

Chapter 3E

A.S.V. SCANNER CUPOLA CONTROLS

LIST OF CONTENTS

	Para.		Para.		Para.
Introduction	1	Extension		SERVICING	
DESCRIPTION AND OPERATION		Down to Search 1	8	General	16
General	2	Search 1 to Search 2	9	Electrically-operated valve ...	17
Indicators	4	Search 2 to Attack	10	Micro-switches	18
Circuit operation	6	Retraction		Ground tests	19
Circuit conditions before		Attack to Search 2	11	Attack position	21
operation	7	Search 2 to Search 1	12	REMOVAL AND INSTALLATION	
		Search 1 to Up	13	General	22
		Ground operation	15		

LIST OF ILLUSTRATIONS

	Fig.		Fig.
Location of equipment	1	Routing chart	
A.S.V. scanner cupola controls ...	2	A.S.V. scanner cupola controls 3(1) and(2)	

Introduction

1. The operation and controls used for extending and retracting the A.S.V.

scanner cupola are described in this chapter. Location of the major electrical components is shown in fig.1 and a theoretical circuit diagram is contained in fig.2.

◀ Mechanical and hydraulic operation of the scanner cupola will be found in Section 3 of this publication. ▶

DESCRIPTION AND OPERATION

General

2. The extension and retraction mechanism of the scanner cupola is operated by two hydraulic jacks, the movement of which are controlled by a twin solenoid selector valve, Type C6725Y, Mk.F. The valve is installed adjacent to the signal discharger panel in the fuselage rear centre section.

3. During flight the position of the cupola is controlled by a 4-way selector switch on the scanner control panel at the

radar operator's station. An over-ride circuit is embodied to ensure that when the landing gear is selected DOWN, the scanner housing is retracted to the 'up' position.

Indicators

4. Under normal operating conditions indication of the cupola position will be shown by four magnetic indicators fitted to the scanner control panel. These indicators are energised to indicate UP,

SEARCH 1, SEARCH 2 and ATTACK respectively. A further indicator, fitted on the pilot's panel will show black when the cupola is fully retracted.

5. If the landing gear is selected DOWN when the scanner selector switch is at any position other than UP a red warning lamp on the scanner control panel will light to warn the radar operator to place the selector switch to the UP position.

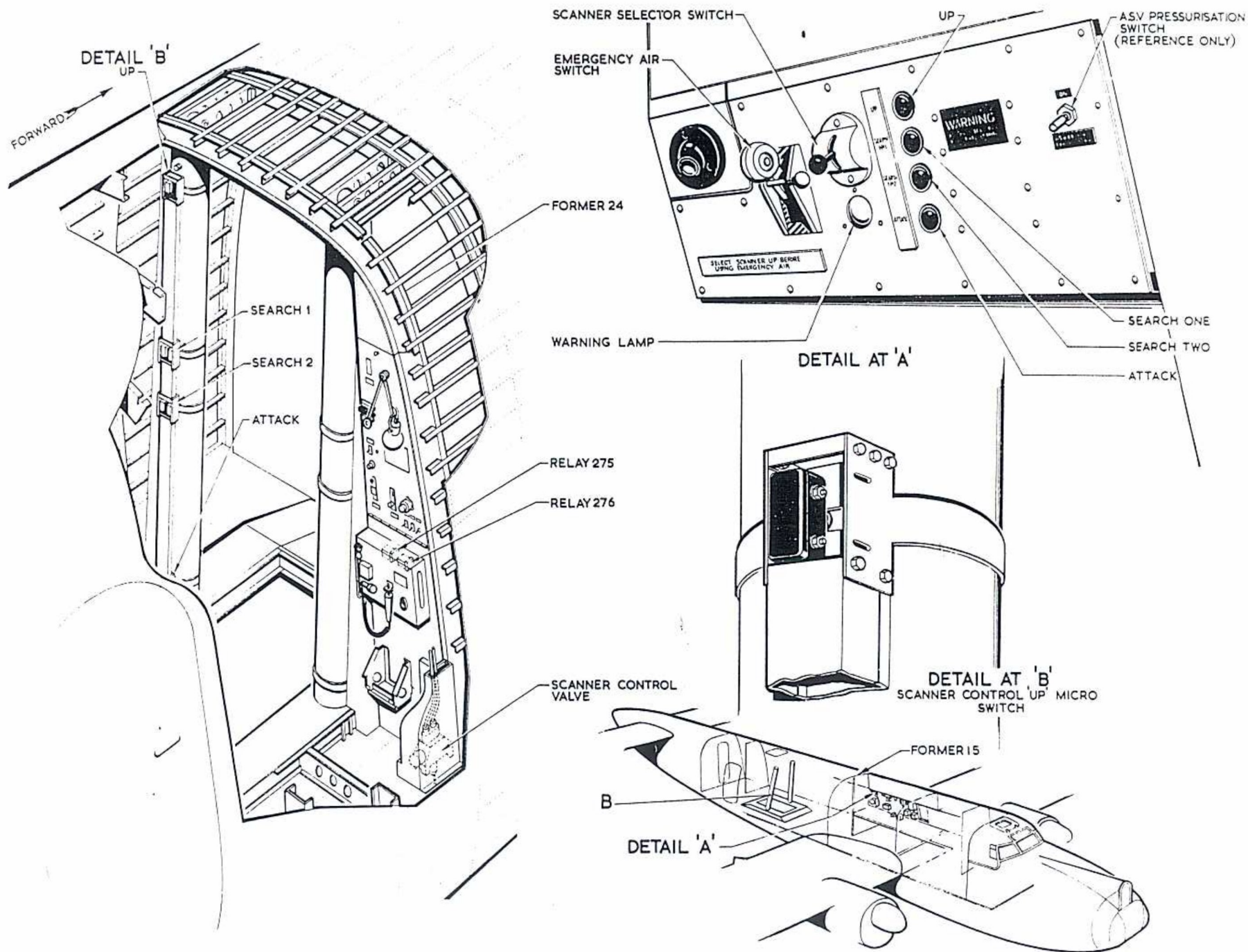


Fig. 1. Location of equipment

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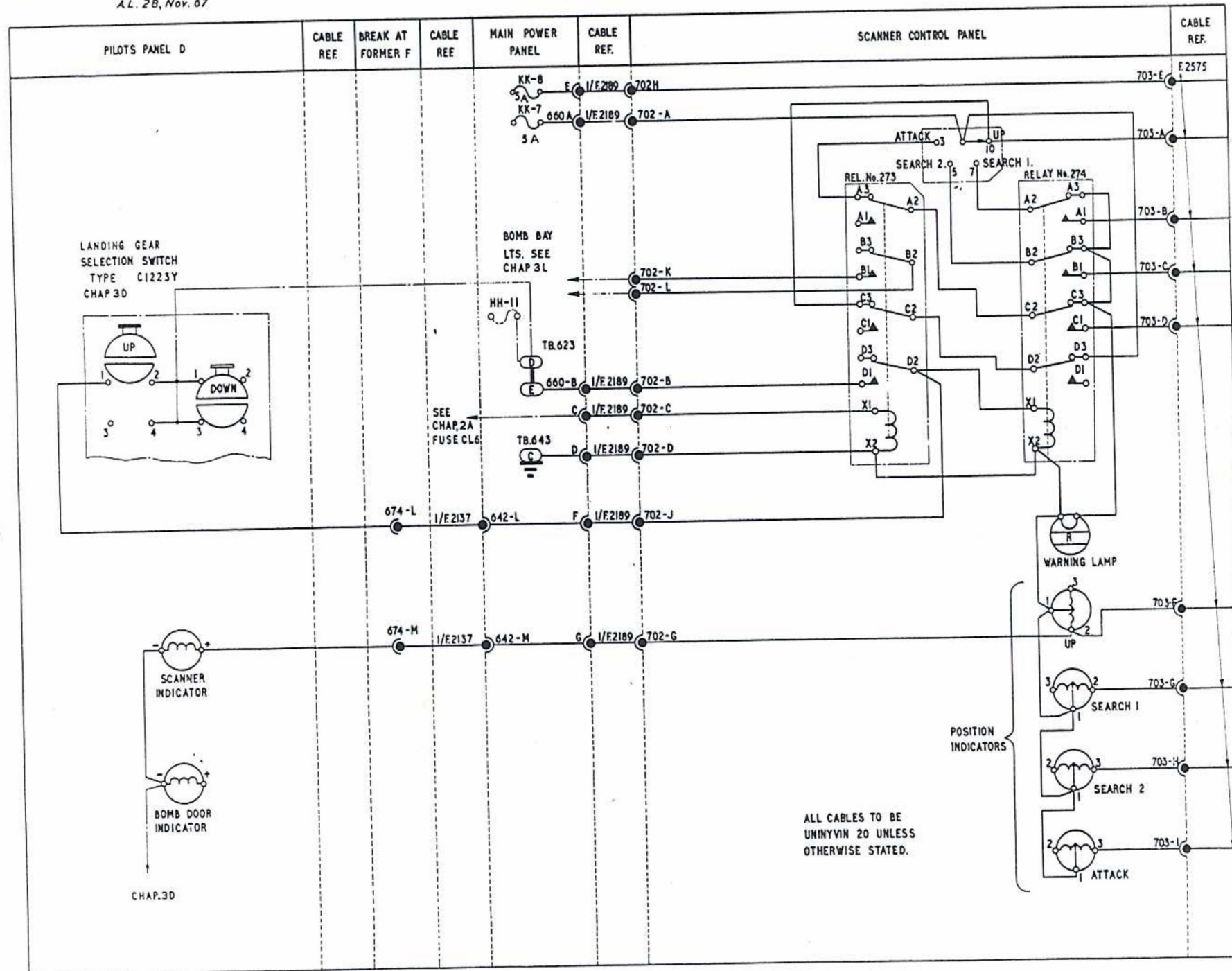


Fig.3 (i), A.S.V. scanner cupola controls
 «Scanner control switch terminal numbers added»

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Circuit operation

6. The circuit operation for each selection is given in the following paras. It is assumed that the aircraft is in flight, the landing gear selected to UP, the cupola in the fully retracted position and relay No.274 energised. Although the operations are given for progressive positions of the selector switch lever, it can be moved direct from UP to ATTACK or vice versa.

Circuit conditions before operation

7. Before operation, the selector switch will be in the UP position, and A-D-E of micro switch MS1 will be made. The supply from fuse KK8 will be energising relay No.276 via contacts A-D of MS1. The supply from fuse KK8 will also feed the hold-in circuit to relay No.276 via MS6 and contacts 276/1. The 'up' valve solenoid will be energised by a supply from fuse K K 7 via the selector switch and the up indicators will be energised from fuse K K 8 via contacts A - E of M S 1.

Extension**Down to Search 1**

8. When the selector switch is moved to the SEARCH 1 position, the 'up' solenoid valve will be de-energised and a supply from fuse KK7 will be fed through the selector switch, relay contacts 274/6, micro switch MS2 (contacts C-B) and relay contacts 275/3 to energise the 'down' valve solenoid. The cupola will then extend, releasing micro switch MS1 and de-energising the 'up' position indicator. As the scanner approaches the search 1 position, micro switch MS2 will be operated to make contacts A-D-E thus cutting off the supply to the 'down' valve solenoid. At the same time, micro switch MS3 will be operated to make contacts A-E and energise the search 1 indicator. Relay No.276 will still remain energised via the hold-in contacts 276/1.

Search 1 to Search 2

9. When the selector switch is moved from the SEARCH 1 to the SEARCH 2 position, the 'down' valve solenoid will be energised from fuse KK7, via the selector switch, relay contacts 274/4, contacts B-C of micro switch MS4 and relay contacts 276/2. The further extensions of the scanner will release micro switches MS2 and MS3, both of which will make at contacts A-B-C, and the search 1 indicator will be de-energised. As the scanner approaches the search 2 position, micro switches MS4 and MS5 will be operated to make contacts A-D-E. The operation of MS4 will cut off the supply to the 'down' valve solenoid. MS5 will energise the search 2 indicator from fuse KK8. Relay No.275 will now be energised from fuse KK8 via contacts D-E of MS4, and a hold-in circuit will be made from fuse KK8 and relay contacts 275/1.

Search 2 to Attack

10. When the selector switch is moved from SEARCH 2 to ATTACK the 'down' valve solenoid will be energised from fuse KK7 via the selector switch and relay contacts 274/2. The cupola will then extend releasing micro switches MS4 and MS5. Both these switches will now make at contacts A-B-C and the search 2 indicator will be de-energised. As the cupola approaches the attack position, micro switch MS6 will be operated to make contacts A-D-E. This action will energise the attack indicator, and at the same time de-energise relay No.276 by breaking the hold-in circuit. Relay 275 will now be energised by two feeds, one, the hold-in circuit from fuse KK8 through the MS1 contacts A-C, and the other, the circuit from fuse KK8 through MS6 contacts A-D.

Retraction**Attack to Search 2**

11. When the selector switch is moved

from ATTACK to SEARCH 2, the 'down' valve solenoid will be de-energised, and the 'up' solenoid will be energised from fuse KK7 via the selector switch, relay contacts 274/4, contacts C-B of MS4 and the relay contacts 276/3. The cupola will then commence to retract, releasing micro switch MS6 to make contacts A-B-C and the attack position indicator will be de-energised. As the scanner approaches the search 2 position, micro switches MS4 and MS5 will be operated to make contacts A-D-E. MS4 will cut-off the supply to the 'up' valve solenoid and MS5 will energise the search 2 indicator.

Search 2 to Search 1

12. Movement of the selector switch to the SEARCH 1 position will energise the 'up' valve solenoid from fuse KK7 via relay contacts 274/6, MS2 contacts B-C and relay contacts 275/2. The cupola will move upwards, releasing micro switches MS4 and MS5. Both these switches will make at contacts A-B-C, and the search 2 indicator will be de-energised. As the cupola approaches the search 1 position, micro switches MS2 and MS3 will be operated to make A-D-E. MS2 will cut off the supply to the 'up' valve solenoid and MS3 will energise the search 1 indicator. The relay No.275 is still energised via MS1. (para.10).

Search 1 to Up

13. The cupola can be fully retracted by placing the selector switch lever to the UP position. This will energise the 'up' valve solenoid from fuse KK7 via the selector switch. The cupola will then move upwards, releasing micro switches MS2 and MS3. Both these switches make at contacts A-B-C, and the search 1 indicator will be de-energised. As the cupola reaches the fully retracted position micro switch MS1 will be operated to make contacts A-D-E. This will break the hold-in

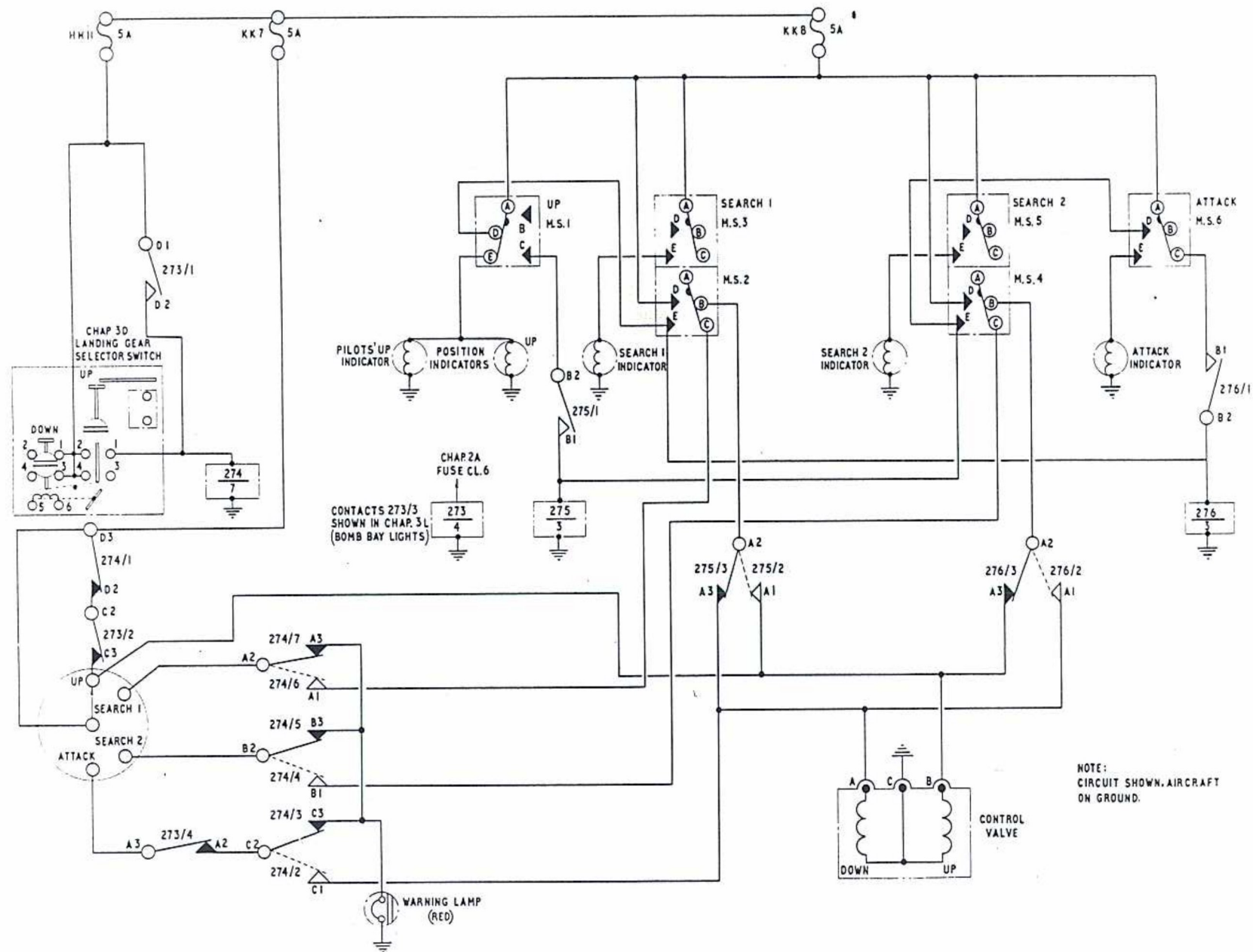


Fig. 2 A.S.V. scanner cupola controls

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circuit to relay No.275, and energise both, the radar operator's and the pilot's indicators.

14. When the alighting gear is selected DOWN, relay No.274 will be de-energised and a supply will be fed from fuse KK7 via relay contacts 274/1 and 273/2 to the 'up' valve solenoid. This will ensure that the cupola returns to the up position. If the selector switch is at any position other than UP, a supply from fuse KK7 and

General

16. In view of the dual functioning of the electro-hydraulic valve used in the control of the cupola circuits it is essential that the closest co-operation is maintained between the electrical and airframe fitter tradesmen. This applies to functional tests on the aircraft and to bench testing the component. Hydraulic system servicing will be found in Book 1 of this publication. Component servicing is described in A.P.1803D, Vol.1.

Electrically-operated valve

17. Servicing of the electrically-operated valve is restricted on the aircraft to checking the cables and connections for security and cleanliness. The six micro-switches attached to the scanner hydraulic jack tubes should be checked for correct override setting in accordance with A.P.4343C, Vol.1, Book 1, Sect.2 and Book 1 of this publication.

Micro-switches

18. The micro-switches are set to depress against the chamfered ring on

the selector switch, and any of the normally closed contacts of relay 274 (with the exception of contacts 274/1) will light the red warning lamp on the scanner control panel.

Ground operation

15. When the aircraft is on the ground, it will be necessary for a ground supply trolley to be connected to the external

SERVICING

the sliding jack through the operating slot at each cupola position, and it is important that the chamfered ring should be in the centre of each slot when switch settings are being carried out. The securing holes in the bracket assemblies are slotted to allow for adjustment of the micro-switches.

Ground Tests

19 All ground testing of the scanner cupola should be carried out in conjunction with the airframe fitter responsible for the hydraulic system. The hydraulic testing trolley used to extend and retract the cupola during ground tests is described in Book 1 of this publication.

20 With the external 28-volt d.c. supply connected proceed as follows:-

- (1) Ensure that the indicators on the scanner and pilots' panels are energised to indicate UP and show black respectively.
- (2) Place the scanner selector switch to the SEARCH 1 position. The cupola should extend to the appropriate position and:-

supply plug in order to operate the cupola. When the trolley is connected relay No.273 will be energised and in turn relay No.274 will be energised from fuse HH11 through relay contacts 273/1. The control circuit from the alighting gear selector switch will thus be by-passed. Note that with the opening of relay contacts 273/4 the attack section of the circuit will be isolated. This ensures that the cupola cannot be fully extended and damaged whilst the aircraft is on the ground.

- (a) The 'up' indicators should be de-energised.
 - (b) The indicator labelled SEARCH 1 on the control panel should be energised.
- (3) Place the selector switch to the SEARCH 2 position. The scanner cupola should now extend to the second search position and:-
- (a) The search 1 indicator should be de-energised.
 - (b) The search 2 indicator should be energised.
- (4) To prove the function of the warning lamp on the scanner control panel, leave the selector switch in the SEARCH 2 position and remove fuse HH11 from its holder. The warning lamp should now light.
- (5) Refit fuse HH11 and the warning lamp should go out.
- (6) Place the selector switch from the SEARCH 2 to the UP position.

The scanner cupola should now return to the fully retracted position and the up indicators only should be energised.

Attack position

21 Should it be required to test the scanner cupola to the attack position,

the aircraft must be jacked up in accordance with the instructions laid down in Book 1 of this publication. With the external supply removed and the internal supply switched on the alighting gear is selected to UP. The cupola can now be fully extended and retracted in the normal manner.

REMOVAL AND INSTALLATION

General

22 No special instructions are required for the removal of electrical components in this chapter. It is important

that the micro switches on the scanner jack, when being removed or refitted should be set according to the instructions contained in Book 1 of this publication.

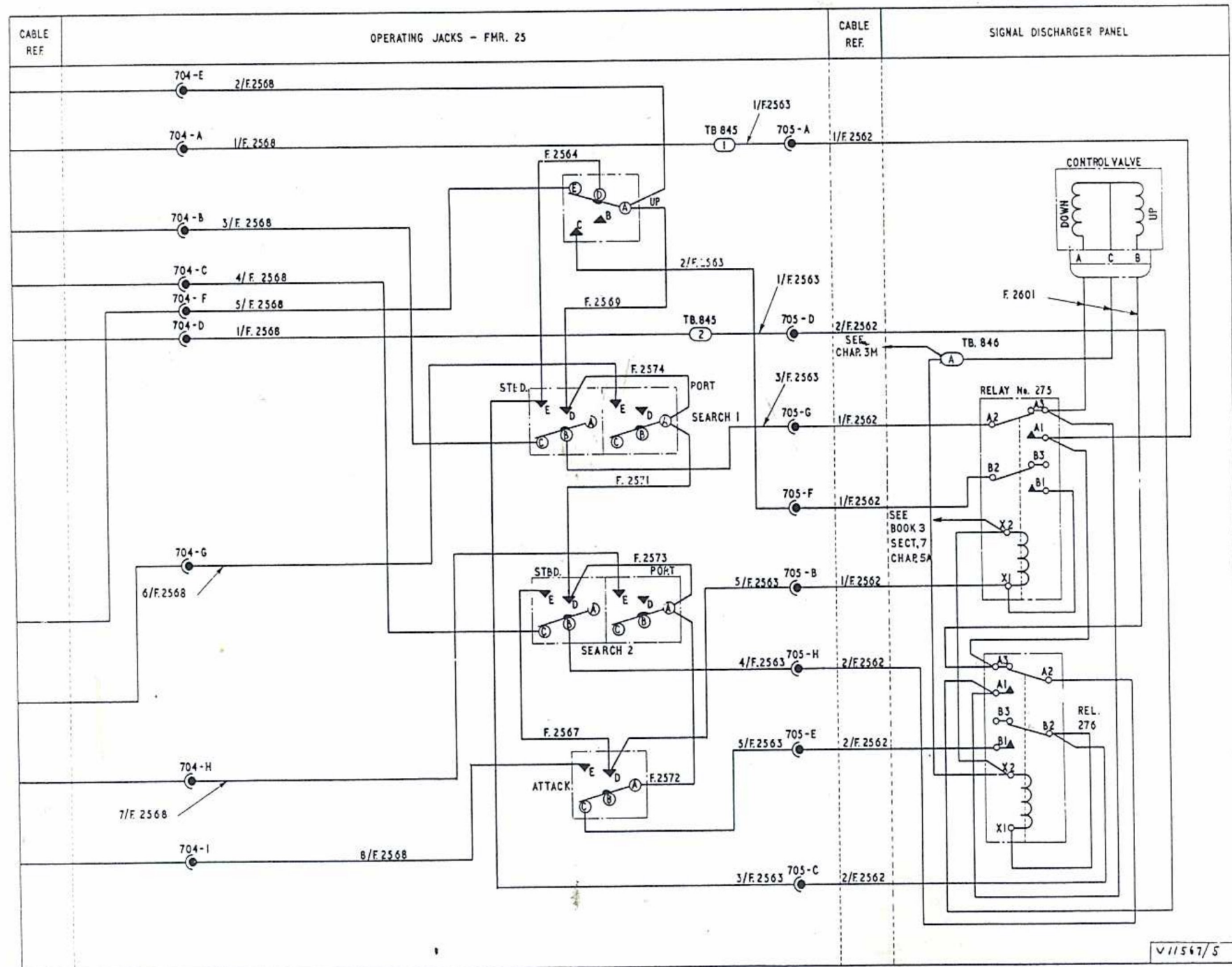


Fig.3 (2) A.S.V. scanner cupola controls

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