

GROUP G.I ARMAMENT SUPPLIES AND CONTROL

(CODE GF, GV, GH, BR, BJ and CG)

LIST OF CONTENTS

<i>Equipment employed</i>	<i>Para.</i>	<i>Fuzing</i>	<i>Para.</i>	<i>Camera operation independent of gun firing</i> ...	<i>Para.</i>
Description	1	<i>Release</i>	17	<i>Camera operation with gun firing</i>	26
<i>Gun firing, ventilation and heating</i>	2	<i>Jettison</i>	18	<i>Camera recorder...</i>	27
<i>Operation</i>	7	<i>Cock test</i>	19		28
<i>Engine fuel and air dipping</i>	10	<i>Practice bomb carriers</i>	20	Servicing	
<i>Operation</i>	11	<i>G45B camera</i>	21	<i>General</i>	29
<i>Bomb release, fuzing and jettison</i>	13	<i>Operation</i>	23	Removal and Assembly	
<i>Operation</i>		<i>General</i>	25	<i>General</i>	30
<i>General</i>	16				

LIST OF ILLUSTRATIONS

<i>Gun firing, ventilation and heating (theoretical)</i> ...	<i>Fig.</i>	<i>Bombs release (routing—front fuselage)</i>	<i>Fig.</i>	<i>Inboard pylon stores (routing)</i>	<i>Fig.</i>
<i>Gun firing, ventilation and heating (routing)</i> ...	1	<i>Bombs release (routing—centre fuselage and wings)</i> 5	4	<i>G45B camera</i>	6
<i>Inboard pylon stores (theoretical)</i>	2				7
	3				

Equipment employed

1. The major components employed in the armament supplies and control circuits are listed below, together with the relevant

Air Publications to which reference should be made for a detailed description and the necessary servicing required to maintain them in an efficient condition:—

Gun firing, ventilation and heating

Control column handgrip, Dunlop, Type A.C.14728	...	...	A.P.4343X, Vol. 1, Sect. 7
Micro-switches, Type 4A	...	...	A.P.4343C, Vol. 1, Book 1, Sect. 2
Tumbler switch, S.P./ON-OFF, Type XD443/1 (<i>butt test</i>)	...	...	A.P.4343C, Vol. 1, Book 1, Sect. 1
Inverter, Type 300	...	...	A.P.4343B, Vol. 1, Book 3, Sect. 16
Actuator, Type CZ.72257 (<i>gun ventilation</i>)	...	...	A.P.4343D, Vol. 1, Book 3, Sect. 14
Actuator, Type CZ.72256 (<i>gun heating</i>)	...	...
Thermostat, Type FHO/A/96	...	...	A.P.1275A, Vol. 1, Sect. 24
Relay, Type RH.2/1 (<i>Oliver Pell</i>)	...	...	A.P.4343C, Vol. 1, Book 2, Sect. 3
Relay, Type Q, No. 1 (<i>relay E.1</i>)	...	...
Relay, Type S, No. 9 (<i>relay C.1</i>)	...	...
Relay, Type S, No. 3 (<i>relay F.1</i>)	...	...
Circuit breaker (5A)	...	...	A.P.4343B, Vol. 1, Book 2, Sect. 10

Engine fuel and air dipping

Solenoid, Type X.17096/90	...	...	A.P.4343X, Vol. 1, Sect. 1
Altitude switch, Type PAD/A/O/12	...	...	A.P.1275A, Vol. 1, Sect. 24C
Tumbler switch, D.P./C.O., Type XD491/1 (<i>test</i>)	...	...	A.P.4343C, Vol. 1, Book 1, Sect. 1

Bomb release, fuzing and jettison

Circuit breaker (10A), Type A.2	A.P.4343B, Vol. 1, Book 2, Sect. 10
Tumbler switch, D.P./C.O., Type XD447/1 (<i>bomb/R.P.</i>)	A.P.4343C, Vol. 1, Book 1, Sect. 1
Tumbler switch, S.P./C.O., Type XD442/1 (<i>ripple/normal</i>)	...	...
Tumbler switch, S.P./C.O., Type XD442/1 (<i>in pylon</i>) (<i>practice/normal</i>)	...	...
Pushbutton switch, D.P., Type B (<i>jettison</i>)	A.P.4343X, Vol. 1, Sect. 5
Rotary switch, 3-way, Type B (<i>fuzing selector</i>)	...	...
Slip release units, No. 1, Mk. 1	A.P.4343C, Vol. 1, Book 2, Sect. 3
Fuzing units	...	...
Relay, Type S, No. 1 (<i>relays B and C</i>)	...	...
Relay, Type S, No. 3 (<i>relay A</i>)	A.P.4343C, Vol. 1, Book 2, Sect. 3
Relay, Type S, No. 3 (<i>relays S and U</i>)	...	...

Camera gun

Camera G.45B, Mk. 3	...	...	A.P.1355D, Vol. 1, Sect. 1
Tumbler switch, S.P./ON-OFF, Type XD779/3	...	...	A.P.4343C, Vol. 1, Book 1, Sect. 1
Tumbler switch, S.P./ON-OFF, Type XD443/1	...	...
Camera recorder, Mk. 3	...	...	A.P.1355D, Vol. 1, Sect. 3

DESCRIPTION

Gun firing, ventilation and heating

2. The 30 mm. Aden guns are controlled and fired electrically, via a junction box on each gun, the firing operation being actuated by a trigger-operated switch located on the forward face of the control column handgrip. The handgrip also contains two push-switches and a tail plane switch. Both push-switches are located at the top of the handgrip, under two spring-loaded flaps. One switch of the pair is used to operate the camera gun independently of the guns and the other is used for bomb release. The flap over the camera gun switch forms a gun safety catch and must be lifted before the guns can be fired. The flap is, however, cut-away locally to enable the camera switch to be pressed, as desired, without lifting the flap.
3. The supply to the camera, safety and gun firing switches is taken through an easily accessible safety plug located in the port stub wing and through two alighting gear compression switches located one on each main undercarriage leg. When disconnected, the safety plug renders all the armament services inoperative. The compression switches are provided to prevent the guns being fired, the camera operated or the bombs released while the aircraft is on the ground. These switches may, however, be overridden, when it is required to fire the guns at the butts, by use of an armament ground test switch (*butt switch*) located on the cabin starboard shelf.
4. The gun firing current is provided by an inverter. The input and output of the inverter is taken through the safety relay E.1 which is controlled by the safety flap switch on the control handgrip. The output from the inverter, via relay E.1, is taken to the guns through the firing relay F.1 which is energized by the gun firing trigger switch, via a slugged relay located in the gun firing and engine control relay box in the radio bay. The firing relay is also linked with the gun ventilation circuit (*para. 5*). The

inverter, circuit breaker, and relays E.1 and F.1 are all mounted on the gun firing panel located in the radio bay.

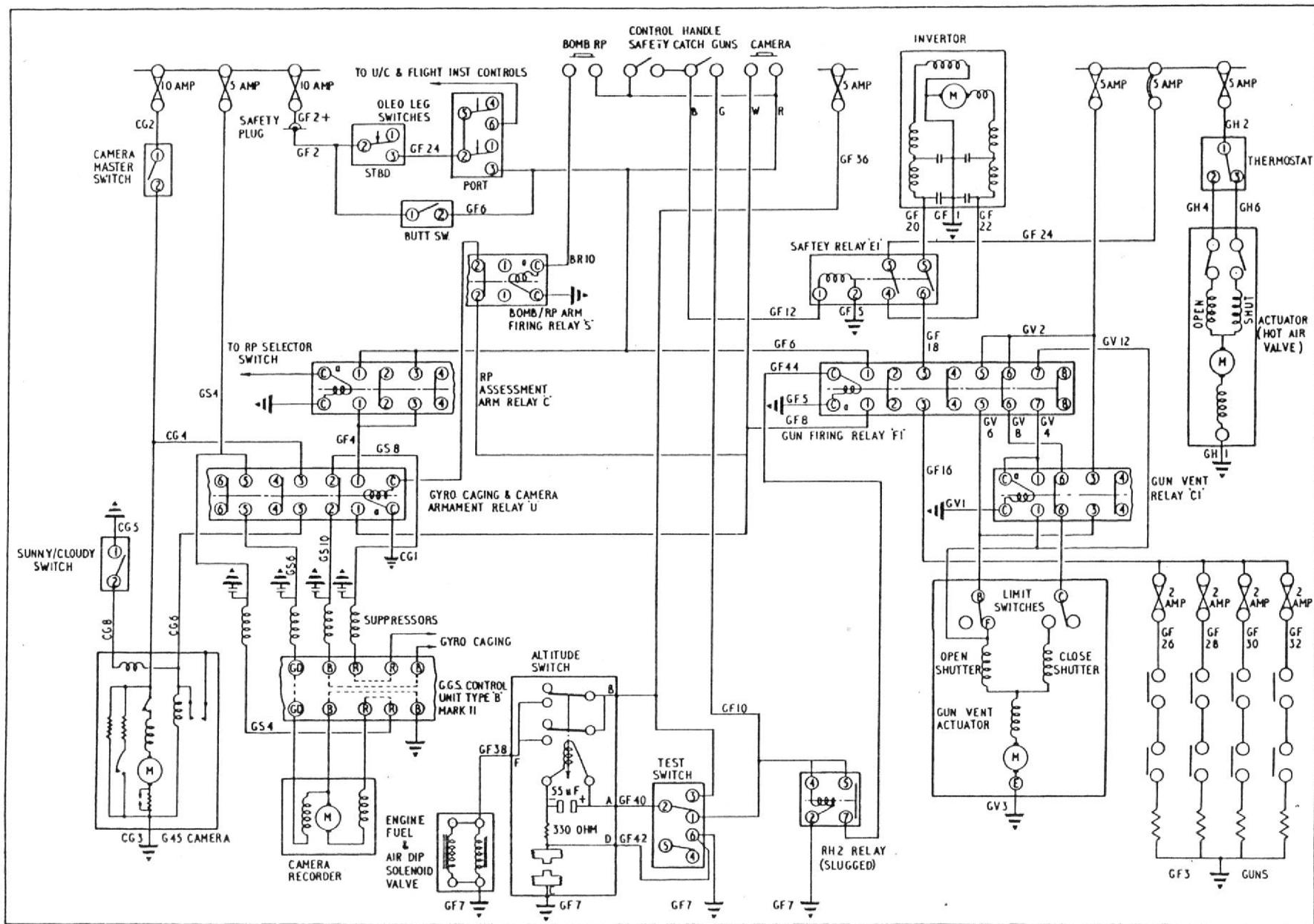
5. The gun package is automatically ventilated whenever the guns are fired, by the opening of a small shutter incorporated in a gun access door located in the undersurface of the front fuselage between frames 11 and 12. This shutter is opened and closed by an actuator also mounted on the access door. The supply to the actuator is taken through the contacts of relay C.1, which is also located on the gun firing panel and controlled by relay F.1. The ventilation shutter must be fully open in 3.5 seconds after the commencement of the guns firing and close in 3.5 seconds after the end of the guns firing.
6. The guns are heated by hot air taken from the engine compressor. The supply of air to the gun package is controlled by a hot air valve, which is operated by an actuator controlled by a thermostat. The hot air valve actuator is mounted on the forward face of frame 19 in the radio bay and the thermostat is located in the gun package.

Operation

7. As the aircraft becomes airborne, the weight is taken off its alighting gear, thus allowing the compression switches on each main undercarriage leg to make contact and, with the safety plug connected, feed the positive supply to the switches in the control column handgrip. When it is required to fire the guns, it is first necessary to raise the safety flap. This completes the circuit to the firing trigger switch and also energizes the safety relay E.1. Relay E.1 controls the input to and output from the gun firing inverter and, when energized, allows the main positive supply from the circuit breaker to energize the inverter, via one set of contacts. The output from the inverter is fed to the firing relay via the other set of contacts. As the firing trigger is pressed, it closes the firing switch to energize the slugged relay (*para.*

11), the contacts of which complete the supply to the coil of the firing relay. When the firing relay is energized, its contacts 3-3a complete the circuit from the inverter and safety relay to the guns and the guns fire. At the same time, the gun ventilation shutter commences to operate (*para. 8*) and the camera gun operates to photograph the target (*para. 23*). When the firing trigger is released, relay F.1 is de-energized, thus isolating the supply from the gun firing inverter and the guns cease firing. As the safety flap is replaced over the camera gun switch, the safety switch will be opened and de-energize relay E.1. With relay E.1 de-energized the supply to the gun firing inverter is broken and the inverter ceases operation.

8. When the guns are fired, the firing relay F.1 is energized, breaking its contacts 6-6a (*fig. 1*), supplying contacts 6-6a of the gun ventilation relay C.1, which feed the 'close' field coil of the ventilation shutter actuator, and contacts 5-5a of relay F.1 are made to complete the circuit to the actuator 'open' field coil. The actuator will, therefore, start to open the shutter. At the same time contacts 5-5a and 7-7a in relay F.1 complete the supply to relay C.1, via the 'open' limit switch of the actuator. Should the firing trigger switch be released and relay F.1 de-energized, before the actuator completes its full travel, relay C.1 will be maintained in the energized state by a hold-on circuit fed direct from the circuit fuse, through its contacts 3-3a, the actuator 'open' limit switch and contacts 1-1a. This feed also supplies the 'open' field coil of the actuator via contacts 3-3a. When the actuator completes its full travel, the open limit switch will be broken, thus stopping the actuator and de-energizing relay C.1. If, however, relay F.1 is still energized, the actuator will remain stationary thus keeping the shutter open. When relay F.1 is de-energized the circuit to the 'close' field coil of the actuator will be completed via contacts 6-6a of relays F.1 and C.1. The actuator will now close the shutter, until switched off by the 'close' limit switch.



B.204540 Issue 5

Fig. 1. Gun firing, ventilation and heating (theoretical)

RESTRICTED

9. The operation of the gun heating circuit is such that when the temperature in the gun package is below approximately 7.5 deg.C the thermostat makes contacts 1 and 2 to complete the supply to the 'open' field coil of the hot air valve actuator, which thus commences operation and opens the valve to allow hot air from the engine compressor to enter the gun package. When the temperature in the package reaches approximately 37.5 deg.C., contacts 1 and 2 of the thermostat open and contacts 1 and 3 make, to supply the 'shut' field coil of the valve actuator. The actuator then closes the valve, thus cutting off the hot air supply to the gun package. The temperature in the gun package is, therefore, automatically maintained between the two limits set by the thermostat.

Engine fuel and air dipping

10. To overcome certain undesirable effects of gun firing, the engine r.p.m. is automatically decreased by a system which restricts the engine fuel flow and bleeds air from the compressor whenever the guns are fired. The fuel restriction and air bleed are controlled by an electro-magnetic solenoid valve mounted on the engine. This solenoid is energized via a relay contained within an altitude switch, which is located in the gun firing and engine control box situated in the radio bay and controlled by the gun firing circuit. The barometric contacts of the altitude switch are by-passed so that the installation operates at all altitudes (*Mod. 719*). To enable the system to be tested during engine ground running, without firing the guns, a test switch is provided on the gun firing and engine control box. This switch energizes the solenoid valve via the control relay, so that the operation of the system may be checked by observing the drop in engine r.p.m.

Operation

11. Whenever the gun firing trigger is pressed, a supply is made, via the normally closed contacts of the fuel dipping test switch, to energize the relay within the

altitude switch. With the relay energized, its contacts complete the supply from the circuit fuse to energize the engine fuel and air dip solenoid valve, which automatically restricts the fuel flow and bleeds air from the engine compressor, thus decreasing the engine r.p.m. The slugged relay in the gun firing circuit (*para. 7*) is provided to allow time for the fuel dipping and air bleed to take effect before the guns fire.

12. The action of the fuel dipping test switch, when in the TEST position, is such that it completes the supply to the relay in the altitude switch direct from the circuit fuse. With the relay energized in this manner, a supply is made to the engine fuel and air dip solenoid valve without firing the guns so that the operation of the system may be tested during engine ground running.

Bomb release, fuzing and jettison

13. The bombs are released from the in-board pylons by depression of the BOMB/R.P. push-switch, located at the top of the control column handgrip, after the bombs have been selected and fuzed by operation of the BOMB/R.P. selector switch and FUZING selector, situated on the BOMB/R.P. control panel in the cabin. If necessary, the bombs may be jettisoned in a safe condition (*i.e. not fuzed*), by operation of a JETTISON push switch also situated on the BOMB/R.P. control panel.

14. The supply to the BOMB/R.P. push switch is taken through the safety plug and alighting gear compression switches in a manner similar to that for the gun firing trigger switch (*described in para. 3*). The supply to the BOMB/R.P. selector switch is taken via the safety plug from a circuit breaker situated below the supply panel.

15. The electro-magnetic bomb release slips, jettison solenoids and fuzing units (*all located in the inboard pylons*), are actuated by a BOMB/R.P. firing relay situated on the

leg panel, and the fuzing relay and pylon stores jettison relay in ARM J.B.2. The operation of these relays and the cock test, practice bomb and S.S.D. sockets, together with the NORMAL/PRACTICE change over switch and series relay (*which are all located in the pylons*), is described in paras. 16 to 22.

Operation

General

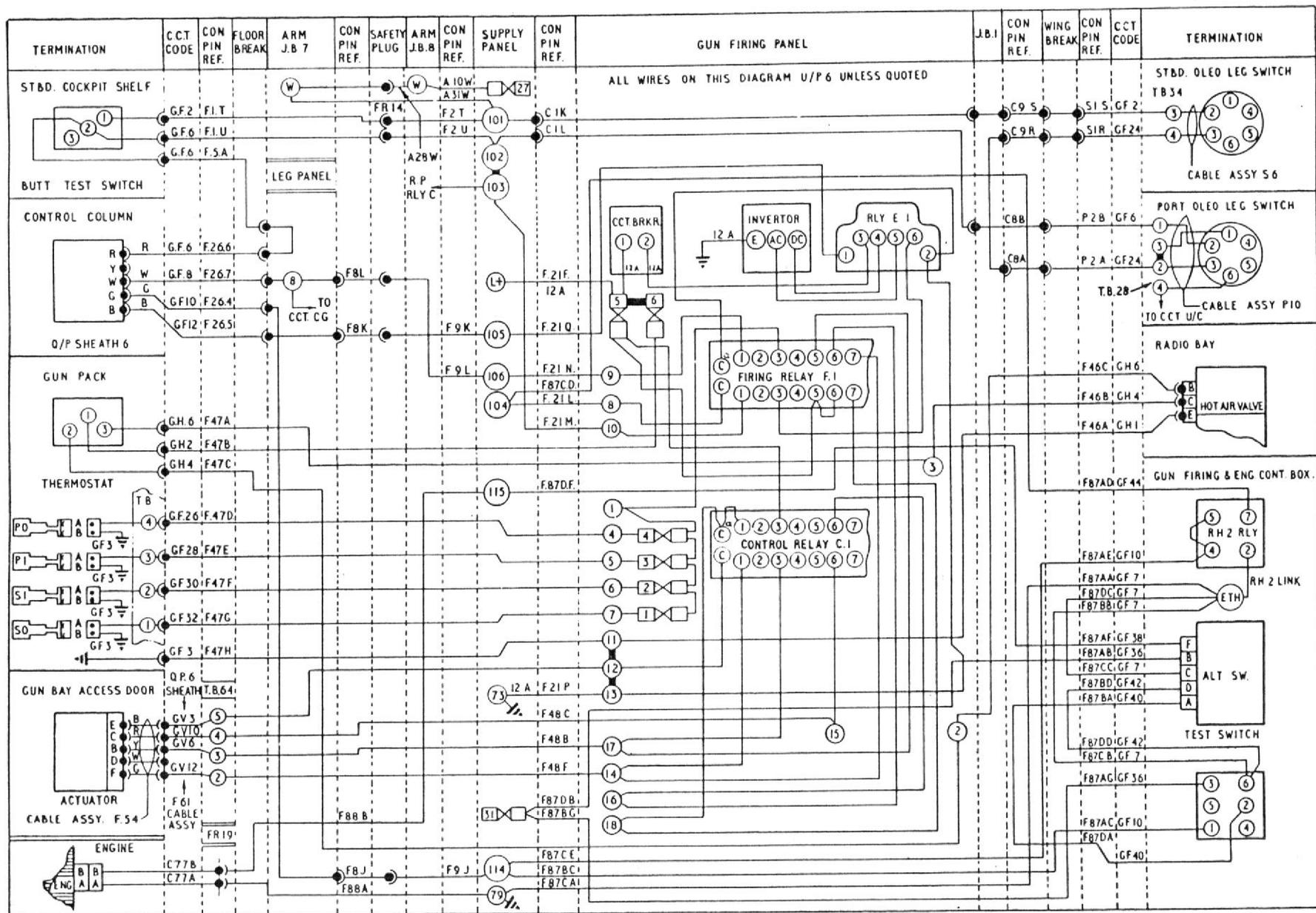
16. When the aircraft is airborne, the BOMB/R.P. release push-switch on the control column handgrip is supplied, via the safety plug and compression switches (*described in para. 7*), in preparation for energizing the BOMB/R.P. firing relay when the push-switch is pressed. The FUZING selector and BOMB/R.P. switches are also supplied via the safety plug.

Fuzing

17. With the FUZING selector in the OFF position a supply is made to the JETTISON push switch in preparation for energizing the pylon stores jettison relay when this latter switch is pressed. When the FUZING selector is placed in the TAIL position a supply is made to the tail fuzing units in the pylons, via a set of contacts in the pylon stores jettison relay which are made while the relay is de-energized. In the TAIL and NOSE position, the fuzing relay is energized and a supply made, via the contacts of the de-energized pylon stores jettison relay, to the tail and nose fuzing units in each pylon.

Release

18. With the BOMB/R.P. switch set to the BOMBS position, a supply is made to three contacts in the BOMB/R.P. firing relay in preparation for supplying the bomb release gear when the relay is energized by the operation of the bomb release push switch. With the firing relay energized, contacts 3-3a and 1-1a will feed the port and starboard release slip solenoids respectively, via the operating coils of the series relays and the release slip isolation switches in each pylon. The release slips will open to drop



B.204522 Issue 6

Fig. 2. Gun firing, ventilation and heating (routing)

RESTRICTED

both bombs and the series relays will also operate and be maintained in this state by hold-on coils fed through their own contacts. Further contacts in the series relays will supply the s.s.d. sockets to energize these as the bombs fall. The remaining set of contacts (*i.e.* 2-2a) in the firing relay will supply each jettison solenoid, via the NORMAL/PRACTICE switches, when in the NORMAL position. The jettison solenoids operate the mechanical release plungers on each release slip, thus opening the release hooks mechanically if they have not already opened electrically.

Jettison

19. Operation of the JETTISON push switch, while the FUZING selector is in the OFF position, will energize the pylon stores jettison relay and the jettison solenoids in each pylon. With the jettison relay energized a supply is made to the normal release slip solenoids, via the series relays and release slip isolation switches. The series relays, jettison solenoids and release slips will all operate (*described in para. 18*), but the nose, tail and s.s.d. units will not be energized as the fuzing supplies are isolated at the FUZING selector and jettison relay, thus the bombs will fall in a safe unfuzed condition.

Cock test

20. The cock test sockets are used to connect a test set, consisting of a lamp and low voltage battery, to the release slip circuit. The lamp will light when the release slip is correctly cocked, as a circuit is made through the release slip feed switches, solenoid coil and the test set.

Practice bomb carriers

21. When the practice bomb carriers are installed on the pylons, the pylon release slip isolation switches are automatically broken to isolate the normal release mechanisms and the practice carrier release gear is fed from the practice bomb sockets. The NORMAL/PRACTICE switches in each pylon must also be placed in the PRACTICE position

to change over the supply to the jettison solenoids, thus preventing them from being energized and jettisoning the carriers when the practice bombs are dropped. The practice bombs are fuzed prior to take off, but to ensure that the correct bombing drill is carried out in practice, the fuzing selector must be placed in the TAIL or TAIL AND NOSE position before the bombs can be dropped. Operation of the bomb release push-switch will now energize the firing relay which in turn energizes relays in the carriers. These relays control the supply to the auto-selector and release slips also in the carriers. A bomb will now be released from one of the carriers, the bomb dropping sequence being controlled by the auto-selectors. The earth return for the relays and release gear in the carriers is via the carrier structure and pylon hook.

22. Operation of the JETTISON push switch, while the practice bomb carriers are fitted and the NORMAL/PRACTICE switches are in the PRACTICE position, will energize the pylon stores jettison relay in the usual manner. With the relay energized, a supply will be made to the jettison solenoids, via the NORMAL/PRACTICE switches, and the jettison solenoids will operate the mechanical release plungers on each release slip. The release hooks will thus open mechanically to allow the practice bomb carriers to fall free. The release slips will not operate electrically under these conditions as the supply to them is isolated at the open isolation switches in each pylon.

G.45B camera

23. The camera gun is located on a mounting platform inside the fuselage nose structure at the top just forward of frame 3 and is focused through a vision tube riveted around an orifice in the skin. The camera is controlled by the gyro caging and camera relay located on the leg panel and is operated whenever the gun firing trigger is pulled to fire the guns or, independently of the guns, by operation of the camera push-switch at the top of the control column handgrip.

24. The camera lens and body heaters are both controlled by the CAMERA MASTER switch, which is located on the leg panel adjacent to the battery, pressure head heater and engine master switches. A switch, used to select the correct iris opening during SUNNY or CLOUDY weather, is located on the starboard instrument panel. When the camera is not fitted, a blanking plate, normally stowed on a bracket on frame 2, is fitted to the aperture in the nose structure.

Operation

General

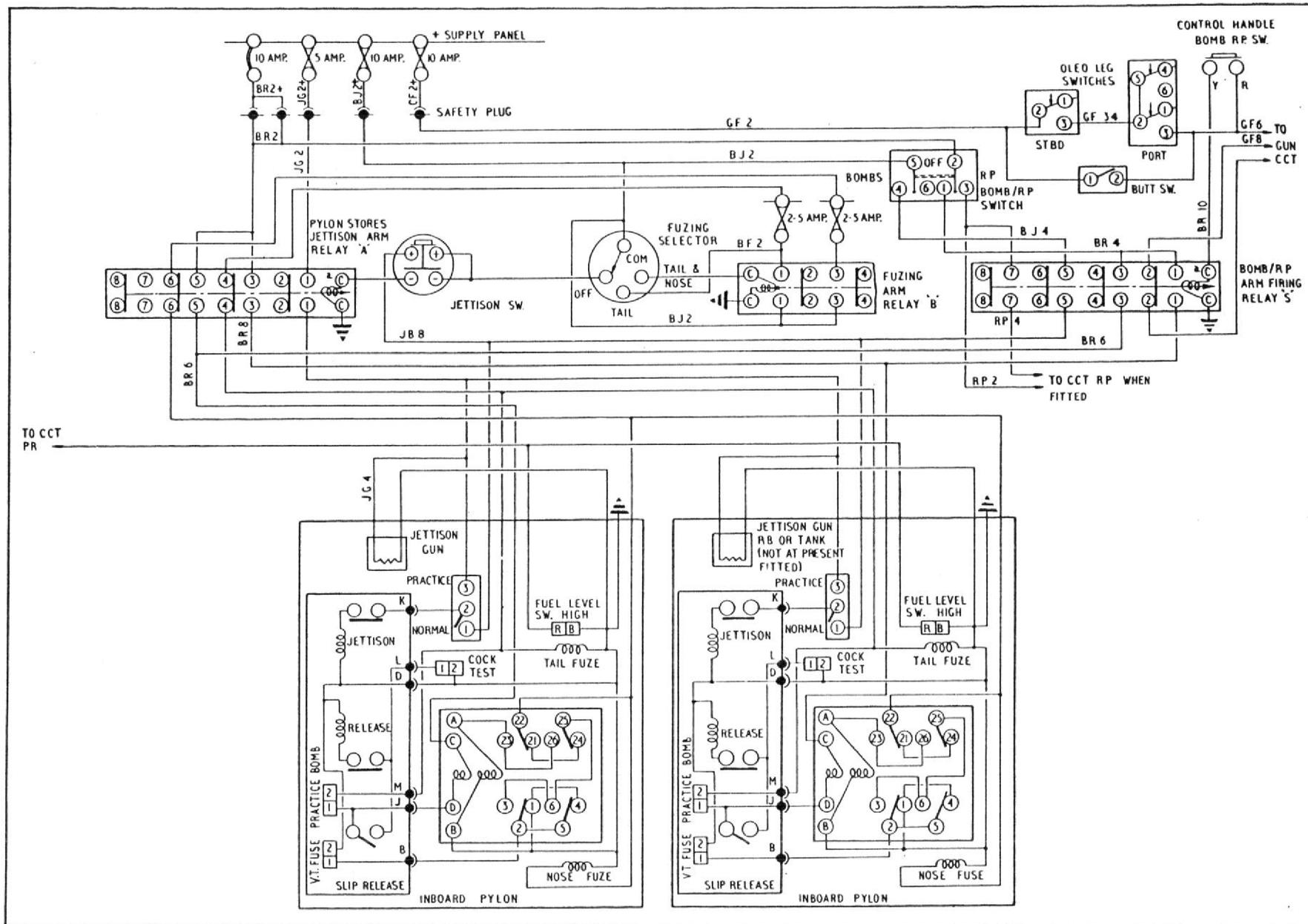
25. The camera lens and body heaters are both on when the CAMERA MASTER switch is closed, the body heater being thermostatically controlled to maintain the camera at its correct operating temperature. The supply to the camera push-switch on the control column handgrip is taken from the gun firing circuit fuse via the safety plug and alighting gear compression switches.

Camera operation independent of gun firing

26. When the aircraft is airborne, the compression switches make contact and complete the supply to the camera push-switch, thus when the switch is pressed to operate the camera, independently of the guns, this supply is fed to the coil of the gyro caging and camera relay. With the gyro caging and camera relay energized a supply is made from the camera circuit fuse and master switch to the camera operating solenoid, via contacts 3-3a in the relay and the camera will operate until the push-switch is released to de-energize the relay.

Camera operation with gun firing

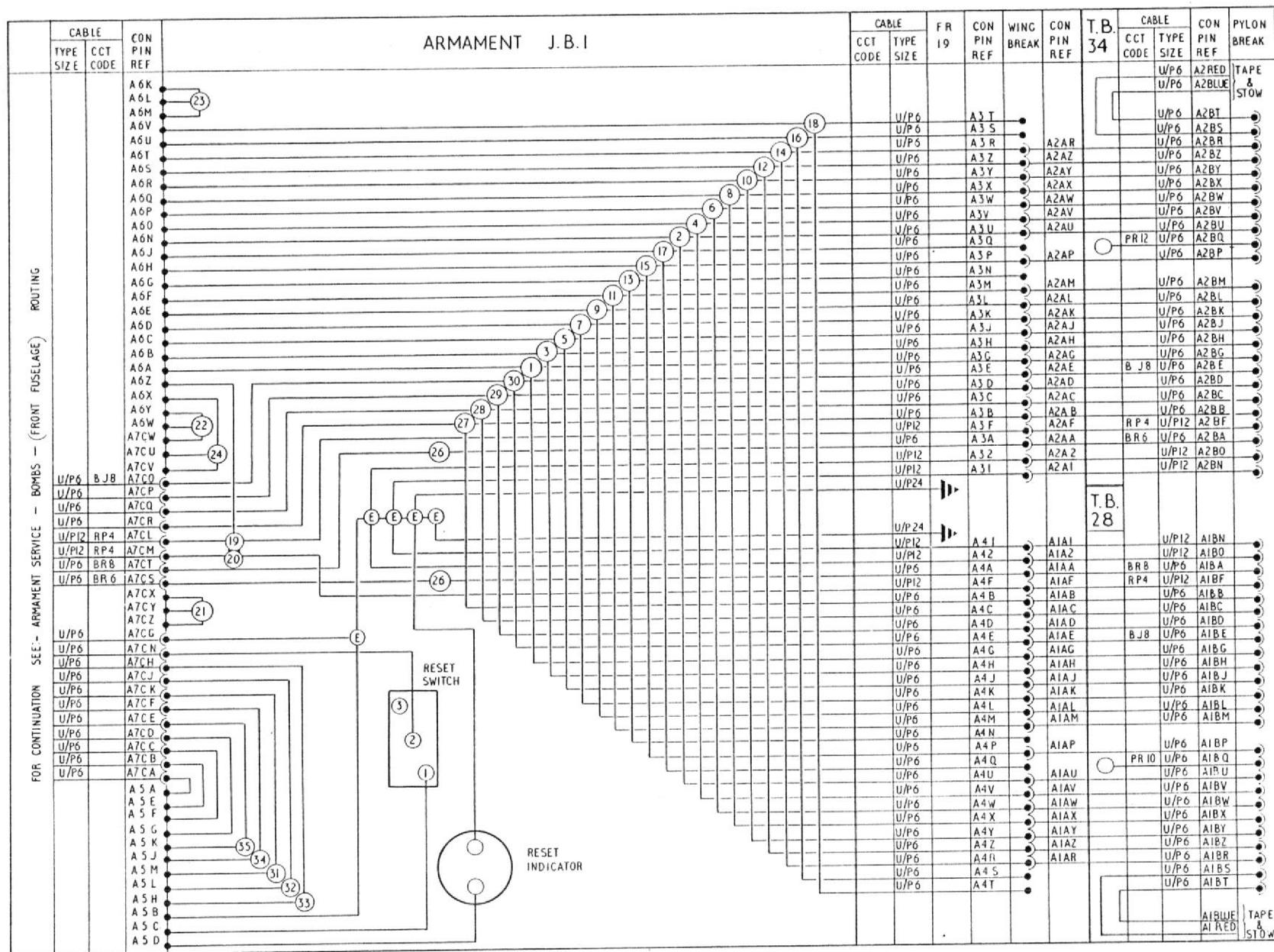
27. When the gun firing trigger is pulled, the gun firing relay is energized and a supply is made via its contacts 1-1a to energize the gyro caging and camera relay. With the gyro caging and camera relay energized, a supply is made to the camera operating



B.204545 Issue 1
(Modified for Mk. 57)

Fig. 3. Inboard pylon stores (theoretical)

RESTRICTED



B.204542 Issue 1

Fig. 5. Bombs release (routing—centre fuselage and wings)

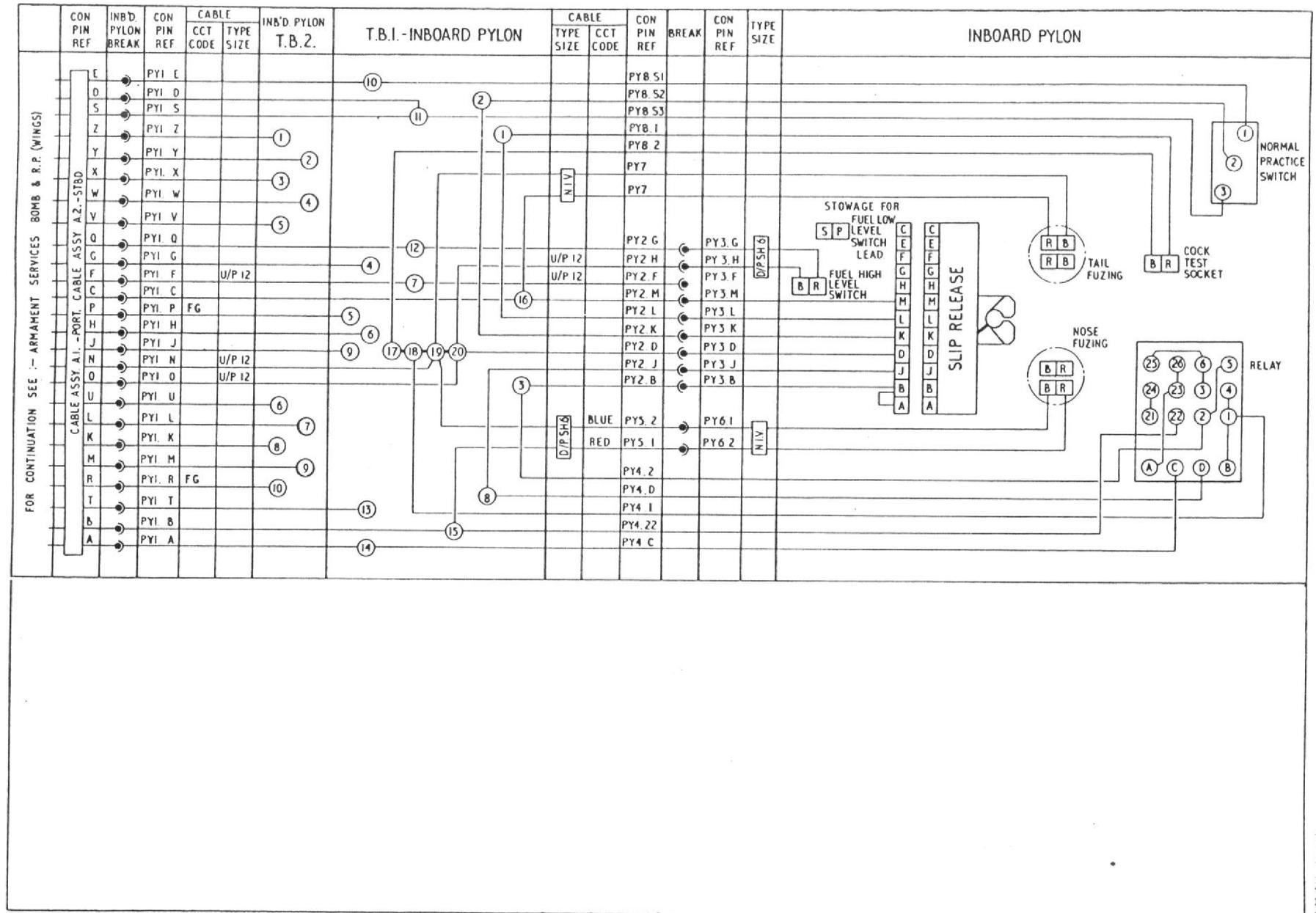


Fig. 6. Inboard pylon stores (routing)

RESTRICTED

solenoid (*as described in para. 25*). The camera will, therefore, operate as the guns are fired to photograph the target, until the gun firing trigger is released and de-energizes the gun firing relay, which in turn de-energizes the gyro caging and camera relay. The camera recorder will also operate as the guns are fired (*described in para. 28*).

Camera recorder

28. If the gun sight and camera recorder are in the combat position at the time the camera gun is operated, contacts 5-5a in the gyro caging and camera relay will complete the supply to the solenoid controlling the camera recorder claw mechanism. The camera recorder will now operate (*described in Sect. 5, Chap. 2*).

SERVICING

General

29. For general servicing of the electrical system as a whole, reference should be made to Group A.1. All the components should be kept clean and examined periodically for signs of damage and to ensure that they are securely mounted. Apart from the standard routine serviceability and bench testing of the components, as described in the relevant Air Publications (*listed in para. 1*), no further servicing should be necessary.

REMOVAL AND ASSEMBLY

General

30. Once access has been obtained, the removal and assembly of the components forming the armament services should present no difficulties. The removal of the gun firing panel and ARM junction boxes, which carry the majority of the components is fully described in Group A.2. The removal of the guns is covered in Sect. 7, Chap. 3 and the removal of the pylons in Sect. 3, Chap. 2. The location of and access to all the components is indicated in Group A.3.





This file was downloaded
from the RTFM Library.

Link: www.scottbouch.com/rtfm

Please see site for usage terms,
and more aircraft documents.