Appendix 3

TAILPLANE INCIDENCE TEST BOX

(26SR/95292)

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DESCRIPTION AND OPERATION

Introduction

1. The test box is provided to facilitate the testing and servicing of the tailplane incidence circuit, thereby simplifying fault tracing. The test box has two functions. One, to enable a complete continuity test of the aircraft wiring to the tailplane incidence coarse and fine motors to be carried out, and the other to carry out a function check on the tailplane. As the test box provides for the functioning of the tailplane, the tailplane motors can be tested for serviceability whilst they are fitted on the aircraft.

Description

2. Contained in the test box is all the equipment required to carry out a continuity check of the tailplane incidence circuit wiring and to function the coarse and fine motors.

3. To continuity check the circuit wiring, lamps, mounted on the face of the box, are provided to represent the various motor circuits, i.e., shunt and series field and direction of rotation of the motor. Certain lamps are initially dimmed by a resistance connected across them to enable the operator to distinguish between the dim and bright illumination which is used to indicate the direction of rotation of the associated motor.

4. Normally the series field of the motor obtains a supply from the negative side of the armature, via a set of contacts in the motor reversing relay, therefore, as the motor is disconnected when testing the circuitry, a SERIES FIELD switch is provided in the test box to connect a supply to the armature negative connection point. When the SERIES FIELD switch is selected the series field lamp will light brightly proving the circuit for the series field of the motor. An EXTREME LIMIT switch is provided to replace the tailplane incidence extreme limit micro switches and enable the coarse and fine contactors to be tripped.

5. The test box circuit for functioning the tailplane is supplied from an external source. The control lines are supplied at 28-volts d.c. and the heavy duty at 112-volts d.c. Two 15-amp. fuses, mounted on the face of the box, are provided to give protection to the 28-volt and 112-volt circuits. Control of the tailplane is by means of switches in the test box and the aircraft limit micro switches. Two lamps, mounted adjacent to the supply switches, light to indicate that a supply is connected to the test box when the respective supply switch is selected to ON.

Operation

6. When using the test box for continuity testing the tailplane incidence circuitry the course and fine motors are disconnected from the aircraft wiring and the test box is connected, via the test looms, to the aircraft wiring, and replaces the motors. Also the EXTREME LIMIT switch is connected across the tailplane incidence extreme limit micro-switches. During this test no supplies are distributed from the test box and the aircraft bus-bars must be energized. All tailplane function selections are made from the control switches, in the aircraft cockpit, and when made will light lamps in the test box to indicate the various motor circuits and direction of rotation of the motor.

7. When functioning the tailplane the respective test loom is connected, from the test box, into the aircraft circuit on panel W. For this test supplies are connected to the test box, via the adaptor box, and distributed, via the test looms, to the aircraft circuit. It is therefore essential that the circuit under test should be isolated to prevent supplies being fed from the test box to the aircraft bus-bars. Switches mounted on the face of the test box control the tailplane and no function selection is required to be made from the cockpit control switches, therefore the aircraft bus-bars need not be energized.

Test box supplies splitter box

8. When the test box is required for functioning the tailplane incidence, the external supplies are connected to the test box via a splitter box. The splitter box is fitted with two ' NATO ' plugs, one for the 28-volts, the other for the 112-volts supplies, to accommodate the ground track supply sockets. The two supplies are connected from the splitter box to the test box by two looms which when not in use are to be stowed in the compartment provided in the splitter box. When functioning the tailplane the splitter box must be bonded to the test box at the connections provided.

Testing the tailplane incidence circuits

Procedure before testing

9. Connect the test box looms to the test box and aircraft connections as detailed in Table 1 and proceed as follows:—

(1) Check the following fuses:

Panel D, Nos. 37, 43, 53 and 97.

Panel E, Nos. 13 and 75.

Panel J, coarse and fine motor 80-amp. H.R.C.

(2) Connect 112-volt and 28-volt supplies to the aircraft external connections.

Table 1

Connections for testing the tailplane incidence circuits

Loom Part No.	Test box connection	Aircraft connection
B	Socket No. 43 (Red)	Coarse motor plug
C	Socket No. 4 (Yellow)	Fine motor plug
AE	Socket No. 2	Switch box connection A1 and A2

Testing

10. Where reference is made in Tables 2 to 5 to the removal of any fuses, proceed as follows:

(1) Disconnect the external supply from the aircraft.

(2) Remove the fuse.

(3) Reconnect the external supply to the aircraft and check that the test box indication is correct.

(4) Disconnect the external supply from the aircraft.

(5) Put back the fuse.

(6) Reconnect the external supply to the aircraft and check that the test box indication is correct.

Table 2
1st pilot coarse

Location	Operation	Test box indication	Check
		(COARSE lamps will indicate as below)	
Control pedestal	Select 1st PILOT on 1st/2nd PILOTS selector switch		
Control pedestal	Select COARSE on COARSE/FINE switch		
Pilots handwheel	Select HIGH on 1st pilot's switches (Switches forward post Mod. 1199) and hold on	LOW and SHUNT FIELD bright. HIGH and SERIES FIELD dim	Coarse contactor and coarse reversing relay HIGH coil energized
Test box	Select SERIES FIELD COARSE switch	All lamps bright	
Panel E. See para. 10	Break and make circuit with fuses Nos. 13 and 75	All lamps go off and come on again for each fuse	Main 28-volt supplies to 1st pilot's HIGH/LOW switches
Test box	Select EXTREME LIMIT switch and then release	All lamps go off and come on again	Coarse trip relay operates causing coarse contactor to operate
Test box	Select SERIES FIELD COARSE switch to OFF	LOW and SHUNT FIELD bright. HIGH and SERIES FIELD dim	
Pilots handwheel	Release 1st pilot's HIGH/LOW switches	All lamps off	Coarse contactor and coarse reversing relay HIGH coil de-energized
Pilots handwheel	Select LOW on 1st Pilot's switches (Switches aft post Mod. 1199) and hold on	HIGH and SHUNT FIELD bright. LOW and SERIES FIELD dim	Coarse contactor and coarse reversing relay LOW coil energized
Test box	Select SERIES FIELD COARSE switch	All lamps bright	
Panel J. See para. 10	Break and make circuit with 80 amp. H.R.C. fuse	All lamps go off and come on again	
Test box	Select EXTREME LIMIT switch and release	All lamps go off and come on again	Coarse trip relay operates causing the coarse contactor to operate
Test box	Select SERIES FIELD COARSE switch to OFF	HIGH and SHUNT FIELD bright. LOW and SERIES FIELD dim	
Pilots handwheel	Return 1st Pilot's HIGH/LOW switches to OFF	All lamps off	Coarse contactor and coarse reversing relay LOW coil de-energized

Table 3
2nd pilot coarse

Location	Operation	Test box indication	Check
		COARSE lamps will indicate as below	
Control pedestal	Select 2nd PILOT on 1st/2nd PILOTS selector switch		
Control pedestal	Select COARSE on COARSE/FINE switch		
Pilots handwheel	Select HIGH on 2nd pilot's switches (Switches forward post Mod. 1199) and hold on	LOW and SHUNT FIELD bright. HIGH and SERIES FIELD dim	Coarse contactor and coarse reversing relay HIGH coil energized
Test box	Select SERIES FIELD COARSE switch.	All lamps bright.	
Panel D. See para. 10	Break and make circuit with fuses Nos. 37 and 53	All lamps go off and come on again for each fuse	Main 28-volt supplies to 2nd pilot's HIGH/LOW switches
Test box	Select EXTREME LIMIT switch and then release	All lamps go off and come on again	Coarse trip relay operates causing the coarse contactor to operate
Test box	Select SERIES FIELD COARSE switch to OFF	LOW and SHUNT FIELD bright. HIGH and SERIES FIELD dim	
Pilots handwheel	Select LOW on 2nd pilot's switches (Switches aft post Mod. 1199) and hold on	HIGH and SHUNT FIELD bright. LOW and SERIES FIELD dim	Coarse contactor and coarse reversing relay LOW coil energized
Test box	Select SERIES FIELD COARSE switch	All lamps bright	
Panel J. See para. 10	Break and make circuit with 80 amp. H.R.C. fuse	All lamps go off and come on again	
Test box	Select EXTREME LIMIT switch and release	All lamps go off and come on again	Coarse trip relay operates causing the coarse contactor to operate
Test box	Select SERIES FIELD COARSE switch to OFF	HIGH and SHUNT FIELD bright. LOW and SERIES FIELD dim	
Pilots handwheel	Return the 2nd pilot's HIGH/LOW switches to OFF	All lamps off	Coarse contactor and coarse reversing relay LOW coil de-energized

Table 4

1st pilot fine

Location	Operation	Test box indication	Check
		FINE lamps will indicate as below	
Control pedestal	Select 1st PILOT on 1st/2nd PILOTS switch		
Control pedestal	Select FINE on COARSE/FINE switch		
Pilots handwheel	Select HIGH on 1st pilot's switches (Switches forward post Mod. 1199) and hold on	LOW and SHUNT FIELD bright. HIGH and SERIES FIELD dim	Fine contactor and fine reversing relay HIGH coil energized
Test box	Select SERIES FIELD FINE switch	All lamps bright	
Panel D. See para. 10	Break and make circuit with fuse No. 43	FINE lamps go off and COARSE lamps come on each time the fuse is removed	Main 28-volt supply to COARSE/FINE change-over relay coil
Test box	Select EXTREME LIMIT switch and release	All lamps go off and come on again	Fine trip relay operates causing fine contactor to operate
Test box	Select SERIES FIELD FINE switch to OFF	LOW and SHUNT FIELD bright. HIGH and SERIES FIELD dim	
Pilots handwheel	Select LOW on 1st pilot switches (Switches aft post Mod. 1199) and hold on	HIGH and SHUNT FIELD bright. LOW and SERIES FIELD dim	Fine contactor and fine reversing relay LOW COIL energized
Test box	Select SERIES FIELD FINE switch	All lamps bright	
Panel J. See para. 10	Break and make circuit with 80 amp. H.R.C. fuse	All lamps go off and come on again	
Test box	Select EXTREME LIMIT switch and hold	All lamps off	Fine trip relay operates to de-energize the fine reversing relay LOW coil
Panel D. See para. 10	Break and make circuit with fuse No. 97	All lamps come on and go off again	Fine trip relay operates causing the fine reversing relay LOW coil to operate
Test box	Select EXTREME LIMIT switch to OFF	All lamps bright	Fine trip relay de-energized allowing fine reversing relay to be energized
Test box	Select SERIES FIELD FINE switch to OFF	HIGH and SHUNT FIELD bright. LOW and SERIES FIELD dim	
Pilots handwheel	Return the 1st pilot's HIGH/LOW switches to OFF	All lamps off	Fine contactor and fine reversing relay LOW coil de-energized

Table 5

2nd pilot fine

Location	Operation	Test for indication	Check
		FINE lamps will indicate as below	
Control pedestal	Select 2nd PILOT on 1st/2nd PILOT selector switch		
Control pedestal	Select FINE on COARSE/FINE switch		
Pilots handwheel	Select HIGH on 2nd pilot's switches (Switches forward post Mod. 1199) and hold on	LOW and SHUNT FIELD bright. HIGH and SERIES FIELD dim	Fine contactor and fine reversing relay HIGH coil energized
Test box	Select SERIES FIELD FINE switch	All lamps bright	
Test box	Select EXTREME LIMIT switch and release	All lamps go off and come on again	Fine trip relay operates to operate fine contactor
Test box	Return SERIES FIELD FINE switch to OFF	LOW and SHUNT FIELD bright. HIGH and SERIES FIELD dim	
Pilots handwheel	Select LOW on 2nd pilot's switches (Switches aft post Mod. 1199) and hold on	HIGH and SHUNT FIELD bright. LOW and SERIES FIELD dim	Fine contactor and fine reversing relay LOW coil energized
Test box	Select SERIES FIELD FINE switch	All lamps bright	
Panel J	Break and make circuit with 80 amp. H.R.C. fuse	All lamps go off and come on again	
Test box	Select EXTREME LIMIT switch and release	All lamps go off and come on again	Fine trip relay operates to operate fine contactor
Test box	Return SERIES FIELD FINE switch to OFF	HIGH and SHUNT FIELD bright. LOW and SERIES FIELD dim	
Pilot's handwheel	Return the 2nd pilot's HIGH/LOW switches to OFF	All lamps off	Fine contactor and fine reversing relay LOW coil de-energized

Procedure after testing

11. Disconnect the 112-volt and 28-volt external supplies from the aircraft and disconnect the test looms from the aircraft looms. Reconnect the aircraft looms to their associated equipment.

Functioning the tailplane incidence

Procedure before functioning

12. Connect the test looms to the test box and aircraft connections as detailed in Table 6 and proceed as follows:—

Note . . .
Care must be taken to ensure that the test box looms feed into the correct part of the circuit, i.e., power from the test box must be fed to the T.P.I. gearbox equipment and not back along the aircraft to the control equipment in the cabin.

Table 6

Connections for functioning the tailplane incidence

Loom Part No.	Test box connection	Aircraft connection
A	Socket No. 1	Panel W connections C8, C9, C10, D5, G1, G2.
AH	Test box —ve	Two earth leads, connection F10 on panel W.

(1) Isolate the aircraft circuit by removing the following fuses:—
Panel D, Nos. 37, 53 and 97.
Panel E, Nos. 13 and 75.
(2) Disconnect the aircraft 112-volt supply cables only from connections G1 and G2 on panel W and connect loom part No. 'A' to the connections.
(3) Connect the test box supplies splitter box to the test box and bond them together at the earth (—ve) connections provided.
(4) Select on the test box 112-volt and 28-volt supplies.

Functioning

13. The procedure for functioning the tailplane incidence is contained in Table 7.

Note . . .
Whilst functioning the tailplane incidence the aircraft main limit switches only are in circuit to operate and disconnect the motors. The extreme limit switches are not in circuit and should the main limit switches fail, the motor can be disconnected by releasing the HIGH/LOW switch.

Table 7

Functioning the tailplane incidence

Control	Location	Operation	Function
COARSE/HIGH	Test box	Select COARSE on COARSE/FINE switch	
	Test box	Select HIGH on HIGH/LOW switch and hold	Tailplane moves down
COARSE/LOW	Test box	Select COARSE on COARSE/FINE switch	
	Test box	Select LOW on HIGH/LOW switch and hold	Tailplane moves up
FINE/HIGH	Test box	Select FINE on COARSE/FINE switch	
	Test box	Select HIGH on HIGH/LOW switch and hold	Tailplane moves down
FINE/LOW	Test box	Select FINE on COARSE/FINE switch	
	Test box	Select LOW on HIGH/LOW switch and hold	Tailplane moves up

Procedure after functioning

14. Switch off the supplies to the test box and perform the following operations:—
(1) Disconnect the test looms from the aircraft and reconnect the aircraft looms and cables to their associated equipment.
(2) Put back any fuses that may have been previously removed.

SERVICING

Care and maintenance of the test box

15. The test box should be handled carefully to prevent damage to the filaments of the indicating lamps and other equipment contained in the test box. Distortion of the test loom sockets and damage to the threads of the sockets, resulting in difficulty in connecting the test looms to the test box and aircraft connections, can be avoided by fitting the blanking caps to the sockets when the test looms are not being used. When connected to the aircraft the long test looms should be supported to prevent undue strain on the aircraft connections.

16. Frequent continuity and insulation tests should be carried out on the test box wiring and test looms. The filaments of the indicating lamps should also be tested for serviceability.

17. The equipment provided in the test box to function the tailplane should also be tested at frequent intervals for correct operation. This check may be carried out by connecting a 28-volt d.c. supply to the operating coils of the various relays and checking for continuity through the relay contacts by means of a lamp and battery or other suitable equipment.

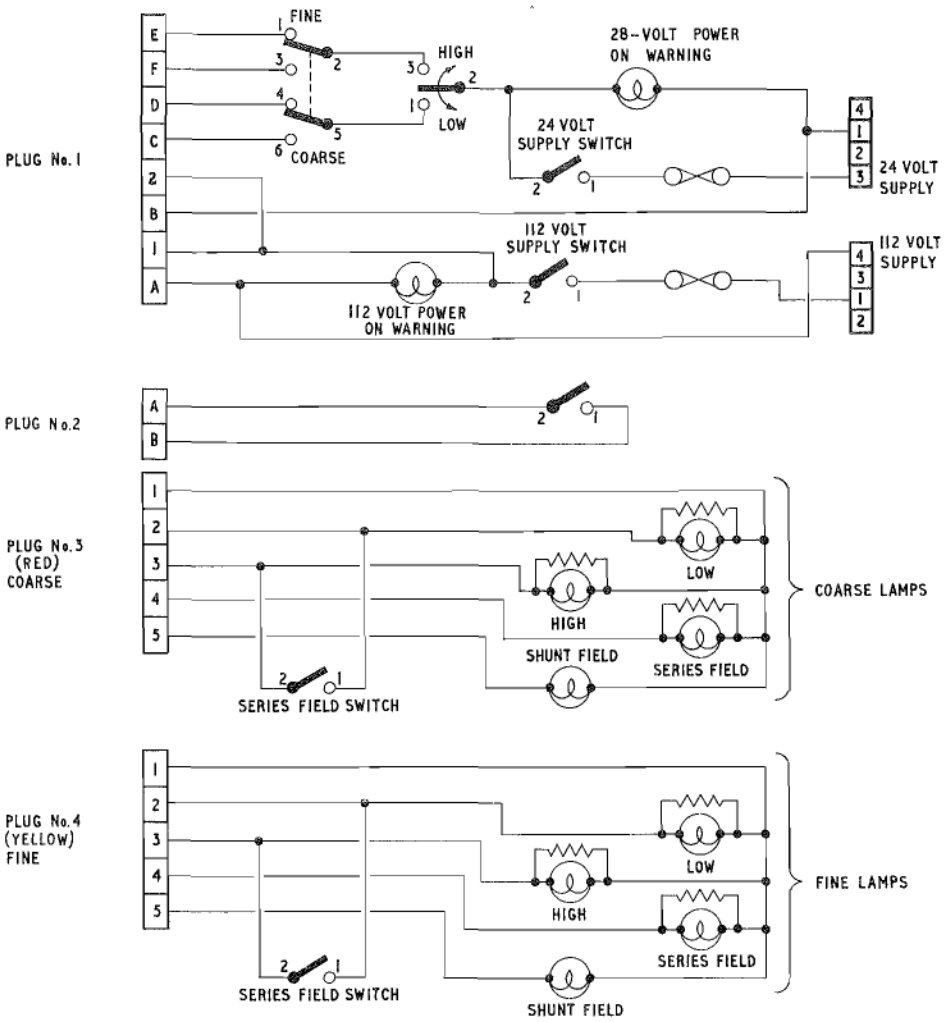

Fig. 1 Tailplane incidence test box

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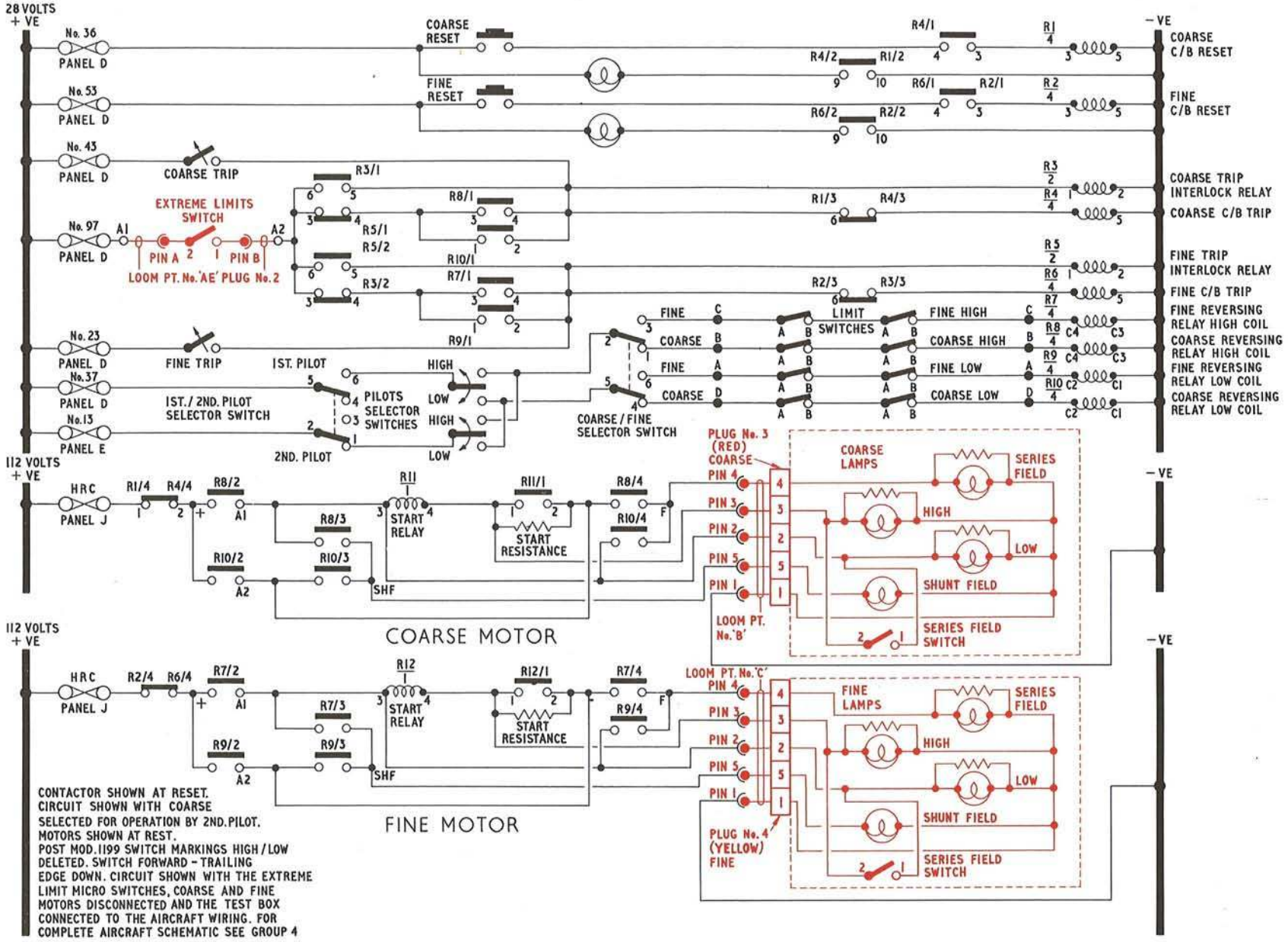

Fig. 2 Tailplane incidence (pre Mod. 2123) (Circuitry check)

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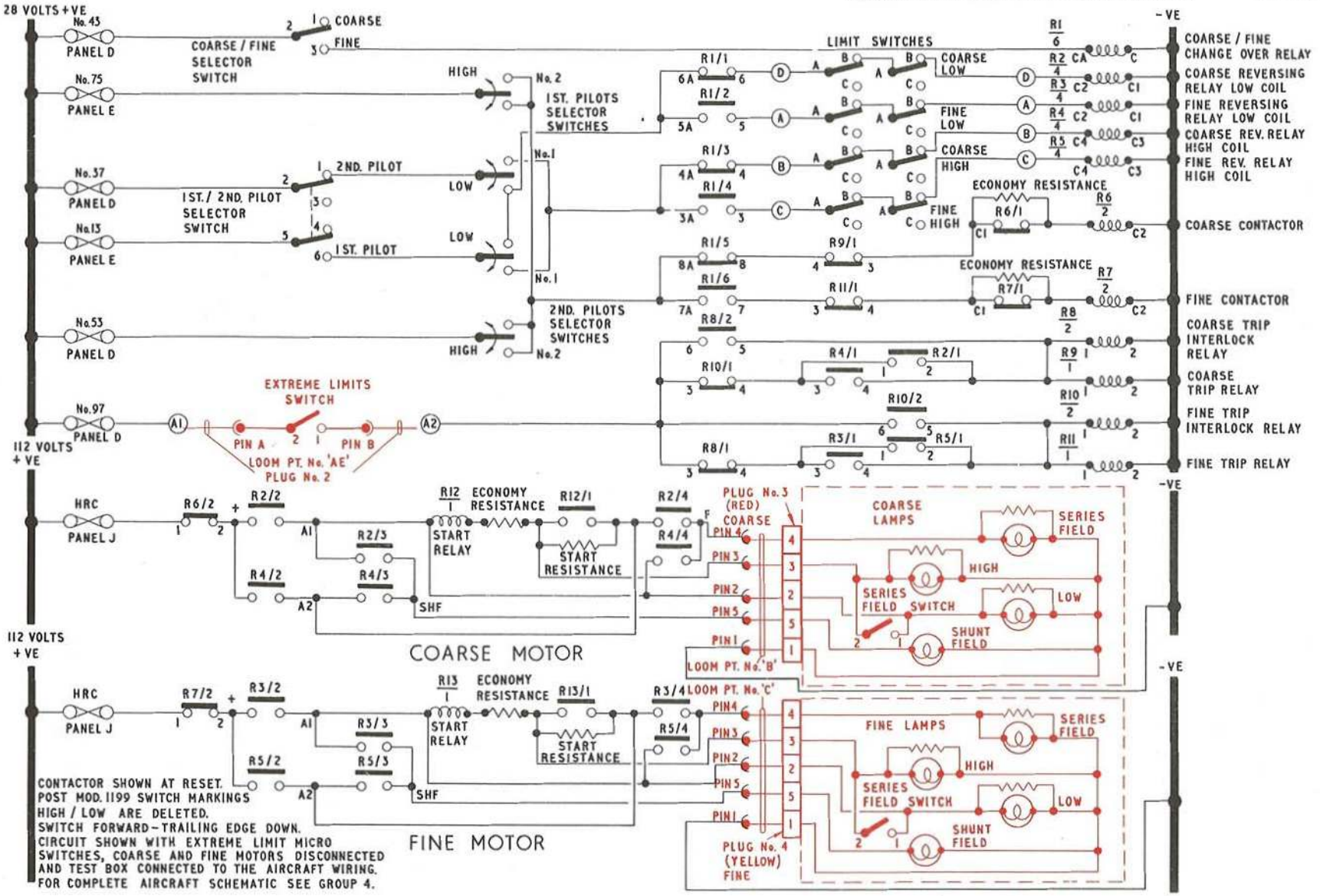

Fig. 3 Tailplane incidence (post Mod. 2123 pre Mod. 2353) (Circuitry check)

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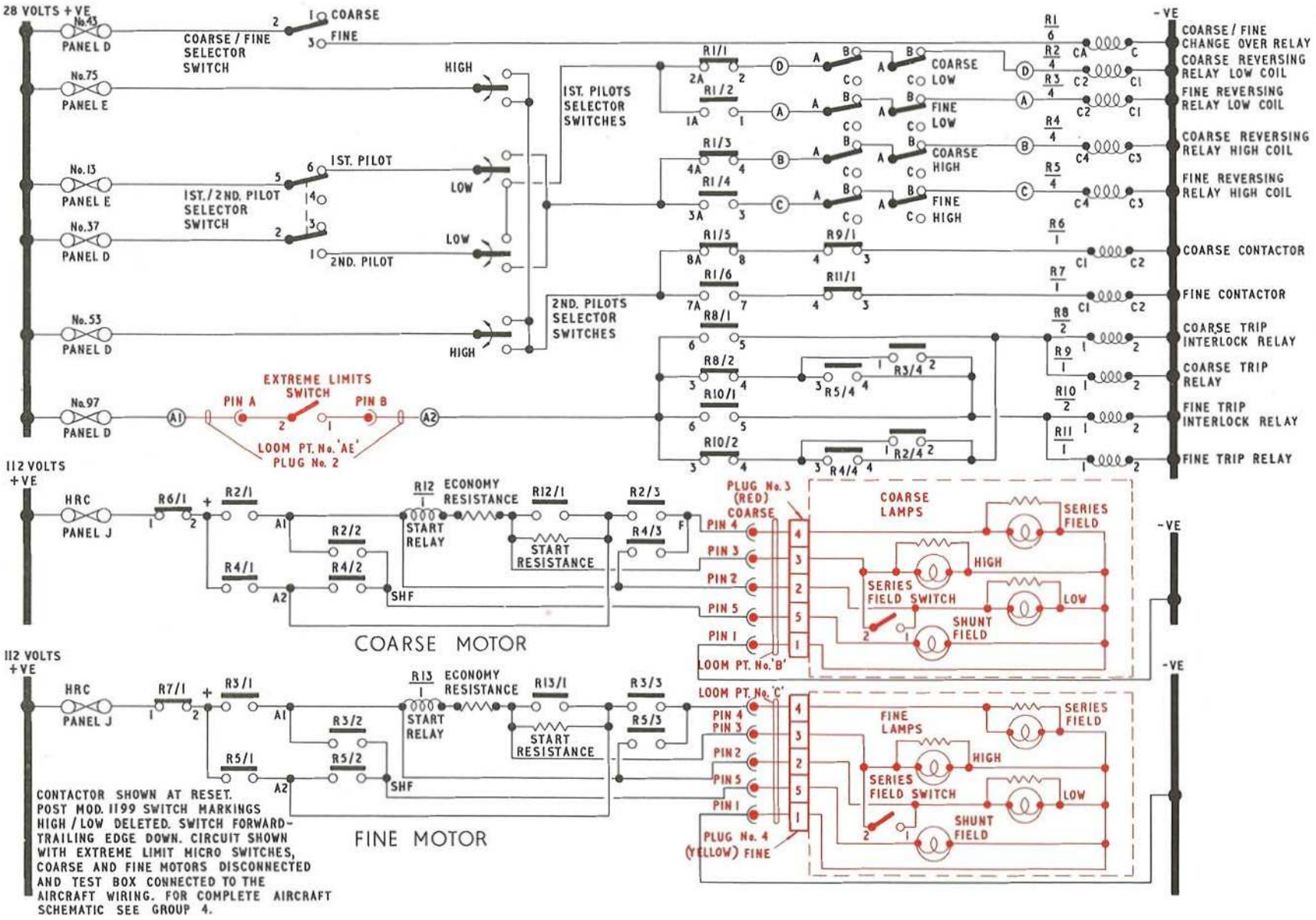

Fig. 4 Tailplane incidence (post Mod. 2353) (Circuitry check)

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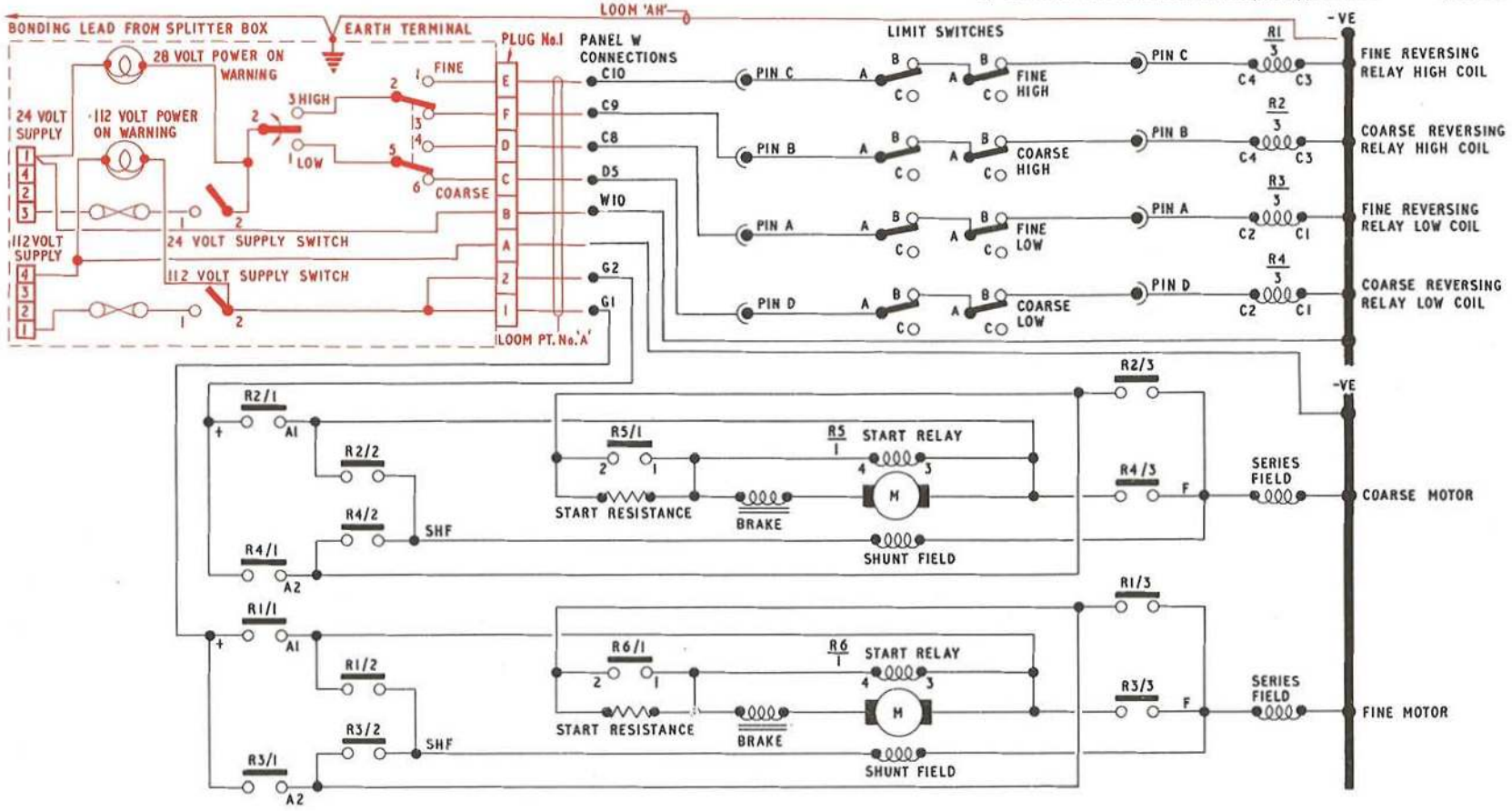

CIRCUIT SHOWN WITH THE SWITCH BOX, COARSE AND FINE MOTORS DISCONNECTED AND TEST BOX CONNECTED TO THE SWITCH BOX COARSE AND FINE MOTORS VIA PANEL W

Fig. 5. Tailplane incidence control (Function check)

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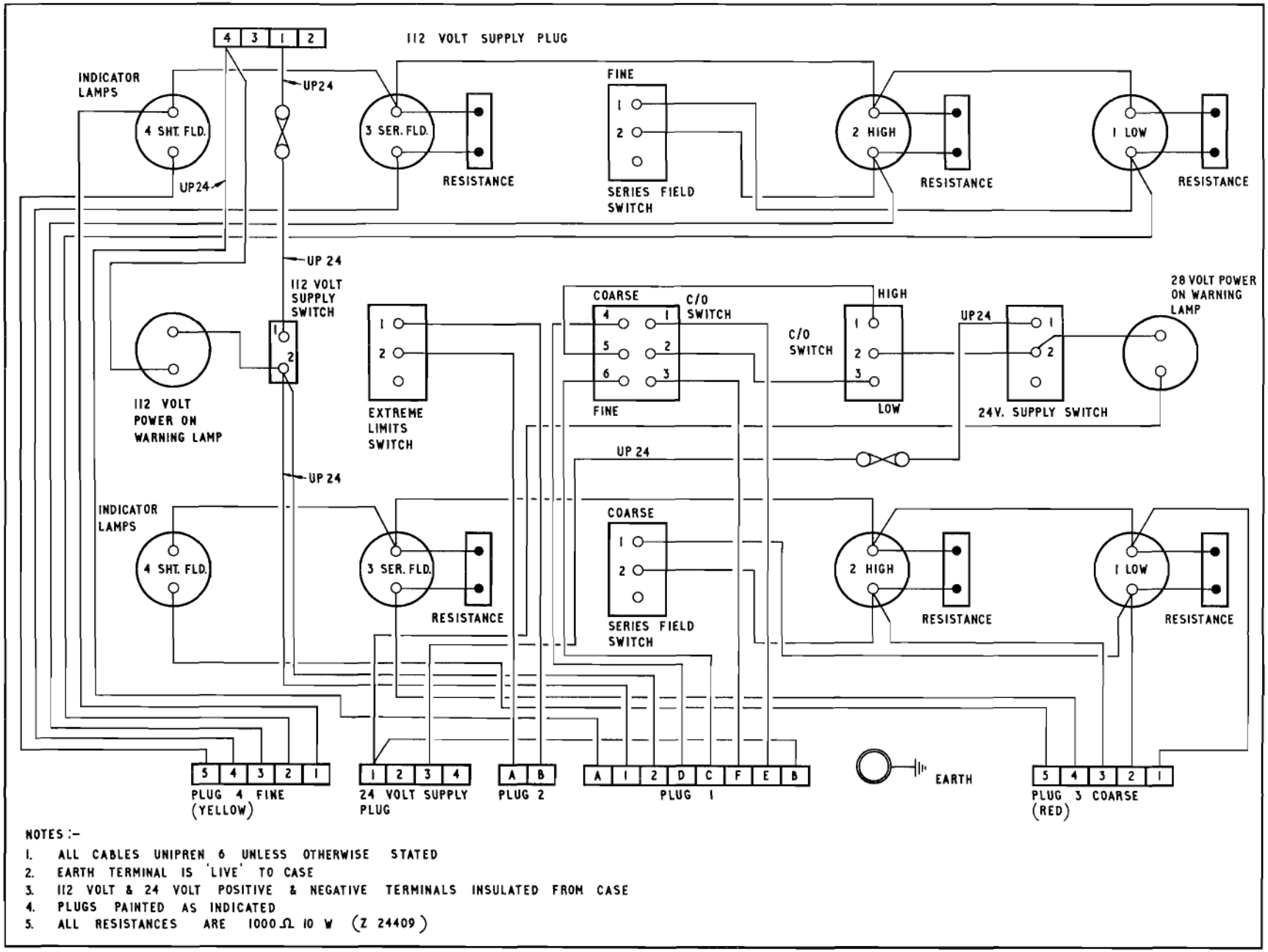

NOTES :-

1. ALL CABLES UNIPREN 6 UNLESS OTHERWISE STATED
2. EARTH TERMINAL IS 'LIVE' TO CASE
3. 112 VOLT & 24 VOLT POSITIVE & NEGATIVE TERMINALS INSULATED FROM CASE
4. PLUGS PAINTED AS INDICATED
5. ALL RESISTANCES ARE 1000 Ω 10 W (Z 24409)

Fig. 6 Tailplane incidence test box

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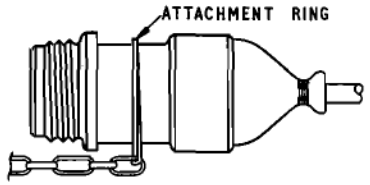
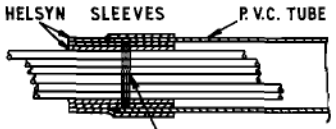
FROM				TO		
PART No.	END FITTINGS	EQUIPMENT	LENGTH	EQUIPMENT	END FITTINGS	CABLE SIZE
A	(No. 1) 5X/6385 5X/242 67479 PT. 6387	TEST BOX SKT. PIN 1	25'-0"	AFT. T.B. G1	5H/9400053	UNISHEATH GROUND 19
		" " " " 2	25'-0"	" " G2	"	" " "
		" " " " C	25'-0"	" " D5	Z84503 Z19980	UNISHEATH GROUND 7
		" " " " D	25'-0"	" " C8	" "	" " "
		" " " " E	25'-0"	" " C10	" "	" " "
		" " " " F	25'-0"	" " C9	" "	" " "
		" " " " A	25'-0"	AIRFRAME LOCAL EARTH (112V-VE)	5X/6671	" " 19
		" " " " B	25'-0"	EARTH (PANEL W-F10)	Z84503 Z19980	" " 7
AE	(No. 2) 5X/6004 5X/1383 67479 PT. 6381 5X/3148	TEST BOX SKT. PIN A	25'-0"	SWITCH BOX TERM. A1	Z19924 Z19979	UNIPREN 6
		" " " " B	25'-0"	" " " A2	" "	" "
B	(No. 3) 5X/6064 RED 5X/1373 67479 PT. 6385 5X/3146 5X/3148	TEST BOX SKT. PIN 1 RED	25'-0"	COARSE PLUG PIN 1 RED	5X/6061 5X/6294 5X/3090 5X/1373 67479 PT. 6375 5X/3146 5X/3148	QUINPREN 6
		" " " " 2 BLUE		" " " 2 BLUE		
		" " " " 3 YELLOW		" " " 3 YELLOW		
		" " " " 4 GREEN		" " " 4 GREEN		
		" " " " 5 WHITE		" " " 5 WHITE		
C	(No. 4) 5X/6064 YELLOW 5X/1373 67479 PT. 6385 5X/3146 5X/3148	TEST BOX SKT. PIN 1 RED	25'-0"	FINE PLUG PIN 1 RED	5X/6061 5X/6294 5X/3090 5X/1373 67479 PT. 6375 5X/3146 5X/3148	QUINPREN 6
		" " " " 2 BLUE		" " " 2 BLUE		
		" " " " 3 YELLOW		" " " 3 YELLOW		
		" " " " 4 GREEN		" " " 4 GREEN		
		" " " " 5 WHITE		" " " 5 WHITE		
AH	5K/1809 BONDING LEAD	TEST BOX EARTH POINT	15'-0"	AIRFRAME LOCAL EARTH	5K/1884	UNISHEATH GROUND 7



TYPICAL METHOD OF SECURING SOCKET BLANKING ASSY. TO SOCKET



TYPICAL METHOD OF SECURING CABLES IN CONDUIT

NOTES:-
1. CABLE ENDS CRIMPED, CABLE SLEEVE Z49397 USED AS REQUIRED.
2. SINGLE CORE LOOMS RUN IN P.V.C. SLEEVING TO SPEC. E & 1659 TO WITHIN 3FT. OF LOOSE ENDS AND BOUND TIGHTLY. LOOSE CABLES SECURED INSIDE P.V.C. CONDUIT BY MEANS OF HELSYN SLEEVES. (SEE DETAIL)
3. PLUG BLANKING ASSY. SECURED TO PLUG BY FIXING TAG UNDER ONE OF PLUG ASSY. BOLTS.
4. CABLES CLEARLY IDENTED BOTH ENDS-PLUG No. AT TEST BOX END.

Fig. 7 Cable looms

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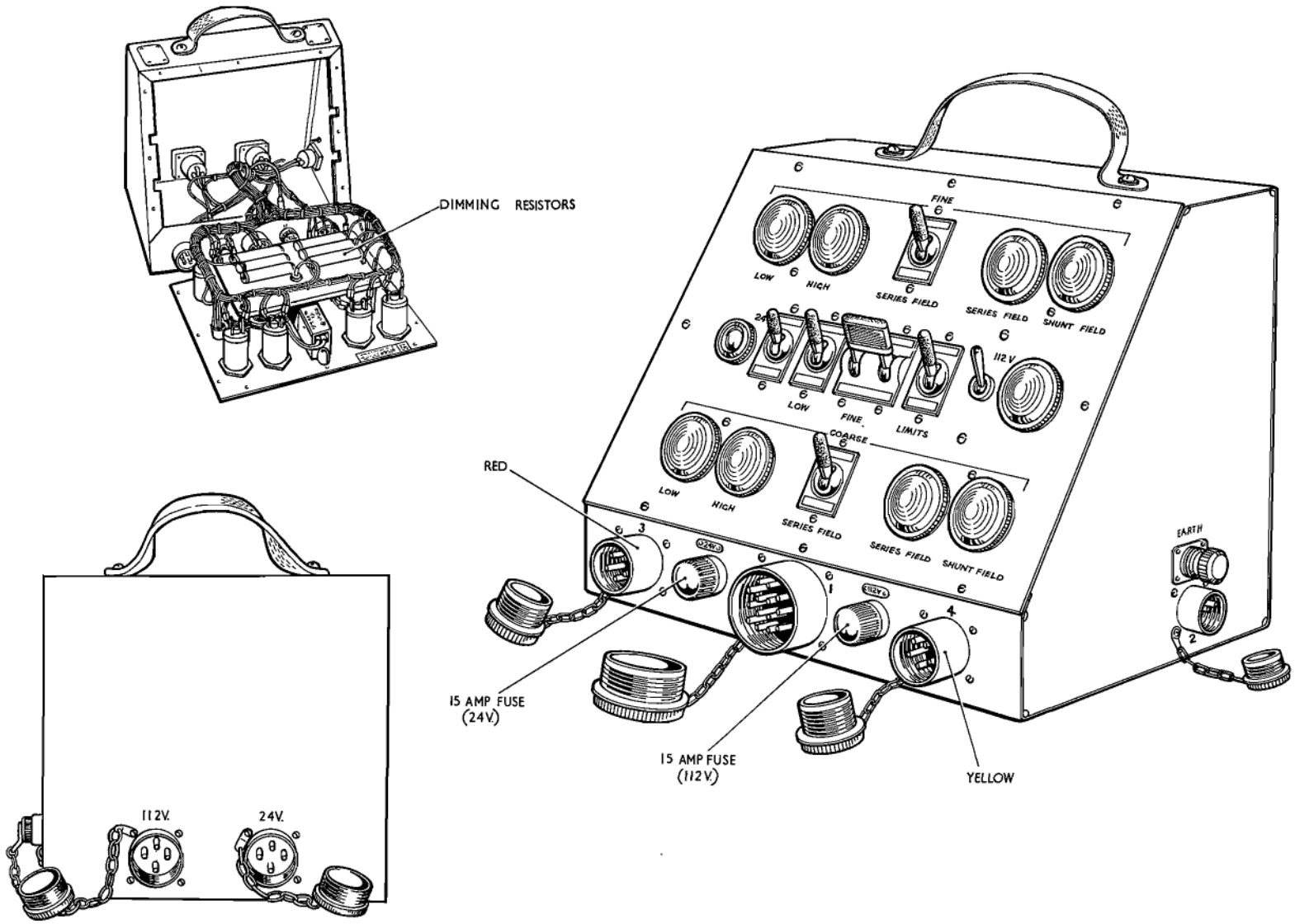

Fig. 8 Tailplane incidence test box

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