GROUP E.1

A.C. SUPPLIES (CODE CH)

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LIST OF ILLUSTRATIONS

Equipment employed

1. The major components employed in the a.c. supplies circuit are listed below, together with the appropriate Air Publications to which reference should be made for detailed descriptions and information on the servicing required to maintain them in an efficient condition:-

Inverters, Type 100A	A.P.4343B, Vol.1, Book 3, Sect.16
Auto-transformers, Smiths 213 M.V.	A.P.4343B, Vol.1, Book 3, Sect.19
Torque switches, Type B.1, E.A.P. 2340	A.P.4343C, Vol.1, Book 2, Sect.4
Circuit breakers, Type A.3	A.P.4343B, Vol.1, Book 2, Sect.10
Suppressors, Type F. No.2	A.P.4343C, Vol.1, Book 3, Sect. 5
Magnetic indicator, Dowty - 5CZ/5074	A.P.4343E, Vol.1, Book 4, Sect.18
Relays, Type S.1, S.3 and 9.B No.1	A.P.4343C, Vol.1, Book 2, Sect. 3
Test and reset switch, C.W.C. Type XD.782, No.3 Inverter selector switch, C.W.C. Type XD.735, No.2	A.P.4343C, Vol.1, Book 1, Sect. 3

DESCRIPTION

A.C. supplies

2. The a.c. supplies circuit controls the supplies to the a.c. operated flight instruments, and the engine temperature control circuit which is described in Sect.5, Chap.2 of this volume. The a.c. supply is provided by two 115 volt, 3-phase, 400 cycles per second inverters. These are both mounted on the cabin floor, behind the seat, and are identified as No.1 and No.2 inverters. Normally, when the d.c. generators are on the line, No.1 inverter supplies the a.c. - operated instruments and engine temperature

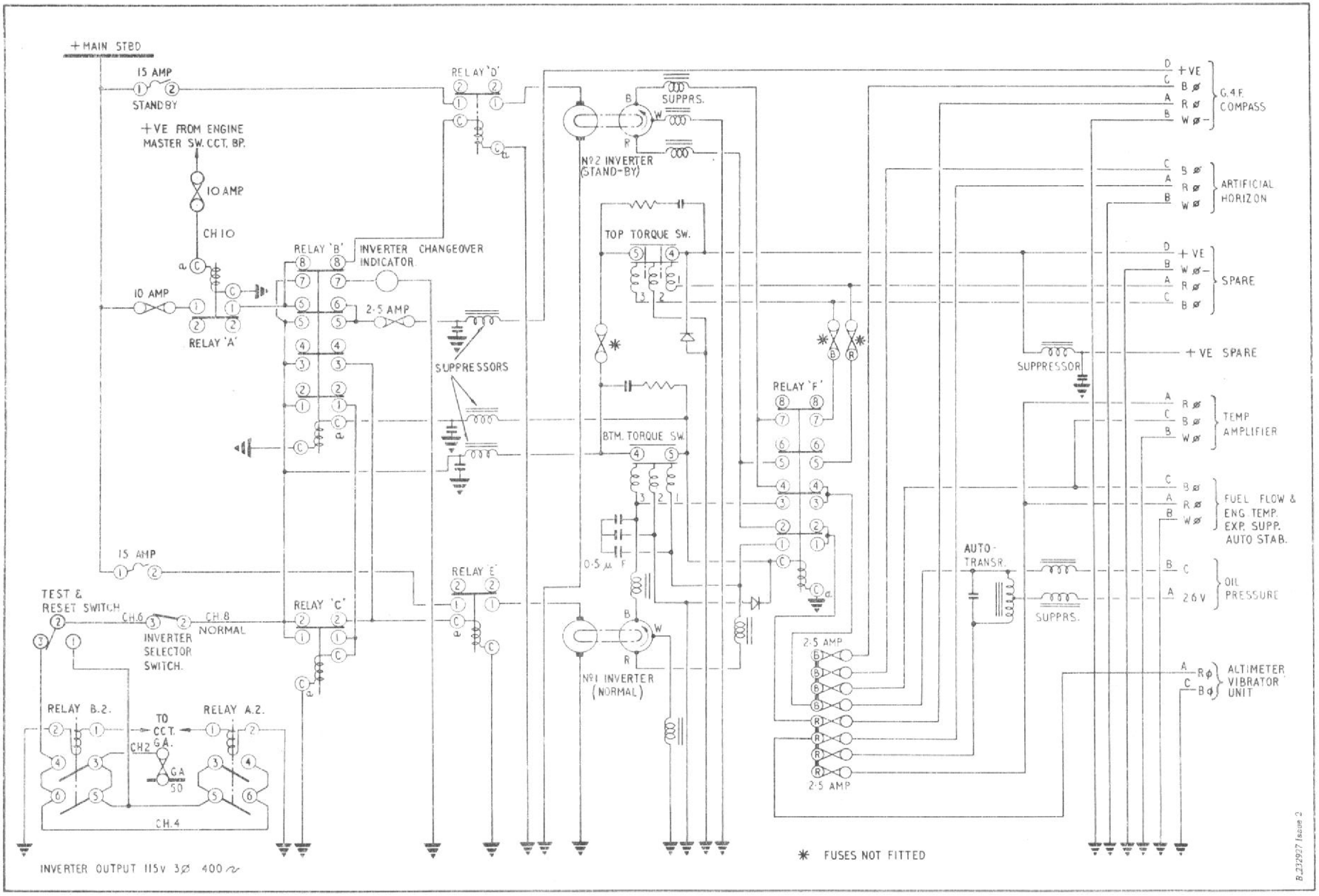

Fig. 1 A.C. Supplies Circuit (Theoretical)

RESTRICTED

installations, while No.2 inverter acts as a standby. In the event of a failure of No.1 inverter, No.2 inverter is automatically brought into operation to provide the required supply. No.2 inverter also provides the required a.c. supply prior to flight, i.e. before the engine is started, but when the engine is running and No.1 inverter commences to operate, No.2 inverter is automatically switched off. Visual indication of inverter change-over is given by a magnetic indicator on the centre instrument panel. An inverter selector switch, marked NORMAL and STANDBY, is mounted on the rear portion of the cabin port shelf, and a switch marked NORMAL and TEST is situated at the bottom of the generator control panel.

A.C. junction box

3. The A.C. junction box is mounted on the starboard side of the cabin. It contains the torque switches and relays which effect the automatic switching of the inverters, and the bus-bars from which their output is taken to the a.c.-operated installations. It also contains an auto-transformer for supplying the oil pressure installation; the supply lines to this installation are fitted with radio-interference suppressors. Suppressors are also included in the d.c. lines at points within the junction box *(fig.1)*. The inverters are supplied from the main d.c. supply line, and each inverter is protected by a circuit breaker. The circuit breakers marked NORMAL and STANDBY, are mounted at the top of the A.C. junction box. The STANDBY circuit-breaker is connected to relay D and when energized, its contacts pass a supply to operate No.2 inverter. Similarly, the NORMAL circuit-breaker is connected to relay E, and passes a supply to operate No.1 inverter.

Operation

4. The operating circuit of relay A is coupled to the engine starter master switch. When this switch is put to ON, relay A operates, passing a supply via a 10 amp. fuse to contacts 6-6 and 8-8 of relay B: contacts 6-6 supply the G.4F compass installation via a fuse and a suppressor; while contacts 8-8 pass a supply to energize relay D. With this relay energized, the STANDBY circuit-breaker and the contacts of the relay complete a supply to No.2 inverter, which commences to operate. Its output is fed, via contacts on the unenergized relay F, to the two phase bus-bars, the third *(white)* phase being connected to earth. From the bus-bars the supplies are taken through fuses to the various a.c. operated installations. The supply to the oil pressure circuit is first taken to the auto-transformer, which reduces the voltage to 26 volts.

5. When the engine is running normally and the correct output voltage of the d.c. generators is obtained, the main circuit-breakers close. Relays A.2 and B.2 on the generator control panel are then energized, thereby completing a supply via the TEST and RESET switch, the inverter selector switch, and contacts of relay C, to energize relay E. With relay E energized a d.c. supply is now available through the NORMAL circuit-breaker to operate No.1 inverter which then supplies the bottom torque switch. When the inverters' output is 100 volts, the torque switch operates, and its contacts 4-5 complete a circuit which energizes both relay B and relay F. By the operation of relay F, the output of No.1 inverter is connected to the a.c. bus-bars to supply the a.c. load. By the operation of relay B, relay D is de-energized, thus isolating No.2 inverter, which ceases to operate. At the same time, contacts 7-7 of relay B feed the inverter change-over indicator; contacts 5-5 continue the supply *(via the fuse and suppressor)* to the G.4F compass: contacts 3-3 pass a hold-on supply to relay E; while contacts 1-1 supply relay C. Relay C, which receives a hold-on supply through its own contacts, operates, thereby isolating the main circuit-breaker supply (Group B.1) from the coil of relay E. This arrangement ensures that, in the event of failure of No.1 inverter *(and consequent de-energization of relay B)* relay E will not be re-energized by the main circuit-breaker supply.

6. If No.1 inverter fails, the bottom torque switch will be de-energized, thus breaking the d.c. supply to the operating coils of relays B and F, which then de-energize. The de-energization of relay B breaks the supplies to the inverter change-over indicator and relay E, and makes a supply to relay D, thereby causing No.2 inverter to be supplied; at the same time the supply *(via fuse and suppressor)* to the G.4F compass is continued. The de-energization of relay F disconnects the a.c. bus-bars from No.1 inverter, and connects

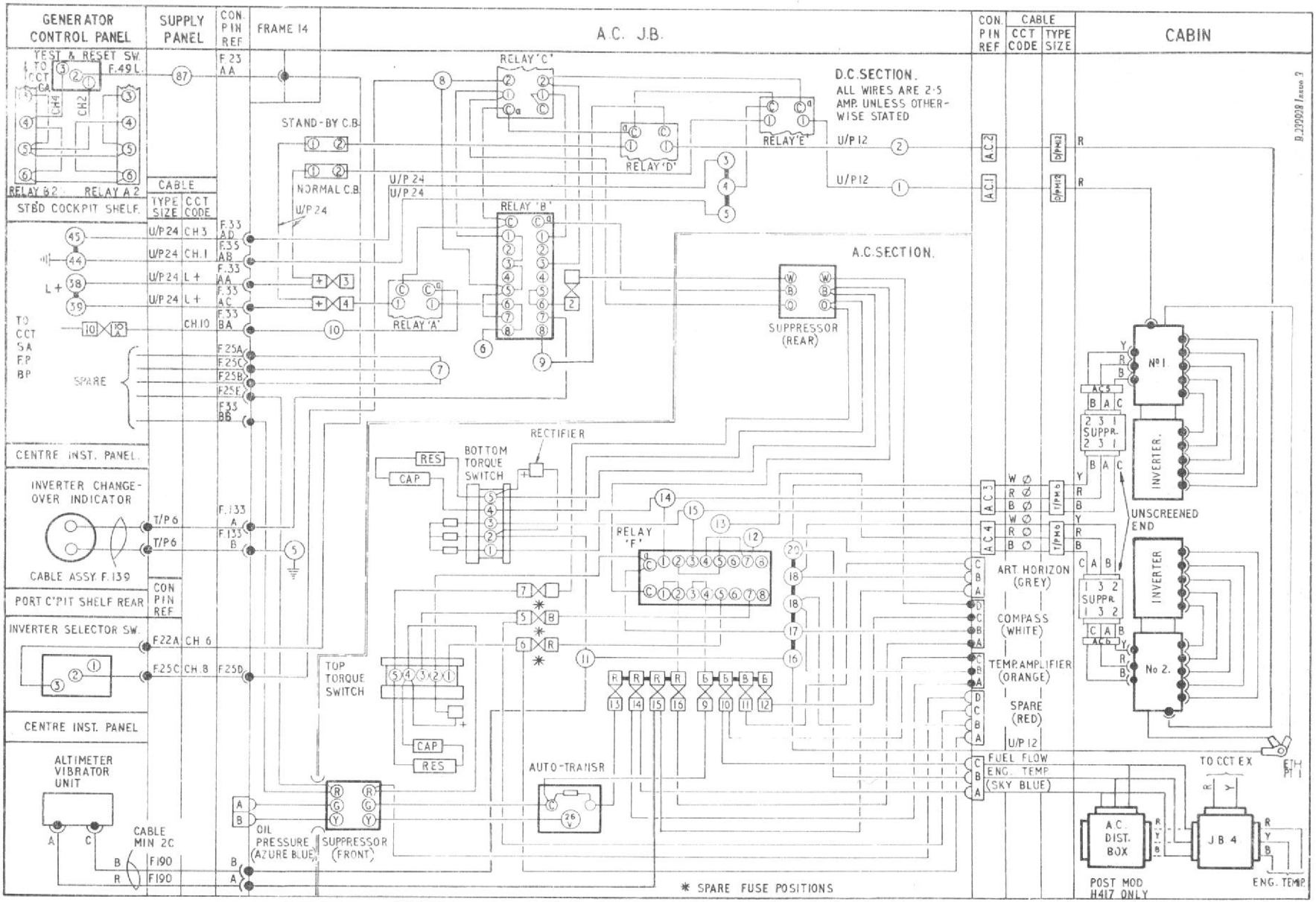

Fig. 2. A.C. supplies circuit (routeing)

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them to No.2 inverter. In this manner, the supply to the a.c. - operated equipment is automatically off-loaded from No.1 inverter and transferred to No.2 inverter in the event of a failure, whether the latter is due to a fuse failing, or an open circuit.

7. The inverter selector switch enables No.1 inverter to be brought into operation again if its failure proves to be temporary. Placing the switch in the STANDBY position will break the supply to relay C, which will then de-energize, making contacts 2-2. If the selector switch is now returned to the NORMAL position, relay E will be energized, completing the circuit through its associated circuit-breaker and restoring the supply to the inverter, which will recommence operation, as described in para.5.

SERVICING

General

8. For general servicing of the electrical system, reference should be made to Group A.1. Apart from keeping the components clean and carrying out the standard routine tests for security and serviceability as described in the appropriate Air Publications quoted in para.1, the only other servicing is the testing of the standby circuit as described in para.9.

Ground testing standby circuit

9. During daily servicing and before each flight, the operation of No.2 inverter and its control circuit should be tested for correct functioning. The method to be adopted is as follows:-

(1) Ensure that the battery master switch is in the ON position or that an external supply is connected to the aircraft's external supply plug *(Group A.1)*.

(2) Switch on the engine master switch and check that No.2 inverter runs up and supplies the G.4F compass, the artificial horizon, and the oil pressure gauge. Check that this applies with the inverter selector switch in both NORMAL and STANDBY positions. Return the inverter selector switch to NORMAL.

(3) Operate and hold ON the test switch on the generator control panel *(thus simulating "engine-running" conditions)*. Check that No.2 inverter ceases operation and No.1 inverter runs up, the instruments originally supplied by No.2 inverter now being supplied by No.1. The change-over indicator should now show BLACK i.e. normal operation. Then check that:-

(a) Selecting STANDBY with the inverter selector switch causes No.2 inverter to take over from No.1 inverter.

(b) Returning the inverter selector switch to NORMAL brings No.1 inverter into operation again and shuts down No.2 inverter.

(4) Trip the circuit breaker for No.1 inverter *(this simulates a failure)* and observe that the inverter stops. Check that the instruments continue to operate, however, as these are supplied by No.2 inverter. The change-over indicator will now show WHITE and the radar indicator BLACK.

(5) Trip No.2 inverters' circuit breaker and observe that No.2 inverter and the instruments stop functioning. Reset the circuit breaker and check that the inverter and instruments recommence operation.

(6) Re-set No.1 inverter circuit breaker and note that there is no resulting change in the operation of the inverters, i.e. No.2 inverter is still supplying the instruments and No.1 not functioning. Momentarily switch the inverter selector switch to STANDBY and back to NORMAL again. Check that No.1 inverter starts and supplies the instruments while No.2 inverter stops.

(7) Release the test switch on the generator control panel and allow it to come to the NORMAL position *(this simulates engine or generator failure)*. Check that No.1 inverter ceases operating and that the instruments are supplied from No.2 inverter. This completes the tests on the inverter change-over circuit.

(8) Return all switches to OFF or NORMAL positions as required and disconnect the external supply if used.

◀ **Setting up inverters**

10. The procedure for setting up the main and standby inverters on the bench, is given in the Air Publication quoted in para.1 and this procedure must be followed for all inverters but for aircraft Post Mod. 538 i.e. radio compass introduced, the frequency of No.1 inverter *(main)* should be set to 398-400 c/s and the frequency of No.2 inverter *(standby)* set to 402-404 c/s. This is necessary, due to the change in inverter power factor, caused by the introduction of suppressors to prevent interference with the radio compass. ▶

REMOVAL AND ASSEMBLY

General

11. Once access has been obtained, the removal and assembly of the components forming the a.c. supplies circuit should present no difficulties. The removal of the A.C. junction box, which contains the majority of the flight instruments control circuit components is described in Group A.2, and the location and means of access to the components is indicated in Group A.3.