blue A Red B Green C Yellow D	56′ 9″ 58′ 3″ 59′ 9″ 61′ 3″	125 U.1340
Fire extinguisher tank port	Similar to 124U/1340	Similar to 124U/1340	4 off 2-pin plug A-1 (modified)	A, B A, B B, C B, C	Blue A Red B Green C Yellow D Blue A Red B Green C Yellow D	Similar to 124U.1340	126 U.1340
Fire extinguisher tanks starboard	—	Similar to 124U.1340		.....	.....	.....	127 U.1340
Fire extinguisher tank starboard	—	Similar to 125U.1340		.....	.....	.....	128 U.1340
Fire extinguisher tanks starboard	—	Similar to 126U.1340		.....	.....	.....	129 U.1340
P.F.C.	1 off Unipren 12 4 off Unipren 35	1 off Lug 5X/6671 2 off 2 off Lug 5X/6546 6549	1 off Ferrule 9V/5650 4 off Lug 5X/6547	See wiring diagram	Field Armature pos. Armature neg.	29′	502 U.1340
Miscellaneous test	Trisheathground 7	5-pin socket Z.4	—	C RED B BLUE A GREEN	—	25′	496 U.1340

Note.—Modified plugs and sockets.

Threads have been machined off to facilitate coupling connections with aircraft components.

Appendix 3 SCHEDULE OF PARTS

Part No.	Description	Qty.	Manufacturer, Spec, Material, Size, etc.
CZ.49618	Socket Assy. Double 37A	6	Plessey
CZ.64770	Socket	2	,,
CZ.71748	,,	1	,,
CZ.56093	,,	1	,,
505/U1340	Resistor	1	A.V. Roe 3/V6305
506/U1340	Fuse unit 100A	1	E.E.C. SM.100P
507/U1340	,, link 100A	1	,, TCP.100
508/U1340	Resistor	1	Berco LW12680
500/U1340	Contactor	1	Rotax drg. No. 9211
501/U1340	,,	1	,, ,, ,, 9241
440/U1340	Castors 7" dia.	4	Flexello XIC T7B.STA.
441/U1340	Resistor	1	Berco K7VP23
442/U1340	Fuse HRC 10A	1	5CZ/5216
443/U1340	Connector ext. power supply 28V	1	5C/4314
444/U1340	Connector ext. power supply 112V	1	5C/4315
445/U1340	Plug 5-pin Z4	18	Plessey CZ50356
446/U1340	Plug 2-pin A1	16	Plessey CZ.50354
447/U1340	Plug 2-pin Z5	1	Plessey CZ.28095
448/U1340	Plug 9-pin B7	6	Plessey CZ.50357
449/U1340	Handle	2	16 s.w.g. $\frac{1}{2}$" o/d. MS. Tube
418/U1340	Stop switch	1	MBT.445 E.
419/U1340	Relay P.1	1	5CW/1722
420/U1340	Switch DP	3	Rotax D.5502
421/U1340	Relay S4	1	5CW/3945
423/U1340	Terminal block covers	16	Plessey CZ.26808
424/U1340	Relay S.1	1	5CW/3942
425/U1340	Lamp warning type A	57	5CX/1069
426/U1340	Switch S.P.	4	Rotax D5404
427/U1340	Switch S.P.	6	5CW/4197
428/U1340	Switch D.P.	6	5CW/4199
429/U1340	Indicator, Desynn (fuel pressure)	1	Smiths 263 P.G.
430/U1340	Ammeter, d.c. 0-20 amps.	2	5Q/25093

Schedule of Parts—(*contd.*)

Part No.	Description	Qty.	Manufacturer, Spec, Material, Size etc.
431/U1340	Ammeter, d.c. 0-10 amps.	1	5Q/25091
27/U1340	On-off switch	14	Rotax D5404
432/U1340	Fusebox Type A fuseholder	11	5CZ/3741
433/U1340	Terminal block	16	5X/2863
434/U1340	Inverter Type 100A	1	5UB/4938
435/U1340	Control box	1	5UC/4939
436/U1340	Fuse, HRC.5A	10	5CZ/5215
437/U1340	Lamps, filament, 28-volt, 3·5W	57	5L/9951272
438/U1340	Terminal block, 3-way	2	5H/6
439/U1340	Terminal block covers	2	5H/12
109/U1340	Chandelier Chain, 2′	2	Commercial grade
110/U1340	Key ring i/d. $\frac{3}{4}$″ min.-1″ max.	4	Commercial grade
	Fuel pressure test rig		
CZ.50356	Plug	1	Plessey
Z.27442	Shroud	1	Plessey
Z.2277/2	Ferrule	1	Plessey
Z.61542	Coupling nut	1	Plessey
164.P.G.	Transmitter, fuel pressure	1	Smiths
30/OB.	Hose	1	Palmer
24.U1340	Hose unit adapter	1	Al. Alloy $4\frac{1}{4}$″ dia. × 3″ long
420.PG	A.V. mounting	1	Smiths
F.C.104	Hose unit assy.	1	Avery Hardoll
23b.	Gas tap $\frac{1}{8}$″	1	Rotherham

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