

Chapter 7

PNEUMATIC SYSTEMS—DOOR AND CANOPY SEALS SYSTEM, AND H2S RADAR AND T.4 BOMBSIGHT SYSTEM

This chapter incorporates the substance of Chapter 16, which is cancelled by this A.L.

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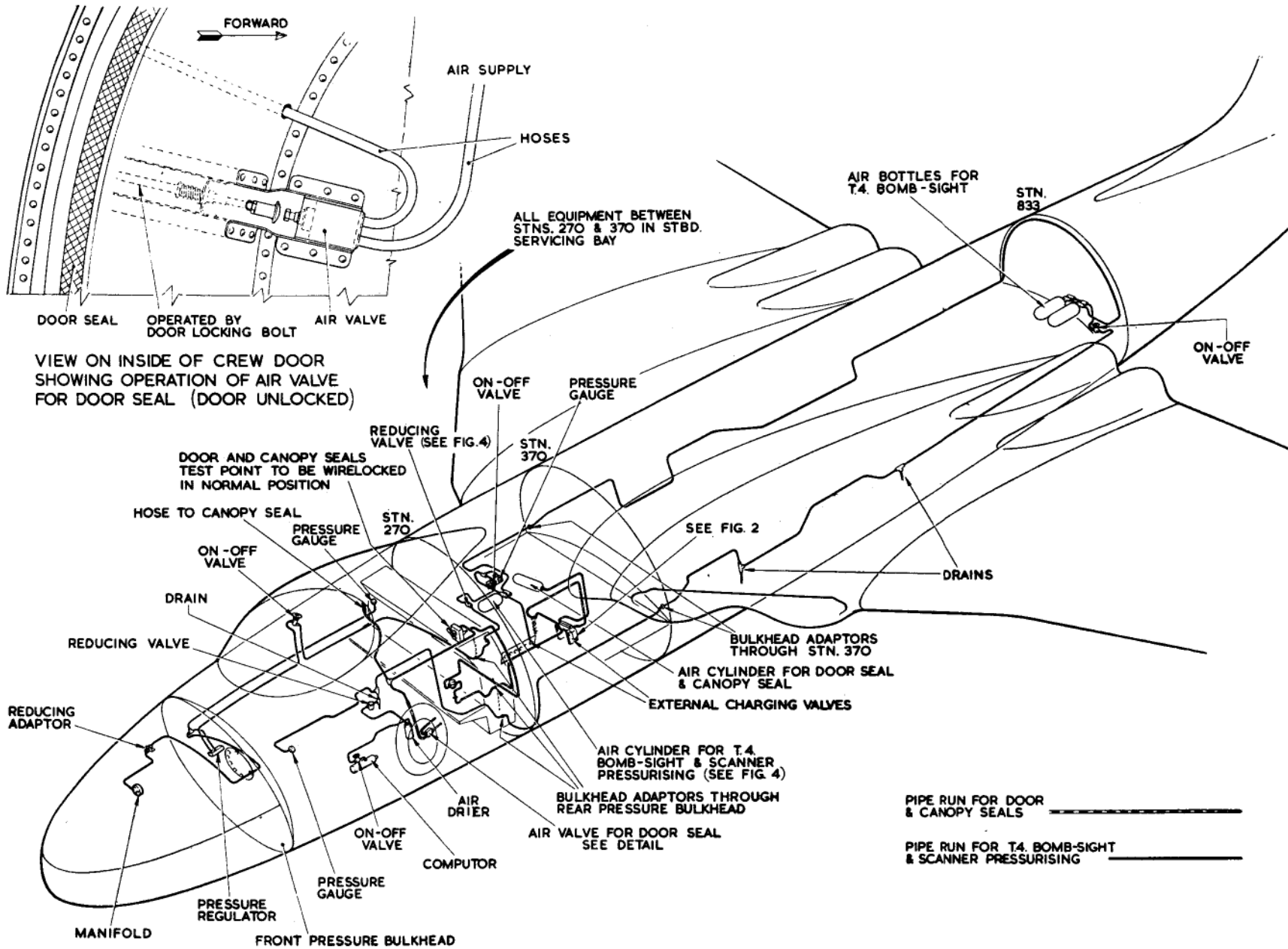


Fig. 1. Pneumatic systems

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DESCRIPTION

1. This chapter is a description of the systems as a whole; reference should be made to A.P.4303B, Vol. 1 or A.P.4303C, Vol. 1 for general notes and data on servicing and testing of aircraft pneumatic equipment.

DOOR AND CANOPY SEALS SYSTEM

(fig. 1 and 3)

2. The system as shown supplies air under pressure to inflate the seals around the main door and pilots' canopy, the object being to prevent air leakage when the cabin is pressurised.

3. An air bottle located in the starboard servicing bay supplies air via a manifold, through a filter to two reducing valves. The reducing valve mounted on the air charging panel reduces the pressure from 450 lb. per sq. in. to 310 lb. per sq. in., while the reducing valve mounted below the radio crate in the pressure cabin further reduces the pressure to 4 lb. per sq. in. The air is then piped to the door seal air valve and the Schrader valve on the canopy seal via a test point.

Air charging panel (fig. 2)

4. An external charging valve and a pressure gauge are mounted on the air charging panel in the starboard servicing bay. This panel also carries a reducing valve, filter and a pressure relief valve.

Door seal valve (fig. 1)

5. The door seal air valve is automatic in operation, its function being to turn on and shut off the air supply as the door is locked and unlocked respectively; it also permits the air in the door seal to exhaust through it as the door is unlocked. The valve is actuated mechanically by the door plungers in the action of locking and unlocking the door.

Door and canopy seals

6. The door seal consists of a flat section endless rubber tube faced with Neoprene and tucked into a lipped channel formed around the inside of the door. When the seal is inflated one side of the tube is expanded around and between the lip on the door and a similar lip on the door surround thus forming a pressure tight seal. The canopy seal is similarly constructed and fitted but is unaffected by the operation of the door bolt mechanism. When the canopy is jettisoned the seal is pulled away at the Schrader valve connection.

H2S, Mk. 9 RADAR AND T4

BOMBSIGHT INSTALLATIONS (fig. 1)

7. The systems which supply the H2S radar and the T.4 bombsight are coupled together for charging only and are entirely separate from the door and canopy seals system. Three storage bottles supply the systems, two in the rear fuselage mounted with an ON/OFF valve to supply the T.4 bombsight, and one in the starboard servicing bay to supply the H2S, Mk. 9 radar. ▶

H2S, Mk. 9 RADAR SYSTEM (fig. 4)

8. To facilitate the efficient working of the scanner equipment it is necessary to supply the unit with air and to control the supply to approximately sea level pressure at all altitudes and during all conditions of flight. An ON/OFF valve, pressure gauge and pressure reducing valve (1800 to 30 lb. per sq. in.) are mounted in the starboard servicing bay and an ON/OFF valve, pressure regulator and pressure gauge are mounted in the cabin. The system is charged from a ground servicing trolley through a charging valve in the starboard servicing bay.

External charging valve (fig. 5)

9. The external charging valve is located on

the hydraulic charging panel, access to which is gained through the forward door of the starboard servicing bay.

Supply pressure gauge

10. This gauge is fitted to register the pressure of air supplied from the bottle and is calibrated to read from 0 to 3000 lb. per sq. in. with a lubber mark at 1800 lb. point. The gauge is fitted to a bracket mounted on the outboard wall of the starboard servicing bay and is accessible through the forward door.

ON/OFF valves

11. Two ON/OFF valves are fitted to the system. One is mounted on the same bracket as the supply pressure gauge, to isolate the system during ground charging operations; the other, which gives the crew control of the supply air, is mounted to the rear of the second pilot's seat on a level with the pilots' floor.

Pressure reducing valve (fig. 5)

12. The function of this valve is to reduce the air bottle supply pressure to 30 lb. per sq. in. above ambient. The valve is mounted on the forward edge of the upper servicing bay floor on the starboard side.

Pressure regulator (fig. 5 and 6)

13. The pressure regulator is fitted to maintain the scanner equipment at approximately sea level pressure at all altitudes and during all conditions of flight. A relief valve will prevent over-pressurisation in the event of failure of the pressure maintaining valve. The regulator also houses an inwards relief valve which will operate in the event of depression occurring in the system. The regulator is mounted on the lower starboard side of the pressure cabin just aft of the front pressure bulkhead at Stn. 124.

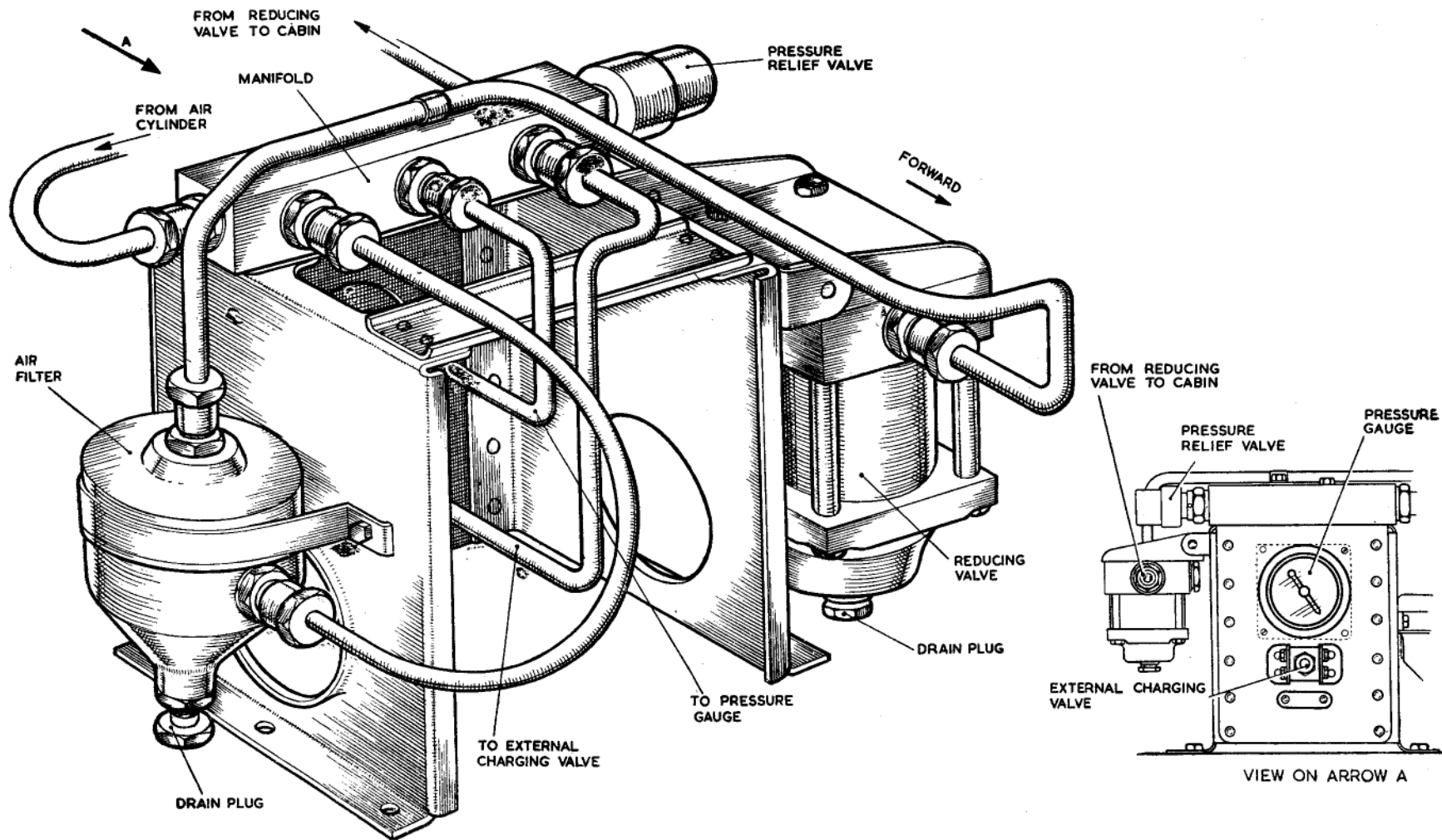


Fig. 2. Charging panel door and canopy seals system

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14. The unit consists of a case with two threaded adaptors for inlet and delivery connections and a plain boss with an internal drilling for outward and inward venting purposes. A partially evacuated bellows to which is attached a valve is mounted over the inlet port; the bellows assembly is mounted within an inner cage which is secured to the outer case by an adjustable fitting. The pressure relief valve with its associated bellows capsule is mounted over and normally seals the vent hole in the outer casing and is attached by an adjustable screwed fitting to the top of the casing. A third capsule and valve for inwards relief is mounted in a vented chamber within the casing and is arranged so that the inside of the bellows is open to the inside of the casing; the outside of the bellows is in communication with the vent, via a drilling in the body of the casing taken from the side of the vent hole. The valve on this capsule assembly normally seals the chamber from the case interior.

Operation of the pressure regulator

15. Fig. 6 shows the regulator in three stages of operation. In the first stage it will be seen that the pressure maintaining valve is open and supply can flow into the case and out of the delivery connection to the scanner equipment. As pressure builds up in the equipment and casing it is felt on the caged bellows which will compress, thus lowering the valve; when the scanner equipment reaches its operating pressure the valve will be closed. A fall of pressure in the equipment will cause the bellows to expand and open the valve until the operating pressure is re-established. In normal operation the valve will always be passing a volume of air equal to the total leakage.

16. In stage two the pressure relief valve is in operation. When the pressure in the scanner equipment and casing exceeds the normal operating pressure by 1 to 2 lb. per sq. in. the relief valve capsule will be com-

pressed, raising the valve and opening the vent to allow the excess pressure to bleed away. As the pressure falls the valve will close.

17. Should the scanner equipment pressure leak down to ambient during a high altitude flight it is possible that during subsequent descent a rise in outside pressure would occur in excess of that existing in the equipment. In these circumstances the inward relief valve will open and balance the pressures. Reference to stage three will show that pressure felt through the drilling from the vent acts on the outside of the inwards relief valve capsule to collapse it against the lower pressure existing inside the bellows and scanner equipment. The valve will open and allow external air from the vent to go through the casing into the scanner equipment. The valve is set to operate under a negative differential of 1 to 2 lb. per sq. in. and cannot normally be adjusted.

Absolute pressure gauge (fig. 5)

18. A tapping is taken from the delivery pipe of the pressure regulator to a gauge calibrated from -10 to +20 lb. per sq. in.

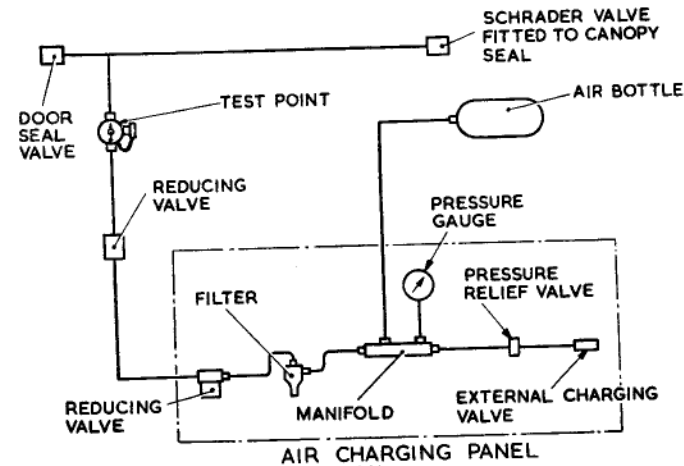


Fig. 3. Door and canopy seals system diagram

absolute which records the pressure in the scanner equipment and under normal conditions on the ground will read approximately 0 lb. per sq. in. The gauge is mounted on the face of the radio crate, starboard side, close to the wall of the cabin.

T.4 BOMBSIGHT INSTALLATION (Mod. 1648) (fig. 1 and 4)

19. To facilitate the efficient working of the bombsight it is necessary to supply the computer with air. This is done from two storage bottles in the rear fuselage via an adjacent ON/OFF valve, pressure gauge, pressure reducing valve, air drier and another ON/OFF valve. Air is stored in the bottles at 1800 lb. per sq. in. and can be controlled by the bomb-aimer from the ON/OFF valve and pressure gauge located in his compartment.

ON/OFF valves

20. Two ON/OFF valves are fitted in the system, one in the rear fuselage at Stn. 833 adjacent to the two storage bottles, to isolate the system during ground charging operations; the other which gives the crew control of the supply air is mounted in the bomb-aimer's compartment.

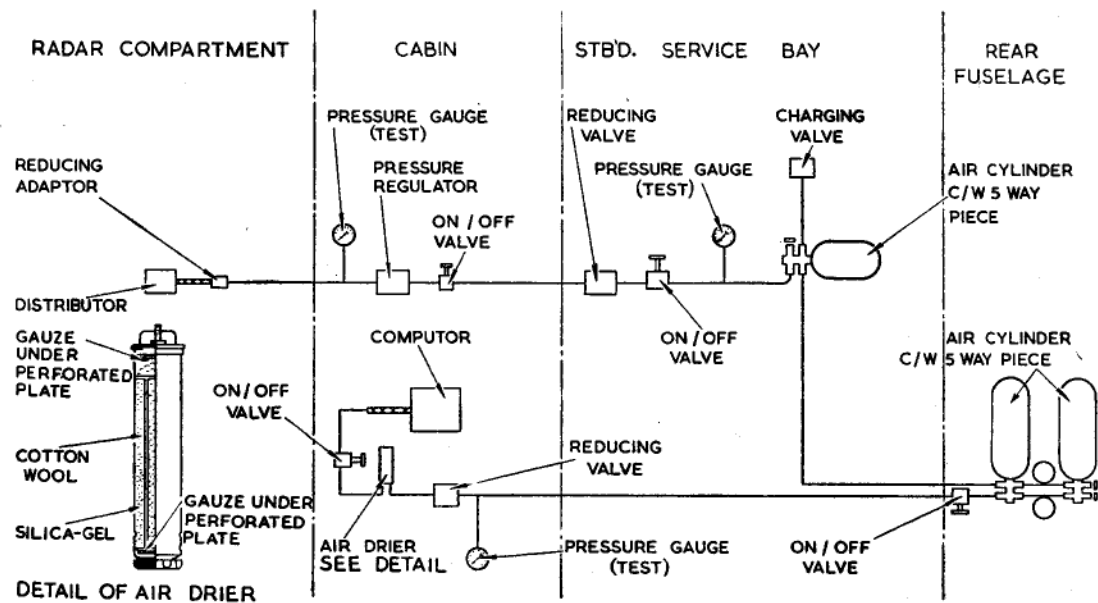


Fig. 4. H2S Mk. 9 radar and T.4 bombsight installation diagram (Mod. 1648)

Supply pressure gauge

21. This gauge is fitted to register the pressure of air supplied from the bottles and is calibrated to read from 0-3000 lb. per sq. in. with a lubber mark at 1800 lb. The gauge is fitted to a bracket mounted on the pilots' floor structure and located at the forward end of the bomb-aimer's compartment.

Pressure reducing valve

22. The function of this valve is to reduce the air bottle supply to 60 lb. per sq. in. above ambient. The valve is mounted on the starboard side of the bomb-aimer's compartment.

Air drier (fig. 4)

23. The air drier is located on the port side of the bomb-aimer's compartment and consists of a cylindrical container into which is packed cotton wool and silica-gel. The supply air is tapped into one side of the container, and out of the other and any moisture that exists in the air is trapped in the silica-gel thus allowing completely dry air to flow to the bomb-sight computer.

SERVICING

DOOR AND CANOPY SEALS SYSTEM Charging

24. The frequency of charging the air bottle depends on the number of operations of the door. The pressure in the air bottle should be checked frequently by the gauge in the starboard servicing bay and the bottle charged as soon as the pressure falls below 250 lb. per sq. in. Connect a dry air bottle to the external charging valve and charge the system to 450 lb. per sq. in.

Testing the system

25. The procedure for testing the door and canopy seals system is as follows:—

- (1) Disconnect the door and canopy seals and blank the system.
- (2) Charge the system to 450 lb. per sq. in.
- (3) Check all pipe connections for leaks.
- (4) There must be no leakage of pressure.
- (5) Connect up the door and canopy seals.

Testing the seals

26. The procedure for testing the door and canopy seals is as follows:—

- (1) Fit a 0-5 lb. per sq. in. pressure gauge to the test point (fig. 3).
- (2) Ensure that the system is charged to 450 lb. per sq. in.
- (3) Shut and lock the cabin door (cabin unpressurised).
- (4) Select the test point to 'SEAL TO TEST POINT' position.
- (5) Check that the pressure gauge reads 4 lb. per sq. in. and that the pressure does not fall below 3.6 lb. per sq. in. in less than 5 minutes.

Pre-installation test

27. Before installation, pipes should be pressure tested to 500 lb. per sq. in. There must be no leaks.

H2S and T.4 BOMBSIGHT SYSTEMS Charging

28. To charge the air bottles, proceed as follows:—

- (1) Close the four ON/OFF valves; one adjacent to the two bottles at Stn. 833, one in the bomb-aimer's compartment, one in the starboard servicing bay and one in the cabin adjacent to the navigational bomb control unit crate.

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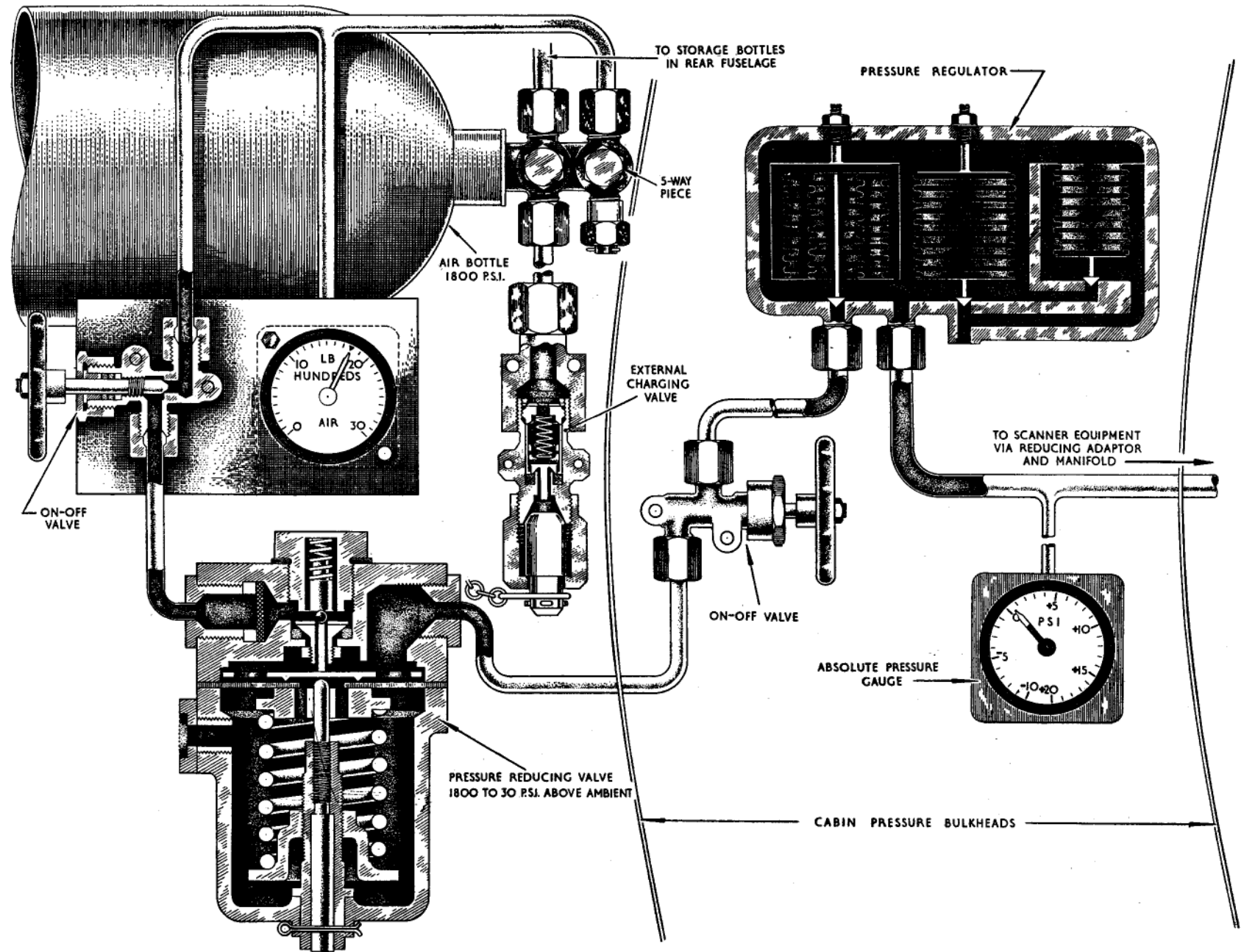


Fig. 5. Scanner pressurisation system

(2) Attach a clean dry air supply to the external charging valve (*fig. 5*) and charge until the gauge (accessible through the forward panel of the staboard servicing bay) reads 1800 lb. per sq. in.

(3) Disconnect the ground air supply and check the pipes and connections for leaks.

Checking the operation of the H2S reducing valve

29. To check the operation of the H2S reducing valve proceed as follows:—

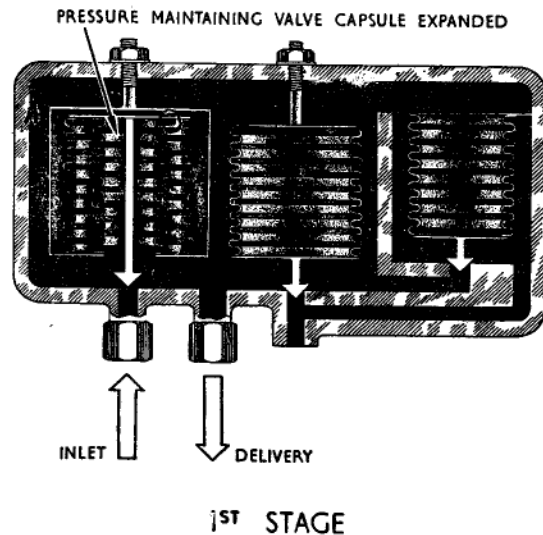
(1) Connect a pressure gauge 0–40 lb. per sq. in. to the piping on the inlet side of the pressure regulator.

(2) Turn on the supply air and check the operation of the pressure reducing valve; the gauge should read 30 lb. per sq. in.

(3) Remove the gauge and connect up the piping.

Checking the H2S system

30. To check the H2S system, proceed as follows:—



(1) With the bottles fully charged, and the ON/OFF valves in the OFF position, connect a pressure gauge 0–5 lb. per sq. in. to the piping on the inlet side of the manifold (*fig. 1 and 4*).

(2) Turn ON the air supply, check that there are no leaks and the pressure gauge reads 1.5 lb. per sq. in.

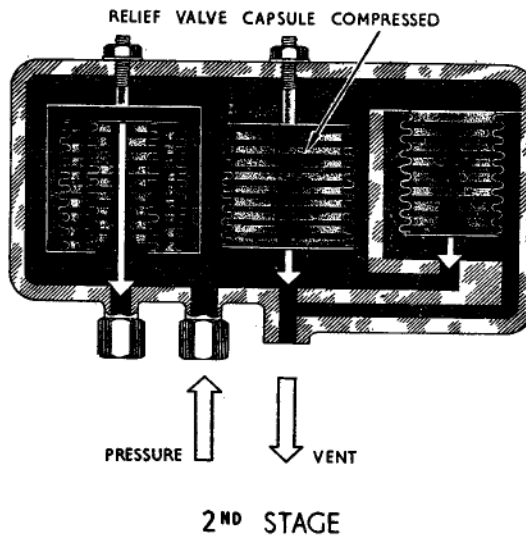
(3) Remove the gauge and connect up the piping.

Checking the T.4 bombsight system

31. To check the T.4 bombsight system proceed as follows:—

(1) With the bottles fully charged and the ON/OFF valves in the OFF position, connect a pressure gauge 0–70 lb. per sq. in. to the piping on the inlet side of the bombsight computer.

(2) Turn ON the air supply, check that there are no leaks and that the pressure gauge reads 60 lb. per sq. in.



(3) Remove the gauge and connect up the piping.

Pre-installation test

32. Before installation, pipes should be pressure tested to 2500 lb. per sq. in. There should be no leaks.

Filling the air drier (*fig. 4*)

33. To fill the air drier proceed as follows:—

(1) Ensure that the container is clean and dry.

(2) Insert the sliding gauze holder with a removable gauze placed on the perforated plate.

(3) Fill the container to within 6.5 in. from the top with grade A silica-gel and complete the filling with cotton wool in large pieces, firmly but not tightly packed.

(4) Place the second gauze on top.

(5) Insert the perforated plate and complete the assembly.

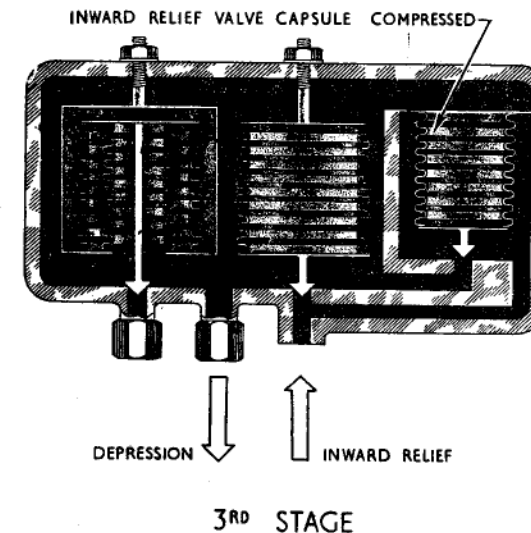


Fig. 6. Functional diagram—pressure regulator

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TABLE 1
Components—Door Seal System

| Component | Type No. | Stores Ref. | A.P. | Vol. | Sect. | Chap. |
|-------------------------|----------------------------------|-------------|-------|------|-------|----------|
| Air bottle | 400 cu. ins. | 6D/129 | 4303Z | 1 | 3 | 1 |
| Door Seal | A. C. O. 1297 | | | | | |
| External charging valve | A. G. S. 1200 (pre Mod. 1111) | | 4303Z | 1 | 4 | 1 |
| | A.57 (post Mod. 1111) | | 4303Z | 1 | 4 | 6 |
| Filter | A. C. O. 1268 | 27G/2091 | 4303B | 1 | 2 | 1 |
| Gauge | 0-500 p. s. i. | 6A/2686 | 1275A | 1 | 3 | 4 |
| Relief valve | R. V. 15 | | 4303C | 1 | 4 | 17 |
| Reducing valve | A. H. O. 19165 | 27G/2092 | 4303B | 1 | 4 | 1 Appx 2 |
| Reducing valve | P. S. 29/7 | | 4303C | 1 | 4 | 15 |
| Shut Off valve | D.5514, Sht. 1 | | | | | |

TABLE 2
Components—H2S and T.4 Systems

| Component | Type No. | Stores ref. | A.P. | Vol. | Sect. | Chap. |
|-----------------------------------|-----------------------------------|-------------|-------|------|-------|-------|
| 2 Air bottles c/w 5 way pieces | | 6D/1734J | 4303Z | 1 | 3 | 1 |
| 1 Air bottle c/w 5 way pieces | | 6D/1405J | 4303Z | 1 | 3 | 1 |
| Air drier | | 9/4592 | 1275D | 1 | | |
| External charging valve | A. G. S. 1200 (pre Mod. 1111) | | 4303Z | 1 | 4 | 1 |
| | A.57 (post Mod. 1111) | | 4303Z | 1 | 4 | 6 |
| Gauge and label | 0-3000 p. s. i. | 6A/2691 | 1275A | 1 | 3 | 4 |
| Gauge | KB554/03 | 6A/2771 | 1275A | 1 | 3 | 4 |
| Reducing valve | 1800-30 p. s. i. | PS29/10 | 4303C | 1 | 4 | 15 |
| Reducing valve | 1800-60 p. s. i. | PS29/62 | 4303C | 1 | 4 | 15 |
| Pressure regulator | | 6W/20 | 4303B | 1 | 4 | |
| 3 ON/OFF valves | A5367, Sht. 1 or A5799, Sht. 1 | | 4303B | 1 | 6 | |
| 1 ON/OFF valve | A1760, Sht. 1 | | 4303B | 1 | 6 | |

TABLE 3
Pipe Coding

| Code | Description |
|------|---|
| A.1 | External charging valve to cylinder and reducing valve. |
| A.2 | Reducing valve to door and canopy seal. |
| A.3 | H2S—from bottle to regulator. |
| A.4 | H2S—from regulator to manifold. |
| A.5 | T.4 bombsight—from bottle in starboard servicing bay to bottles in rear fuselage. |
| A.6 | From bottles in rear fuselage to bombsight computer. |



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