

Chapter 3

REHEAT SYSTEM TEST SET

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LEADING PARTICULARS

<i>Reheat system test set</i>	<i>Ref. No. 5G/NIV</i>
<i>Overall dimensions</i>	10 in. × 7 in. × 4½ in.
<i>Weight (without test lead)</i>	2 lb.

Introduction

1. The Reheat System Test Set enables a functional test to be made on the electrical circuit controlling the Reheat System fitted to Lightning aircraft. This is made possible by indicating the continuity of supply to the various components of the system by the use of red warning lamps and simulating the operation of the engine differential pressure switches by the use of toggle-type switches.

2. The test set is made up locally and can be used for the diagnosis of faults, and also for checking the electrical circuit after rectification of faults, either with the engine removed or in situ.

DESCRIPTION

3. The test set (*fig. 1*) consists of a front panel assembly fitted in a wooden case, a test lead and a fabric case in which the test lead is stowed. The front panel (*fig. 4*), which is of light alloy, is fitted with six warning lamps, three toggle-type switches and a 26 pole plug, and is secured to battens in the wooden case by six wood screws. The wiring diagram for the front panel is shown in *fig. 3*.

4. The wooden case has a hinged lid fitted with a catch, and has a leather carrying handle. *Fig. 2* gives the information necessary for the manufacture of the case.

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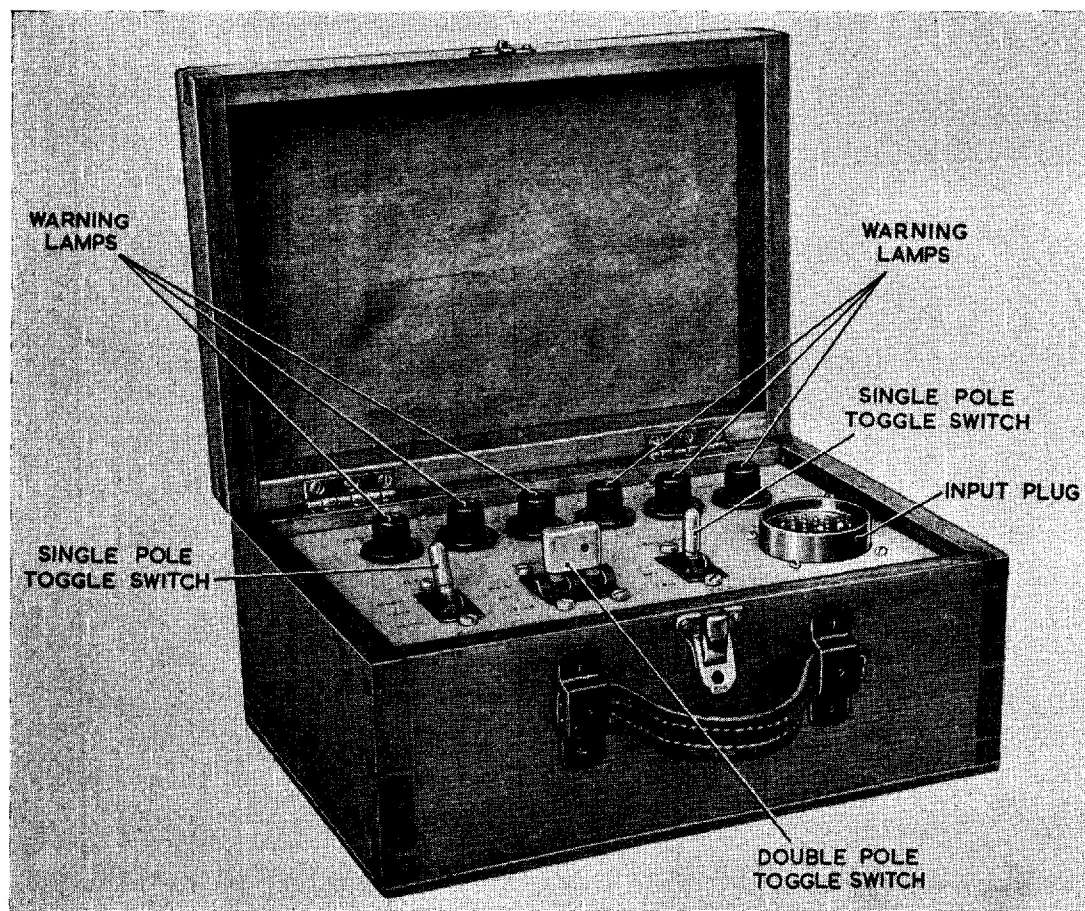


Fig. 1. Test set

5. The test lead is made up of presheath cables and terminates in breeze plugs at one end to facilitate connection to the aircraft components, and a breeze socket at the other end to connect with the input socket on the front panel. A wiring diagram for the lead is shown in fig. 6 and fig. 7 shows the dimensions and components of the lead. The lead is stowed in a fabric case (*fig. 8*) fitted with carrying handles and a zip fastener.

OPERATION

6. To carry out a functional test of the reheat circuit, the test set is initially connected to the appropriate terminations on the aircraft. The engine throttle is moved through the various stages of reheat in conjunction with the operation of the toggle switches fitted to the test set. The sequence of illuminations of the warning lamps is then

observed for correct operation. A detailed sequence of test operations for the Lightning aircraft is given in paragraphs 12 to 17.

MANUFACTURE

7. The items of equipment and materials required are listed in tables 1 to 4.

Test set case

8. In the manufacture of the protective test set case, reference is made to fig. 2. for details of dimensions and assembly. The following is the procedure that should be adopted:—

- (1) Mark out and cut $\frac{1}{2}$ in. wooden sections.
- (2) Assemble wooden sections, using dovetail jointing.
- (3) Mark out and cut $\frac{3}{8}$ in. plywood sections.

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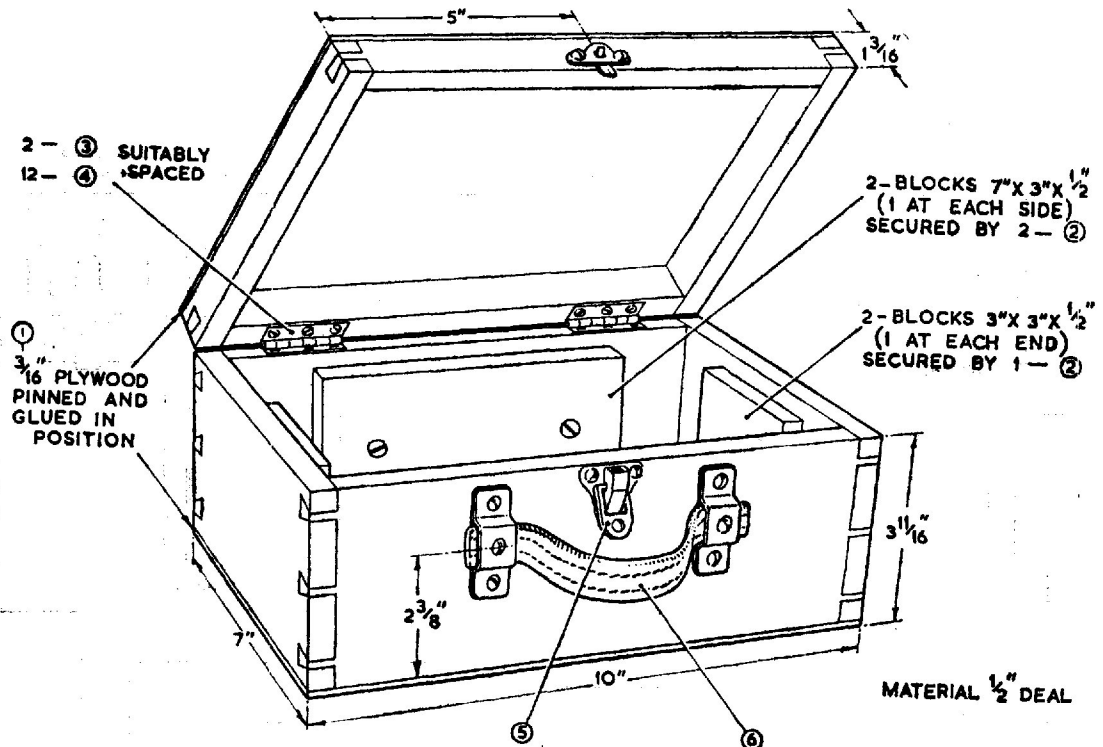


Fig. 2. Test set case

TABLE 1
Material required for test set case (fig. 2)

Item No.	Description	Ref. No.	Quantity
1	$\frac{3}{16}$ in. plywood, 10 in. $\times$ 7 in.	31B/116	2
2	Woodscrew, c'sk, No. 6 $\times$ $\frac{3}{4}$ in.	29B/3765	6
3	Hinge, butt, brass, $1\frac{1}{2}$ in.	29G/1000	2
4	Woodscrew, c'sk, No. 4 $\times$ $\frac{1}{2}$ in.	29B/3748	12
5	Fastener, complete with screws	N.I.V.	1
6	Handle, complete with screws and brackets	N.I.V.	1

Items 5 and 6 to be obtained by L.P.O.

(4) Secure plywood sections in their correct positions.

(5) Fit hardwood battens into case.

(6) Finish all exposed surfaces using varnish shellac.

(7) Fit fastener and handle.

(8) Fit hinges.

Front panel

9. Dimensions and details of the front panel are given in fig. 5. The correct method of assembly is as follows:—

(1) Mark out, drill, and cut, the aluminium alloy sheet.

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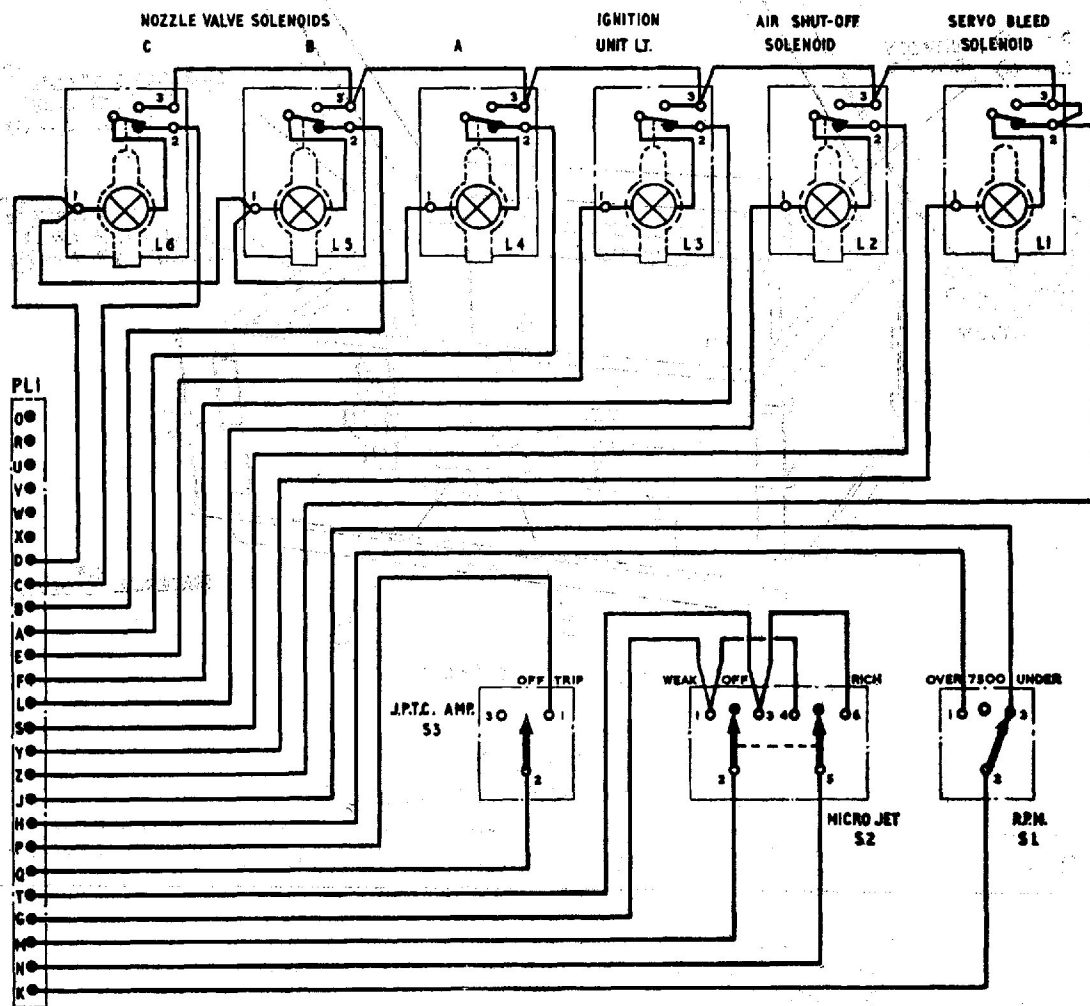


Fig. 3. Wiring Diagram of Test Set

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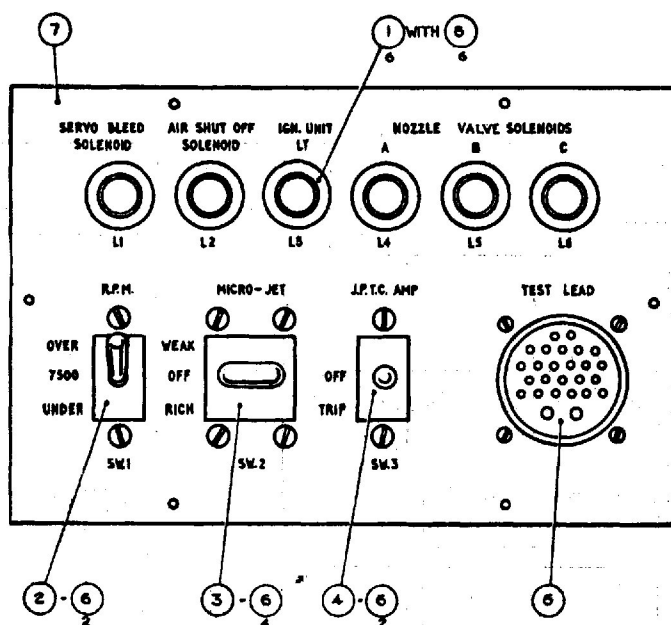


Fig. 4. Front panel assembly

TABLE 2

Material required for front panel assembly (fig. 4)

Item No.	Description	Ref. No.	Quantity
1	Lamps, warning, Type H3402	5CX/5213	6
2	Switch, S.P., Type XD778	5CW/6429	1
3	Switch, D.P., Type XD/787	5CW/6439	1
4	Switch, S.P., Type XD781	5CW/6433	1
5	Plug, single, 26 pole, size D	5X/6131	1
6	Screw, r'd head, brass, 4 B.A. $\times \frac{1}{2}$ in.	28S/2079	8
7	Front panel (as detailed in fig. 4)	N.I.V.	1
8	Lamps, filament, 24V, 2-4W	5L/9959215	6
9	Cable electric, Unipren 6	5E/3038	5 yards
10	Woodscrews, r'd head, brass, No. 4 $\times \frac{1}{2}$ in.	29B/3827	6

Item 9 used for connecting components of front panel.

Item 10 used for securing front panel into case.

(2) Finish the upper surface using duck-blue paint.

(3) Fit the warning lamps and breeze socket.

(4) Fit the single and double pole switches.

(5) Connect the components of the panel in accordance with the wiring diagram (fig. 3), using unipren 6 cable.

(6) Fit the assembled front panel into the test set case.

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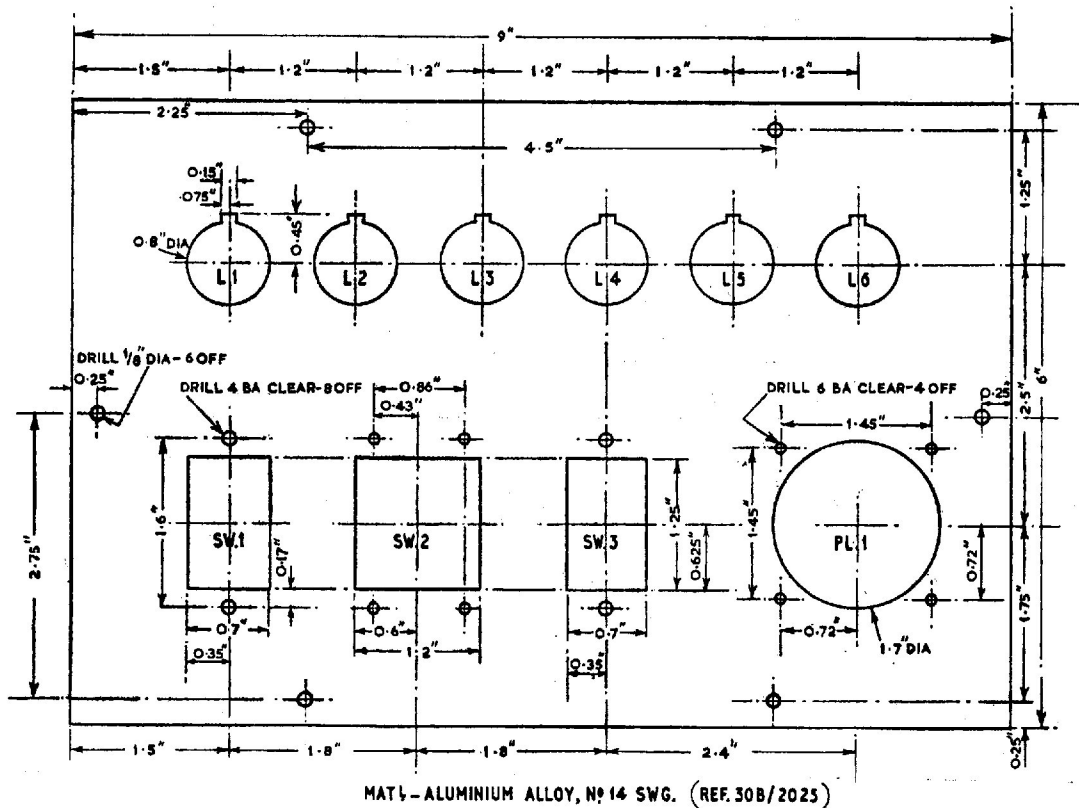


Fig. 5. Details of front panel

Test lead

10. Fig. 7 gives details of assembly and dimensions of the test lead and the following sequence should be adhered to:—

(1) Cut the presheath cables to the dimensions shown and prepare the cable ends.

(2) Fit the synthetic tubing, cable markers and ferrules.

(3) Connect the breeze plugs and sockets as shown in the wiring diagram (fig. 6).

(4) Bind the ends, using braided cord, and shellac the cord.

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Test lead case

11. The dimensions and details necessary for manufacture of the case are given in fig. 8. The correct method of assembly is as follows:—

(1) Mark out and cut the fabric sections.

(2) Assemble the fabric sections and sew them together.

(3) Assemble the fabric handle and sew it to the case.

(4) Assemble the zips and sew them to the case.

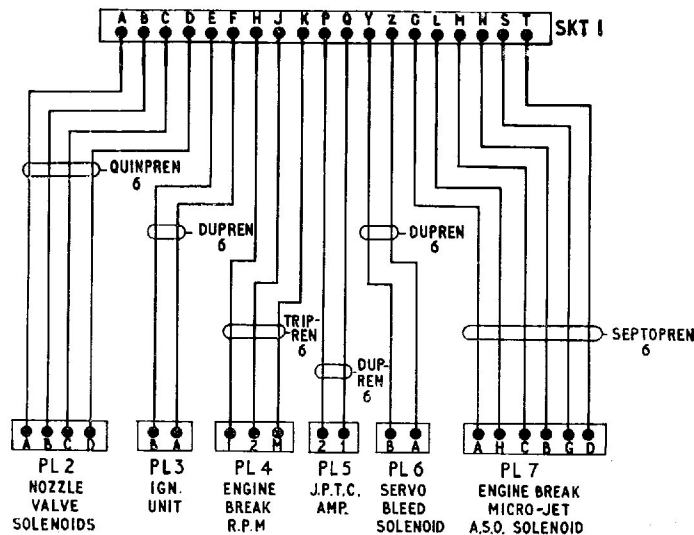


Fig. 6. Wiring diagram of test lead

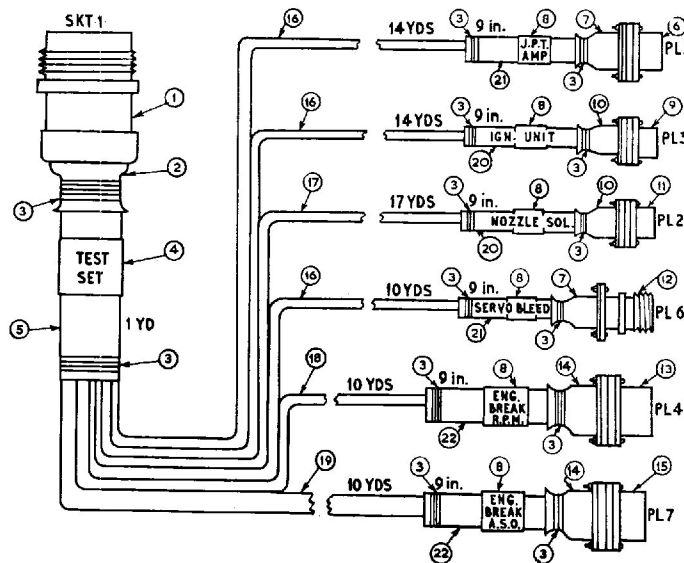


Fig. 7. Details of test lead

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TABLE 3
Material required for test lead (fig. 7)

Item No.	Description	Ref. No.	Quantity
1	Socket, single, 2 pole, size D	5X/6134	1
2	Ferrule, round, size D	5X/243	1
3	Cord, stringing, braided	32A/94	As req'd
4	Sleeves, binding, Type A, 20 m.m.	5K/9107071	1
5	Tubing, synthetic, 0.875 in. O.D.	5F/2047	1 yard
6	Plug, single, 4 pole, size Z	5X/6031	1
7	Ferrule, square, size Z	5X/2193	2
8	Sleeves, binding, Type A, 5 m.m.	5K/9107067	6
9	Plug, single, 2 pole, size A	5X/6001	1
10	Ferrule, square, size A	5X/1375	2
11	Plug, single, 4 pole, size A	5X/6006	1
12	Plug, 2 pole, Pt. No. 7481871A	36LL/6466	1
13	Plug, single, 14 pole, size C	5X/6207	1
14	Ferrule, square, size C	5X/2190	2
15	Plug, single, 12 pole, size C	5X/6086	1
16	Cable, electric, Duprensheath 6	5E/3802	38 yards
17	Cable, electric, Quinprensheath 6,	5E/3115	17 yards
18	Cable, electric, Triprensheath 6	5E/3114	10 yards
19	Cable, electric, Septoprensheath 6	5E/3116	10 yards
20	Tubing, synthetic, 0.25 in. O.D.	5F/2143	1 ft. 6 in.
21	Tubing, synthetic, 0.455 in. O.D.	5F/2034	1 ft. 6 in.
22	Tubing, synthetic, 0.705 in. O.D.	5F/2036	1 ft. 6 in.

Item 12 is to be demanded by L.P.O. on J. Lucas G.T., Ltd., Birmingham.



Fig. 8. Test Lead Case

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TABLE 4
Material required for test lead case (fig. 8)

Item No.	Description	Ref. No.	Quantity
1	Fabric, blue grey	32B/504	8 ft. × 1 ft. 6 in.
2	Zip fastener	N.I.V.	2

Item 2 to be obtained by L.P.O.

AIRCRAFT TEST PROCEDURE

12. The test procedure detailed in para. 13 and 14 is applicable to the Lightning aircraft only before incorporating Lightning Modifications:

- Mod. 1887 (Mk. 1A)
- Mod. 1888 (Mk. 1)
- Mod. 1972 (Mk. 4)▶

No. 1 engine

13. The following sequence should be adhered to when testing No. 1 engine:—

(1) Disconnect the following aircraft connectors:—

- (a) 2R76B from No. 1 jet pipe nozzle control valve.
- (b) RIB from No. 1 servo bleed solenoid.
- (c) F74B from No. 1 engine junction box.
- (d) F74A from No. 1 engine junction box.
- (e) R215 from No. 1 reheat ignitor unit.
- (f) R86A from No. 1 J.P.T.C. control amplifier.

(2) Connect the test set to No. 1 engine reheat installation.

(3) Connect and switch on the 28V d.c. supply to the aircraft. Lamps 1 and 5 on the test set should light.

(4) Check the serviceability of all warning lamps on the test set by the 'Press to Test' facility.

(5) Move No. 1 engine throttle forward until it is just through the gate into the reheat position. As the throttle moves

through the gate lamps 1 and 5 should be extinguished and lamps 2, 3 and 4 should light.

(6) Momentarily set SW2 to RICH. The following should take place:—Lamp 2 should remain illuminated, lamp 4 should be extinguished, lamp 6 should light; lamp 3 should extinguish 15 seconds after operating switch SW2.

(7) Move the throttle slowly forward until fully open. The various stages of reheat will be indicated by lamps 4, 5 and 6. Lamp 2 should remain illuminated throughout. The indications of lamps 4, 5 and 6 will be:—

- (a) Stage 1. Lamps 4 and 5 extinguished and lamp 6 illuminated.
- (b) Stage 2. Lamp 5 extinguished and lamps 4 and 6 illuminated.
- (c) Stage 3. Lamp 4 extinguished and lamps 5 and 6 illuminated.
- (d) Stage 4. Lamps 4, 5 and 6 illuminated.

(8) Set No. 1 J.P.T.C. control switch in the cockpit to OFF. Momentarily set SW3 to TRIP. Lamps 2, 4, 5 and 6 should remain illuminated.

(9) Set No. 1 J.P.T.C. control switch to AUTO. Momentarily set SW3 to TRIP. Lamps 2, 4, 5 and 6 should be extinguished. Lamp 1 and No. 1 Top Temp. Trip warning lamp in the cockpit should illuminate.

(10) Move the throttle back through the gate to engine idling. Lamp 1 should remain illuminated and lamp 5 should illuminate as the throttle passes through the gate. No. 1 Top Temp. Trip warning lamp in the cockpit should extinguish.

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(11) Move the throttle forward through the gate into the first stage of reheat. Lamps 2, 3 and 4 should illuminate and lamps 1 and 5 should extinguish.

(12) Momentarily set SW2 to WEAK. Lamps 2, 3 and 4 should extinguish and lamp 1 should illuminate. No. 1 Top Temp. Trip warning lamp in the cockpit should illuminate.

(13) Move the throttle back to engine idling. Lamp 1 should remain illuminated and lamp 5 should illuminate.

(14) Set SW1 to OVER 7500 RPM. Lamp 5 should extinguish.

(15) Set SW1 to UNDER 7500 RPM. Lamp 5 should illuminate.

(16) Switch off 28V d.c. supply.

(17) Disconnect the test set from No. 1 engine reheat installation and reconnect all aircraft connectors disconnected for test purposes.

No. 2 engine

14. The procedure for checking No. 2 engine on the Lightning aircraft is as follows:—

(1) Disconnect the following aircraft connectors:—

(a) 2R76D from No. 2 jet pipe nozzle control valve.

(b) 2R70E from No. 2 servo bleed junction.

(c) 2R77A from the No. 2 engine junction box.

(d) 2R77B from No. 2 engine junction box.

(e) R216 from No. 2 reheat ignitor unit.

(f) R87A from No. 2 J.P.T.C. control amplifier.

(2) Repeat operations (2) to (17) in para. 13, changing reference from No. 1 engine to No. 2 engine.

AIRCRAFT TEST PROCEDURE

◀15. The test procedure detailed below is applicable to Mk. 1, Mk. 1A, and Mk. 4 Lightning aircraft after incorporation of the following aircraft modifications:

Lightning Mod. 1887 (Mk. 1A)

Lightning Mod. 1888 (Mk. 1)

Lightning Mod. 1972 (Mk. 4)

No. 1 engine

16. (1) Disconnect the following aircraft connections:—

(a) Cable assy. 2R76B (Mk. 1) R76B (Mk. 1A) (Mk. 4) from the jet pipe nozzle control valve.

(b) Cable assy. RIB from the servo-bleed solenoid.

(c) Cable assy. F74B to the air shut-off cock, disconnect at No. 1 engine J.B.

(d) Cable assy. R215 from the reheat ignition unit.

(e) Cable assy. R86A from the jet pipe temp. control unit.

(2) Connect the test box to the No. 1 engine reheat installation. Ensure that SW1 switch is in the UNDER 7500 position.

(3) Disconnect cable assy. F162 from the a.c. fuse and relay box (Mk. 1 and Mk. 1A). Unplug No. 1 port and No. 2 stbd. a.c. fuel pump relays from the main distribution box (Mk. 4).

(4) Remove fuse 54 from the starboard fuse box (Mk. 1 and Mk. 1A) fuse 225 from the main distribution box (Mk. 4).

(5) Connect and switch ON the 28-volt d.c. supply to the aircraft. Lamps L1 and L5 on the test box should light.

(6) Check the serviceability of all test box warning lamps by the "press-to-test" facility.

(7) Operate No. 1 engine throttle lever forward until it is *just through* the gate into the reheat sector. As the throttle passes through the gate, lamps L1 and L5 should go out. Lamp L2, L3 and L4 should light. After 10 sec. lamps L2, L3 and L4 should go out and L1 light.

(8) Move the throttle back to the engine idling position. Lamp L1 and L5 should come on, all others should be off.

(9) Move the throttle into reheat, lamps L2, L3 L4 should light and at the same time operate switch SW2 on the test box to the RICH position.

Note . . .

Switch SW2 must be operated immediately or the system will shut down.

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Indications are as follows:—

Lamp L4 should go out. Lamp L6 should light.

Lamp L3 should go out 15 sec. after operating the switch.

Lamp L2 should remain lit.

(10) Move throttle slowly forward until fully opened. The different stages of reheat will be indicated by lamps L4, L5 and L6. Lamp L2 should remain lit throughout. The indications are as follows:—

Stage 1 L4 off — L5 off — L6 on

Stage 2 L4 on — L5 off — L6 on

Stage 3 L4 off — L5 on — L6 on

Final stage L4 on — L6 on — L6 on

(11) Set No. 1 jet pipe temperature control switch to the OFF position. Operate switch SW3 on the test box to the TRIP position. Lamps L2, L4, L5 and L6 should remain lit.

(12) Set No. 1 jet pipe temperature control switch to AUTO. Lamps L2, L4, L5, and L6 should go out and L1 light. The TTC1 warning light should come on in the cockpit. Operate switch SW3 on test box to the OFF position. This should have no effect.

(13) Move throttle back to the gate. Lamps L2, L4, L5 and L6 should stay out and L1 stay lit. Move throttle back to the idling position, L1 should stay lit and L5 come on, TTC1 warning should go off.

(14) Move the throttle into reheat, lamps L2, L3 and L4 should light. Momentarily operate the micro-jet switch SW2 on the test box to the RICH position. Lamp L4 should go out. Lamp L6 should light. Lamp L3 should go out 15 sec. after operating the switch. Lamp L2 should remain on.

(15) Move throttle back to engine idling position, lamp L1 and L5 should be on. All other lamps should be out.

(16) Move the throttle into reheat, lamps L2, L3, L4 should light. Momentarily operate switch SW2 on the test box to the RICH position. Lamp L4 should go out, lamp L6 should light; L3 should go

out 15 sec. after operating the switch, lamp L1 should remain on.

(17) Operate switch SW2 to the WEAK position, lamps L2 and L6 should go out and L1 light. The TTC1 warning lamp in the cockpit should come on.

(18) Move throttle back to the engine idling position, lamps L1 and L5 should be on and all other lamps out.

(19) Operate the R.P.M. switch SW1 on test box to the OVER 7500 position, lamp L5 should go out.

(20) Operate the R.P.M. switch SW1 on the test box to the UNDER 7500 position, lamp L5 should come on.

(21) Move the throttle into reheat, lamps L2, L3 and L4 should light. Momentarily operate switch SW2 on test box to the RICH position, lamp L4 should go out, L6 should light; L3 should go out 15 sec. after operating the switch, and L2 should remain on.

(22) Replace fuse 54 (Mk. 1, Mk. 1A) fuse 225 (Mk. 4). Lamps L2 and L6 should go out and L1 come on. The TTC1 warning lamp in the cockpit should come on. Remove fuse 54 or 225 as the case may be, this should have no effect.

(23) Move the throttle lever back to the engine idling position. The TTC1 warning should go off, L1 should stay on and lamp L5 come on.

(24) Move the throttle into reheat, lamps L2, L3 and L4 should light. Operate switch SW2 to the RICH position and lamp L4 should go out, L6 light, L3 should go out after 15 sec. and L2 should remain on.

(25) Re-connect cable assy. F162 (Mk. 1, Mk. 1A). Plug in the a.c. fuel pump relay, No. 1 port (Mk. 4). Lamps L1, L2, and TTC1 warning should come on.

(26) Move throttle back to the engine idling position. Lamp L5 should come on, L1 should stay on, and TTC1 go off.

(27) Remove the 28 volt d.c. supply, replace fuse 54 or 225 as the case may be, disconnect the test box and replace all cables disconnected for test purposes.

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No. 2 engine

17. Repeat all tests para. 16 (1)—(25) with the following changes:—

- (1) For No. 1 engine read No. 2 engine.
- (2) For Cable assy. 2R76B (Mk. 1) read 2R76D (Mk. 1).
- (3) For TTC1 warning read TTC2 warning.

(4) In para. (25) for “relay, No. 1 port” read “relay, No. 1 stbd.” ►

SERVICING

18. Routine servicing is restricted to examination of the test set components for security of connections and indications of damage or deterioration of the test lead and, if necessary, effecting repairs.

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