Group D.1

RUDDER AND AILERON TRIM CONTROL (CODE R AND A)

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

TABLE

Introduction

1. This Group contains the description and operation of the rudder and aileron trim 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's electrical system, reference should 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 Publications listed in Table 1.

DESCRIPTION

Rudder and aileron trim control

Actuators

2. Trim tabs one in the trailing edge at the bottom of the rudder, and another

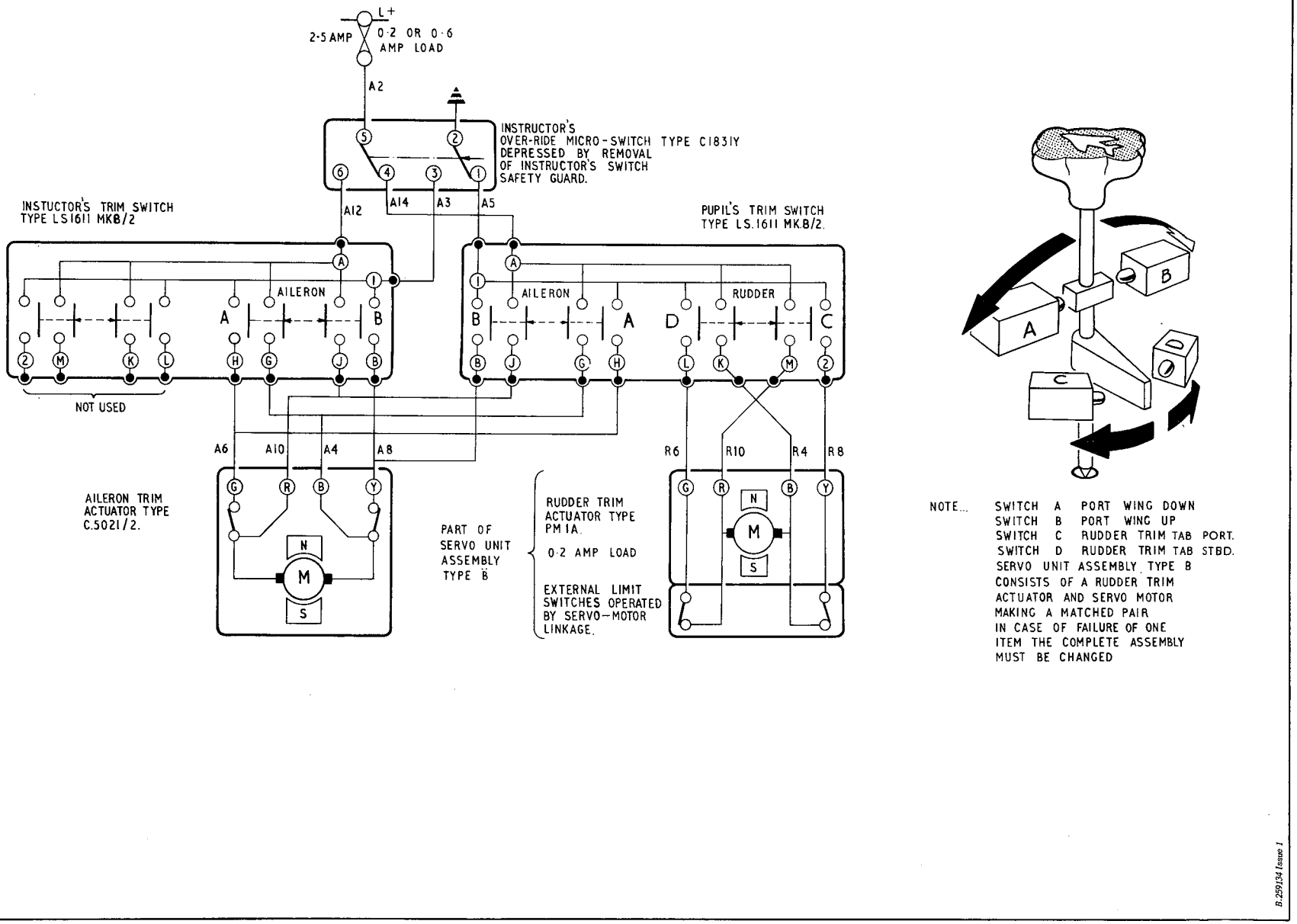

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Fig. 1. Rudder and aileron trim control (theoretical)

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in the inboard trailing edge of the port aileron, enable adjustments of trim to be made during flight. The rudder tab is operated by an actuator situated in the fin structure. This actuator is mechanically linked with the autostabiliser servo-motor unit to move the servomotor fore and aft in its cradle, thereby operating the rudder trim tab by changing the datum position of the servomotor. The aileron tab is also operated by an actuator, mounted in the aileron structure, which is linked to the trim tab by an adjustable operating rod. These actuators have permanent magnet field type motors.

Trim switch units

3. Trim is controlled by the combined rudder and aileron trim switch units located, one on the forward portion of the cabin port shelf for the pupil's use and the other on the cabin starboard shelf for the use of the instructor. The instructor's switch unit is, however, used for aileron trim only and is normally out of circuit until brought into use by the operation of an override facility as described in para.6.

4. These trim control units each contain two double-pole microswitches used to select port wing up or down, and a rotary switch, used to select rudder trim to port or starboard. The switches are operated by a knob projecting from the top of the unit. This knob is rocked from side to side for aileron trim and is turned for rudder trim. To facilitate simultaneous trimming in two planes, the knob can be turned and rocked sideways at the same time. After the desired trim has been obtained, the knob must be released and allowed to return to its neutral position.

5. When the knob reaches the neutral position, the actuator switches off, the tab position being then maintained by the load of the actuator gear train. To prevent inadvertent operation of the aileron tab when using the power controls, a pivoted locking lever, which prevents lateral movement of the trim control knob, can be swung into position around each control knob.

Instructor's override control

6. The locking lever of the instructor's trim switch, differs from that of the pupil's switch in that it is mechanically linked to an override microswitch, mounted on the underside of the cabin starboard shelf. When the instructor's switch is unlocked this override microswitch is operated to isolate the pupil's trim switch unit from the circuit and to give control of aileron trim to the instructor.

TABLE 1

Equipment type and Air Publication reference

Equipment Type	Air Publication
Rudder trim actuator motor Type PM.1A	A.P.4343D, Vol.1, Book 4, Sect.20
Aileron trim actuator, Rotax Type C.5021/2	A.P.4343D, Vol.1, Book 5, Sect.16
Trim switches, Type LS1611 Mk.B/2	A.P.4343C, Vol.1, Book 1, Sect.1
Override microswitch, Dowty Type C.1831Y	A.P.4343C, Vol.1, Book 1, Sect.2

Operation

Rudder, trim tab, starboard

7. When the instructor's trim switch is restricted by its locking lever, the contacts of the override microswitch are in the position to make the supply and return for the pupil's trim switch. The instructor's switch is then out of circuit. If the pupil's trim switch is now turned anti-clockwise, the two pole rotary switch D *(fig.1)* is made and current via the fuse

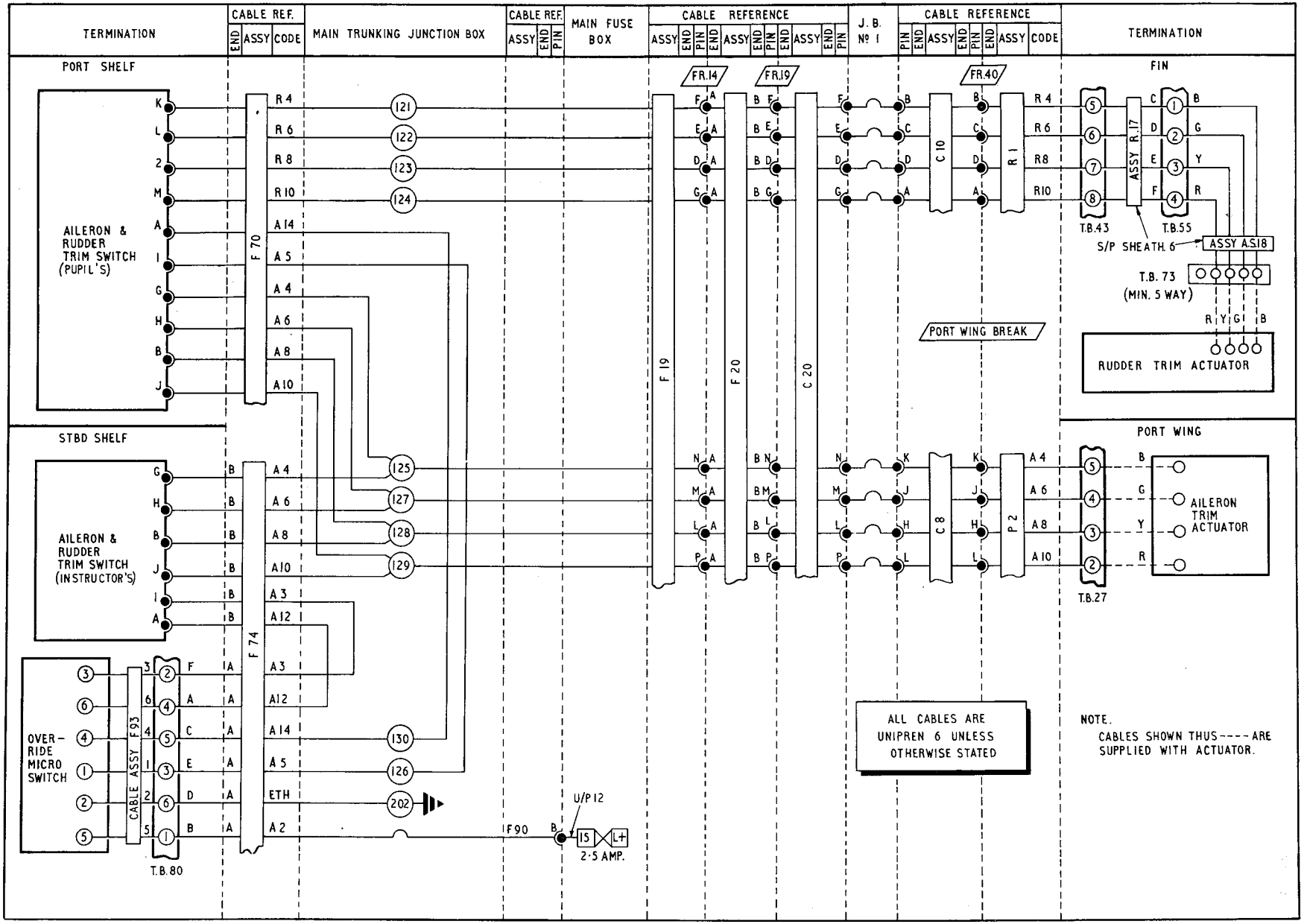

Fig. 2. Rudder and aileron trim control (routeing)

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and override microswitch passes through one set of the switch contacts to pin K of the trim switch unit. From the trim switch, the current is fed to the rudder trim tab actuator.

8. The negative return from the actuator passes through the contacts of a limit switch on the actuator and back to pin 2 of the trim switch unit. At the trim switch the negative return is taken through the other set of contacts of the rotary switch, to pin 1 of the unit and so to earth via the override microswitch.

9. When the current is passing in this direction the actuator motor will retract the linkage and so draw the servomotor forward in its cradle. This action moves the tab to starboard until the actuator is switched off, either by returning the trim switch knob to neutral or, by the opening of the limit switch when the actuator has completed its pre-set travel.

Rudder, trim tab, port.

10. When the trim switch knob is turned clockwise, the two pole rotary switch C is made and current is fed through one set of the switch contacts to pin M of the trim switch unit. The current now passes to the rudder trim tab actuator in the opposite direction to that described in para.7; the negative return passing back to the trim switch at pin L, through the other contacts of the rotary switch, to pin 1 of the unit and so to earth, via the override microswitch as before.

11. The actuator motor will now rotate in such a direction as to extend the linkage and drive the servomotor aft in its cradle. This moves the tab to port, until switched off either by returning the knob to the neutral position or, by the limit switch being opened when the actuator has completed its pre-set travel.

Aileron trim

12. When the trim switch knob is moved from neutral to either side, contacts of the double-pole microswitches A or B are closed. These control the direction of rotation of the aileron trim tab actuator motor in a manner similar to that for the rudder tab actuator described above.

Instructor's override

13. If the instructor wishes to override the trim applied by the pupil, all he need do is to swing the locking lever clear of his trim control knob. This action operates the override microswitch, via a mechanical linkage. The change-over contacts then isolate the pupil's trim switch by breaking its power supply and return lines and at the same time complete the supply and return to the instructor's switch. The operation of the instructor's trim control switch, which only controls the aileron trim, is similar to that described in para. 12.

SERVICING

General

14. General servicing of the aircraft electrical system is described in Group A.1. The standard serviceability tests which should be applied will be found in the appropriate Air Publications quoted in Table 1. Apart from keeping all the components clean and carrying out the normal routine test of security and serviceability, the only other servicing necessary is the actuator tests as described in the following paragraph.

Tab actuator testing

15. These actuators should be tested periodically for correct functioning over their full travel and their range checked on the indicators, by operation of each trim switch in turn. Also check the operation of the instructor's override facility. The actuators have permanent magnet field motors and it is recommended that only a pure d.c. supply is used, when testing. Rectified a.c. supply must not be used unless this has been checked as suitable, or the field of the actuators will be de-magnetized.

Note . . .

The Type 37 rectifier (Ref.5P/2908) or the Westruk 609 and 829 are suitable for testing actuators with permanent magnet pole pieces.

16. Spare fin structures and port ailerons

are supplied without actuators and these must have actuators assembled to them before they are fitted to aircraft. Before fitting a new fin or port aileron, it is recommended that the actuators are tested, as described in the appropriate Air Publication quoted in Table 1. It is most important to ensure that the supply polarity is correct when testing, as incorrect connections or the use of a supply other than that specified will cause serious damage.

REMOVAL AND ASSEMBLY

General

17. Once access has been obtained, the removal and assembly of the actuators should present no difficulties. Access to the rudder trim actuator may be gained by removing doors from the side of the upper fin structure. After the removal of the aileron, access to the aileron tab actuator may be obtained by removing an access door from the upper surface of the aileron nosing.

18. It must be noted that the operating rod from the aileron tab to the actuator, is removed with the actuator, and therefore must be disconnected from the tab operating lever before attempting to withdraw an actuator from the structure. The location of and access to all the components is described in Group A.3.