

Group 5
R.A.T.O.G. INSTALLATION

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CROSS REFERENCES

<i>Release unit</i> ... Book 3, Sect. 7, Chap. 2	<i>Release unit housing</i> ... Book 3, Sect. 7, Chap. 2	<i>Release unit actuator housing</i> ... Book 1, Sect. 4, Chap. 7
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APPENDIX

<i>R.A.T.O.G. installation test box</i> ...		<i>App.</i> 1▶
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WARNING

Voltages in excess of 100 volts, either a.c. or d.c. can be dangerous under certain circumstances. Personnel should therefore

ensure that the electrical system is electrically safe before any servicing is attempted. Where it is essential that tests or adjust-

ments be made with the electrical power switched on the greatest care must be exercised.

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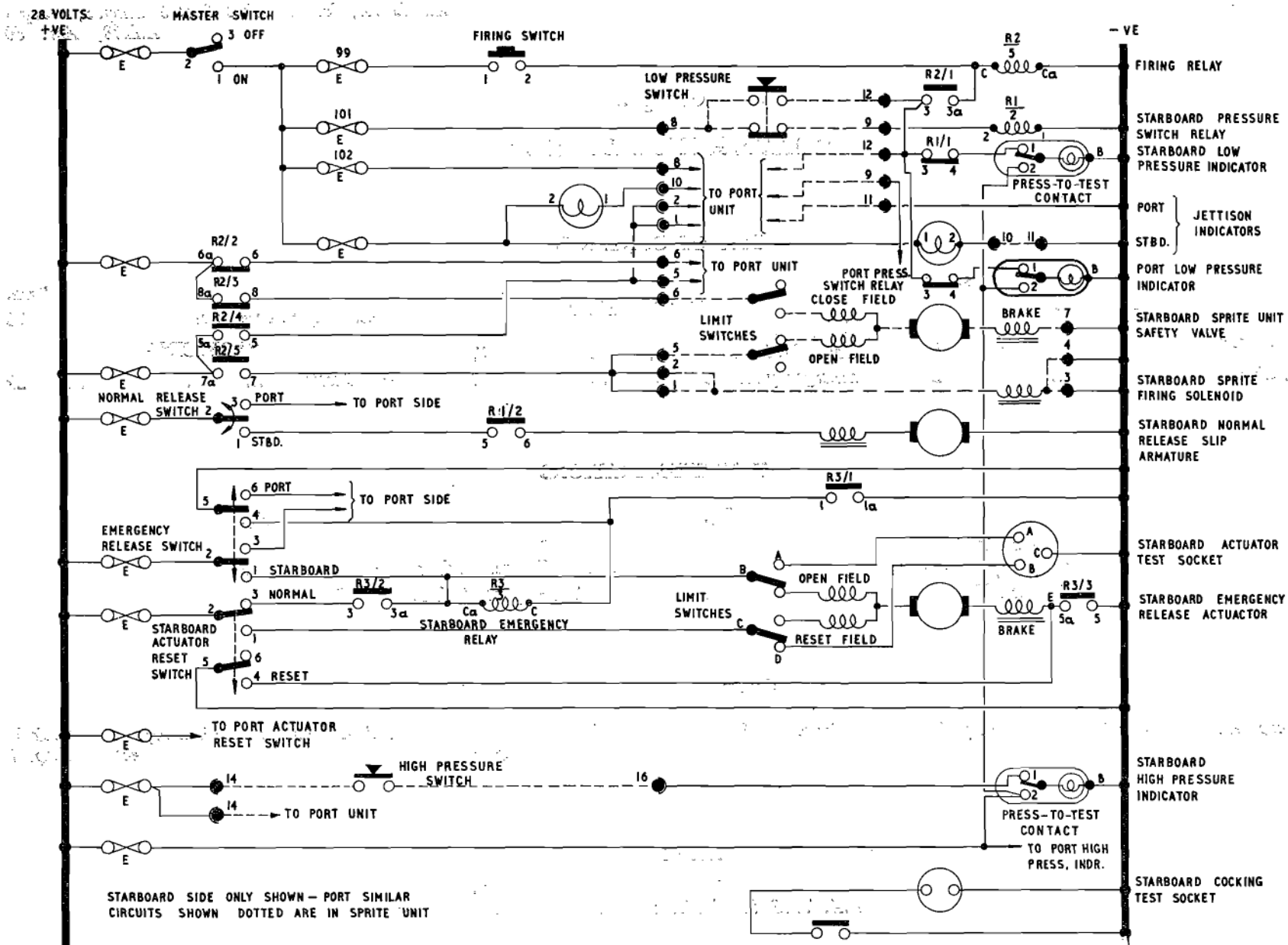


Fig. 1. R.A.T.O.G. control (post Mod. 2330 or 2331)

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DESCRIPTION

Note . . .

These circuits are only applicable and operational provided Super Sprite Mods, S.S.89 and N.S.S.99 are incorporated in the Super Sprite units.

Introduction

1. The R.A.T.O.G. system is operative only after the incorporation of Mods. 2330 (B Mk. 1) or 2331 (B/PR Mk. 1, B/K Mk. 1 and B/K/PR Mk. 1). Circuits and switches, etc., are fitted prior to these Mods. but these are not to be used and therefore no description is given of their function. Routing diagrams show the aircraft wiring pre-Mod. 2330 or 2331 for reference purposes only. Structural provision for carrying the R.A.T.O.G. units is made by Mod. 1756 and 2544; pre-Mod. 1756 provision was made for carrying the units on the side of the fuselage, but this system is no longer applicable and is therefore non-operational.

Firing

7. Assume that the R.A.T.O.G. units are loaded. The MASTER switch on the control pedestal controls the firing and fuel valve circuits and the normal release interlocks; emergency release can be achieved irrespective of the selection of the MASTER switch. When the MASTER switch is ON, its supply from panel E feeds the firing relay, pressure switch relay and jettison indicator circuits via four individual fuses on panel E.

8. When the MASTER switch is selected ON, its supply is connected via a fuze on panel E to the jettison indicator lamps on the

Operation

2. The R.A.T.O.G. units are suspended under the inner wings between the engine bays from No. 2 bomb slips. Before loading the units the aircraft electrical circuits are tested for satisfactory functioning with the aid of two test boxes, one for the unit fuel valve actuator and firing solenoid and for the emergency release actuator and, when loaded, a cocking testbox (Ref. No. 5G/560) to check that the release slip is satisfactorily cocked.

3. The R.A.T.O.G. units are loaded UN-PRESSURIZED and after loading, fuel valve and firing solenoid operation in the units are checked by using the aircraft controls; the units can then be pressurized.

4. When the units are loaded and connected up to the aircraft and with the master switch ON, two amber lamps on the control pedestal come on and stay on until the units are released. The units are fired by depressing a guarded switch on the port control handwheel, and when firing, the amber and green

L.P. and H.P. pressure indicators at the forward end of the starboard coaming panel come on. Whilst firing, the units cannot be released from the aircraft by the normal release system.

◀ Note . . .

The indicators located forward of the starboard coaming panel are removed by Mod. 3004 and the wiring made safe. ▶

5. When firing is completed, the units may be released by using the normal release switch, which energizes the E.M. release unit in the normal manner. In case of emergency, or if the normal system fails to operate, the units may be released by using the emergency release switch which operates the mechanical release buttons on the release units via the medium of linear actuators.

6. Resetting and testing facilities for the emergency release actuators include NORMAL/RESET switches mounted under the inner wings between the jet pipes.

CIRCUIT OPERATION

control pedestal; the negative returns from these lamps are made by internal links in the Sprite units, when connected up to the aircraft (pins 10 and 11).

9. The same supply from the MASTER switch is connected via separate fuzes on panel E through the normally closed contact of the low pressure switches in the Sprite units (pins 8 and 9) to the coil of the relative pressure switch relays R1, Type Q3, mounted on a panel above panel J. These relays, thus energized, close the contacts R1/2 in the circuits to the relative normal release slip rotor, and open their contacts R1/1 in the circuits

to the low pressure warning lamps.

10. When the FIRING switch on the port control handwheel is depressed and held momentarily, the supply from the MASTER switch is connected via a fuze on panel E to the coil of the firing relay R2, Type S4, mounted on a panel above panel J. This relay, thus energized, closes its contact R2/1 to connect a hold-in supply to its coil. The hold-in supply circuit is completed when either or both the Sprite unit low pressure switch contacts change-over (pins 8 and 12) when nitrogen pressure is released to the hydrogen peroxide tank.

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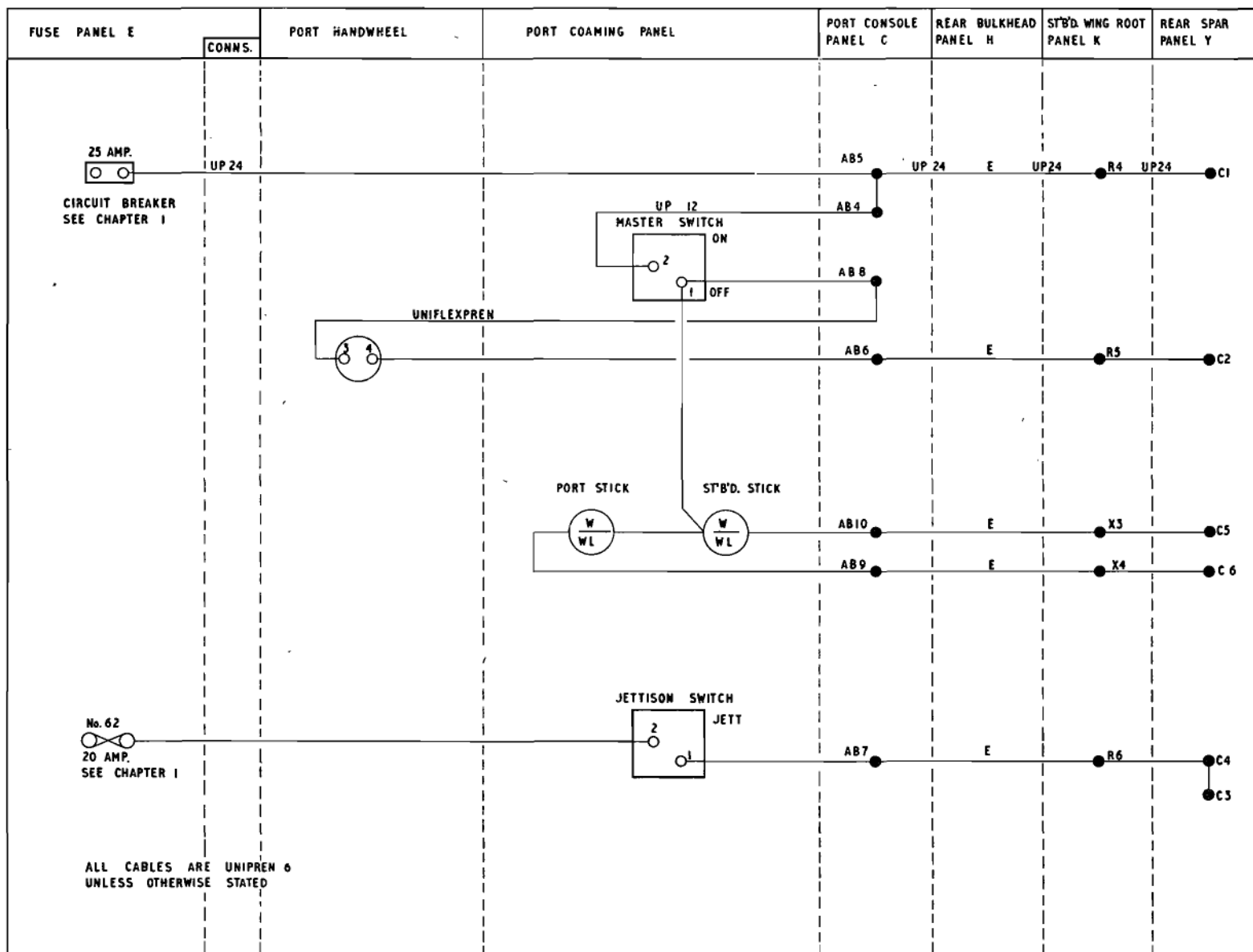


Fig. 2 R.A.T.O.G. (Pre-Mod. 2330 or 2331)

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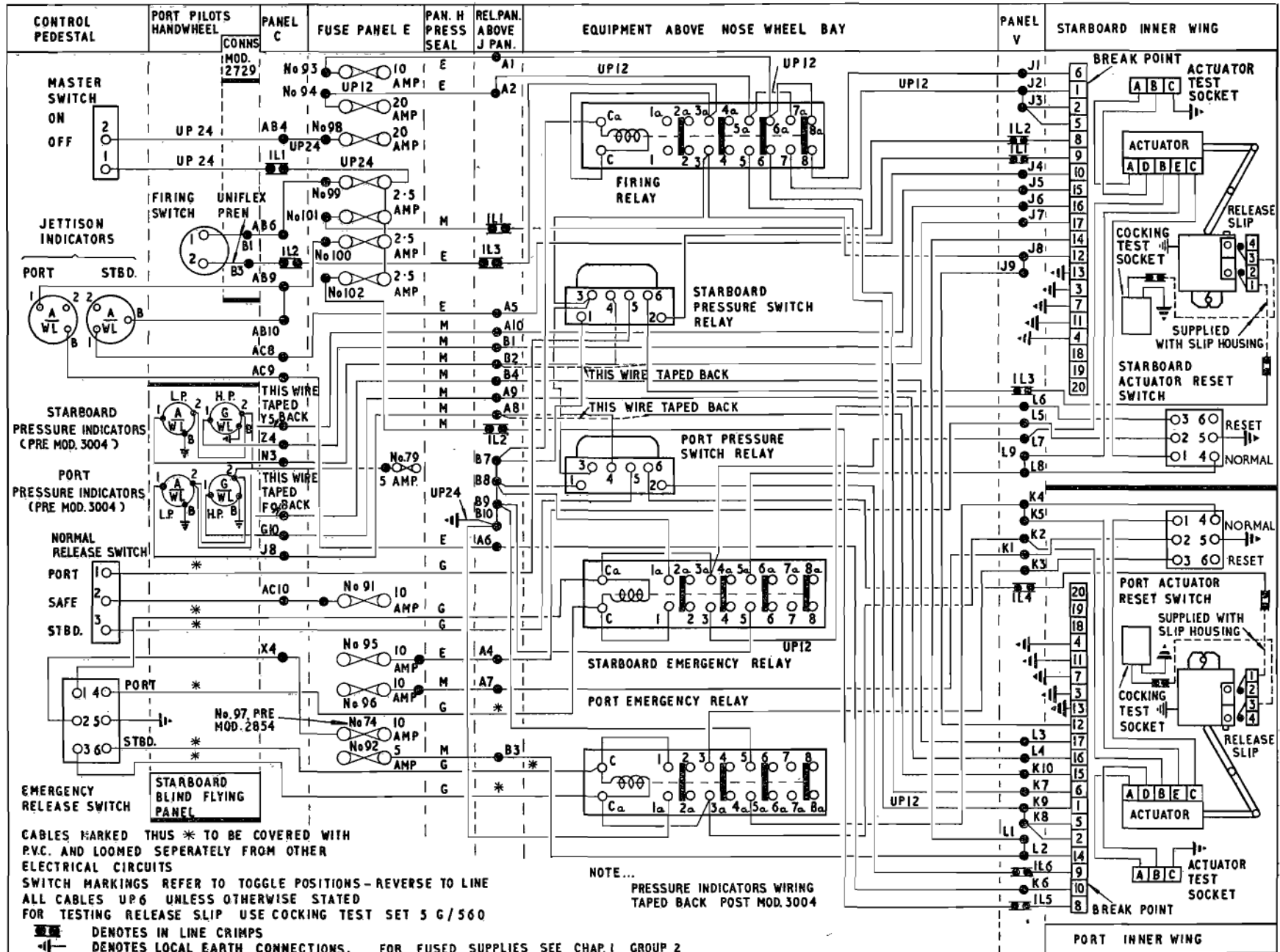


Fig. 3 R.A.T.O.G. (post Mod. 2330 or 2331)

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11. Contacts R2/2 and R2/3 of the firing relay open in the 'close' circuits to the Sprite unit fuel valve actuators (pin 6) and contacts R2/4 and R2/5 close to connect separate supplies from panel E to the fuel valve actuators 'open' fields (pin 5) and thence to the armatures and brake solenoids, and also to the Sprite unit firing solenoids (pins 1 and 2 in parallel).

12. The negative returns from the fuel valve actuators are carried back into the aircraft via connectors pin 7 and thence to earth and the negative returns from the firing solenoids are carried back into the aircraft via connectors pin 3. The limit switches in the fuel valve actuators break the supply when the limit of travel is reached.

13. The unit is now firing. Whilst firing commenced the Sprite unit low pressure switch contacts will have changed over and the supply to the pressure switch relays R1 will be broken. These relays, thus de-energized, open their contacts R1/2 to isolate the normal release circuits so that the Sprite unit cannot be released from the aircraft by the normal system whilst the firing is in progress and close their contacts R1/1 to connect the supply from the low pressure switch to the LOW PRESSURE (amber) indicator lamps on the starboard coaming panel.

Note . . .

During single engine ground firing both port and starboard LOW PRESSURE (amber) indicator lamps will come on when the low pressure switch contacts make but only the relative HIGH PRESSURE indicator lamp will come on. This also applies during circuit-ary testing (Appendix 1).

14. When full thrust is available, the high pressure switches in the unit close to connect supplies from panel E to the HIGH PRESSURE (green) indicator lamps on the starboard coaming panel (pins 14 and 16). Wiring is provided on the aircraft for "Desynn" type thrust indicators which may

replace the pressure indicator lamps at a later date. Where wiring for these "Desynn" indicators is not utilized for the existing pressure indicator lamps, it is taped back.

15. When firing is completed, both HIGH and LOW PRESSURE indicator lamps will go out; the pressure switches will have reset when the nitrogen pressure fell below a pre-determined value. On resetting the low pressure switches break the hold-in supply to the firing relay R2 (via connector pins 8 and 12) and make the circuits to the pressure switch relays R1 (via connector pins 8 and 9) thus preparing the circuit for releasing the units by the normal release system.

16. The firing relay, thus de-energized, opens its contacts R2/4 and R2/5 in the fuel valve actuators 'open' and firing solenoid circuits, and closes its contacts R2/2 and R2/3 to connect the supplies from panel E to the fuel valve actuators 'close' fields and thence to the armatures and brake solenoids; the negative returns are taken back to earth inside the aircraft via connectors pin 7. The fuel valves are then closed and the firing solenoids de-energized. The actuator internal limit switches break the supply to the actuators when the limit of travel is reached.

Normal release

17. When both the HIGH and LOW PRESSURE indicators go out, the units are ready to be released. When firing is completed, the pressure switches in each unit reset and the supply to the pressure switch relay coils R1 from the MASTER switch at ON is re-connected. Contact R1/2 of these relays close to prepare the circuit to the release slip armatures.

18. The NORMAL RELEASE switch has two positions, PORT and STARBOARD, and is spring-returned to the central (off) position, so that only one unit can be released at a time. When the switch is selected STARBOARD and held, a supply from panel E is

connected through contacts R1/2 of the starboard pressure switch relay to the starboard release slip armature. The slip, thus energized, operates to release the Sprite unit. The switch is then selected to PORT to release the port Sprite unit in a similar manner.

19. As the Sprite units fall away, the negative return circuits from the jettison indicators are broken by the supply connector pins 10 and 11 as the plugs are snatched out. The indicator lamps go out as indication that the units have left the aircraft.

Emergency release

Note . . .

This circuit is not interlocked with the firing circuits.

20. In case of emergency, during firing, or in case of failure of the normal release system, the units can be released by the emergency system. The EMERGENCY RELEASE switch has two positions, PORT and STARBOARD, and is spring-returned to the central (off) position.

21. When the EMERGENCY RELEASE switch is selected STARBOARD and held, a supply from panel E is connected via terminals 2-1 of the switch to coil R3 of the starboard emergency relay, Type S4, mounted on the panel above panel J, and also to the 'open' field of the starboard emergency release actuator and thence through its armature and brake solenoid to the contact R3/1 of the emergency relay. The negative return from the starboard emergency relay coil R3 is completed via terminals 4-5 of the switch.

22. The emergency relay is thus energized and closes its contacts R3/1 and R3/2 to complete a hold-in circuit to its coil R3 so that the port unit is jettisoned without having to wait until the starboard unit falls

away; contact R3/1 is in the negative circuit and contact R3/2 connects the positive hold-in supply from panel E via terminals 2-3 of the starboard actuator RESET switch at NORMAL.

23. Contact R3/3 of the emergency relay completes the negative return circuit from the emergency release actuator. The actuator operates a lever system to depress the mechanical release plunger on the release slip, the jaws of which are thus opened to release the Sprite unit. The actuator internal limit switches will break the supply when the limit of travel is reached. The actuator will remain in the open position until the aircraft returns to base and the RESET switch can be selected RESET.

24. As the Sprite unit falls away, the negative return circuit from the jettison

indicator is broken by the supply connector pins 10 and 11 as the plug is snatched out. The indicator lamp goes out as indication that the unit has left the aircraft.

25. Selecting the EMERGENCY RELEASE switch to PORT releases the port Sprite unit in a similar manner.

Emergency release reset

26. If the emergency release system has been used, the actuators and associated relays cannot be reset in flight. These circuits are reset by using the ACTUATOR RESET switches after the aircraft has returned to base. These switches are mounted between the jet pipes near the hoist positions and have two positions, NORMAL and RESET and are spring-returned to the NORMAL position.

27. When the STARBOARD ACTUATOR RESET switch is selected RESET and held, the hold-in supply to the emergency relay R3 is broken by terminals 2-3 of the switch. The supply from Fuse 95, panel E is now connected by terminals 2-1 of the switch to the actuator 'reset' field and thence through the armature and brake solenoid and terminals 4-5 of the reset switch to earth. The actuator will now reverse to release the slip mechanical release plunger. The internal limit switches of the actuator will stop the actuator when the limit of travel is reached, the supply being connected by the limit switch to the test socket pin B.

28. A test box connected at the emergency actuator test point can be used to ascertain that the actuator is in the 'reset' position. The reset switch can then be returned to NORMAL.

SERVICING

◀WARNING

Voltages in excess of 100 volts, either a.c. or d.c. can be dangerous under certain circumstances. Personnel should therefore ensure that the electrical system is, electrically safe before any servicing is attempted. Where it is essential that tests or adjustments be made with the electrical power switched on, the greatest care must be exercised.▶

Introduction

29. Reference should be made to the General Information Group at the beginning of this Section, immediately following the Sect. 5 marker card. This group gives routine servicing instructions and fault finding procedures.

30. Circuit checking is carried out with the aid of a test box (Mod. GE.2565). For details of this box and of the testing procedures refer to appendix 1 of this group. This box is also to be used for checking the

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system before loading the R.A.T.O.G. units.

◀31. Before testing the circuits the aircraft has to be fitted for carrying the R.A.T.O.G. units, i.e. the release units housings and release units will have to be fitted according to instructions contained in Book 1, Sect. 4, Chap. 7. Details of the release unit and its housing is contained in Book 3, Sect. 4, Chap. 7.▶

32. If an E.M. release unit connector (fitted to the release unit housing) has to be replaced, the two cables to it have to be cut at the in-line crimps and the crimps removed altogether. These crimps are situated at the inboard face of the rib station 45 adjacent to the forward face of the rear spar. The E.M. release unit housing has then ▶to be removed (see *Book 1, Section 4, Chapter 7*). The retaining pin securing the▶ connector into the forward face of the housing can then be withdrawn and the connector removed from the housing. The cables can now be drawn completely out of the aircraft.

33. Two six-foot lengths of unipren 6 cable are to be soldered to the replacement connector in the workshops taking care not to damage the moulding with the soldering iron. When refitting, these cables are fed through the housing tunnel at rib station 45 and through the grommet in the rib. The cables should then be passed through the conduit secured to the inboard face of the rib. The connector should then be fitted to the housing and the retaining pin inserted. As the housing is fitted to the aircraft, the cables should be drawn through the conduit until the housing is finally in position. Cut the cables *allowing a minimum free length of 2 feet from the end of the conduit*. Each cable should then be connected to the appropriate cable run from the fuselage via the conduit secured to the rear spar. A.M.P. in-line crimps of the correct size should be used for the connection in accordance with A.P.4343, Vol. 1, Sect. 12. The spare length of cable should be securely stowed.

Appendix 1 R.A.T.O.G. INSTALLATION TEST BOX**LIST OF CONTENTS**

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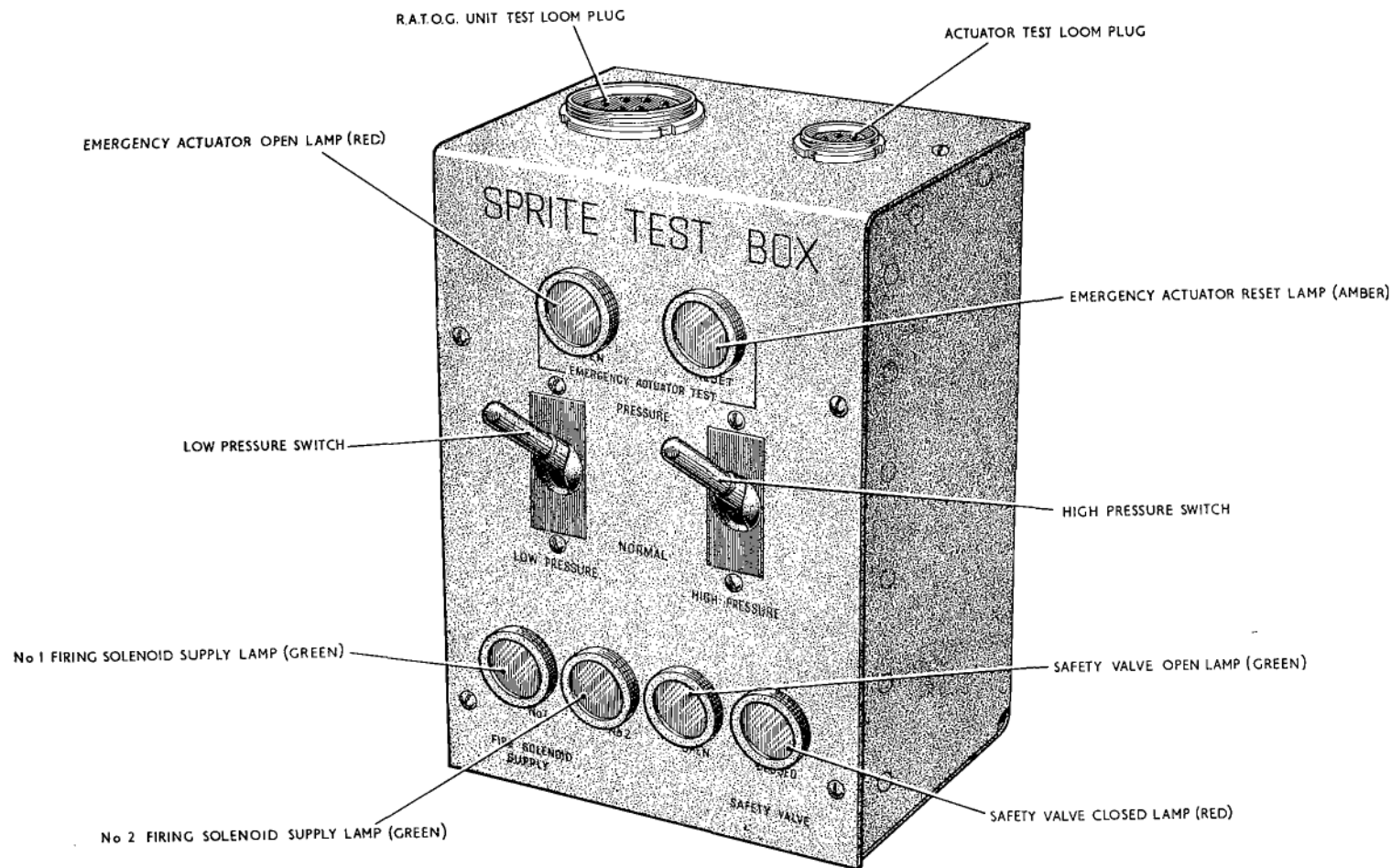


Fig. 1. R.A.T.O.G. test box

DESCRIPTION AND OPERATION

Introduction

1. The R.A.T.O.G. test box is provided to enable a continuity check to be carried out on the aircraft circuit wiring and to check the equipment, incorporated in the aircraft circuit, for correction operation. Fault tracing is therefore simplified.

2. When testing the circuit it is necessary that two operators are employed, one in the cockpit, to make the circuit selections from the aircraft control switches and the other

operator outside the aircraft, to make the test box selections. The two operators must be able to communicate with each other; either by means of the aircraft mic/tel system (using the mic/tel point at the electrical services external supply panel on the port side of the aircraft and the 1st pilot mic/tel point on his ejector seat) or by means of a radio inter-communication set (Main unit, Type 36 (Ref. 10G/20001), Loud speaker unit, Type 10007 (Ref. 10U/17229) and Power battery operated unit, Type 8997 (Ref. 10K/20203)).

The test box

3. When used for testing the circuit, the test box (Valiant Mod. GE.2565) replaces the R.A.T.O. unit. Switches are provided in the test box, to represent the pressure switches contained in the R.A.T.O. unit, and enable the positive supplies to be switched from one part of the circuit to another. The lamps in the test box represent the safety valve actuator and firing solenoid circuits.

Use of the test box

4. When testing the circuit, the test box

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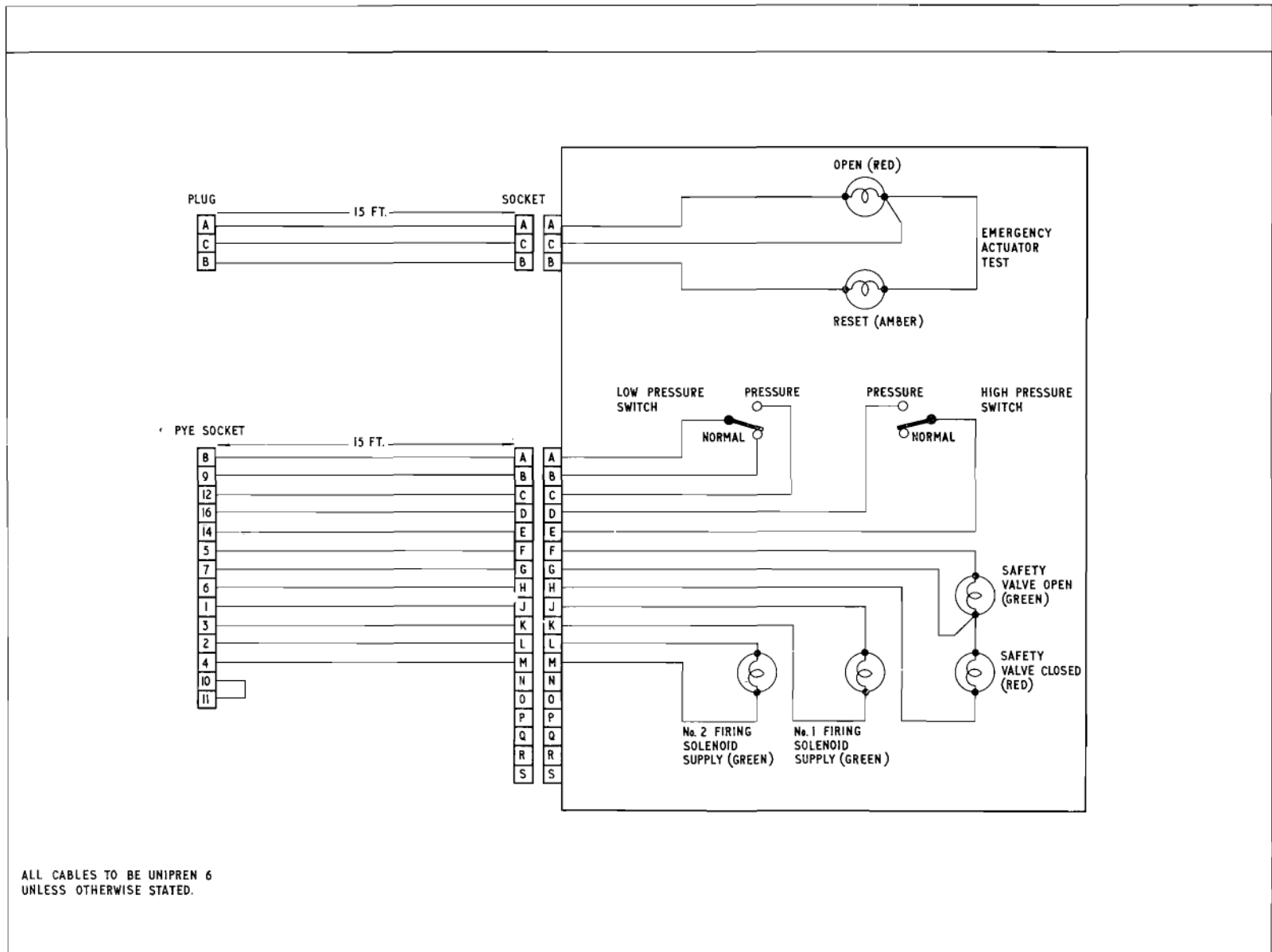


Fig. 2. R.A.T.O.G. test box (wiring)

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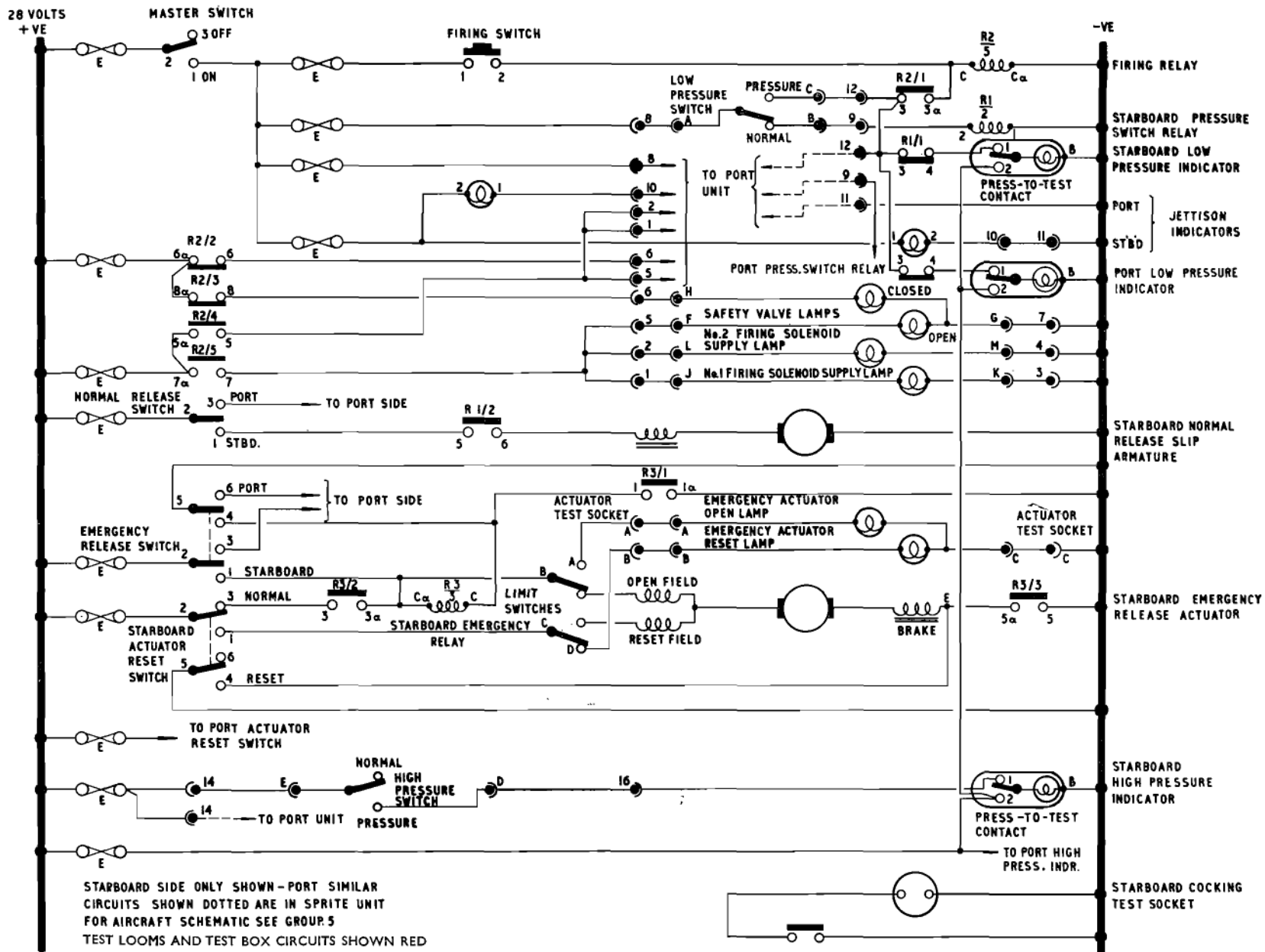


Fig. 3. R.A.T.O.G. Circuit checks

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is connected to the inner wing break point and actuator test socket by means of the test box looms. All circuit function selections are made from the circuit control switches in the cockpit and when made, together with various selections on the test box, will light lamps in the test box to indicate that the associated circuit wiring is correct.

Testing the normal release system

5. Testing the normal release system

- (1) *2nd operator*, outside the aircraft, connects the test box to the 20-pole R.A.T.O.G. connection socket under the inner wings using the appropriate test box lead and checks that the external 28-volt electrical supply is connected to the aircraft.
- (2) *1st operator*, in the cockpit, when instructed by the *2nd operator* selects the R.A.T.O.G. MASTER switch in the cockpit to ON.
- (3) *2nd operator*, checks that the E.M. release unit jaws are closed, and then instructs the *1st operator* to select and hold the NORMAL RELEASE switch in the cockpit to the appropriate side. The E.M. release unit jaws should open. The switch may then be released.
- (4) *2nd operator*, re-closes the E.M. release unit jaws and removes the test box and lead.
- (5) Repeat for the opposite side.

Testing the emergency release system

6. *2nd operator*, removes the appropriate access panel (adjacent to the rear eye bolt socket under the outboard falsework door of the inner plane) and connects the test box to the 3-pole emergency release actuator test socket (on the rib between the jet pipes) using the appropriate test box lead.
- (2) *2nd operator*, then checks that the external 28-volt electrical supply is connected to the aircraft.
- (3) *1st operator*, when instructed by the *2nd operator*, lifts the guard, selects

and holds the EMERGENCY RELEASE switch in the cockpit to the appropriate side.

- (4) *2nd operator*, checks that the OPEN (red) lamp on the test box comes on when the actuator has reached the release position and that the E.M. release unit jaws are open. The *1st operator* can then be instructed to release the switch.
- (5) *2nd operator*, selects and holds the actuator RESET switch adjacent to the actuator test socket to RESET. The OPEN (red) lamp on the test box should go out as soon as the actuator starts to move and the RESET (amber) lamp should come on as soon as the actuator reaches the reset position.
- (6) *2nd operator*, may then release the RESET switch which should spring return to the NORMAL position.
- (7) *2nd operator*, refits the access panel.
- (8) Repeat for the other side.

Testing the R.A.T.O.G. control circuits

7. (1) *2nd operator*, checks that the external 28-volt electrical supply is connected to the aircraft; checks that the release unit jaws are closed, checks that the LOW PRESSURE and HIGH PRESSURE switches on the test box are selected to NORMAL and then connects the test box to the 20-pole R.A.T.O.G. connection socket under the inner plane. The SAFETY VALVE CLOSED (red) lamp on the test box should light.
- (2) *1st operator*, when instructed by the *2nd operator*, selects the R.A.T.O.G. MASTER switch in the cockpit to ON and checks that the appropriate side JETTISON indicator lamp in the cockpit comes on. Each of the pressure indicator lamps should light up when pressed.
- (3) *1st operator*, when instructed by the *2nd operator*, depresses and holds the firing push-switch on the port control handwheel whilst the *2nd operator*

checks the following lamps on the test box:—

Firing solenoid supply (1) (green)	ON
Firing solenoid supply (2) (green)	ON
Safety valve open (green)	ON
Safety valve closed (red)	OUT

The JETTISON indicator in the cockpit should remain ON.

- (4) *2nd operator*, then selects the LOW PRESSURE switch on the test box to PRESSURE, and instructs the *1st operator* to check that both L.P. indicator lamps (amber) in the cockpit come on.
- (5) *2nd operator*, then instructs the *1st operator* to release the firing switch in the cockpit. There should be no alteration to the lamp indications which should be as follows:—

Jettison indicator in cockpit	ON
L.P. indicators (amber) in cockpit	ON
Firing solenoid supply (1) (green)	ON
Firing solenoid supply (2) (green)	ON
Safety valve open (green)	ON
Safety valve closed (red)	OUT
- (6) *2nd operator*, then selects the HIGH PRESSURE switch on the test box to PRESSURE and instructs the *1st operator* to check that the appropriate side H.P. indicator lamp (green) in the cockpit comes on.
- (7) *2nd operator*, instructs the *1st operator* to select the NORMAL RELEASE switch in the cockpit to the appropriate side. The *2nd operator* checks that the E.M. release unit jaws remain closed.
- (8) *2nd operator*, return the HIGH PRESSURE switch on the test box to NORMAL and instructs the *1st operator* to check that the appropriate H.P. indicator lamp (green) in the cockpit goes out.
- (9) *2nd operator*, returns the LOW PRESSURE switch on the test box to NORMAL and instructs the *1st operator* to check that the L.P. indicator lamps (amber)

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in the cockpit goes out and checks the lamps on the test box as follows:—

Safety valve closed (red)	ON
Safety valve open (green)	OUT
Firing solenoid supply (1) (green)	OUT
Firing solenoid supply (2) (green)	OUT

- (10) *2nd operator*, instructs the *1st operator* to select the NORMAL RELEASE switch in the cockpit to the appropriate side and checks that the E.M. release unit jaws open.

- (11) *2nd operator*, then removes the test box lead from the R.A.T.O.G. connector socket and instructs the *1st operator* to check that the JETTISON indicator lamp in the cockpit goes out.

- (12) *1st operator*, returns the R.A.T.O.G. MASTER switch to OFF.

- (13) Repeat for the port side.

Note . . .

Ensure that the jaws of the E.M. release units are left open so that they are ready

to receive the swinging links on the R.A.T.O.G. if it is to be loaded.

SERVICING

Test box

8. Continuity and insulation checks should be carried out periodically on the test box wiring and test looms; at the same time the filaments of the indicating lamps should be checked for serviceability thereby ensuring that the test box is serviceable before testing the aircraft circuit.

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