

GROUP D.10

(Completely revised)

AIR BRAKE CONTROL (CODE AB)

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Introduction

1. This Group contains the description and operation of the air brake control circuit, together with information on the servicing required to maintain the equipment in an efficient condition. Routeing and theoretical circuit diagrams are also included. For a general description of the aircraft electrical system, reference must be made to Groups A.1, A.2 and A.3. Detailed information on the standard items of equipment used in the circuit will be found in the Air Publication listed in Table 1.

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DESCRIPTION*Electro-hydraulic valves*

2. The electrical control circuit for the hydraulically operated air brake is actuated by a thumb switch, marked IN and OUT, incorporated in the throttle twist grip. This switch controls two electro-hydraulic solenoid control valves located in the rear fuselage on the port side adjacent to frame 50, via a relay box and a hydraulic pressure switch. The relay box, which contains

three control relays and a spring return test switch, is located in the cabin just aft of the hood control switch box. The hydraulic pressure switch is mounted adjacent to the solenoid valves in the rear fuselage.

Position indicator

3. To indicate the position of the air brake, a magnetic indicator is installed on the port instrument panel adjacent to the undercarriage warning lamp. This instrument

gives a white indication when the air brake is extended and black when retracted, and is controlled by a micro switch situated on a bracket attached to frame 47.

Air brake and alighting gear interlock

4. To prevent damage due to the limited ground clearance, the air brake control circuit is interconnected with the alighting gear circuit so that it is impossible to extend the air brake by the normal controls, while the alighting gear is lowered. If the alighting gear is lowered while the air brake is extended, the air brake will automatically retract due to this interconnection. Similar action will also be obtained by the closing of a micro switch, located below the cabin port shelf, which is operated by the alighting gear emergency air valve, when the alighting gear emergency lowering system is used.

5. The installation may, however, be tested on the ground while the alighting gear is down, by operation of the spring return test switch on the relay box. Operation of this switch, in conjunction with a micro switch located adjacent to the air brake port hinge, will permit partial extension and immediate retraction of the air brake sufficient to give indication on the magnetic indicator in the cabin that the system is operating satisfactorily.

Operation

OUT circuit

6. When the alighting gear is retracted, contacts 3 and 4 of the alighting gear control UP switch are made and supply the air brake control switch, via the normally closed contacts of the alighting gear emergency air valve micro switch. Operation of the air brake control switch to the OUT

position will now energize the solenoid of the main electro-hydraulic control valve (No.1) and hold-on relay P.1. A supply is also made to the hydraulic pressure switch, the contacts of which are open at this time. After the control switch is released, the circuit to this solenoid valve is maintained via the closed contacts 3, 4, 5 and 6 of relay P.1, contacts 5 and 6 of the test switch and contacts 2 and 4, of the de-energized relay R.1.

7. The air brake jack will now extend to put the air brake out, by differential action at high speed, until the rise in hydraulic pressure due to the air load on the air brake causes the hydraulic pressure switch to operate and close its contacts. The closing of these contacts completes the supply to the solenoid of the high speed electro-hydraulic control valve (No.2) and relay N.1. This circuit is maintained, once the pressure switch has operated, via contacts 3, 4, 5 and 6 of the hold-on relay N.1. The jack continues to extend to put the air brake out, but now at full power normal speed, until the full out position is reached. When the air brake starts to extend, the aft micro switch completes the earth return for the magnetic indicator which is then energized by a supply from the circuit fuse and shows white to indicate that the air brake is extended.

Air brake and alighting gear interlock

8. If the alighting gear is selected down,

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TABLE 1

Equipment type and Air Publication reference

| Equipment Type | Air Publication |
|--|-----------------------------------|
| Solenoid valve, Type C.5701Y, Mk.B | A.P.1803D, Vol.1, Book 3, Sect. 8 |
| Solenoid valve, Type C.5705, Mk.A | A.P.1803D, Vol.1, Book 3, Sect. 8 |
| Pressure switch, Type TP.5300, 5300/1, 5300/2 or 1300 | A.P.1275A, Vol.1, Sect.11 |
| ◀ Magnetic indicator, Type C.5165Y or Type A.2 ▶ | A.P.113F - 0615 - 1 ▶ |
| Micro switches, Type 1A | A.P.4343B, Vol.1, Sect.20 |
| ◀ Relays, Type 9B, No.1 and Type S, No.1 ▶ | A.P.113D - 1309 - 1 ▶ |

while the air brake is extended, the UP switch of the alighting gear control will immediately break contacts 3 and 4 to disconnect the supply to the air brake control switch and de-energize the electro-hydraulic control valves and hold-on relays, thereby automatically retracting the air brake. Similar action is also obtained on using the alighting gear emergency lowering system, by the opening of the contacts of the microswitch operated by the emergency air valve. Air brake retraction must not normally be obtained by selecting alighting gear down.

IN circuit

9. On operation of the air brake control switch to the IN position, relay R.1 is energized to open the circuit to the hold-on relays P.1 and N.1, thereby de-energizing the solenoids of the electro-hydraulic control valves. With the control valves de-energized, the air brake jack will retract and bring the air brake to the IN position. When the air brake is fully in, the aft micro switch contacts are open thus de-energizing the magnetic indicator, which will show black, to indicate that the air brake is retracted.

TEST circuit

10. The operation of the spring return

test switch, used to test the air brake installation on the ground while the alighting gear is down, is such that when it is placed in the ON position, current is fed via the circuit fuse, through contacts 4 and 5 of the test switch and contacts 2 and 4 of relay R.1, to energize the solenoid of the main electro-hydraulic control valve. The air brake jack will now extend to put the air brake out until, at a position of approximately 15 deg. out, the forward micro switch is operated by the air brake hinge arm. This micro switch then completes the supply via contacts A and B, to the coil of relay R.1, via contacts 1 and 2 in the test switch. When energized, this relay breaks the supply to the electro-hydraulic control valve and the air brake immediately retracts.

11. Relay R.1 is maintained in the energized state, by a hold-on circuit through its own contacts, until the test switch is released and returns to the OFF position. As the air brake extends, the magnetic indicator is energized by the operation of the aft micro switch, in a manner similar to that described in para. 7, to provide indication that the installation is operating satisfactorily.

SERVICING

General

12. For general servicing of the electrical system, reference should be made to Group A.1 of this chapter. Apart from keeping all the components clean and carrying out the normal routine tests of security and serviceability, the only other servicing necessary is the adjustment of the micro switches, to ensure the correct operation of the installation and magnetic indicator as described in Section 3 Chapter 4, followed by the functioning checks of the installation as described in Section 3, Chapter 6 of this volume. The electrical tests of the electro-hydraulic control valves are described in the appropriate Air Publications quoted in Table 1 of this group.

REMOVAL AND ASSEMBLY

General

13. Once access has been obtained, the removal and assembly of the components forming the air brake control circuits should present no unusual difficulties. The location and access to all the components is indicated in Group A.3 of this chapter.

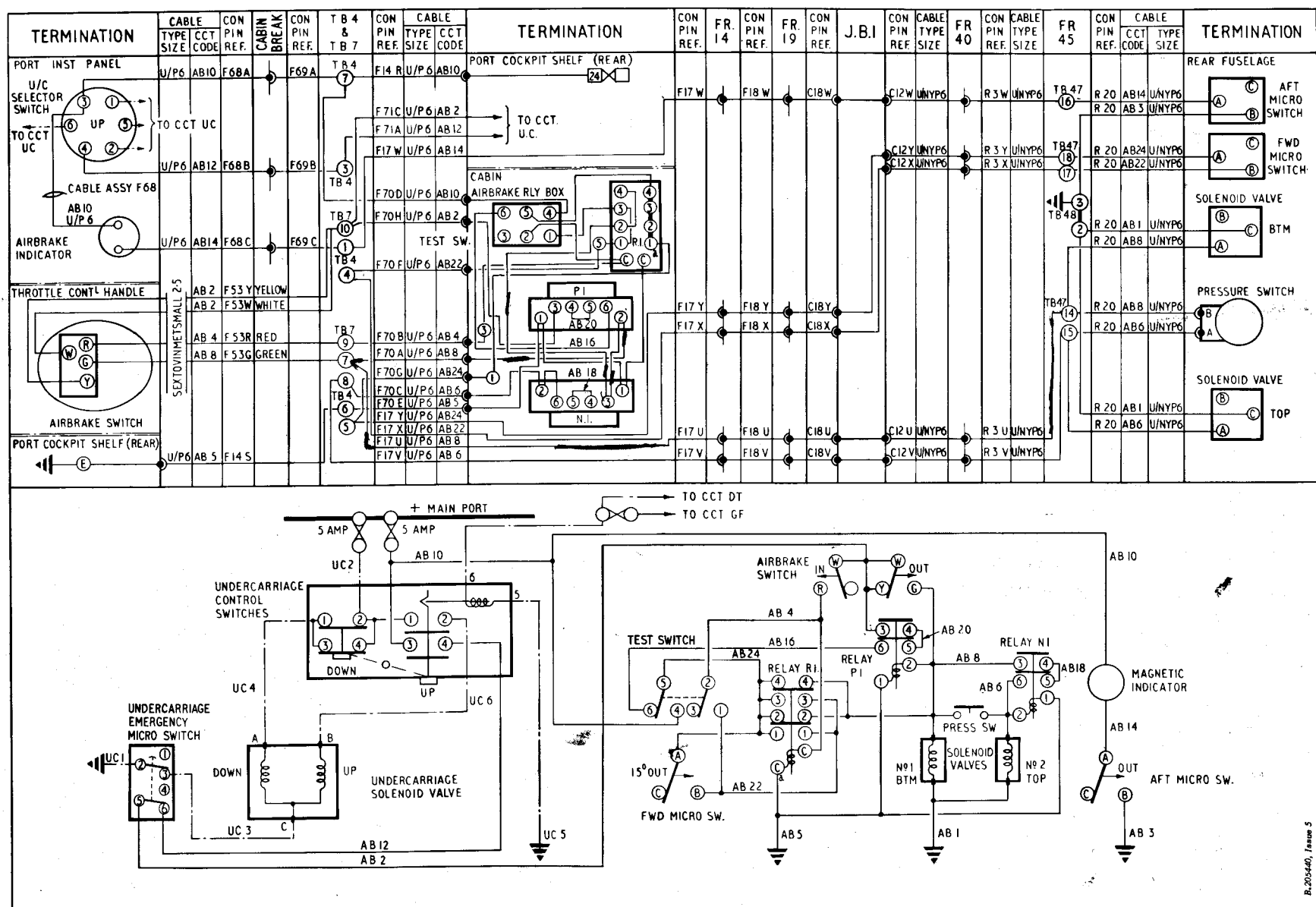


Fig.1 Air brake control (routing and theoretical)

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