

## GROUP G — ARMAMENT

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## Introduction

1. The information in this group refers to the whole of the armament systems which may be either collectively or singly used on the aircraft. The individual components used are described in the specialist Air Publications listed as follows.

Equipment	Air Publication
Micro switch Type 1A	4343C, Vol. 1, Sect. 1 Chap. 4
Control column handle Type AC.1400	4343X, Vol. 1, Sect. 7 Chap. 1
Relay Type P1	4343C, Vol. 1, Sect. 3, Chap. 3
Relay Type S1 and S3	4343C, Vol. 1, Sect. 3, Chap. 8
Suppressor Type F2 and P2	4343C, Vol. 1 Sect. 5, Chap. 10
Voltage regulator Type 22	4343B, Vol. 1, Sect. 1, Chap. 1
G.G.S. retraction unit Type 3 Mk. 3	1275E, Vol. 1, Sect. 6, Chap. 4
Maxiflux gun firing unit	1641E, Vol. 1
Two-way bomb distributor	4343X, Vol. 1, Sect. 3 Chap. 1
E.M. release unit, Mk. 1	4343X, Vol. 1, Sect. 5, at a later date
Carrier unit, EM/EF 100/1,000 lb.	4343X, Vol. 1, Sect. 5, Chap. 6
Light series bomb carrier, Mk. 3 and 12	1664A, Vol. 1, Sect. 1, Chap. 9
Four-way auto-selector, Type C2	4343X, Vol. 1, Sect. 3, Chap. 22
Resistance and relay unit	4343X, Vol. 1, Sect. 16 at a later date
Cine camera, G.45B Mk. 3	1355D, Vol. 1, Sect. 1, Chap. 3

## GENERAL SUPPLIES

### Description

2. To avoid duplication of certain components in the armament system illustrations, the components forming the core of the system are shown in fig. 2 of this group. In certain instances duplication is still necessary on some illustrations; the duplicated wiring in these cases is shown dotted.

3. Each armament service, except that for the G.G.S. retraction units, derives its electrical supply via components in the armament services relay panel fitted to the lower forward face of bulkhead 4.

4. Three terminal blocks form a cable break point between the services and the components inside the relay panel; the terminal block connections to the various services are cross-referenced, on fig. 2, with the relevant services routing chart fig. number.

5. Each armament service, except again for the G.G.S. retraction units, is controlled by push-button switches fitted integrally with the straight-type control column handles. The two handles are wired in parallel with each other.

6. All the fuses for the armament services are housed in the armament services junction box which is bolted to the forward face of bulkhead 2, immediately behind the pupil pilot's seat. A wander lamp socket is fitted on this box to allow a 24-volt inspection lamp, supplied from the aircraft batteries, to be used for servicing.

7. An armament safety micro switch, ganged mechanically with the alighting gear nose up-lock and door-lock micro switches, completes the d.c. supply to the control column handle firing push-switches when the alighting gear is locked up.

8. The armament safety micro switch may be shorted out whilst the aircraft is standing on the ground by selecting the ganged camera test switches, fitted to the main instrument panel, to their TEST position. These switches, when at their TEST position, connect a supply only to the cine camera, the

cannons, bombs and R.P. circuits being then open-circuited. The bombs R.P. switch, however, should not be set to R.P. when testing the cine camera, or the camera caging relay will remain energised after the camera push-switch on the control column handle has been released (*para. 63*).

### Servicing

9. All the components shown on fig. 2 are described in the specialist Air Publications list in para. 1.

### Micro switch setting

#### WARNING

*Before attempting any servicing of the armament system, ensure that NO ARMAMENT STORES are fitted to the aircraft and that the aircraft is rendered electrically safe (Gen. Inf., para 16).*

10. The armament safety micro switch is set simultaneously with the alighting gear nose up-lock and door-lock micro switches (*Group F*).

### Removal

11. The armament safety micro switch is easily removed via the access panel in the nose bay.

12. All components in the armament services relay panel are easily removed once the panel itself has been removed from the forward face of bulkhead 4. To remove the panel remove the nine 2 BA bolts and washers; then suspend the panel from the bulkhead with cord such that the weight of the panel is taken by the cord and not by the panel wiring looms.

13. To remove any component from the armament services junction box, the box must first be removed from the forward face of bulkhead 2 by removing the four retaining 4 BA screws and washers. To gain access to the box the pupil pilot's ejection seat must first be removed.

14. The removal of any switch housed in the straight-type control column handle is described in A.P.4343X, Vol. 1, Sect. 7, Chap. 1.

## G.G.S. RETRACTION UNITS

### Description

15. Each gyro gun sight, described in Chap. 2, Group D of this Section, is mounted on a retraction unit, fitted immediately in front of the main instrument panel, to allow both gyro gun sights to be retracted when not required. When both units are retracted, an uninterrupted forward view is available to each pilot, and a clear path is provided for them should the need arise to use their ejection seats.

16. Each retraction unit is electrically supplied from a 10-amp. circuit breaker fitted to the main instrument panel, the circuit being shown in fig. 3. UP selection of either selector switch, fitted adjacent to each retraction unit, energises the unit's motor to extend the mounting carriage and move the gun sight to its combat position.

17. At the same time a supply is directed via the retraction units, through fuses 20 and 21 in J.B.1 to energise either or both relays fitted to the retraction unit relay panel. Each of these relays supplies fuses 1 and 2, via fuse 3, in the armament services junction box.

18. These are the fuses for both gyro gun sights, fuse 1 supplying  $22 \pm 0.5$ -volts d.c. from the voltage regulator, Type 22, whilst fuse 2 supplies 28-volts d.c. from the aircraft generator system. The retraction units selector switches therefore also serve as the gyro gun sights selector switches.

19. The retraction unit motors are each controlled by an integral limit switch. When the retraction unit is down contacts C-D of the limit switch are made creating a closed circuit from the motor and effecting regenerative braking.

20. Provision for emergency retraction is afforded by a black and yellow painted knob on the right of each retraction unit. The rod, when pushed forward, operates a push-rod coupled to the mechanical release mechanism.

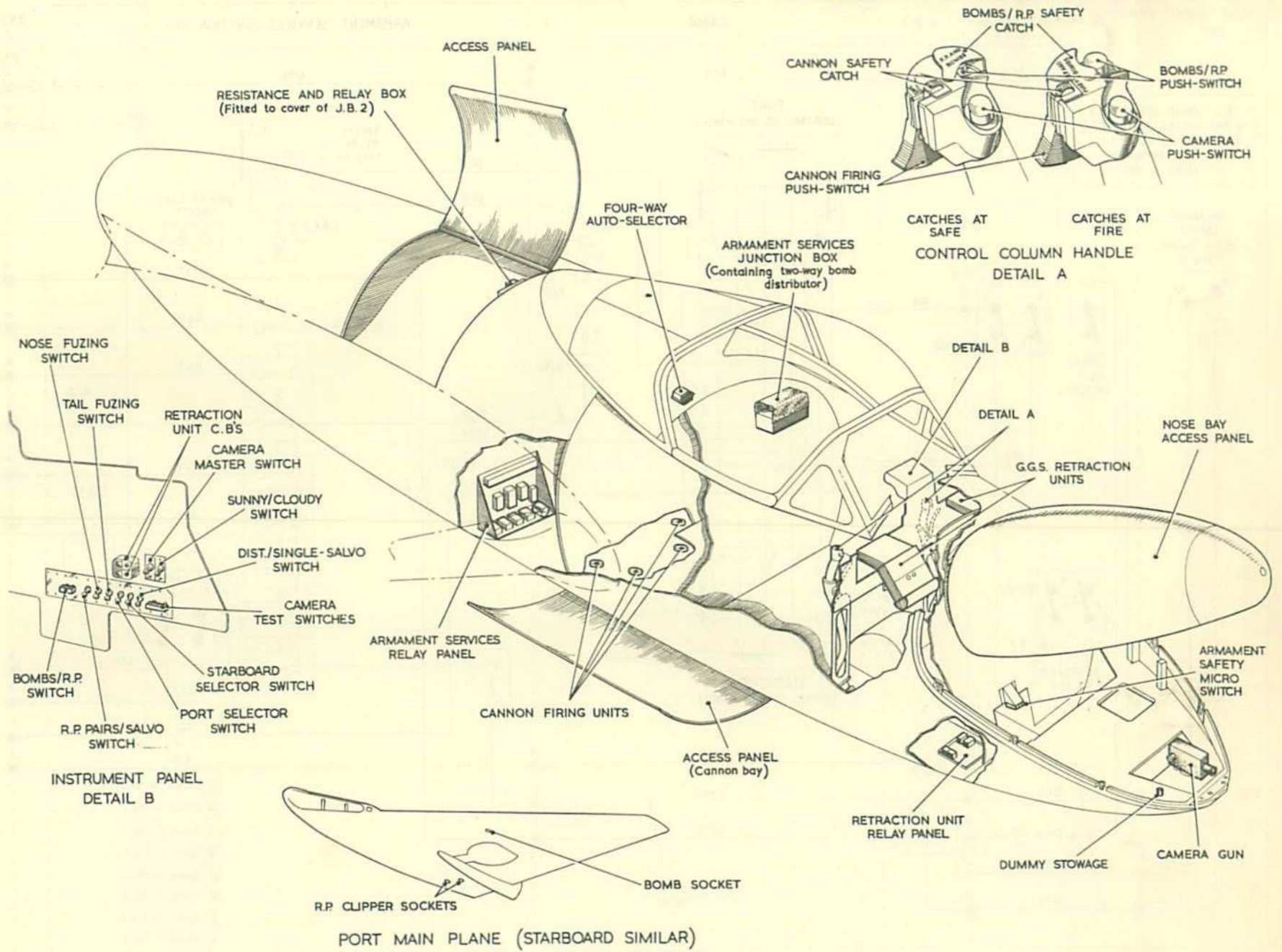
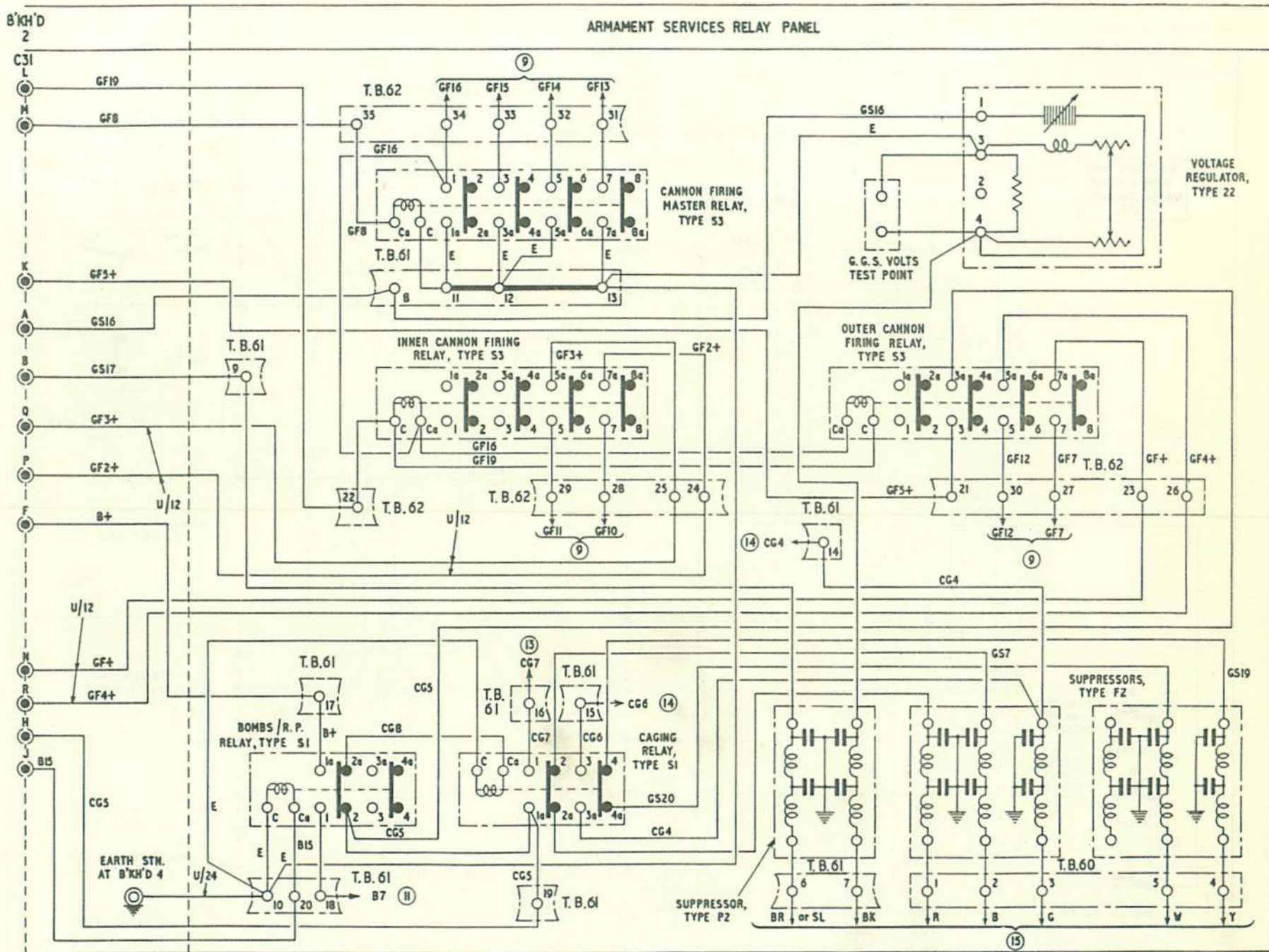


Fig.1. Location and access of components





supplies - B, RP, GS, CG, GF

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21. The knob must be struck smartly with the palm of the hand to break the 18 s.w.g. copper wire locking the push-rod to the retraction unit's side frame. A gravity lock mechanism secures the movable carriage in the down position.

#### Servicing

22. The retraction unit and relays employed in the circuit are described in the specialist Air Publications listed in para. 1.

#### Removal

23. To remove either retraction unit the following sequence of operations is recommended:—

- (1) Run the retraction unit to its combat position, and trip the circuit breaker on the instrument panel to maintain the combat position of the unit. Render the aircraft electrically safe (*Gen. Inf., para. 16*).
- (2) Disconnect the gyro gun sight and, on the port mounting only, the recorder camera socket.

#### Note . . .

*The range-control and gyro-and-optics plugs are identical in form, and could therefore inadvertently be wrongly coupled: the former is therefore marked in RED and the latter in GREEN, their mating sockets being marked accordingly.*

- (3) Give the gun sight locking pin on the rear of the unit a quarter turn, and pull out. Now unscrew the star nut holding the gun sight to the mounting base plate and remove the sight.
- (4) Remove the selector switch from the unit to afford clearance when lowering the instrument panel. Release the instrument panel by unlocking the six Oddie fasteners, lower the panel rearward and downward on its hinges and disconnect the strain wires from their attaching key-rings at the top of the panel to allow further clearance.
- (5) Disconnect the gyro gun sight (and, port only, camera recorder) socket and the ten-way terminal block from the unit.

- (6) At the base of the windscreen remove the locking wire and nuts from the two bolts, and withdraw the bolts.
- (7) Uncrew the Simmonds nut from the forward fixing bolt, and withdraw the bolt.
- (8) Withdraw the retraction unit from its location taking care not to foul or damage any other items of equipment.

24. Refitting is the reverse of removal. It is advisable to check the following before and after refitting:—

- (1) BEFORE: Ensure that the retraction unit motor is at the combat position, and that the jettison handle is wire-locked with 18 s.w.g. copper wire in its normal position.

#### WARNING

*The motor must not be operated while the unit is in its jettison retracted position.*

- (2) AFTER: Check the function of the mechanical jettison operation of the unit WITHOUT the gyro gun sight fitted. Reset the unit, re-lock the jettison handle and fit the gyro gun sight. Carry out an electrical functional test of the retraction unit, gyro gun sight (*Chap. 2, Group D*) and camera recorder. The gun sight must now be harmonized (*Sect. 7, Chap. 3*).

#### CANNON FIRING

##### Description

25. The provision for, and installation of, the cannons is described in Sect. 7, Chap. 3. They are electrically fired, being fitted with electrical Maxiflux sear mechanisms. The firing circuit is controlled by an armaments safety micro switch (*para. 7*).

26. To fire the cannons the safety catches on BOTH control column handles must be set to FIRE (*fig. 2*). The catch on the instructor pilot's control column (*starboard*) handle completes the circuit to energise the safety relay, whilst the catch on the pupil pilot's control column (*port*) handle conducts a supply to energise the cannon

firing master relay, via the safety relay, to complete the negative return for all four Maxiflux cannon firing units.

27. Pressure on either cannon firing push-switch will then complete the circuit to energise the inner and outer firing relays, provided the outboard cannons isolating switch fitted to the armament services junction box has been selected, and all cannons will fire deriving their supplies from the firing relays. The firing units' supplies are shown theoretically on fig. 5. The cine camera circuit is inter-connected with the cannon firing circuit (*para. 62*).

#### Servicing

28. The Maxiflux firing units are described in the specialist Air Publication listed in para. 1. As a safety measure a plug and socket connection has been installed for each cannon circuit, being bracketed to the rear cannon stirrups in the cannon bay. Before connecting the sockets to the plugs always test the plug poles with a suitable test lamp to ensure that the firing circuit is disconnected.

29. All safety devices, namely the armament safety micro switch, the safety catches on the control column handles and the rear stirrup breaks, should be frequently inspected and maintained in good electrical condition.

30. Periodic functional checks of the circuit should be made using suitable test lamps connected in lieu of the Maxiflux firing units. The method of assembling the socket connectors, for the firing unit cables is detailed in A.P.4343X, Vol. 1, Sect. 13, Chap. 1.

#### Removal

31. Each firing unit is fitted to a base plate by a large serrated wheel-type securing bolt, the plate in turn being secured to the sear housing of the cannon by six set screws. Removal of the firing units should be undertaken only by a qualified Armaments tradesman.

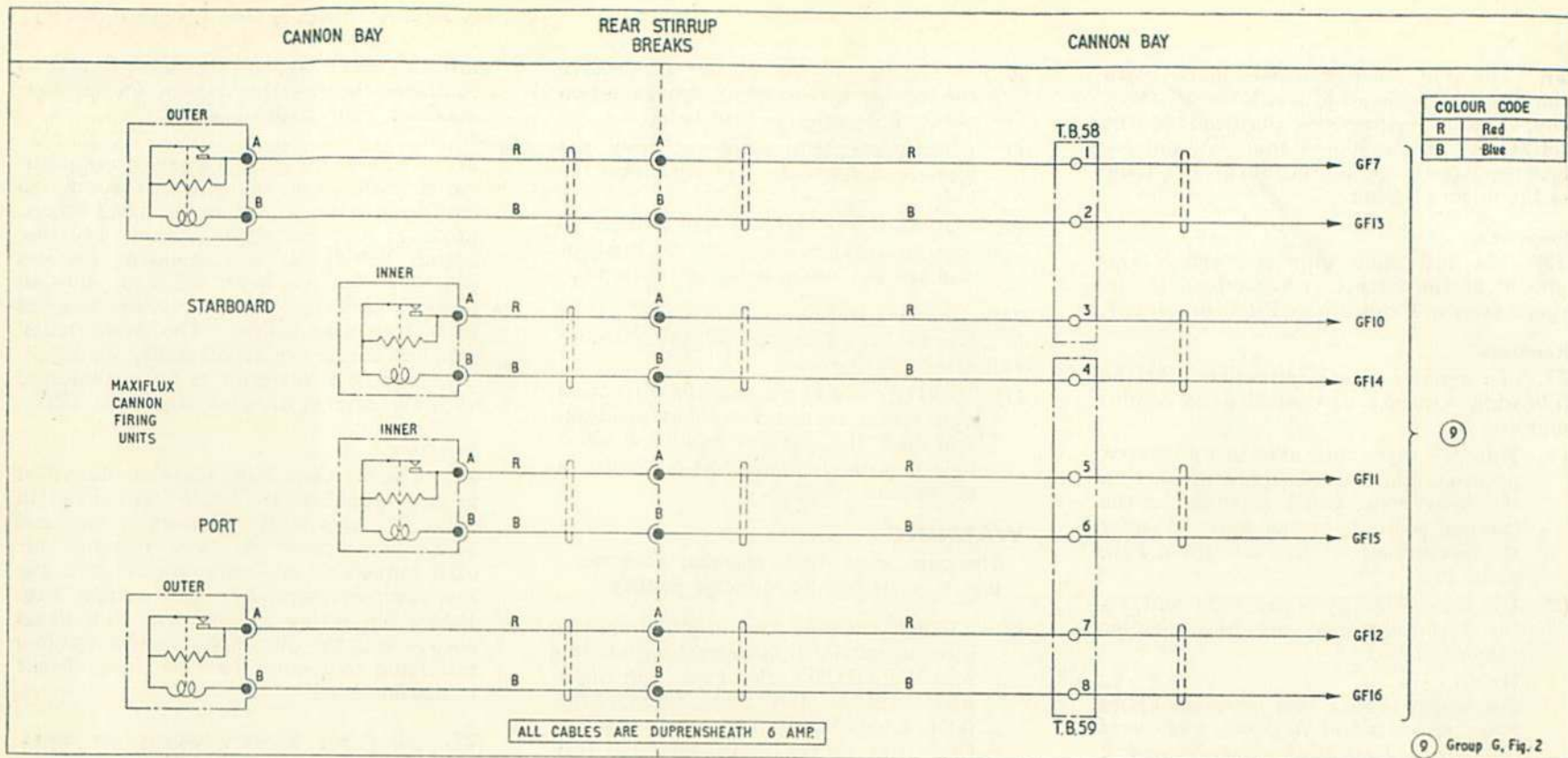


Fig. 4. Cannon firing—GF

### BOMB RELEASE

#### Description

32. Sect. 7, Chap. 4 describes the provision made for carrying bombs. The standard provision is for a 100/1,000 lb. bomb beam attached to a mechanical release unit built into the wing outboard of the wheel well. This arrangement is illustrated in Sect. 7, Chap. 4.

33. A light-series bomb carrier may be fitted to the 100/1,000 lb. bomb beam, allowing small practice bombs to be carried.

34. The built-in mechanical release unit is actuated by selection of a handle located between the pilots' seats. When the 100/1,000 lb. bomb beam has been coupled to the mechanical release unit, it should be

electrically connected to the seven-pin clipper socket fitted to the lower wing skinning.

35. When the bombs are to be dropped, pressure on the BOMBS/R.P. push-switch on either control column handle will energise the bombs/R.P. relay via the camera test switch, this switch being selected to NORMAL.

36. With the bombs/R.P. relay energised, a supply from fuse 10 (fig. 8) in the armaments services junction box will be conducted to the BOMBS/R.P. selector switch, fitted to the instrument panel, via contacts 1-1a of the bombs/R.P. relay.

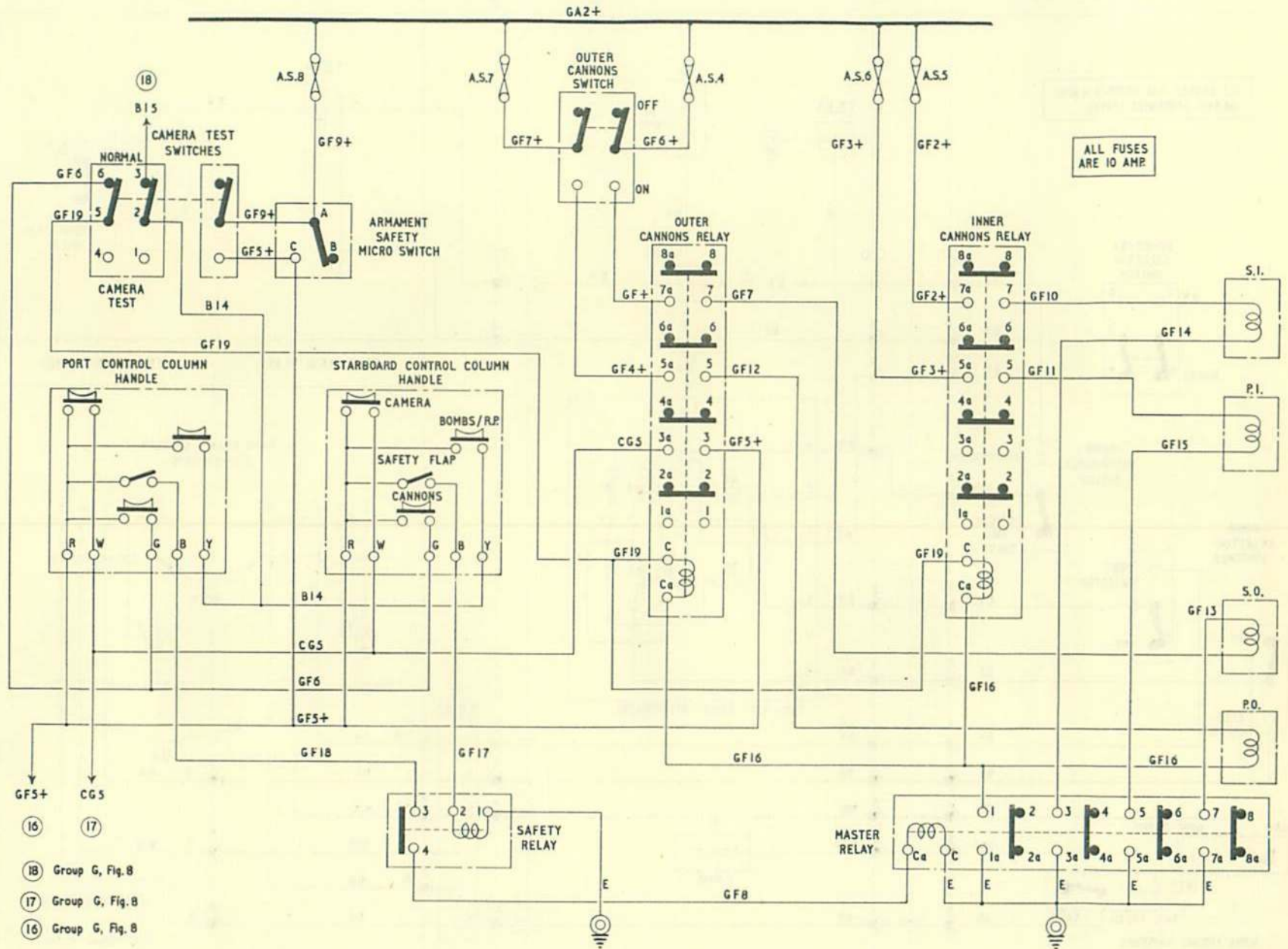
37. With this switch set to BOMBS, coil

R1 of the two-way bomb distributor will be energised, closing contacts M1 and thereby releasing the port or starboard bombs, or both simultaneously, as selected by the individual bomb selector switches fitted to the instrument panel.

38. With the distributor switch and both selector switches closed, operation of either BOMBS/R.P. push-switch will release the port bomb followed by the starboard bomb after a pre-determined time delay of 0.3 sec. This time delay is due to the slugging of the relays in the two-way bomb distributor.

39. Two conventional fusing units, nose and tail, are fitted inside each 100/1,000 lb. bomb beam, and are controlled by individual switches on the instrument panel.

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- (16) Group G, Fig. B
- (17) Group G, Fig. B
- (18) Group G, Fig. B

Fig. 5. Cannon firing theoretical

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(A.L. 51, Aug. 57)

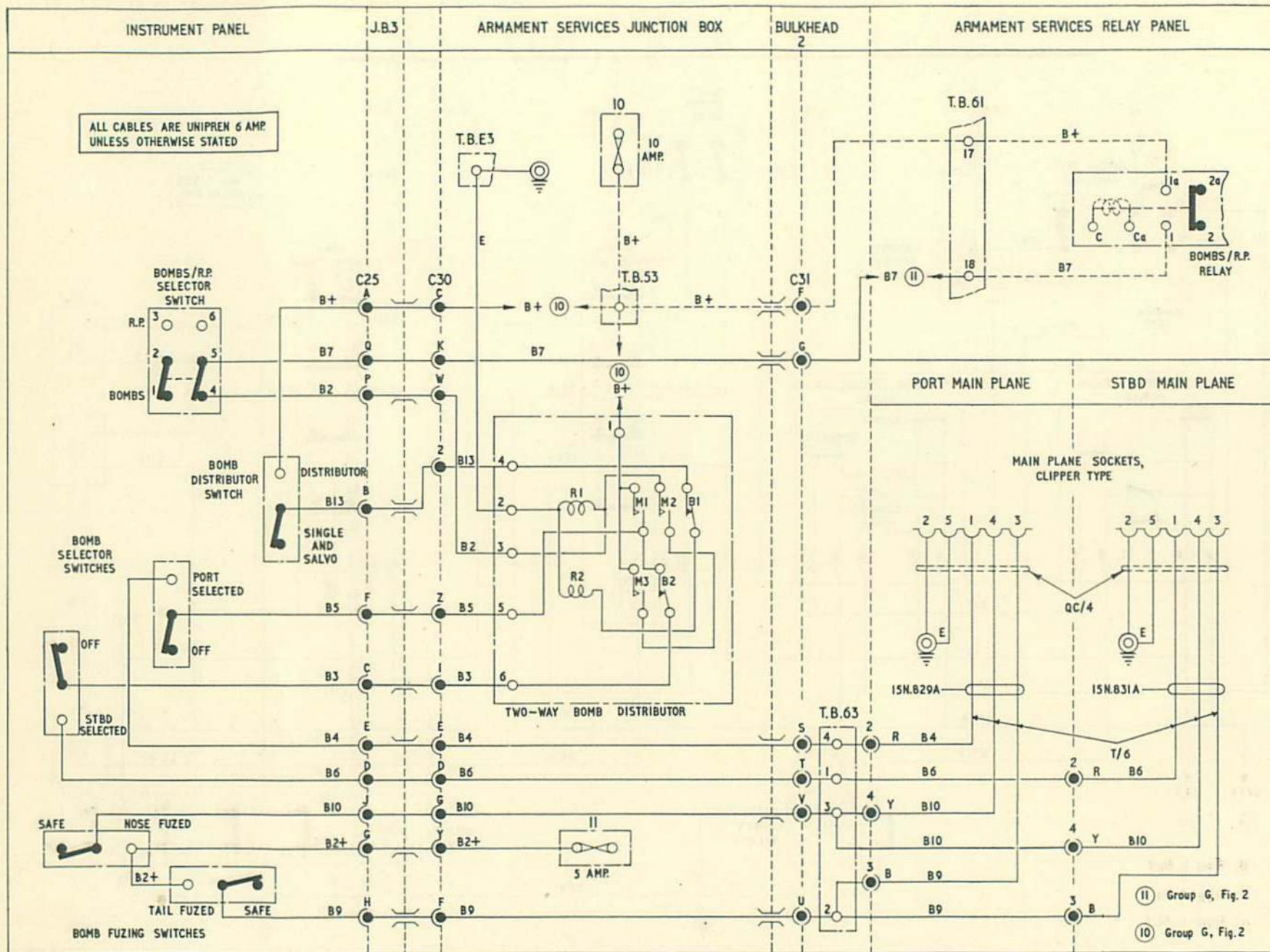


Fig. 6. Bomb release-B  
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40. When light-series bomb carriers are fitted to the 100/1,000 lb. bomb beams the rotary switch on each bomb beam must be set to its s.B.C./s.C.I. position, and the two-pole plug of the bomb carrier mated with the two-pole socket of the bomb beam. An adaptor, Mk. 3 (A.P.1664A, Vol. 1, Sect. 2, Chap. 5), is required to allow the light-series bomb carrier, Mk. 3 or Mk. 12, to be fitted to the 100/1,000 lb. bomb beam.

41. When light-series carriers are fitted the sequence of dropping the practice bombs from each carrier is controlled by a four-way auto-selector switch which forms part of the carrier, the normal bomb selector switches on the instrument panel controlling the supply to the particular carrier only. The practice bombs are manually fuzed before take-off.

42. The light-series carrier cannot be electrically jettisoned. The bomb beam may be jettisoned by operating the handle in the cabin, so actuating the mechanical release unit. This handle is annotated DROP TANKS JETTISON LEVER.

#### Servicing

43. The components in the bomb circuit and installation are described in the specialist Air Publications listed in para. 1. The cable insulation resistance to earth should be periodically tested as a separate circuit, the reading obtained to be not less than 500,000 ohms. The cables and wing clipper sockets must be maintained in good condition and kept free from moisture.

44. A functional test of the mechanical release unit can be carried out by suspending from the release jaws weighted eyes of the type specified for testing the fuel drop tank release mechanism (Sect. 4, Chap. 2).

#### Removal

45. The removal of the two-way bomb distributor fitted in the armament services junction box is described in para. 13, whilst the mechanical release unit must be removed

in collaboration with the engine tradesman (Sect. 4, Chap. 2).

### R.P. FIRING

#### Description

46. Sect. 7, Chap. 2 describes the provision and the method of attachment to the aircraft or rocket projectiles. Eight projectiles may be carried, four beneath each main plane in banks of two.

47. The projectiles are electrically fired, being connected to the saddle attachments on the main plane by pig-tail electrical connections; the saddles in turn are electrically connected to the main plane by three-pole plugs.

48. The routing chart is shown in fig. 7. The firing circuit consists of the BOMBS/R.P. push-switch on the control column handle and the bombs/R.P. relay fitted in the armament services relay panel.

49. The selection control circuit includes the BOMBS/R.P. and PAIRS/SALVO selector switches fitted to the main instrument panel, a four-way auto-selector switch unit fitted to the cabin canopy decking, a relay and resistance unit fitted to the cover of junction box 2, the safety breaks in the wheel wells and the three-pole sockets at the R.P. saddle connections in the main planes.

50. Pressure on the BOMBS/R.P. push-switch on the control column handle completes the circuit to energise the bombs/R.P. relay via the camera test switch, this switch being in its NORMAL position. This relay, when energised, connects a supply, via its then closed contacts 1-1a, from fuse 10 in the armament services junction box to the BOMBS/R.P. selector switch.

51. With the switch closed to R.P. the supply will then be conducted to the auto-selector switch, and thence in sequence to the resistance and relay unit, through the safety breaks to the main plane sockets and thence to the projectiles.

52. With the auto-selector set to No. 1 the first depression of the BOMBS/R.P. push-switch will fire the outer-lower projectile on each main plane. Successive operations of the push-switch will then fire the outer upper, inner-lower and inner-upper projectiles, respectively.

53. If the pairs/salvo switch has been closed the relay in the relay and resistance unit will be energised and, with the auto-selector again set to No. 1, the first depression of the BOMBS/R.P. push-switch will fire all the lower projectiles; the next depression of this push-switch will fire all the upper projectiles. The projectile firing and selector circuits are inter-connected with the cine camera circuit (para. 63).

#### Servicing

54. The specialist Air Publications listed in para. 1 describe the equipment used in the R.P. firing system.

55. Periodically, an insulation resistance test to earth of the circuit wiring should be carried out; the reading obtained should not be less than 200,000 ohms.

56. A functional test may be carried out by fitting suitably mounted test lamps, Stores Ref. 5G/310, to the pig-tail connector of the rear saddles. Check that these lamps light in the correct sequence, as detailed in the previous paragraphs.

#### Note . . .

*The upper connection on each rear saddle is the LOWER R.P. connector.*

57. Prior to connecting the projectiles to the rear saddle pig-tail connectors the following safety procedure is recommended.

- (1) Fit suitably mounted test lamps, Stores Ref. 5G/310, to each rear saddle pig-tail connector. Check that no lamps glow.
- (2) Open the safety break in each wheel well.
- (3) Prior to take-off, reconnect the safety brakes and check that no lamps glow.



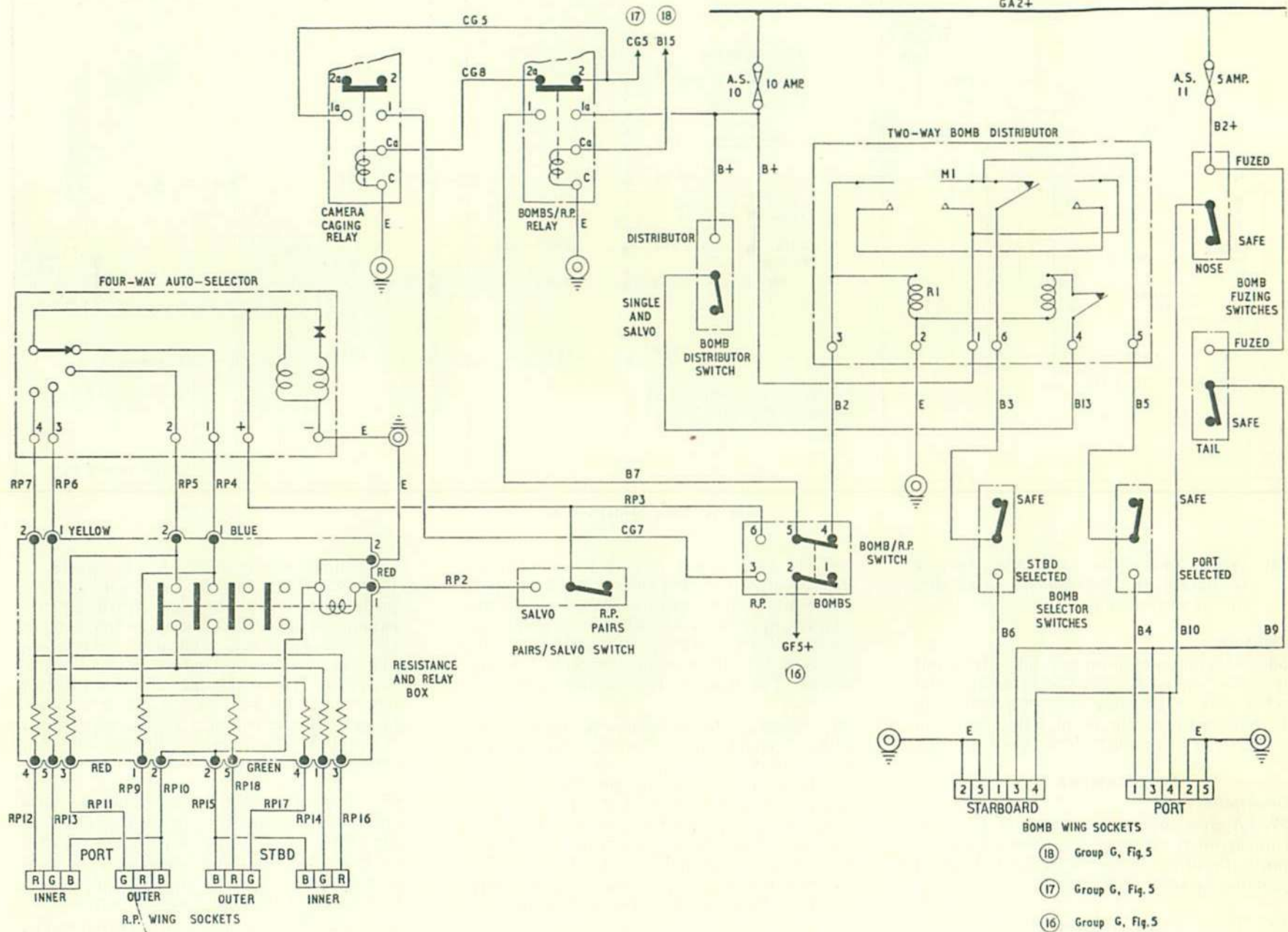


Fig. 8. Bombs/R.P. firing theoretical

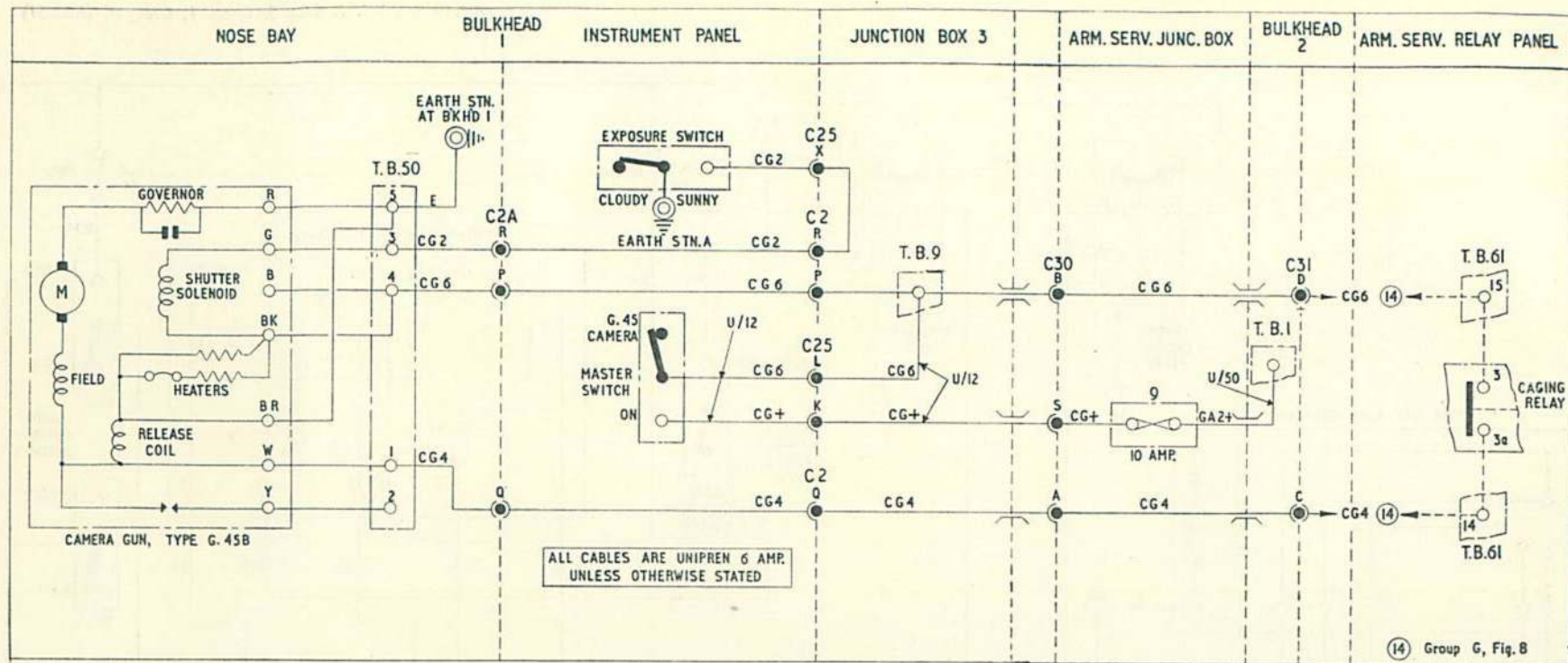


Fig. 9. Cine camera—CG

- (4) When check (3) is satisfactory, remove the lamps and connect the projectiles to the rear saddles.

#### Removal

58. The four-way auto-selector switch unit is easily removed, as is the resistance and relay unit. The latter, however, can only be removed after the lid of J.B.2. has been removed by loosening its four Dzus fasteners.

#### CINE CAMERA

##### Description

59. A cine camera is mounted in the nose compartment to record cannon or rocket projectile firing, or for use as an individual practice attack weapon.

60. The camera is controlled by two selector switches fitted on the main instrument panel. One, the camera master

switch, controls the camera lens and body heater circuits, whilst the other, the camera exposure switch, operates a solenoid in the camera aperture mechanism to provide the choice of two alternative apertures to be selected for either sunny or cloudy conditions. Fig. 9 shows the routing chart.

61. Pressure on the camera push-switch on either control column handle will energise the caging relay inside the armaments services relay panel via contact 1a of the caging relay and 2-2a of the bombs/R.P. relay (fig. 2). With the caging relay energised its contacts 3-3a will consequently be closed to conduct the supply from the camera master switch, when in its ON position, to the camera motor (fig. 9).

62. The camera will automatically function when the cannons are fired, provided

the camera master switch has been selected to ON. Operation of the cannon firing push-switch will, besides operating the cannon firing circuit, actuate the camera, the circuit to close the caging relay being via the armaments safety micro switch, T.B.55 in the armaments services junction box, contacts 3-3a of the outer cannons firing relay and contacts 2-2a of the bombs/R.P. relay. The camera will stop when the cannons firing push-switch is released.

63. During R.P. firing the camera will also automatically function, again provided that the camera master switch has been selected to ON. The duration of running is different to that when the cannons are fired, as will be seen from the following test procedure:

- (1) Select the camera master switch to ON and the BOMBS/R.P. switch to R.P. Press the camera push-switch to

operate the camera in the normal manner; the camera will run.

- (2) On releasing the camera push-switch the camera will continue to run, as the caging relay now has a retaining circuit. This circuit is supplied from the BOMBS/R.P. switch via contacts 1-1a of the caging relay itself and contacts 2-2a of the bombs/R.P. relay.
- (3) When the R.P.'s are fired and the bombs/R.P. relay consequently energised, its contacts 2-2a will open to discontinue the caging relay retaining circuit. The caging relay contacts 3-3a

will then open resulting in the camera being stopped.

#### **Servicing**

**64.** The camera is described in the specialist Air Publication listed in para. 1, the same publication dealing with magazine loading and installation in the camera.

**65.** The camera may be tested whilst the aircraft is standing on the ground, and the armament safety micro switch contacts consequently open, by moving the camera test switches on the main instrument panel

to the TEST position. These switches short-circuit the armaments safety micro switch, and disconnect all other armament circuits.

#### **Removal**

**66.** A Type 27 mounting is secured to a bracket in the aircraft nose bay by four 0.25 in. bolts and washers. A conventional fit is made between the camera and the Type 27 mounting by a Type 32 adaptor. A dummy stowage is provided for the camera supply socket when the camera is not fitted, the stowage being adjacent to the camera mounting.

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