GROUP E.1

A.C. SUPPLIES (CODE CH)

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Equipment employed

1. The major components employed in the A.C. supplies circuit are quoted below, together with the appropriate Air Publications to which reference should be made for a detailed description and the necessary servicing required to maintain them in an efficient condition:-

Invertors, Type 100A	A.P.4343B, Vol.1, Sect.16, Chap. 6.
Torque switches, Type B.1, E.A.P.2312	A.P.4343B, Vol.1, Sect.22, Chap.23.
Auto-transformer, Smiths 213MV	A.P.
Suppressors, Type F. No.2	A.P.4343B, Vol.1, Sect.24, Chap.10.
Magnetic indicator, Dowty, Type C 5165Y, Mk.1 or Type A.2	A.P.4343E, Vol.1, Sect.18, Chap. -.
Circuit breakers, Type A.3	A.P.4343B, Vol.1, Sect.10, Chap. 6.
Test switch, Rotax D.5404	A.P.4343C, Vol.1, Sect. 1, Chap. -.
Relays, Type S.1 and S.3	A.P.4343B, Vol.1, Sect.22, Chap.13.

DESCRIPTION

A.C. supplies

2. This circuit controls the supply to the alternating current operated flight instruments and the engine temperature control circuit described in Section 5, Chapter 2 of this volume and to the A.R.I.5820 installation described in Section 6, Chapter 2 also of this volume. The supply is 3-phase, 400 cycles per second, 115 volts, which is obtained from two inverters mounted on the cabin floor on the starboard side behind the seat. The flight instruments and engine temperature control are normally operated by No.1 inverter, while No.2 inverter supplies the A.R.I.5820 installation, but should No.1 inverter fail, No.2 inverter will automatically off-load the A.R.I.5820 installation and act as a stand-by supply to maintain operation of the flight instruments and engine temperature control circuit. The No.2 inverter does, however, supply the flight instruments while the aircraft is on the ground. Located on the top of the A.C. junction box are two circuit breakers, one of which protects each inverter, a magnetic indicator to give indication of normal supply failure; and a stand-by test switch, marked TEST and NORMAL. The D.C. input to each inverter is controlled by relays. Suppressors are provided between the D.C. and A.C. sections of the circuit to minimize interference with the radio equipment. The A.C. output of the inverters and the off-landing of the A.R.I.5820 installation is controlled by two torque switches and a relay while the supply to the oil pressure gauge is taken through an auto-transformer and another suppressor. The torque switches, auto-transformer, control relays and suppressors are all located within the A.C. junction box, situated on the starboard side of the cabin. The circuit is coupled to the engine starter master switch and to the alighting gear indicator circuit via the A.R.I.5820 supply circuit.

Operation

3. When the engine master switch is placed in the ON position, a supply from the engine starter circuit breaker will energize relay A. With this relay energized, a supply is conducted from the 10-amp. circuit fuse, through a set of contacts of relay B, which are made while this relay is de-energized and through the radar ranging ON/OFF switch to energize relay D. The D.C. bias supply for compass correction is also taken from a set of contacts within relay B, via a 2.5-amp. circuit fuse. With relay D energized, the circuit from No.2 circuit breaker to No.2 inverter is completed and this inverter will commence operation and feed the phase bus-bars in the A.C. junction box, via contacts in relay F, which are made while this relay is de-energized. The compass, artificial horizon and the magnetic amplifiers in the cabin pressurization and engine temperature control circuits together with the oil pressure gauge, thus commence operation. The supply to the oil pressure gauge, is, however, taken through an auto-transformer, which reduces the voltage to the value required by this instrument.

4. When the aircraft is airborne and the alighting gear retracted, relay E is energized by a supply conducted from the alighting gear indicator circuit fuse, through the down micro switches, radar test switch and a pair of contacts in relay C, which are made while this relay is de-energized. With relay E energized, a supply is made to No.1 inverter, via its circuit breaker, and the inverter commences operation to energize the bottom torque switch. When the output reaches 100 volts the torque switch makes contact and feeds the coils of relays B and F, via the 10-amp. circuit fuse and suppressor. A supply is also made to the contacts of the top torque switch, via a 5-amp. fuse, in preparation for supplying the A.R.I.5820 junction box and type 200 inverter when the top torque switch is energized (para.5).

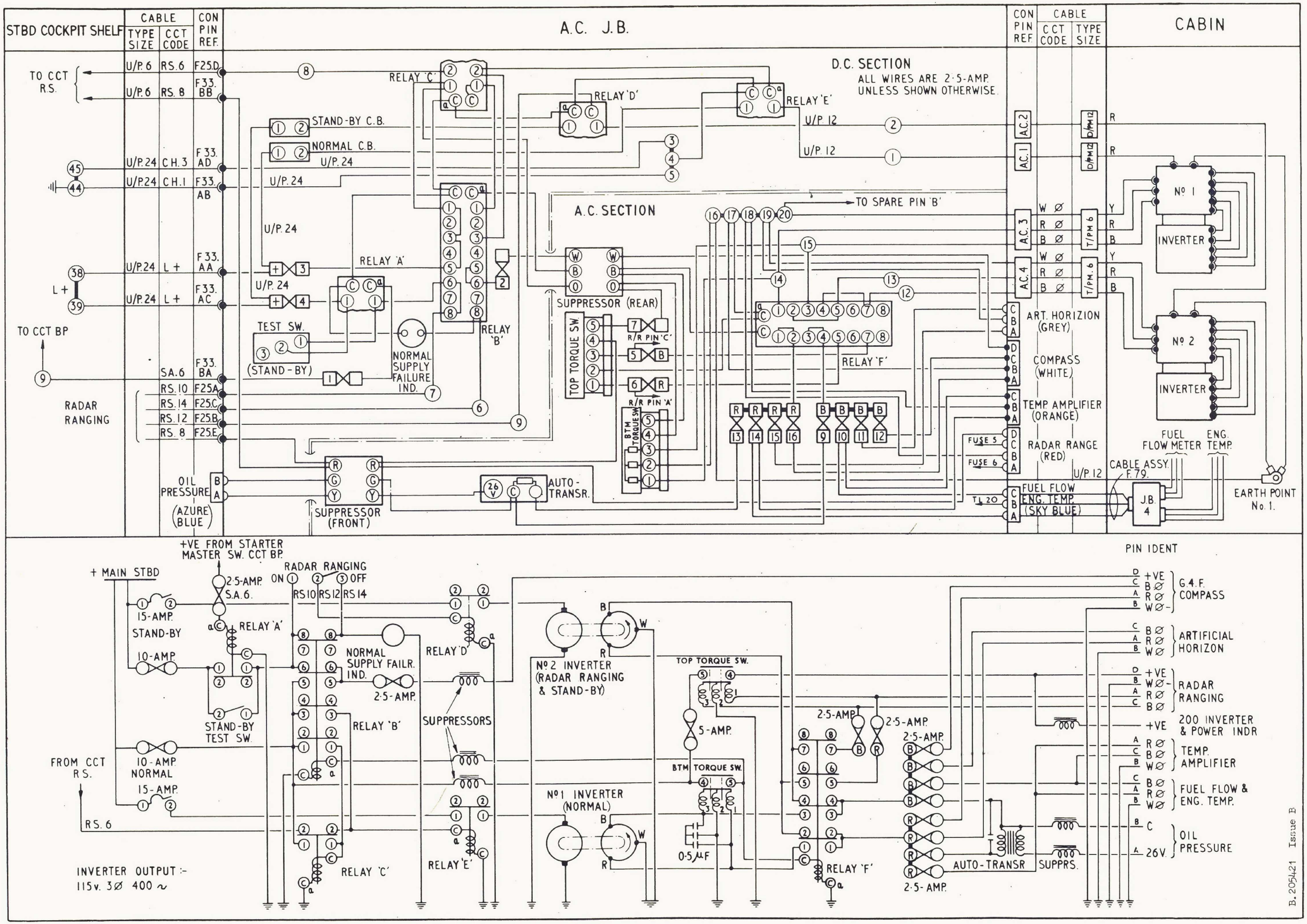

FIG. 1 A.C. SUPPLIES

When relay B is energized, it energizes relay C, which with relay B, forms an interlock circuit to isolate the alighting gear indicator circuit from relay E. Relay E will not be de-energized by the opening of relay C as it is maintained in the energized state via the made contacts of energized relay B. Once energized, relay C is maintained in this state by a hold-on circuit through its own contacts, thus preventing relay E from being re-energized by the supply from the alighting gear indicator circuit when relay B is de-energized during failure of No.1 inverter (para.6). The supply to the coil of relay D, via the radar ranging ON/OFF switch when in the OFF position, is also broken when relay B is energized, thus relay D is de-energized and No.2 inverter ceases operation. The equipment originally supplied by No.2 inverter will be fed from No.1 inverter via relay F, which controls the output of the inverters and when energized allows No.1 inverter to supply the phase bus-bars.

5. When the A.R.I.5820 installation is switched ON, a supply is conducted from the 10-amp. fuse to the contacts of relay A, which are closed while this relay is energized and through the radar ranging control switch to the coil of relay D. With relay D energized, the supply from No.2 circuit breaker to No.2 inverter is completed and the inverter commences operation to feed the top torque switch and the phase bus-bars in the A.R.I.5820 junction box, via the contacts of relay F, which are made while this relay is energized. When the output of No.2 inverter reaches 100 volts, the top torque switch will make contact to supply D.C. to the A.R.I.5820 junction box and Type 200 inverter (para.4) and the A.R.I. 5820 installation commences operation.

6. If No.1 inverter fails, the bottom torque switch will be de-energized, thus breaking contact and de-energizing relays B and F. The de-energizing of relay B completes a supply to the normal supply failure indicator, and also maintains the supply for compass correction. The de-energizing of relay F causes the top torque switch to de-energize and break the supply to the A.R.I.5820 installation, thus off-loading this equipment and rendering that installation inoperative. At the same time, No.1 inverter is isolated from the phase bus-bars and the output of No.2 inverter is connected to the bus-bars, thus maintaining the flight instruments in operation. This whole operation takes place automatically and the normal supply failure indicator provides warning for the ground crew that failure has occurred. A similar process takes place if the supply fails due to a fuse failure or an open-circuit.

7. The operation of the stand-by test switch is such that, when closed while the aircraft is on the ground, it overrides relay A and energizes the normal supply failure indicator, together with relay D, irrespective of the position of the alighting gear micro switches and radar ranging control switch. Relay D feeds No.2 inverter, which operates and feeds the phase bus-bars as described in para.6, thus the operation of the stand-by circuit is tested.

SERVICING

General

8. For general servicing of the electrical system as a whole, reference should be made to Group A of this chapter. Apart from keeping all the components clean and carrying out the standard routing tests of security and serviceability as described in the appropriate Air Publications quoted in para.1, the only other servicing is the testing of the stand-by circuit as described in para.9 of this group.

Testing stand-by circuit

9. During daily servicing, the stand-by operation of No.2 inverter and its control circuit should be tested for correct functioning by placing the stand-

by test switch, located on the top of the A.C. junction box, to the TEST position. The normal supply failure indicator should then function and No.2 inverter commence operation to supply the flight instruments. This may be checked by reference to the indicator and by observing the behaviour of the compass, artificial horizon and oil pressure gauge, which should all operate in the normal manner. After the test, return the stand-by test switch to the NORMAL position.

General

10. Once access has been obtained, the removal and assembly of the components forming the flight instruments control circuit, should present no unusual difficulties. The removal of the A.C. junction box, which contains the majority of the flight instruments control circuit components is fully described in Group A of this chapter together with the location and access to all the components.