DEMAND OXYGEN REGULATORS,

NORMALAIR-GARRETT MK. 17 SERIES

GENERAL AND TECHNICAL INFORMATION

ILLUSTRATED PARTS CATALOGUE

BY COMMAND OF THE DEFENCE COUNCIL

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(Ministry of Defence)

FOR USE IN THE

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ROYAL AIR FORCE

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AMENDMENT RECORD SHEET

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NOTE TO READERS

This publication is now unclassified; new or revised leaves will not carry a security marking. Amendment List No. 4, January 69 called for all security markings to be deleted from pages already issued. Users should take this action as soon as it is reasonably practicable to do so, and in any event before this publication or any part of it is disposed of as waste.

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Chapter

1	Demand oxygen regulator, Mk.17G ▶

Chapter 1

DEMAND OXYGEN REGULATORS, MK.17 SERIES

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Introduction

1. The purpose of the Mk.17 series regulator is to deliver a metered supply of oxygen in accordance with the physical demand of the user, the delivery pressure being controlled by aneroids which respond to changes in cabin pressure. The regulator delivery provides normal protection against hypoxia at cabin altitudes up to 42 000 ft and affords the user 'get down' protection from a maximum cabin altitude (after depressurization) of 50 000 ft without the aid of pressure garments. A pressure breathing mask of the Type P or Q series must be used with the regulator.

2. The regulator supplies the correct ratio of oxygen and air in accordance with the cabin altitude, or undiluted oxygen irrespective of altitude, and provides a visual indication of delivery. The manual controls of the regulator, that is, the shut-off valve control, the air inlet shutter control and the emergency button, are located on the front of the regulator panel. In addition

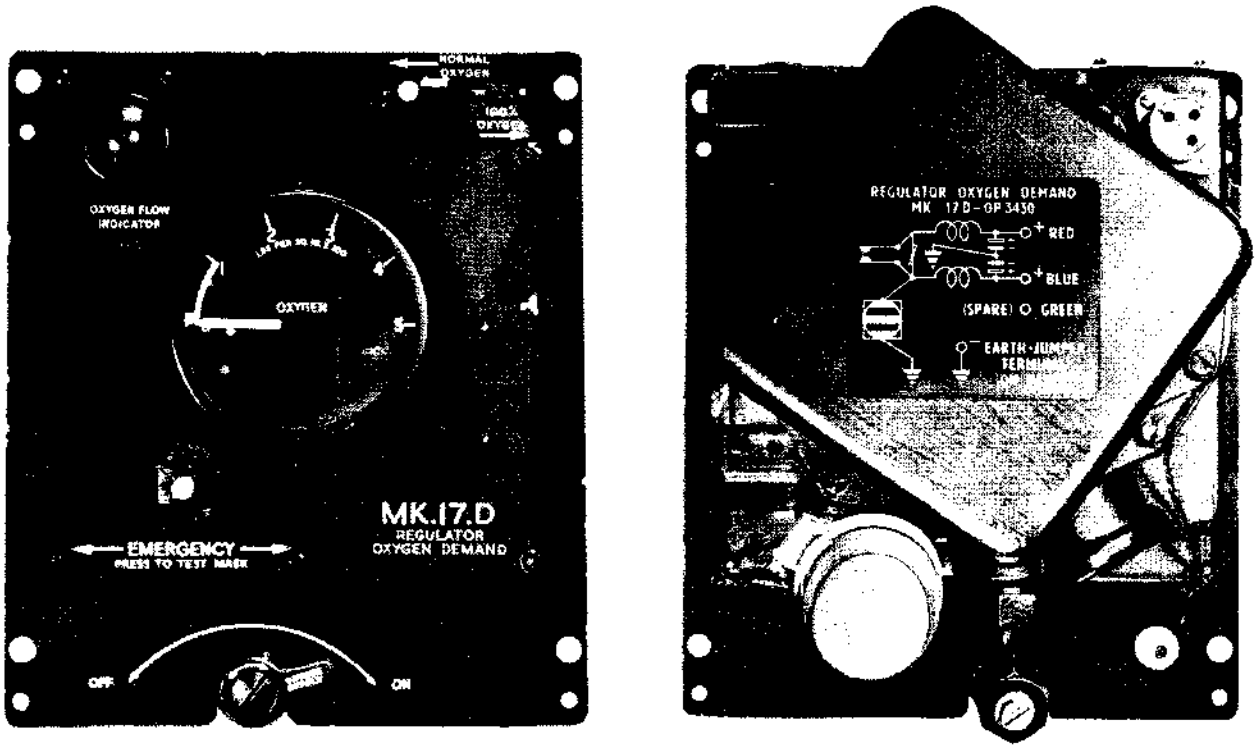

Fig.1. Typical demand oxygen regulator

to the integral electro-magnetic oxygen flow indicator, the regulator will operate a maximum of two remote blinker indicators, if required. Suppressors are fitted in the regulator to prevent interference with the aircraft communication services.

Summary of functions

3. The regulator operates with an input pressure of not less than 150 or more than 500 lbf/in^2 and provides the following:-

(1) A gas supply, either 100% oxygen or a mixture of air and oxygen at the correct flow, pressure and composition, for breathing and pressure protection as required.

(2) A visual indication when the regulator is supplying oxygen.

(3) Slight pressurization of the supply to prevent mask inwards leakage at cabin altitudes commencing within a range extending from 11 000 to 14 000 ft.

(4) A progressive increase in delivery pressure with increasing altitude from 38 500 to 50 000 ft.

(5) A manual control which enables the air inlet to be closed in the event of a toxic hazard, or if 100% oxygen is required at any altitude.

(6) A manual control to enable oxygen at positive pressure to be delivered by the regulator in the event of an emergency, and for the purpose of testing the regulator and mask before flight.

(7) Automatic venting of excess pressure when the pressure in the regulator breathing chamber reaches about 1·5 lbf/in^2.

DESCRIPTION

4. A typical regulator (fig. 2 and 3) of the Mk.17 series incorporates a mounting panel on which the magnetic flow indicator and the manual controls of the regulator are located, and a housing in which the regulator components are installed. Seven screws secure the panel to the housing in which the shut-off valve and pressure reducer, the demand valve, the air mix valve, the injector and mixing tube and the outlet elbow are installed in their respective chambers and passageways. Where necessary, gaskets and plugs are fitted to provide a seal. In the rear recess of the housing, a demand valve lever and a counterweight lever are provided; the latter connects with a diaphragm assembly which blanks off the recess to form the breathing chamber. An external lever bracket on which a safety pressure/pressure-breathing aneroid is mounted, secures the diaphragm to the housing and provides a seal. Protection of the aneroid is provided by a cover secured to the lever bracket. A manual safety pressure assembly and a pressure gauge, together with suppressors and electrical wiring, is installed in the front recess of the housing.

Mounting panel

5. The mounting panel incorporates the glass fronted bezel, the emergency button control and the oxygen flow indicator of the regulator. The bezel

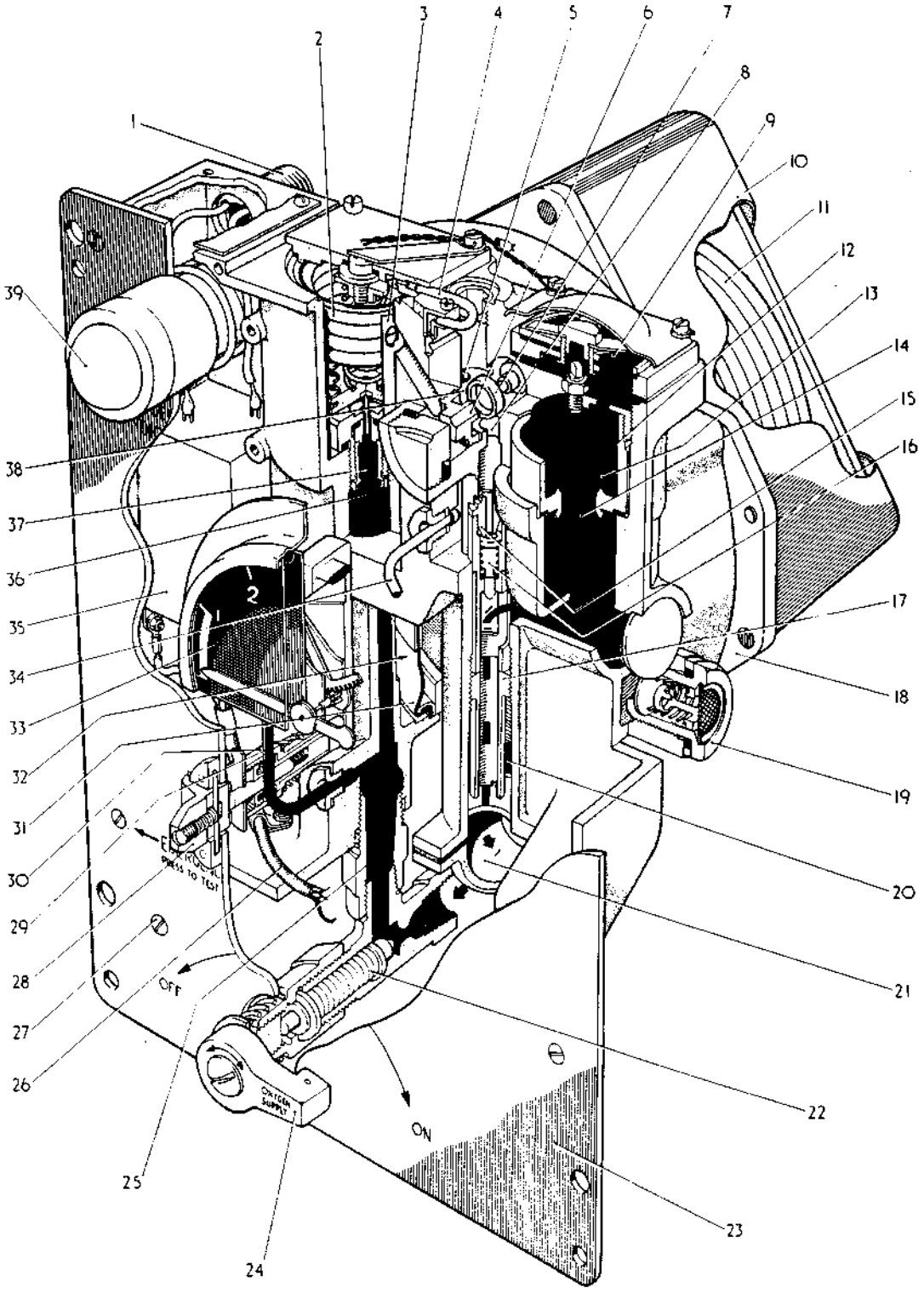

Fig.2. General arrangement

partially encases the regulator pressure gauge and, to prevent short circuits occurring between the panel and gauge, a Tufnol insulating strip is secured to the rear face of the panel. The emergency button connects with the manual safety pressure assembly (para.24).

Oxygen flow indicator

6. The flow indicator is a Dowty type, electro-magnetic indicator, and is secured to the panel by a distance bush and a spring-loaded retainer. The indicator terminal coded 2 is connected to a panel bonding screw fitted close to the indicator, whilst the terminal coded 1 is connected to a supply terminal of the radio interference suppressor in the regulator housing.

Earthing terminal

7. The regulator must be effectively earthed to the aircraft, and an earthing terminal is provided on the lower left-hand corner of the panel. The terminal consists of a countersunk screw secured to the panel by two lockwashers and a special locknut, with a second nut provided for securing the earthing lead. To ensure good conductance, the surface treatment is removed from the mating surfaces of the panel and the lockwasher, and the joint formed by the locknut is sealed with a protective varnish; hence, only the second nut must be used to secure the earthing lead to the bonding screw. The threads of the screw are 6-32 UNC.

Housing

8. The regulator housing comprises a casting machined, drilled and tapped, to receive and interconnect the various components of the regulator. The housing is provided with a small, highly-polished bush in which the demand valve is located and, where necessary, blanking plugs are fitted to seal off holes drilled purely for machining purposes.

Inlet filter and shut-off valve

9. The inlet filter, consisting of a sintered bronze filter element soldered to an adapter, is screwed into the base of the regulator housing; it provides a first stage filter and connects the shut-off valve with the inlet passageway. The shut-off valve is screwed into the filter adapter and incorporates the connection for the oxygen supply. The valve comprises a body in which a valve spindle, fitted with a metal bellows and conical nylon cap, is retained by the valve housing and actuated by a screw. Serrations on the actuating screw locate the control arm which is fitted and retained by a shakeproof washer and securing screw. Except during servicing checks, the control arm is normally ◀secured in the ON position with 28 swg copper enamelled wire (Ref. No. 5E/9102399).▶

Inlet valve and pressure reducer

10. The inlet valve is screwed into the base of the pressure reducer chamber and controls the flow of oxygen from the inlet passageway to the reducer chamber. The valve comprises a valve housing in which the spring-loaded

poppet type valve seats on the nylon insert fitted in the housing. The upper stem of the poppet valve protrudes through the nylon seat and the valve housing, thus permitting expansion of the pressure reducer bellows to depress the stem and unseat the valve. A monel metal filter is incorporated in the base of the inlet valve to prevent the entry of foreign matter.

11. The pressure reducer, consisting of a cover plate, a spring-loaded metal bellows and a feed-back adapter, is secured to the top face of the regulator housing. The bellows is located in the reducer chamber and operates the inlet valve to maintain oxygen at a pressure of approximately 30 lbf/in^2 in the reducer and demand valve chambers. The feed-back adapter is piped to the inside of the bellows and connects with a transverse passageway leading into the demand valve chamber; this ensures oxygen is fed back to assist the operation of the bellows. A spring dampener located in the circumferential groove of the bellows baseplate maintains frictional contact with the liner installed in the reducer chamber, to minimise rapid fluctuation of the bellows.

Demand valve

12. The demand valve is positioned in the bush (para.8) which is concentric to the demand valve chamber. The valve consists of a plated and polished valve stem with a silicone rubber gasket fitted in the valve head. When the demand valve is closed, the gasket seals the bore of the seat fitted in the base of the demand valve chamber.

Injector and mixing tube

13. The injector assembly is retained, by the mixing tube, in the outlet passage-way of the regulator housing. The assembly comprises a spring-loaded nozzle retained in its housing by a nozzle seat. At one end, the nozzle is counterbored to provide a restriction to flow,whilst at the other end a taper bore accommodates the injector seat; this ensures that when the demand is such that the restricted orifice cannot pass the flow, the nozzle unseats and permits the excess oxygen to pass to the outlet of the regulator.

Key to Fig. 2

1 SOCKET, 3-POLE
2 PRESSURE REDUCER BELLOWS
3 PRESSURE REDUCER LINER
4 FEED-BACK PIPE
5 PASSAGEWAY TO BLINKER DIAPHRAGM
6 DEMAND VALVE SEAT
7 DEMAND VALVE
8 PASSAGEWAY TO INJECTOR
9 AIR INLET SHUTTER
10 SP—PB ANEROID COVER
11 SP—PB ANEROID ASSEMBLY
12 AIR MIX ANEROID
13 THROTTLING PLATE
14 CHECK VALVE
15 INJECTOR SEAT
16 INJECTOR NOZZLE
17 MIXING TUBE
18 LEVER BRACKET
19 RELIEF VALVE
20 PORT TO OUTLET ELBOW
21 OUTLET ELBOW
22 SHUT-OFF VALVE BELLOWS
23 MOUNTING PANEL
24 SHUT-OFF VALVE CONTROL
25 FILTER
26 LEADS TO SPRING CONTACTS ETC.
27 EARTHING TERMINAL
28 EMERGENCY BUTTON
29 PRESSURE GAUGE PIPE
30 MANUAL SAFETY PRESSURE ASSEMBLY
31 MAIN DIAPHRAGM
32 BREATHING CHAMBER
33 PRESSURE GAUGE
34 PIPE TO BLINKER DIAPHRAGM
35 RADIO INTERFERENCE SUPPRESSORS
36 FILTER
37 OXYGEN INLET VALVE
38 DEMAND VALVE CHAMBER
39 OXYGEN FLOW INDICATOR

Air inlet

14. The air inlet consists of the manually operated shutter, the air aneroid, the throttling plate and the spring-loaded check valve. It is located in the housing recess which connects via a passageway, to the mixing tube (*para.* 13). An external cover is fitted over the air inlet shutter to prevent the ingress of moisture.

15. With the control lever of the shutter positioned at 100% OXYGEN, the shutter is closed and undiluted oxygen is supplied to the user, irrespective of cabin altitude. When the shutter control is positioned at NORMAL, the shutter is open. The throttling plate is then barometrically controlled by the air aneroid and regulates the intake of air in accordance with the cabin altitude. The check valve is opened only by suction from the mixing tube, and when closed, prevents the escape of oxygen through the air inlet. The throttling plate is wide open at sea level and closes progressively with increase in cabin altitude. When cabin altitudes of about 32 000 ft and above are experienced, the throttling plate is completely closed.

Demand valve and counterweight levers

16. The demand valve and counterweight levers pivot in brackets secured to the base of the main chamber recess, and connect with the main diaphragm. Two adjusting screws are provided in the demand valve lever, one connects with the demand valve spring, the other with the demand valve. This spring loading of the lever holds the demand valve in the closed position.

17. The counterweight lever is provided with a pre-formed fulcrum on which the demand valve lever rests, and has a looped portion to maintain the contact between the two levers. This ensures that any movement of the demand valve lever is transferred to the counter-weight lever, the forked end of which is coupled to the centre flange of the main diaphragm (*para.* 19).

Main diaphragm and external levers

18. The main diaphragm complete with ring is retained in the main chamber recess by the bracket of the external lever, the latter being secured to the regulator housing.

19. *Main diaphragm.* The diaphragm assembly comprises a silicone rubber diaphragm on which two metal stiffening plates are clamped by a tubular centre flange and securing nut. The head of the centre flange has a circumferential groove in which the forked end of the counterweight lever fits (*para.* 17). A headed pin located in the bore of the centre flange transmits the thrust from the SP-PB aneroid, via the external levers, to the demand valve lever.

20. *External levers.* The lever assembly comprises a lever bracket in which two levers are hinged. The bottom lever is provided with an adjustable slide which serves as a fulcrum for the upper lever. A T-shaped spring secured to the lever bracket ensures that contact is maintained between the two levers. A large pin fitted to the upper lever is located in the bore of the SP-PB aneroid adjusting screw to transfer thrust, via the bottom lever and the headed diaphragm pin, to the demand valve lever.

Safety pressure-pressure breathing aneroid

21. The safety pressure-pressure breathing aneroid assembly is secured to the lever bracket. It comprises two concentric bellows fitted to end plates and provided with internal and external springs. A spring-loaded adjusting screw protrudes from the centre of the inner bellows and

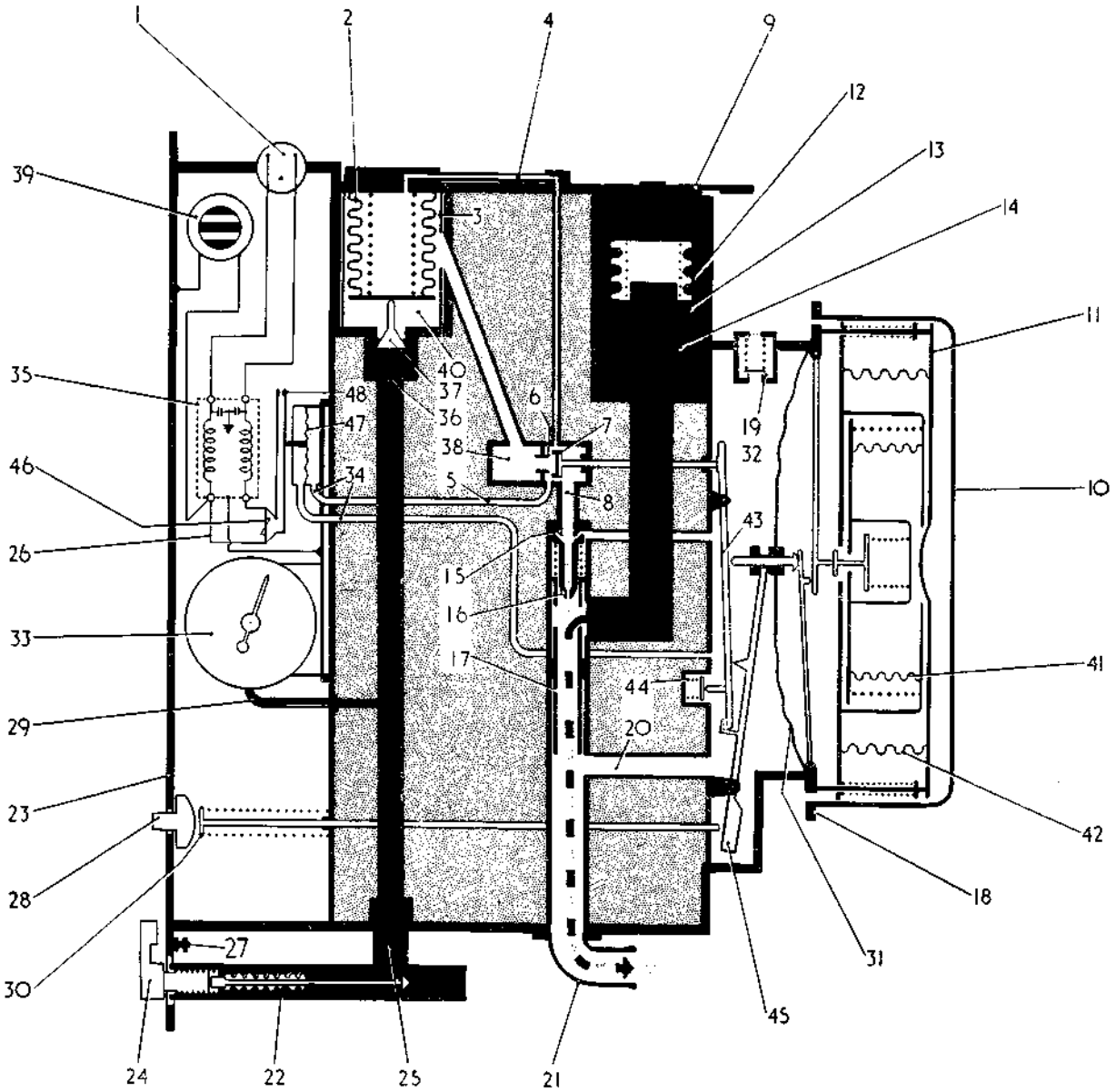

Fig. 3. Schematic diagram

Key to Fig. 3

1 SOCKET, 3-POLE
2 PRESSURE REDUCER BELLOWS
3 PRESSURE REDUCER LINER
4 FEED-BACK PIPE
5 PASSAGEWAY TO BLINKER DIAPHRAGM
6 DEMAND VALVE SEAT
7 DEMAND VALVE
8 PASSAGEWAY TO INJECTOR
9 AIR INLET SHUTTER
10 SP—PB ANEROID COVER
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26 LEADS TO SPRING CONTACTS ETC.
27 EARTHING TERMINAL
28 EMERGENCY BUTTON
29 PRESSURE GAUGE PIPE
30 MANUAL SAFETY PRESSURE ASSEMBLY
31 MAIN DIAPHRAGM
32 BREATHING CHAMBER
33 PRESSURE GAUGE
34 PIPE(S) TO BLINKER DIAPHRAGM
35 RADIO INTERFERENCE SUPPRESSORS
36 FILTER
37 OXYGEN INLET VALVE
38 DEMAND VALVE CHAMBER
39 OXYGEN FLOW INDICATOR
40 PRESSURE REDUCER CHAMBER
41 SAFETY PRESSURE BELLOWS
42 PRESSURE BREATHING BELLOWS
43 DEMAND VALVE LEVER
44 SPRING
45 COUNTERWEIGHT LEVER
46 SPARK SUPPRESSOR
47 BLINKER DIAPHRAGMS
48 SPRING CONTACTS

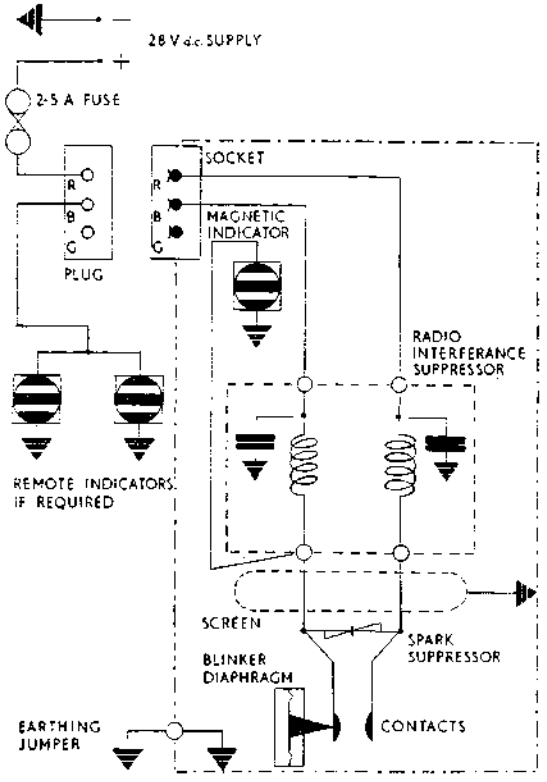

Fig. 4. Circuit diagram

accomodates the pin of the lever assembly (*para.* 20). A cruciform plate secured to the aneroid bottom plate, acts as a stop to prevent further expansion of the inner (safety pressure) bellows at a cabin altitude of between 9 000 and 12 000 ft (11 000 and 14 000 ft for post-mod G.1111 regulators); above that height the inner bellows act as an integral part of the outer (pressure breathing) bellows. Four stop screws which protrude through the stop plate are adjusted so that they contact the lever bracket and stop expansion of the pressure breathing aneroid at an altitude of 60 000 ft.

22. A cover which encases the SP-PB aneroid is secured to the lever bracket. A circuit diagram for the regulator is provided on the cover.

Relief valve

23. The relief valve is screwed into the side of the regulator and protrudes into the breathing chamber. A bonded seal is interposed between the valve head and the regulator wall to prevent leakage from the joint. The valve comprises a spring-loaded non-return valve which is set to open if the pressure in the breathing chamber rises above 3 in. Hg. In such cases, the valve is capable of passing a flow of 50 litre/min to atmosphere.

Manual safety pressure assembly

24. The manual safety pressure assembly, located in the front recess of the regulator housing, pro-

vides the linkage between the emergency button of the panel and the counterweight lever in the breathing chamber. The assembly incorporates a spring-loaded actuator rod which extends into the chamber above the counterweight lever. Thus, when the emergency button is deflected or depressed, the resultant movement of the actuator rod operates the counterweight lever. This causes the demand valve to open and a positive pressure to be delivered.

Pressure gauge

25. The pressure gauge assembly is secured in the front recess of the housing. It comprises a Bourdon type gauge together with blinker diaphragm and spring contact assemblies, and includes three pipelines which are connected to passageways in the regulator housing. The connections ensure that the Bourdon gauge is subjected to the input pressure from down-stream of the shut-off valve, and that the blinker diaphragm has pressure from down-stream of the demand valve on one side and pressure from the main chamber on the other.

26. The spring contact assembly is provided with two contact springs which extend above the centre of the diaphragm. An actuator positioned on the centre of the diaphragm connects with the lower contact arm, thus movement of the diaphragm affects the gap between the spring contacts. A spark suppressor is fitted, to prevent interference with the aircraft communication services.

Suppressors and electrical socket

27. Two suppressor assemblies are provided in the regulator, one of which serves as a spark suppressor (*para.* 26). This is connected across the spring contacts of the gauge together with radio interference suppressors on both the supply and the blinker indicator feed lines. The electrical socket provides accommodation for the three terminal pins of the plug. (*Ref. No.* 5*D*/645) which enables the 24/29V d.c. supply and also the remote indicators if required, to be coupled to the regulator. Note that the terminal pin coded GREEN is not used.

OPERATION

28. The use of the regulator in flight is very simple, as once the shut-off valve is turned ON it is fully automatic. It is however, provided with certain manual controls for use in emergencies, and for ground test purposes. Note that with the air inlet shutter set at NORMAL, apertures in the shutter permit the entry of air and results in a considerable saving of oxygen at the lower altitudes. Moving the control to the 100% OXYGEN position closes the shutter, thus enabling undiluted oxygen to be supplied at any altitude.

29. With the emergency button set at neutral, i.e. central position, the operation of the regulator is as follows:—When the shut-off valve is turned ON, oxygen enters the valve and flows from the valve into the inlet filter. It is then filtered by the sintered bronze element and passes, via the inlet passageway of the regulator housing, to the inlet valve and to the pressure gauge. The gauge registers the input pressure (200 to 400 lb/in^2 from system reducing valve; 150 to 200 lb/in^2 from liquid oxygen converter). At this stage the demand valve is held closed by the spring-loaded lever, and oxygen passes from the inlet passageway through the monel metal filter and the orifice of the inlet valve, into the pressure reducer and demand valve chambers. When the pressure of the oxygen in the chambers reaches approximately 30 lb/in^2 it compresses the reducer bellows and allows the spring-loaded inlet valve to close.

30. When the emergency button control is deflected or depressed, it actuates the manual safety pressure and affects the counterweight and demand valve levers. This results in pressurization of the main chamber and the delivery of oxygen at a positive pressure. Indiscriminate operation of the button results in gross wastage of oxygen; it must therefore be kept in the neutral position and used only for ground test and emergency purposes.

31. Inhalation, i.e. suction in the mask tube, causes a depression in the breathing chamber of the regulator. This depression acts on the main diaphragm, movement of which causes the demand valve to open. On exhaling, the resultant change of pressure in the breathing chamber causes the demand valve to close. Thus, the inlet valve, the pressure reducer and the demand valve all operate in accordance with the users breathing cycle.

32. When a demand flow is created (*para.* 30 *and* 31) the pressure on the lower surface of the blinker diaphragm from downstream of the demand valve exceeds that of the breathing chamber. This causes the diaphragm to move the actuator and close the gap between the contact points of the gauge. The electrical circuit is completed and the solenoid of the blinker indicator is energized causing the Doll's eye to rotate and expose the fluorescent strip, to indicate flow. Similarly on exhalation, the pressures acting on the blinker diaphragm equalize and movement of the diaphragm permits the gap between the contact points to be re-established. The electrical circuit is broken and the blinker indicator returns to the no-flow indication. The radio interference and spark suppressors prevent interference to the aircraft communication services during the making and breaking of the electrical circuit.

33. Oxygen flowing from the demand valve chamber passes through the injector into the mixing tube. At cabin altitudes below 32 000 ft and providing the air inlet shutter is at NORMAL, air is drawn through the air inlet valve into the mixing tube and mixes with the oxygen. At sea level the air aneroid controlled throttling plate is wide open and inhalation causes only a slight depression in the main chamber of the regulator, thus the flow of oxygen is correspondingly small in relation to the intake of air. As the throttling plate closes with increase in cabin altitude the depression increases accordingly and more oxy-

gen and less air is supplied until, at approximately 32000 ft, the throttling plate closes completely to prevent the intake of air. When the air shutter is set at 100% OXYGEN, no air is admitted and undiluted oxygen is supplied irrespective of altitude.

34. The safety pressure/pressure-breathing aneroid responds immediately to changes in the cabin altitude; at an altitude of not less than 11000 or more than 14000 ft, the expansion of the safety-pressure bellows acts on the linkage system to provide a slight pressurization of the regulator delivery. This positive pressure, known as the safety pressure, remains constant for subsequent altitudes up to 30000 ft and increases slightly in value from that altitude up to 38500 ft, due to the movement of the pressure-breathing bellows; its purpose is to aid breathing and, to a certain extent, prevent inward leakage at the mask and associated pipelines.

35. The pressure-breathing bellows continues to expand with altitude and, from 40000 to 50000 ft, it provides an additional force on the linkage system which causes the delivery pressure to be progressively increased from 2 to 17 in wg. In the event of cabin de-pressurization, the SP/PB aneroid automatically adjusts the delivery pressure in accordance with the cabin altitude encountered, to protect the user against hypoxia whilst taking the appropriate 'get down' action. The relief valve opens to prevent an excessive build-up of pressure in the regulator, particularly at unoccupied crew positions.

INSTALLATION

36. Before fitting the regulator in an aircraft, refer to the relevant aircraft air publication for details of the installation. Check that the direction of the regulator outlet elbow conforms with the appropriate L.P. oxygen supply system. The regulator is despatched with the outlet facing rearwards. To change the outlet to the alternative (lateral) position:-

(1) Sever the locking wire on the outlet securing screw. Remove all four securing screws and lockwashers, and withdraw the outlet from the regulator. Examine the gasket (Part No. 793524-1/N), and renew if necessary.

(2) Locate the gasket on the outlet face of the regulator housing. Fit the outlet elbow (Part No.793523-1/N) in the alternative position and reassemble the screws (4-48 UNF) and the lockwashers (Part No. OP.10429). The drilled headed screw (Part No. OP.11316) is to be fitted in the outlet flange hole nearest to the protruding panel screw, and the three screws (Part No. OP.10413) in the remaining holes. Tighten all four screws progressively. Lock the drilled headed screw to the panel screw, using 22 swg locking wire (Ref. No. 30A/9437135).

(3) Fit the rubber bung (Part No. B26/001) to the regulator outlet and supply oxygen at 150 lbf/in^2 to the regulator inlet. Set the regulator shut-off valve control to ON and deflect the emergency button either to the left or to the right. ◀Apply leak test solution to the outlet joint and check for leaks; there should not be any leakage. Refer to Chap. 1-1, para.3 for information concerning leak test solution.▶

(4) Turn the shut-off valve control OFF, centralize the emergency button, disconnect the oxygen supply, and remove all traces of the leak test solution (Chap.1-1 para.3).

Note...

If the outlet cuff (Part No. OP.18518) has been removed, install the cuff fully home on the outlet elbow, and secure with the clip (AGS.605/0X or Part No. OP.15556). The clip must be behind the lip on the outlet, and its adjusting screw is to be within the boundary of the regulator housing. Check the cuff/outlet joints for leaks, using the test procedure (sub-para.(3) and (4)). There must be no leaks.

37. When assembling the adapter (Ref. No.6D/1647) avoid overtightening the adapter on its tapered thread. Sealing is effected by means of PTFE tape which must comply with, and be fitted in accordance with, the instructions contained in AP 107D-0001-1, Chap.2-2. Avoid moving the shut-off valve and filter inlet since leakage results if these joints are disturbed.

38. When installing the regulator, ensure that the 28V d.c. supply is coupled in the correct polarity, and that the panel of the regulator is bonded to the aircraft in accordance with the circuit diagram (fig.4). The remote indicators illustrated in the diagram are not necessarily fitted in all types of aircraft. Only the outer nut is to be removed from the panel bonding screw (6-32 UNC). This nut is to be used to secure the aircraft bonding lead to the panel.

Removal of regulator

39. The rubber outlet cuff is essentially a part of the regulator and, when removing the regulator from an aircraft, the clip securing the cuff to the regulator should not normally be disturbed.

40. When the regulator is removed from an aircraft for storage or transit purposes, it must be prepared in accordance with sub-para.(1) to (5). If the removal is of a temporary nature, the instructions contained in sub-para.(5) may be omitted, provided that the regulator is kept under approved storage conditions.

(1) Set the air inlet shutter control at 100% OXYGEN.

(2) Fit the transit plug (Part No. PB23847-1/N) to the on-off valve.

(3) Fit the rubber bung (Part No. B26/001) in the outlet cuff.

(4) Deflect the emergency button.

(5) Place the regulator in a clean polythene bag, seal the bag and position in a cardboard carton (external dimensions $9\frac{1}{2}$ x $8\frac{1}{2}$ x $10\frac{1}{2}$ in.) filling the excess space with shredded wax paper or some similar material which will not contaminate the regulator. Finally, fit the carton in a special transit box (Ref. No. 6D/2016).

SERVICING

General

41. Routine servicing is confined to exercising the regulator, applying the servicing checks (para.45 to 48) and conforming to the requirements of para.42. If the serviceability of the regulator is suspect, it must be removed from the aircraft and either tested in accordance with the standard serviceability test (Chap. 1-1, 1-1-1, or 1-2) or returned for reconditioning.

42. The regulator shut-off valve control must be wire-locked (para.9) at the ON position before take off and, where Q.R. sockets Mk.7 (Ref.No.6D/1642) are concerned, the dummy plug (Ref. No.6D/1764) must be fitted when the regulator is not in use; this prevents the ingress of foreign matter and also reduces

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the loss of oxygen due to automatic pressurization of the regulator at cabin altitudes of 12 000 ft and above. When the regulator air inlet control is at 100% OXYGEN, the bleed orifice of the plug permits the entry of sufficient air to prevent abnormal differential cabin/regulator pressures prevailing when rapid increases of cabin pressure occur.

WARNING...

1. MANY MATERIALS, PARTICULARLY OIL AND GREASE, ARE SUBJECT TO SPONTANEOUS COMBUSTION WHEN EXPOSED TO UNDILUTED OXYGEN UNDER PRESSURE. PRECAUTIONS MUST BE TAKEN, THEREFORE, TO EXCLUDE OIL, GREASE, DUST AND METAL PARTICLES FROM THE REGULATOR AND ASSOCIATED EQUIPMENT.

◀2. CLEANING AND DEGREASING OF OXYGEN EQUIPMENT COMPONENT PARTS MUST BE DONE STRICTLY IN ACCORDANCE WITH THE INSTRUCTIONS CONTAINED IN A.P.107D-0001-1, CHAP. 2-0-3.

3. SEALANTS, ADHESIVES AND COMPOUNDS SPECIFIED FOR USE ON THIS REGULATOR MUST BE FROM AN IDENTIFIABLE BATCH WHICH HAS BEEN TESTED TO CAT. A OR CAT. B AND APPROVED FOR USE WITH OXYGEN. THE TEST CATEGORY SHOULD BE STAMPED ON THE CONTAINER.

4. AT ALL TIMES WHEN A REGULATOR IS NOT IN USE, A BLANKING CAP (AGS.596) MUST BE FITTED TO THE INLET ADAPTER, A TRANSIT BUNG (PART NO. B26/001) MUST BE FITTED TO THE OUTLET, AND THE REGULATOR MUST BE KEPT IN A TIED POLYTHENE BAG. THIS IS TO ENSURE THAT FOREIGN MATTER IS EXCLUDED FROM THE INTERNAL MECHANISM AND PASSAGES.

Shut-off valve control lever

42A. Normally, it should not be necessary to remove the shut-off valve control lever. However, should the lever be removed for any reason, it is particularly important to ensure that the tufnol washer (Part No. OP.10463) is located over the shoulder on the actuating screw when re-assembling, and that the lever securing screw is tightened correctly. Locking for this screw consists of a lockwasher under the head and a spot of EC.1022 adhesive (tested to Cat. A or Cat. B) applied to the threads. It is recommended that the lever securing screw is checked for tightness when applying servicing checks.▶

Test equipment

43. The undermentioned items of equipment are necessary to carry out in-situ servicing tests.

(1) Suction tube (Ref. No. 6C/1015): used for exercising and functional tests.

(2) Metering tube (Ref. No. 6C/1041378): used in conjunction with item (3) for the flow tests (para.45).

(3) Flow tester Mk.5A* (Ref. No. 6C/475): to be calibrated at 1·1 in. wg.

Note...

When applying servicing tests to regulators used in conjunction with combined oxygen and mic-tel seat hose assemblies, a test adapter (Ref. No. 6C/3194) is required in addition to the equipment listed above. This adapter is required to interconnect either the suction tube or the metering tube with the socket of the combined oxygen and mic-tel seat hose assembly.

Exercising the regulator

44. Because the regulator has to function without the aid of lubrication, an initial lag may be experienced after a period of disuse. For this reason if the regulator fails to satisfy the routine (ground crew) tests it must be exercised then retested, and assessed on the latter test; regulators unused for a period in excess of three days must be exercised prior to testing. The procedure is as follows:-

(1) Set the regulator control to ON, the emergency button central and the air inlet control to NORMAL. Connect the suction tube (Ref. No. 6C/1015), or a pressure breathing mask, to the outlet hose of the regulator.

(2) Using the suction tube (or mask), exercise the regulator for at least six heavy breathing cycles, then move the air inlet control to 100% OXYGEN and repeat the operation.

(3) Remove the suction tube (or mask) and proceed with routine servicing checks.

Flow test

45. Use the metering tube and Mk.5A* flow tester. The free end of the metering tube must be kept well clear of obstructions to permit an undisturbed discharge from the orifice, and the regulator gauge reading (inlet pressure) should remain within the specified limits whilst applying the tests. In H.P. oxygen storage systems, the regulator gauge reading should be not less than 200 or more than 400 lbf/in^2, and in liquid oxygen systems, it should be not less than 150 or more than 200 lbf/in^2. If the inlet pressure starts at the lower limit, a temporary decrease below this figure is permissible during the tests, provided it has no adverse affect on the flow tester reading. The test procedure is as follows:-

(1) Set regulator on-off valve control to ON, air inlet control to 100% OXYGEN and emergency button central.

(2) Plug metering tube into Q.R. socket on outlet hose of regulator, and connect rubber tube of metering tube to flow tester.

(3) Deflect emergency button to left and to right, in turn, checking flow tester reading and regulator blinker indicator. At these positions, flow tester reading should be not less than 2 litres/min and regulator blinker indicator should indicate flow.

Continued on page 11

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(4) Centralize and fully depress emergency button; check that the flow tester reading is not less than the calibrated value of the tester (calibrated at 1·1 in. w.g. pressure) and that the regulator blinker indicates flow.

Note . . .

The flow reading obtained is dependent on how far the emergency button is depressed, therefore, a variation in the day-to-day results is permissible providing the specified value is obtained.

(5) Release emergency button; flow should cease, and blinker must return to no-flow indication. A regulator which continues to give an audible flow when the blinker indicates no-flow after releasing the button, can be accepted providing it satisfies the following test:—

(a) Disconnect the flow tester from the metering tube. Connect a Mk. 2 oxygen leakage tester (*Ref. No.* 6C/1418) to the 18 in. rubber tube on the metering tube.

(b) Depress and release the emergency button until the "audible" flow continues after releasing the button. Roll the thumb slowly across the metering tube orifice so that it gradually blanks-off the orifice. During this operation the flow should cease; no further bubbles (flow) should appear in the leakage tester, if the regulator is acceptable. The test is to be applied at least three times, and the orifice must be blanked off gradually, otherwise a back pressure surge can be created. If this occurs the result is to be ignored, and the test must be repeated.

46. When the emergency button is deflected or depressed, a continuous noise may occur in the regulator; the noise is permissible provided that it ceases on returning the button to the neutral position and does not continue when a normal demand breathing cycle is taken by means of a suction tube, or mask.

47. Regulators not conforming to the test requirements after exercising, are to be removed from the aircraft.

Servicing checks

48. The checks listed in Table 1 are to be completed in the order given. To obtain the OFF position, the regulator shut-off valve control must be turned counter-clockwise until resistance to further movement is felt, otherwise leakage may occur.

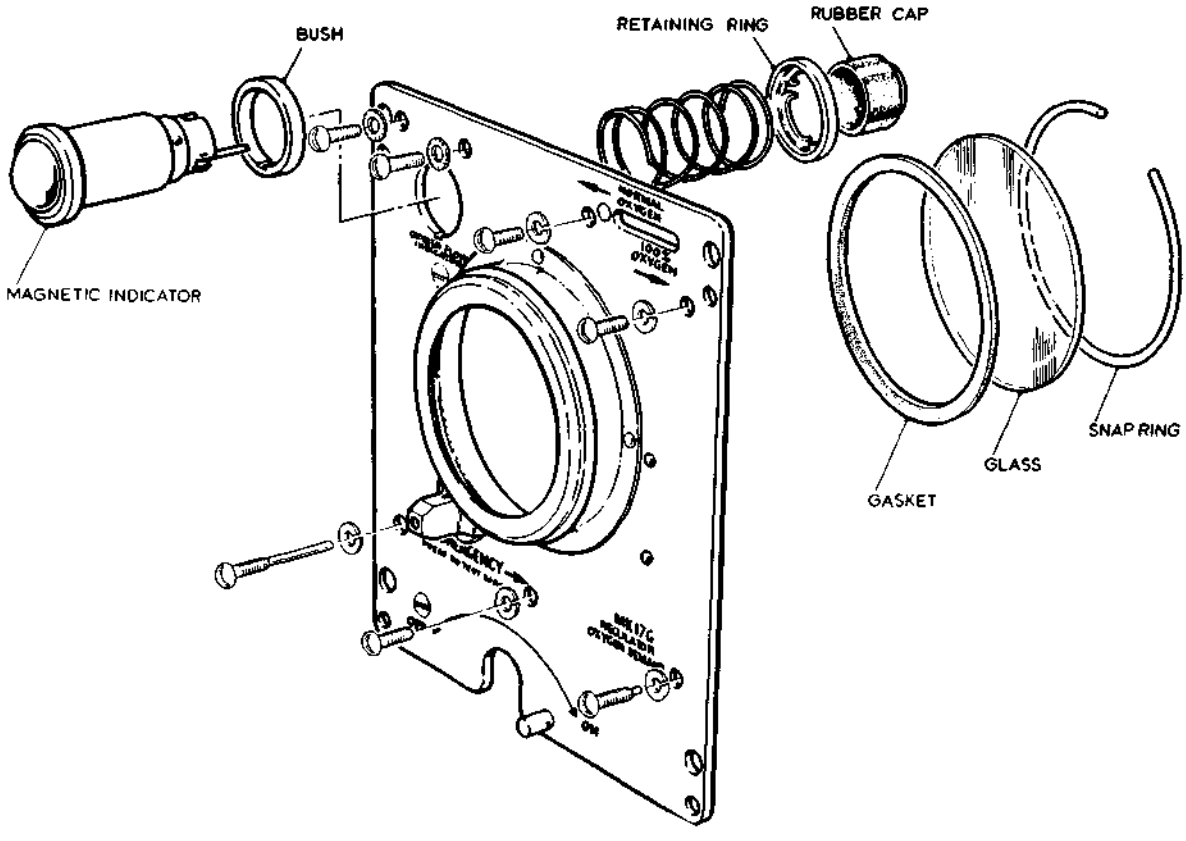

Fig. 5. Pressure gauge glass and magnetic indicator removed

Renewing a pressure gauge glass (*fig.* 5)

49. The following instructions detail the procedure for renewing a cracked or broken pressure gauge glass. A broken glass may be renewed in service only if all the pieces are recovered. *Where pieces are not recovered or where there is doubt, the regulator must be disposed of in accordance with current Service procedure.*

(1) Invert the regulator, detach any loose pieces of glass and retain the pieces.

(2) Remove the seven screws and lockwashers securing the mounting assembly to the housing. Refer to *fig.* 1. Ease the assembly away from the housing until the back of the magnetic indicator is accessible. Remove the rubber cap, disconnect the blue lead from the indicator and remove the mounting plate assembly, taking care not to damage the gauge dial.

Caution . . .

Do not disturb any part of the mechanism within the housing.

(3) Remove the snap ring, then remove the glass and the gasket. The gasket is to be discarded.

(4) If the glass is broken, ensure that all pieces are accounted for. Refer to para. 49.

(5) Examine the housing mechanism for cleanliness and for any defects.

(6) Assemble a new gasket (*Part No.* 778408-1/*N*) and a new glass (*Part No.* 778409-1/*N*) to the bezel and secure with the snap ring.

(7) Position the mounting plate assembly on the housing, pass the blue lead from the suppressor through the indicator cap and secure the lead to terminal 2 on the indicator. Ensure that the black lead is secure at terminal 1 and at the bonding point on the back of the mounting plate.

(8) Secure the mounting plate assembly to the housing with the seven screws, five lockwashers and two shakeproof washers. The shakeproof washers are to be used with the screws above the blinker indicator. Fit the two long screws to enter the housing at the bottom corner positions.

(9) Apply the standard serviceability tests (*Chap.* 1-1, 1-1-1 *or* 1-2).

Renewing the magnetic indicator (*fig.* 5)

50. To renew the magnetic indicator, proceed as follows:—

(1) Remove the mounting plate assembly as described in para. 49 (2).

(2) Disconnect the black lead from the indicator.

(3) Align the slots in the spring retainer with the raised portions on the indicator body and then release the spring. Withdraw the indicator and bush from the mounting plate. Refer to *fig.* 5.

(4) Ensure that the new indicator has satisfied the prescribed electrical tests.

(5) Examine the housing mechanism for cleanliness and for any defects. Ensure that the pressure gauge glass in the mounting plate assembly is clean and secure.

(6) Fit the bush to the magnetic indicator, assemble the indicator to the mounting plate, and retain with the spring and the cap. Ensure that the pin in the bush enters the locating hole in the mounting plate.

(7) Pass the black lead through the indicator cap and connect to terminal 1.

(8) Assemble the mounting plate assembly to the housing in accordance with the instructions contained in para. 49, sub-para. (7) and (8).

(9) Apply the standard serviceability tests (*Chap.* 1-1, 1-1-1 *or* 1-2).

TABLE 1

Servicing checks

Note . . .

The maximum test pressure for the regulator is 500 lb / in². Service Units using rigs manufactured from local resources MUST, therefore, take the necessary precautions to prevent the inadvertent application of excessive test pressure. A pressure gauge (0-600 lb / in²) and a reducing valve must be teed into the pipeline between the regulator inlet and the supply source. Supply controls must be opened slowly so that when test pressure of 500 lb / in² is applied the transient pressure does not exceed this figure. Failure to observe the above precautions can result not only in damage to the regulator gauge, but may also, in certain circumstances, overstress other components of the regulator.

To check	Conditions	Remarks
1. Oxygen supply.	Shut-off valve: OFF.	Contents gauge reading: FULL.
2. Leak past regulator shut-off valve.	Shut-off valve: OFF. Suction tube (mouthpiece open) plugged into L.P. outlet socket.	Depress emergency button until regulator gauge reads zero. On releasing button, gauge reading must remain at zero for at least 30 sec.

TABLE 1 (Cont.)

Servicing checks

To check	Conditions	Remarks
3. System reducing valve (H.P. gaseous oxygen systems).	Shut-off valve: ON.	Regulator gauge should indicate not less than 200 or more than 400 lbf/in^2.
3a. Delivery pressure (liquid oxygen converter).	Shut-off valve: ON.	Regulator gauge should indicate not less than 150 or more than 200 lbf/in^2.
4. Leakage from regulator.	Shut-off valve: OFF.	Gauge reading should not drop more than 25 lbf/in^2 in 1 min.
5. Emergency button manual safety pressure and flow indicator.	Shut-off valve: ON.	Deflect emergency button to left and right, then centralize, fully depress, and release button. The flow from suction tube should be distinct, blinker indicator must indicate flow in each case. Deflect button to right or left, close mouthpiece of suction tube momentarily. Flow should cease and indicators return to no-flow indication. Centralize button. If flow indicators fail to operate, check fuse in power supply or regulator/aircraft bonding connection.
6. Leakage from L.P. pipelines or regulator.	Shut-off valve: ON. Air inlet control: NORMAL. Mouthpiece of suction tube closed. If the emergency oxygen system employs a demand emergency oxygen regulator, the aneroid bleed of the emergency regulator must be sealed by placing a finger over the bleed orifice.	Set emergency button to right or left, turn shut-off valve control OFF: gauge reading should not fall to zero in less than 1 min. Centralize button. If failure occurs, check associated pipelines and suction tube for leakage before rejecting regulator.
7. Air inlet valve.	Shut-off valve: OFF. Air inlet control: 100% OXYGEN.	Suck gently through suction tube: after initial effort, resistance to suction should

TABLE 1 (continued)

Servicing checks

Tc check	Conditions	Remarks
		be distinct; move air inlet control to NORMAL and resistance to suction should be negligible.
8. Oxygen supply.	Shut-off valve: ON. Air inlet control: NORMAL.	Use suction tube to simulate normal breathing cycles: the flow indicator(s) should operate in phase with breathing cycle.
9. Flow test.	Shut-off valve: ON. Air inlet control: 100% OXYGEN.	Refer to para.45.

◀ Regulator cleaning

Dismantling

51. In certain installations, the location of the oxygen regulator renders it susceptible to the ingress of dust and other foreign matter, and necessitates periodic cleaning. Where the associated Servicing Schedule specifies cleaning, the following procedure is to be adopted:-

Note...

(1) The only cleaning agent to be used is trichloroethane (Ref. No. 33D/2201949).

(2) The parts are to be brush-cleaned using a brush having 100 per cent nylon bristles.

(3) The cleaning agent must be used sparingly when cleaning parts assembled to the regulator housing and care must be taken to prevent the fluid entering the regulator.

(4) When cleaning metal parts removed from the regulator, use the two-container method in which the brush is dipped only in the clean fluid and any foreign matter brushed into the second container.

(1) Remove the seven screws and lockwashers securing the mounting plate assembly to the housing assembly. Refer to fig.5. Ease the mounting plate away from the housing until the back of the magnetic indicator is accessible. Remove the rubber cap, disconnect the blue lead from the indicator and remove the mounting plate assembly, taking care not to damage the pressure gauge dial. ▶

◀ (2) Remove the top plate from the top of the manual safety pressure assembly and withdraw the pin, the spring and, if fitted, the spacer; this spacer is used for adjustment purposes when necessary. Refer to fig.6.

(3) Remove the two screws and lockwashers, and remove the manual safety pressure assembly. Remove and discard the gasket (Part No. 717343-1/N).

(4) Remove the four screws, lockwashers, and spacer tubes, then remove the cover, shutter assembly, gasket (Part No. 778448-1/N) and the screen. Refer to fig.6. Discard the gasket. Do not disturb the aneroid and check valve assembly.

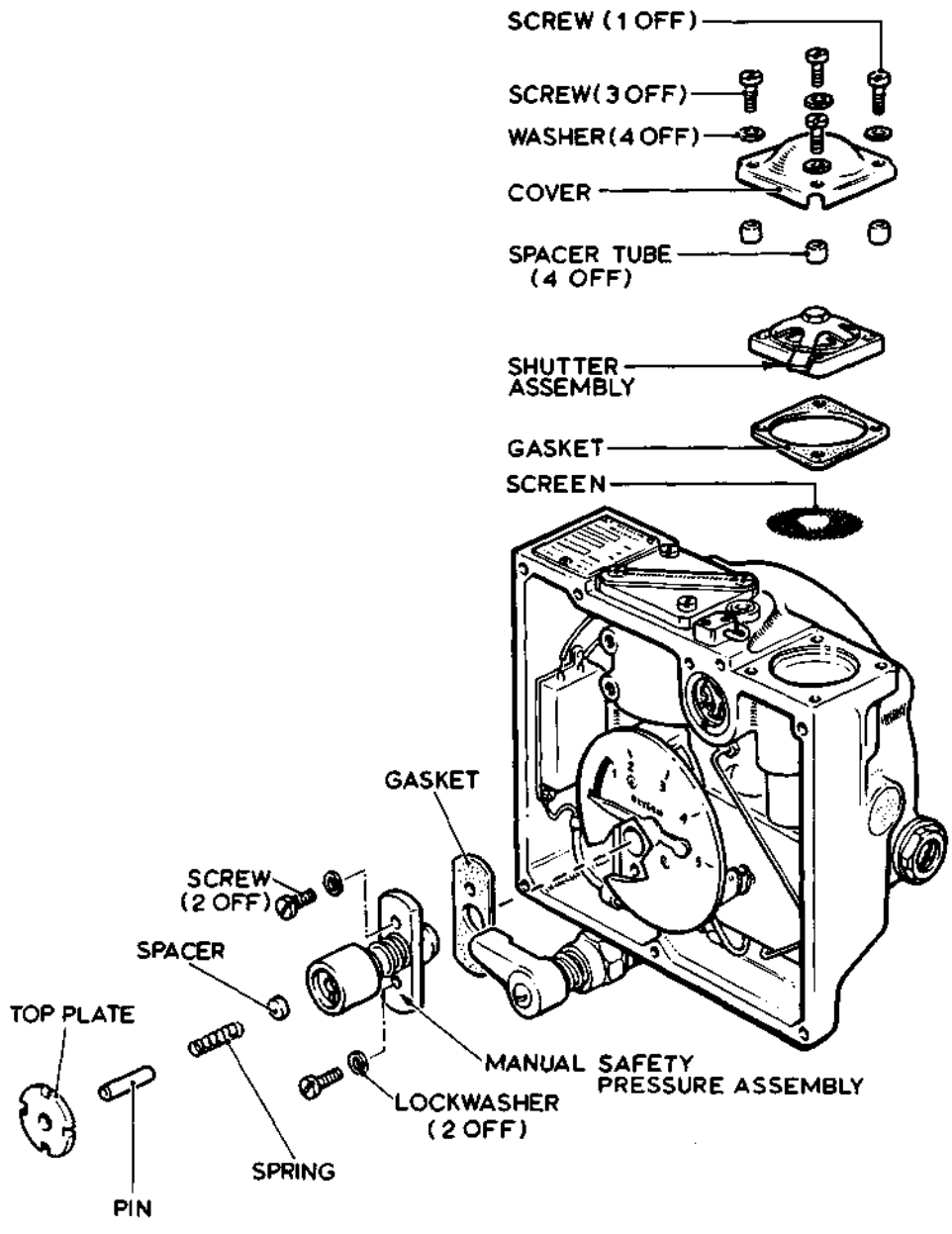

Fig.6. Safety pressure assembly and air inlet shutter assembly removed ▶

◀ 52. Regulator assembly.

(1) Holding the assembly in the near-inverted position, brush-clean the internal parts, paying particular attention to the indicator suppressor, electrical socket and the spring contacts. Use the cleaning agent sparingly, ensuring that it is not applied to the dial or allowed to pass into the diaphragms of the gauge assembly.

(2) Allow the assembly to dry for 1 hour at a temperature of 70 ± 10°C.

Note...

A portable, hot air blower, approved for use with oxygen, can be used to accelerate drying if available.

(3) Examine generally for damage, paying particular attention to the soldered connections, spring contacts, and the pressure gauge pointer and dial.

Note...

Should soldering be necessary, use R.C. Ersin multi-core or Superspeed R.C. solder, and flux to DTD.599.

53. Manual safety pressure assembly. Wash the assembly in the cleaning agent and dry for 1 hour at 70 ± 10°C. Check the assembly for freedom of operation and examine the head of the adjusting screw; it should be smooth and polished. This assembly must not be dismantled.

54. Shutter assembly and associated parts.

(1) Wash the filter screen (Part No. 778452-1/N) in the cleaning agent, then examine for cleanliness and damage. Renew if defective.

(2) Wash the cover in the cleaning agent and examine for damage.

(3) Whilst operating the air inlet shutter, apply a jet of breathing oxygen at moderate pressure, then wipe the assembly with a clean non-fluffy, lint-free cloth. The cleaning agent must not be used on this assembly.

55. Mounting plate assembly.

Note...

Should it be necessary to renew either the gauge glass or the magnetic indicator, refer to para.49 or 50, as appropriate.

(1) Using a clean, lint-free cloth moistened with a weak detergent solution (Stergene or Teepol are suitable), wipe both sides of the plate and the gauge glass. Wipe all surfaces dry with a clean cloth, then allow to dry for 1 hour at 70 ± 10°C. ▶

◀ (2) Check the operation of the emergency button (to left and right, and straight in) and examine the panel markings for legibility. Ensure that the magnetic indicator is clean and undamaged, and that the black lead is secure.

Assembling

56. Air inlet assembly (fig.7)

(1) Position the screen in the air inlet shutter housing and then locate a new gasket (Ref. No. 6DD/496) over the screen.

(2) Insert the shutter assembly into the housing with the lever at the front of the regulator.

(3) Assemble the screws and lockwashers to the cover, fit a spacer tube to each screw (on the underside of the cover), then assemble the cover to the regulator and secure the assembly with the screws. The screw having the wire-locking hole should be on the inner side and at the rear, and should be wire-locked to the adjacent screw which secures the strap over the pressure reducer assembly.

(4) Check the air shutter lever for full and free movement.

57. Manual safety pressure assembly (fig.6)

(1) Ensure that the manual safety pressure assembly is clean and dry. Position a new gasket (Ref. No. 6DD/491) on the manual safety pressure assembly mating face in the regulator, then mount the assembly and secure with the two lockwashers and screws.

(2) Insert a spacer (only if one was removed during dismantling) into the bore of the actuating rod of the manual safety pressure assembly, insert the spring and then the pin.

(3) Fit the top plate to the housing of the manual safety pressure assembly and ensure that it is secure.

58. Mounting plate assembly (fig.5)

(1) Position the mounting plate assembly on the housing, pass the blue lead, from the suppressor, through the indicator cap and secure to terminal 2 on the indicator. Ensure that the black lead is secure at terminal 1 and at the bonding point on the back of the mounting plate.

(2) Secure the mounting plate assembly to the housing with the seven screws, five lockwashers and two shakeproof washers. The shakeproof washers are to be used with the screws above the magnetic indicator. Fit the two long screws to enter the housing at the bottom corner positions.

Testing

59. Apply the standard serviceability tests (Chap. 1-1, 1-1-1 or 1-2). ▶

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Chapter 1-1

STANDARD SERVICEABILITY TESTS
for
DEMAND OXYGEN REGULATORS, Mk.17 SERIES
(For use where test stand, Mk.2 (Ref. No. 6C/1042) is available)

Introduction

1. The tests detailed in this chapter should be applied before the regulator is fitted to an aircraft, and when the serviceability of the regulator is in doubt. If a Mk.2 test stand is not available, a series of less comprehensive tests (Chap. 1-2) can be applied using the test rig for pressure demand oxygen regulators (A.P.112T-01123-1).

TEST EQUIPMENT

2. The equipment required is as follows:-

(1) Test stand, Mk.2 (Ref. No. 6C/1042). Refer to A.P.112T-01110-1.

(2) Oxygen regulator, Mk.17 series.

(3) Inlet adapter (Part No. OP.10073) (Ref. No. 6D/1647).

(4) Pressure reducing and control unit (Ref. No. 6C/1597).

(5) Mk.7 breathing hose, approx 4 ft (Ref. No. 6D/1597).

(6) Electrical indicator (Ref. No. 5CZ/5003).

(7) Plug, 3-pole (Ref. No. 5D/645).

(8) ◀ Bridge, universal (J.S. Cat. No. 6625-99-972-4702) - R.N.
or
Bridge, universal (Ref. No. 10S/9553163) - R.A.F.

(9) Multimeter, CT498A (Ref. No. 5QP/1057049) or similar. ▶

(10) 20 to 29V d.c. supply.

Note...

When Mk.17 series oxygen regulators are received for testing, the main pressure inlet is to be fitted with the adapter (Ref. No. 6D/1647). ◀ Refer to Chap. 1, para.37. ▶ All routine tests are to be carried out with the adapter fitted; once fitted it should not be removed for normal routine tests or servicing.

PARTICULARS OF TESTS

3. The tests are to be applied under normal temperature and pressure conditions. The gas supply for the tests can be either breathing oxygen or clean,

dry, oil-free air (Nato air), but the test stand flowmeters must be calibrated for the gas used. Unless otherwise specified, the regulator is to be supported with the mounting panel horizontal and uppermost. Soap solution for leak testing is to be prepared from soft soap J.S. Cat. No. 6505-99-210-1935. Precautions must be taken to prevent the solution entering the regulator, and all traces of the solution are to be removed when the test is completed. Use clean, lint-free, non-fluffy cloth, then apply a jet of breathing oxygen at moderate pressure.

WARNING...

MANY MATERIALS, PARTICULARLY OIL AND GREASE, ARE SUBJECT TO SPONTANEOUS COMBUSTION WHEN EXPOSED TO UNDILUTED OXYGEN UNDER PRESSURE. PRECAUTIONS MUST BE TAKEN, THEREFORE, TO EXCLUDE OIL, GREASE, DUST AND METAL PARTICLES FROM THE REGULATOR AND THE TEST EQUIPMENT.

4. Regulators not conforming to the test requirements are to be disposed of in accordance with current Service procedure.

5. Unless otherwise specified, the remote indicator (Ref. No. 5CZ/5003) of the test equipment must be connected to the regulator for the oxygen flow indicator tests (para.18). Where observation of the regulator indicator is called for, the remote indicator must also be checked. The power supply is to be between 20 and 29V d.c. (positive to the regulator RED terminal and negative to earth) with the remote indicator connected between the regulator BLUE terminal and earth. A 2·5A fuse must be incorporated in the positive line, and the bonding terminal of the regulator must be connected to earth.

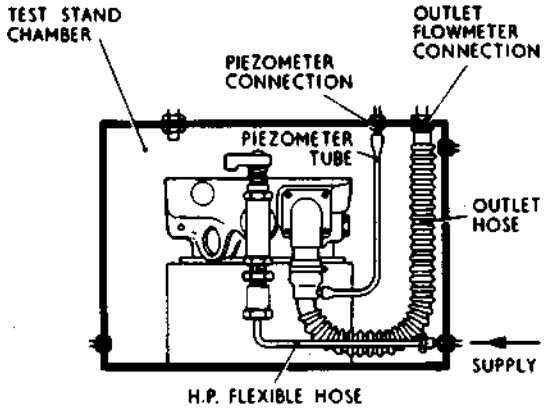

Fig.1. Connections for exercising the regulator

6. Unless otherwise specified:-

(1) Apply the test stand servicing checks.

(2) Set the altimeter to 1013·2 millibars.

(3) Commence each test with the test stand control valves OFF and the chamber door open.

(4) Open the supply control valves slowly and smoothly to avoid excessive transient pressures.

(5) The flow values quoted are for true ambient flows related to the outlet pressure of the regulator. Corresponding flowmeter readings should be determined from the flowmeter correction graphs of the particular test stand.

(6) Restore ground level conditions within the altitude chamber on completion of each test.

June 1972

ADVANCE INFORMATION LEAFLET NO.2/72

Insert this leaflet in Chap.1-1 to face page 2

Solutions for leak testing

WARNING...

SOAP SOLUTION PREPARED FROM SOFT SOAP J.S. CAT. No. 6505-99-210-1935 MUST NOT BE USED FOR LEAK TESTING OXYGEN EQUIPMENT.

1. The approved solutions for oxygen leak testing are as follows:-

   (1) Sherlock, Type 1 (for temp range 35 to 160°F)

   (2) Sherlock, Type 2 (for temp range -65 to +35°F)

   (3) Snoop: Real Cool Snoop (for temp range -65 to +35°F)

2. Until supplies of the approved solutions are available through Service sources, they may be obtained, by local purchase order, from:-

   (1) Sherlock, Types 1 and 2 : The British Oxygen Company Limited,
   Pinnacles,
   Harlow,
   Essex.

   (2) Snoop : Techmation Limited,
   58 Edgware Way,
   Edgware,
   London.

Notes

(1) The information contained in this leaflet will be incorporated by normal amendment action in due course.

(2) If, after receipt of this leaflet, an amendment list with a prior date and conflicting information is received, the information in the leaflet is to take precedence.

TEST PROCEDURE

Exercising the regulator

7. Before commencing the tests, the regulator must be exercised as follows:-

(1) Connect the inlet adapter to the regulator shut-off valve.

(2) Mount the regulator in the test stand and connect the high-pressure flexible hose to the inlet adapter on the regulator. Connect the mask hose of the piezometer ring to the outlet adapter in the chamber and the piezometer tube to the piezometer connection. Connect the piezometer ring to the regulator outlet (fig.1).

(3) Set the regulator shut-off valve to ON, the air inlet control to NORMAL and the emergency button central.

(4) Close and clamp the chamber door, then open the high-pressure ON/OFF valve. Using the reducing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

TABLE 1

Regulator inlet pressures

Regulator	Inlet pressure
Mk.17, 17C, 17D and 17E	150 lbf/in^2
Mk.17F and Mk.17G	95 lbf/in^2

(5) Using the outlet flowmeter valve, draw a flow of 10 litres/min from the regulator.

(6) Employing the vacuum valve, evacuate the chamber to an altitude of 45 000 ft and then close the valve.

(7) Close and open the outlet flowmeter valve a minimum of six times at breathing rate, then open the atmosphere valve and return the regulator to ground level conditions.

Electrical tests

8. For the continuity test (para.9), the contacts of the regulator are to be closed by a demand flow drawn from the regulator.

Continuity test

9. Position the regulator outside the chamber of the test stand and proceed as follows:-

(1) Connect the high-pressure hose to the regulator inlet adapter.

(2) Open the test stand high-pressure ON/OFF valve and, using the reduc-

ing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

(3) Set the regulator shut-off valve to ON and the emergency button either to the left or to the right.

Note...

The terminal voltage of the Multimeter used in the following tests (sub-para.(4) to (6)) must not exceed 5V d.c.

(4) Using the Multimeter set to ohms, check the resistance between the RED and BLUE terminals of the regulator socket. The reading should not exceed 1·2 ohms.

(5) Close the high-pressure ON/OFF valve and centralize the emergency button to open the regulator contacts. The resistance between the RED ◀ and BLUE terminals should be not less than 0·5 megohms. ▶

(6) Check the resistance between the BLUE terminal and the regulator casting. The resistance should be not less than 445 or more than 500 ohms.

Functional tests

10. With the regulator connected to the test chamber as for exercising (fig.1), the procedure is as follows:-

(1) Connect the piezometer tube to the piezometer ring blanking plug.

(2) Set the regulator shut-off valve to ON and the emergency button central.

(3) Open the high-pressure ON/OFF valve and, using the reducing valve, apply the appropriate inlet pressure (Table 1).

(4) Using the 28V d.c. supply, connect the positive lead to the regulator RED terminal and the negative lead to the regulator casting. Open the outlet flowmeter valve and observe the blinker indicator. The indicator should function immediately.

Continued on page 3

(5) Close the outlet flowmeter valve and set the regulator shut-off valve to OFF to open the regulator contacts.

(6) Using the same d.c. supply (sub-para. (4)), connect the positive lead to the BLUE terminal and the negative lead to the regulator casting. The blinker indicator should operate immediately and without hesitation.

Capacitance tests

11. With the regulator disconnected from the test stand, and using a bridge capacitance test set, proceed as follows:—

(1) Check the capacitance value between the RED terminal and the regulator casting. The capacitance should be not less than 0·7 microfarads.

(2) If it is required to check the capacitance value between the BLUE terminal and the regulator casting, it will be necessary to isolate the magnetic indicator. To do this, remove the front panel securing screws and detach the panel sufficiently to break the electrical contacts in the circuit to the indicator. The capacitance value should be as specified in sub-para. (1).

High-pressure oxygen leak test

12. The procedure is as follows:—

(1) Mount the regulator in the test stand and connect the high-pressure flexible hose to the inlet adapter on the regulator.

(2) Set the regulator shut-off valve to ON, the air inlet control to 100% OXYGEN and the emergency button central.

(3) Open the test stand high pressure ON/OFF valve and, using the reducing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

(4) ◀ Draw a thin soap film over the regulator outlet; the film should not rupture in less than 3 sec. ▶

(5) Connect a 4 ft. length of Mk. 7 flexible hose (*Ref. No.* 6*D*/1597) to the regulator outlet and set the air inlet control to NORMAL. The inlet pressure should be as specified in Table 1 and the regulator valve should be set to ON.

(6) Deflect the emergency button either to the left or to the right, to cause flow, then return the button to the central position.

(7) Remove the hose and repeat the test detailed in sub-para. (4).

Shut-off valve leak test

13. With the regulator connected as for the previous test, the test procedure is as follows:—

(1) Set the regulator shut-off valve to OFF and the air inlet control to 100% OXYGEN.

(2) Set the emergency button either to the right or to the left.

(3) Open the test stand high pressure ON/OFF valve and, using the reducing valve, apply an inlet pressure of 500 lb/in² to the regulator.

(4) ◀ Draw a thin soap film over the regulator outlet; the film should not rupture in less than 3 sec. ▶

High pressure oxygen leak—gauge pressure leak test

14. With the high pressure flexible hose connected to the regulator, the test procedure is as follows:—

(1) Set the regulator shut-off valve to ON, the air inlet control to 100% OXYGEN and the emergency button central.

(2) Open the test stand high-pressure ON/OFF valve and using the reducing valve, apply an inlet pressure of 500 lb/in² to the regulator.

(3) Close the test stand ON/OFF valve and the regulator shut-off valve, disconnect the high pressure flexible hose from the regulator and note the reading of the regulator pressure gauge. Over a period of two minutes, the fall in pressure should be not more than 50 lb/in².

Outwards leak test

15. With the regulator connected to the test stand as for exercising (*fig.* 1), the test procedure is as follows:—

(1) Set the regulator shut-off valve to ON, the air inlet control to NORMAL and the emergency button central.

(2) Open the test stand high pressure ON/OFF valve and, using the reducing valve, apply an inlet pressure of between 200 and 300 lb/in² to the regulator.

(3) Push the emergency button straight in to obtain an outlet pressure of 10 in. wg. in the mask tube, then release the button.

(4) Close the high-pressure ON/OFF valve and disconnect the high-pressure hose from the regulator, allowing the regulator gauge reading to fall to zero, but leaving the 10

in. wg. pressure trapped within the mask tube.

(5) Observe the time taken for the mask hose pressure to fall from 9·5 to 7·5 in. wg. The time should be not less than 8 seconds.

(6) Disconnect the piezometer ring from the regulator to release the pressure, then reconnect the ring for the next test.

Inwards leak test

16. With the regulator connected to the test stand as for the previous test, the test procedure is as follows:—

(1) Disconnect the high-pressure flexible hose from the regulator.

(2) Set the regulator shut-off valve to OFF, the air inlet control to 100% OXYGEN and the emergency button central.

(3) Open the outlet flowmeter valve carefully and apply a suction of 1·5 in. wg. to the regulator outlet. Care must be exercised to obviate the loss of water from the manometer.

(4) Close the outlet flowmeter valve and observe the time taken for the suction to rise from 1·3 in. wg. to zero. The time should be not less than one minute.

Relief valve flow test

17. With the regulator mounted in the test stand and disconnected, the test procedure is as follows:—

(1) Connect the piezometer ring to the regulator outlet, the mask hose to the inlet adapter of the chamber and the piezometer tube to the blanking plug on the piezometer ring (*fig.* 2).

(2) Set the regulator shut-off valve to ON, to relieve any pressure in the regulator, then set the valve to OFF. Set the air inlet control to 100% OXYGEN and the emergency button central.

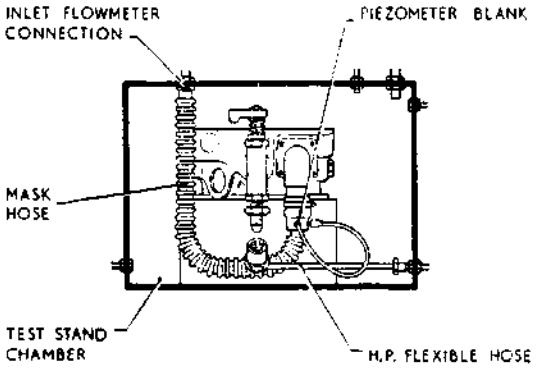

Fig. 2. Connections for relief valve flow test

(3) Close and clamp the chamber door, and open the test stand by-pass valve fully.

(4) Observe the reading of the chamber altimeter, then using the outlet flowmeter valve, raise the chamber altitude by 2 900 ft. Maintain this altitude and note the reading of the outlet flowmeter. Employing the correction curves, determine the true ambient flow; this should be not less than 50 litres/min.

(5) Open the chamber-to-atmosphere valve, close the outlet flowmeter valve and the by-pass valve, open the chamber door and disconnect the regulator.

Oxygen flow indicator functional test

18. With the regulator connected as for exercising (*fig.* 1), the procedure is as follows:—

(1) Connect the electrical plug to the regulator socket and the regulator panel to earth.

(2) Set the regulator shut-off valve to ON, the air inlet control to NORMAL and the emergency button central.

(3) Switch on the power supply.

(4) Open the high pressure ON/OFF valve and, using the reducing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

(5) Open the outlet flowmeter valve slowly and observe the flow indicated on the outlet flowmeter when the regulator and remote indicators give indication of full flow. Employing the outlet flowmeter correction curves, determine the true ambient flow. The indicators should give full indication of flow before the flow attains 25 litres/min.

(6) Move the air inlet control to 100% OXYGEN and repeat the procedure detailed in sub-para. (5). The indicators should now give full indication before the flow attains 20 litres/min.

(7) Move the air inlet control to NORMAL and close the outlet flowmeter valve. When the flow falls to zero, the indicators should change to the 'no flow' indication with a 'snap' action.

Pressure gauge calibration

19. With the high-pressure supply hose connected to the regulator the test procedure is as follows:—

(1) Set the regulator shut-off valve to ON, the air inlet control to NORMAL and the emergency button central.

(2) Open the test stand high pressure ON/OFF valve and, using the reducing valve, apply an inlet pressure of 500 lb/in^2 to the regulator (test stand pressure gauge). Check the reading of the regulator pressure gauge

with that of the pressure gauge on the test stand. ◄The regulator pressure gauge should indicate a pressure between 465 and 535 lb/in².►

(3) ◄Adjust the reducing valve until the inlet pressure is 100 lb/in². (test stand pressure gauge). The regulator pressure gauge should indicate a pressure between 85 and 115 lb/in².

Note . . .
During the above tests, there must not be any demand flow from the regulator.►

Suction flow test

20. With the regulator mounted and connected as for exercising (fig. 1), the test procedure is as follows:—

Note . . .
Care must be exercised when increasing flows to obviate the loss of water from the mask tube manometer.

(1) Set the regulator shut-off valve to ON, the air inlet control to 100% OXYGEN and the emergency button central.

(2) Open the test stand high pressure ON/OFF valve.

(3) Using the outlet flowmeter valve and the reducing valve, establish an indicated flow, equivalent to a true ambient flow of 60 litres/min. together with an inlet pressure of 55 lb/in².

(4) Note the suction indicated on the mask tube manometer. The reading should not exceed 1·0 in.wg.

(5) Raise the regulator inlet pressure to the appropriate value stipulated in Table 1.

(6) Draw a true ambient flow of 120 litres/min. and note the suction indicated on the mask tube manometer. The reading should not exceed 2·6 in.wg.

Emergency pressure test

21. With the regulator mounted and connected as for the previous test, the procedure is as follows:—

Note . . .
A continuous noise from the regulator, when the emergency button is deflected or pressed, is permissible provided that it ceases when the button is centralized or released and a demand flow is taken from the regulator.

(1) Set the regulator shut-off valve to ON, the air inlet control to 100% OXYGEN and the emergency button central.

(2) Open the test stand high pressure ON/OFF valve and, using the reducing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

(3) Using the outlet flowmeter valve, draw a true ambient flow of 10 litres/min. from the regulator.

(4) Deflect the emergency button to the left and note the pressure indicated by the mask tube manometer. Repeat the test with the emergency button deflected to the right. In both instances, the outlet pressure should be between 1·5 and 2·5 in.wg.

(5) Centralize the emergency button and then press it in fully. The outlet pressure should be not less than 10 in.wg.

(6) Increase the outlet flow to 60 litres/min. (true ambient), deflect the emergency button to the left and then to the right, noting the outlet pressure with the button in each position. The pressure should be not less than zero.

Air/oxygen ratio tests

22. With the regulator mounted and connected as for the previous test, the procedure is as follows:—

(1) Set the regulator shut-off valve to ON, the air inlet control to NORMAL and the emergency button central.

(2) Open the test stand high pressure ON/OFF valve and, using the reducing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

(3) Close and clamp the chamber door, and switch on the altimeter vibrator.

(4) Using the outlet flowmeter valve in conjunction with the inlet flowmeter valve, raise the chamber altitude to the altitudes specified in Table 2 and maintain the chamber at each altitude while drawing the corresponding breathing flow from the regulator. At each altitude and corresponding breathing flow, note the added air (inlet flowmeter reading). After correction (inlet flowmeter correction graphs), the inlet flows should be within the limits stipulated in Table 2.

Note . . .
The vacuum valve must be used to obtain chamber altitudes of 30 000 ft and above, and the valve must be closed before taking flowmeter readings.

TABLE 2
Air/oxygen ratio test

Chamber altitude (ft.)	Breathing flow (true ambient litres/min.)	Added air (true ambient litres/min.)	
		Min.	Max.
10 000	10	0	9·4
15 000	30	14·0	27·0
20 000	30	12·0	24·0
25 000	30	7·0	18·0
30 000	30	0	12·0
34 000	135	0	3·0

Safety pressure and pressure breathing tests

23. When applying these tests, the specified chamber altitudes should be obtained without being exceeded. Should a chamber altitude be exceeded inadvertently, establish the specified altitude from an altitude well below that required. The vacuum valve of the test stand must be used to obtain chamber altitudes of 30 000 ft. and above, and must be closed before taking flowmeter readings. A small demand flow should be drawn from the regulator when raising the chamber altitude.

24. With the regulator mounted and connected as for the previous test, the procedure is as follows:—

(1) Set the regulator shut-off valve to ON, the air inlet control to NORMAL and the emergency button central.

(2) Open the test stand high pressure ON/OFF valve and, using the reducing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

(3) Close and clamp the chamber door, and switch on the altimeter vibrator.

(4) Using the outlet flowmeter valve, draw a true ambient flow of 10 litres/min. from the regulator and observe the mask tube manometer. At a manometer reading of zero, the chamber altitude should be not less than 11 000 ft. (9 000 ft. for pre-mod G1111 regulators).

(5) Raise the chamber altitude to 14 000 ft. (12 000 ft. for pre-mod G1111 regulators) and, using the inlet and outlet flowmeter valves, draw a true ambient flow of 10 litres/min while maintaining the specified altitude. The outlet pressure (water manometer reading) should be within the limits stipulated in Table 3.

(6) Maintaining the altitude specified in sub-para. (5), draw a true ambient flow of 70 litres/min. from the regulator and note the outlet pressure; this should be not less than that stipulated in Table 3.

(7) Raise the chamber altitude to 30 000 ft., establish a true ambient flow of 10 litres/min. and note the outlet pressure. The pressure should be within the limits given in Table 3.

(8) Maintaining the altitude specified in sub-para. (7), increase the outlet flow to 70 litres/min. (true ambient flow) and note the outlet pressure. The pressure should be not less than that quoted in Table 3.

(9) Raise the chamber altitude to 40 000 ft., establish a true ambient flow of 10 litres/min. and note the outlet pressure. The pressure should be within the limits specified in Table 3.

(10) Close the outlet flowmeter valve and, three seconds after zero flow is attained, note the outlet pressure. The pressure should not exceed that obtained for a 10 litre/min. flow by more than 1·5 in.wg. (Table 3).

(11) Adopting the procedure outlined in sub-para. (9) and (10), check the outlet pressure for a 10 litre/min. flow and the pressure increase at zero flow, at the altitudes specified in Table 3. The pressure should be within the limits stipulated in the table.

TABLE 3

Safety pressure and pressure breathing tests

Altitude (ft)	Positive pressure for 10 litres/min flow (in.wg)		Max. increase (above pressure for 10 litres/min flow) at zero flow (in.wg)	Min. positive pressure for 70 litres/min flow (in.wg)
	Min.	Max.		
12 000 (pre-mod G1111 regulators) / 14 000 (post-mod G1111 regulators)	0·05	0·9	—	0·05
30 000	0·2	1·2	—	0·1
40 000	—	2·2	1·5	—
41 000	1·8	—	1·5	—
50 000	14·8	17·7	1·5	—

Chapter 1-1-1

STANDARD SERVICEABILITY TESTS

(For use where test stand, Mk.2, embodying Mod. DC(M)514, is available)

Introduction

1. The tests detailed in this chapter should be applied before the regulator is fitted to an aircraft and when the serviceability of the regulator is in doubt. If a Mk.2 test stand is not available, a series of less comprehensive tests (Chap. 1-2) can be applied using the test rig for pressure demand oxygen regulators (A.P.112T-01123-1).

Test equipment

2. The equipment required is as follows:-

(1) Test stand, Mk.2 (Ref. No. 6C/1042) incorporating Mod. DC(M)514.

(2) Pressure reducing and control unit (Ref. No. 6C/1597).

(3) Oxygen regulator, Mk.17 series.

(4) Inlet adapter (Part No. OP.10073) (Ref. No. 6D/1647).

(5) Mk.7 breathing hose, approx. 4 ft (Ref. No. 6D/1597).

(6) 20 to 29V d.c. supply.

◀(7) Bridge, universal (J.S. Cat. No. 6625-99-972-4702) - R.N.

or

Bridge, universal (Ref. No. 10S/9553163) - R.A.F.

(8) Multimeter, CT498A (Ref. No. 5QP/1057049) or similar.▶

Note...

When Mk.17 series oxygen regulators are received for testing, the main pressure inlet is to be fitted with the adapter (Ref. No. 6D/1647). ◀ Refer to Chap. 1, para.37.▶ All routine tests are to be carried out with the adapter fitted; once fitted it should not be removed for normal tests or servicing.

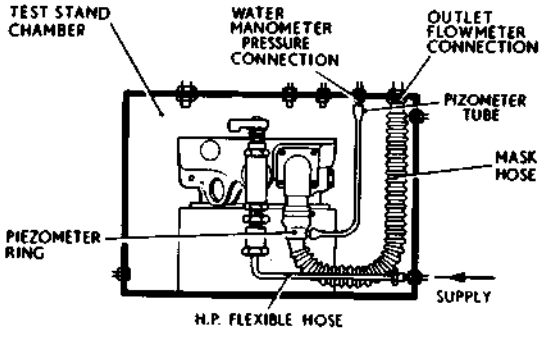

Fig.1. Connections for exercising the regulator

PARTICULARS OF TESTS

3. The test values specified are related to conditions of normal room temperature and pressure. The gas supply for the tests can be either breathing oxygen or Nato air, but the test stand flowmeters must be calibrated for the gas used. Unless otherwise specified the regulator is to be supported with the mounting

panel horizontal and uppermost. Soap solution for leak testing is to be prepared from soft soap J.S. Cat. No. 6505-99-210-1935. Precautions must be taken to prevent the solution entering the regulator, and all traces of the solution are to be removed when the test is completed. Use clean, lint-free, non-fluffy cloth, then apply a jet of oxygen at moderate pressure.

WARNING...

MANY MATERIALS, PARTICULARLY OIL AND GREASE, ARE SUBJECT TO SPONTANEOUS COMBUSTION WHEN EXPOSED TO UNDILUTED OXYGEN UNDER PRESSURE. PRECAUTIONS MUST BE TAKEN, THEREFORE, TO EXCLUDE OIL, GREASE, DUST AND METAL PARTICLES FROM THE REGULATOR AND THE TEST EQUIPMENT.

4. Regulators not conforming to the test requirements are to be disposed of in accordance with current Service procedure.

5. General requirements:-

(1) Apply the test stand servicing checks. (A.P.112T-01110-1).

(2) Set the altimeter to 1013·2 millibars.

(3) Commence each test with the test stand control valves OFF and the chamber door open.

(4) Open the supply control valves slowly and smoothly to avoid excessive transient pressures.

(5) The flow values quoted are for true ambient flows related to the outlet pressure of the regulator. Corresponding flowmeter readings should be determined from the flowmeter correction graphs of the particular test stand.

(6) Restore ground level conditions within the altitude chamber on completion of each test.

TEST PROCEDURE

Exercising the regulator

6. Before commencing the tests, the regulator must be exercised as follows:-

(1) Connect the inlet adapter to the regulator shut-off valve.

(2) Mount the regulator in the test stand and connect the high-pressure flexible hose to the inlet adapter on the regulator. Connect the mask hose of the piezometer ring to the outlet adapter in the chamber and the piezometer tube to the connection labelled PRESSURE. Connect the piezometer ring to the regulator outlet (fig.1).

(3) Set the regulator shut-off valve to ON, the air inlet control to NORMAL and the emergency button central.

(4) Close and clamp the chamber door, then open the high-pressure ON/OFF valve. Using the reducing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

June 1972

ADVANCE INFORMATION LEAFLET NO.3/72

Insert this leaflet in Chap.1-1-1 to face page 2

Solutions for leak testing

WARNING...

SOAP SOLUTION PREPARED FROM SOFT SOAP J.S. CAT. No. 6505-99-210-1935 MUST NOT BE USED FOR LEAK TESTING OXYGEN EQUIPMENT.

1. The approved solutions for oxygen leak testing are as follows:-

(1) Sherlock, Type 1 (for temp range 35 to 160°F)

(2) Sherlock, Type 2 (for temp range -65 to +35°F)

(3) Snoop: Real Cool Snoop (for temp range -65 to +35°F)

2. Until supplies of the approved solutions are available through Service sources, they may be obtained, by local purchase order, from:-

(1) Sherlock, Types 1 and 2 : The British Oxygen Company Limited,
Pinnacles,
Harlow,
Essex.

(2) Snoop : Techmation Limited,
58 Edgware Way,
Edgware,
London.

Notes

(1) The information contained in this leaflet will be incorporated by normal amendment action in due course.

(2) If, after receipt of this leaflet, an amendment list with a prior date and conflicting information is received, the information in the leaflet is to take precedence.

TABLE 1

Regulator inlet pressures

Regulator	Inlet pressure
Mk.17, 17C, 17D and 17E	150 lbf/in^2
Mk.17F and Mk.17G	95 lbf/in^2

(5) Using the outlet flowmeter valve, draw a flow of 10 litres/min from the regulator.

(6) Employing the vacuum valve, evacuate the chamber to an altitude of 45 000 ft and then close the valve.

(7) Close and open the outlet flowmeter valve a minimum of six times at breathing rate, then open the atmosphere valve and restore ground level conditions in the chamber.

Electrical tests

7. For the continuity test (para.8), the contacts of the regulator are to be closed by a demand flow drawn from the regulator.

Continuity test

8. Position the regulator outside the chamber of the test stand and proceed as follows:-

(1) Connect the high-pressure hose to the regulator inlet adapter.

(2) Open the test stand high-pressure ON/OFF valve and, using the reducing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

(3) Set the regulator shut-off valve to ON and the emergency button either to the left or to the right.

Note...

The terminal voltage of the Multimeter used in the following tests (sub-para.(4) to (6)) must not exceed 5V d.c.

(4) Using the Multimeter set to ohms, check the resistance between the RED and BLUE terminals of the regulator socket. The reading should not exceed 1·2 ohms.

(5) Close the high-pressure ON/OFF valve and centralize the emergency button to open the regulator contacts. The resistance between the RED ◀ and BLUE terminals should be not less than 0·5 megohms. ▶

(6) Check the resistance between the BLUE terminal and the regulator casting. The resistance should be not less than 445 or more than 500 ohms.

Functional tests

9. With the regulator connected to the test chamber as for exercising (fig.1) the procedure is as follows:-

(1) Connect the piezometer tube to the piezometer ring blanking plug.

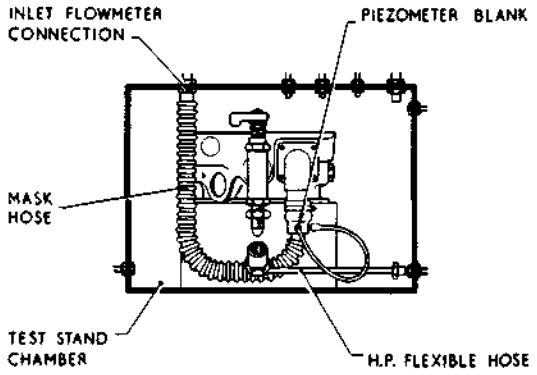

Fig.2. Connections for relief valve flow test

(2) Set the regulator shut-off valve to ON and the emergency button central.

(3) Open the high-pressure ON/OFF valve and, using the reducing valve, apply the appropriate inlet pressure (Table 1).

(4) Using the 28V d.c. supply, connect the positive lead to the regulator RED terminal and the negative lead to the regulator casting. Open the outlet flowmeter valve and observe the blinker indicator. The indicator should function immediately.

(5) Close the outlet flowmeter valve and set the regulator shut-off valve to OFF to open the regulator contacts.

(6) Using the same d.c. supply (sub-para.(4)), connect the positive lead to the BLUE terminal and the negative lead to the regulator casting. The blinker indicator should operate immediately.

Continued on page 3

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Capacitance tests

10. With the regulator disconnected from the test stand, and using a bridge capacitance test set, proceed as follows:—

(1) Check the capacitance value between the RED terminal and the regulator casting. The capacitance should be not less than 0·7 microfarads.

(2) If it is required to check the capacitance value between the BLUE terminal and the regulator casting, it will be necessary to isolate the magnetic indicator. To do this, remove the front panel securing screws and detach the panel sufficiently to disconnect the BLUE lead from the indicator. The capacitance value should be as specified in sub-para. (1). Reconnect the lead and secure the front panel.

High-pressure oxygen leak test

11. The procedure is as follows:—

(1) Mount the regulator in the test stand and connect the high-pressure flexible hose to the inlet adapter on the regulator.

(2) Set the regulator shut-off valve to ON, the air inlet control to 100% OXYGEN and the emergency button central.

(3) Open the test stand high-pressure ON/OFF valve and, using the reducing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

(4) ◀ Draw a thin soap film over the regulator outlet; the film should not rupture in less than 3 sec. ▶

(5) Connect a 4 ft. length of Mk. 7 flexible hose (Ref. No. 6D/1597) to the regulator outlet and set the air inlet control to NORMAL. The inlet pressure should be as specified in Table 1 and the regulator valve should be set to ON.

(6) Deflect the emergency button either to the left or to the right, to cause flow, then return the button to the central position.

(7) Remove the hose and repeat the test detailed in sub-para. (4).

Shut-off valve leak test

12. With the regulator connected as for the previous test, the test procedure is as follows:—

(1) Set the regulator shut-off valve to OFF and the air inlet control to 100% OXYGEN.

(2) Set the emergency button either to the right or to the left.

(3) Open the test stand high-pressure ON/OFF valve and, using the reducing valve, apply an inlet pressure of 500 lb/in² to the regulator.

(4) ◀ Draw a thin soap film over the regulator outlet; the film should not rupture in less than 3 sec. ▶

High-pressure oxygen leak—gauge pressure leak test

13. With the high-pressure flexible hose connected to the regulator, the test procedure is as follows:—

(1) Set the regulator shut-off valve to ON, the air inlet control to 100% OXYGEN and the emergency button central.

(2) Open the test stand high-pressure ON/OFF valve and using the reducing valve, apply an inlet pressure of 500 lb/in² to the regulator.

(3) Close the test stand ON/OFF valve and regulator shut-off valve, disconnect the high-pressure flexible hose from the regulator and note the reading of the regulator pressure gauge. Over a period of two minutes, the fall in pressure should not exceed 50 lb/in².

Outwards leak test

14. With the regulator connected to the test stand as for exercising (fig. 1), the test procedure is as follows:—

(1) Set the regulator shut-off valve to ON, the air inlet control to NORMAL and the emergency button central.

(2) Open the test stand high-pressure ON/OFF valve and, using the reducing valve, apply an inlet pressure of between 200 and 300 lb/in² to the regulator.

(3) Push the emergency button straight in to obtain an outlet pressure of 10 in. wg in the mask tube, then release the button.

(4) Close the high-pressure ON/OFF valve and disconnect the high-pressure hose from the regulator, allowing the regulator gauge reading to fall to zero, but leaving the 10 in. wg pressure trapped within the mask tube.

(5) Observe the time taken for the mask hose pressure to fall from 9·5 to 7·5 in. wg. The time should be not less than 8 seconds.

(6) Disconnect the piezometer ring from the regulator to release the pressure, then reconnect the ring for the next test.

Inwards leak test

15. With the regulator connected to the test stand as for the previous test, the test procedure is as follows:—

(1) Disconnect the high-pressure flexible hose from the regulator.

(2) Connect the piezometer tube to the connection labelled SUCTION.

(3) Set the regulator shut-off valve to OFF, the air inlet control to 100% OXYGEN and the emergency button central.

(4) Open the outlet flowmeter valve carefully and apply a suction of 1·5 in. wg to the regulator outlet.

(5) Close the outlet flowmeter valve and observe the time taken for the suction to fall from 1·3 in. wg to zero. The time should be not less than one minute.

Relief valve flow test

16. With the regulator mounted in the test stand and disconnected, the test procedure is as follows:—

(1) Connect the piezometer ring to the regulator outlet, the mask hose to the inlet adapter of the chamber and the piezometer tube to the blanking plug on the piezometer ring (fig. 2).

(2) Set the regulator shut-off valve to ON, to relieve any pressure in the regulator, then set the valve to OFF. Set the air inlet control to 100% OXYGEN and the emergency button central.

(3) Close and clamp the chamber door, and open the test stand by-pass valve fully.

(4) Observe the reading of the chamber altimeter, then using the outlet flowmeter valve, raise the chamber altitude by 2900 ft. Maintain this altitude and note the reading of the outlet flowmeter. Employing the correction curves, determine the true ambient flow; this should be not less than 50 litres/min.

(5) Open the chamber-to-atmosphere valve, close the outlet flowmeter valve, and the by-pass valve, open the chamber door and disconnect the regulator.

Oxygen flow indicator functional test

17. With the regulator connected as for exercising (fig. 1), the procedure is as follows:—

Note . . .

During this test, the magnetic indicator on the test stand must be checked together with the regulator magnetic indicator.

(1) Connect the electrical plug to the regulator socket and the earth lead to the bonding connection on the regulator panel. Set the test stand indicator circuit switch to ON.

(2) Set the regulator shut-off valve to ON, the air inlet control to NORMAL and the emergency button central.

(3) Switch on the power supply.

(4) Open the high-pressure ON/OFF valve and, using the reducing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

(5) Open the outlet flowmeter valve slowly, and observe the flow indicated by the outlet flowmeter when the regulator and test stand indicators give indication of full flow. Employing the outlet flowmeter correction curves, determine the true ambient flow. The indicators should give full indication of flow before the flow attains 25 litres/min.

(6) Move the air inlet control to 100% OXYGEN and repeat the procedure detailed in sub-para. (5). The indicators should now give full indication before the flow attains 20 litres/min.

(7) Move the air inlet control to NORMAL and close the outlet flowmeter valve. When the flow falls to zero, the indicators should change to the 'no flow' indication with a 'snap' action.

(8) Set the indicator circuit switch to OFF, and disconnect the electrical plug and earth lead from the regulator.

Pressure gauge calibration

18. With the high-pressure supply hose connected to the regulator, the test procedure is as follows:—

(1) Set the regulator shut-off valve to ON, the air inlet control to NORMAL and the emergency button central.

(2) Open the test stand high-pressure ON/OFF valve and, using the reducing valve, apply an inlet pressure of 500 lb/in² to the regulator (test stand pressure gauge). Check the reading of the regulator pressure gauge with that of the pressure gauge on the test stand. The regulator pressure gauge should indicate a pressure between 465 and 535 lb/in².

(3) Adjust the reducing valve until the inlet pressure is 100 lb/in² (test stand pressure gauge). The regulator pressure gauge should indicate a pressure between 85 and 115 lb/in².

Note . . .

During the above tests, there must not be any demand flow from the regulator.

Suction flow test

19. For the suction flow test, the regulator is to be connected to the test stand as for exercising (fig. 1), but the piezometer tube must be connected to the connection labelled SUCTION.

(1) Set the regulator shut-off valve to ON, the air inlet control to 100% OXYGEN and the emergency button central.

(2) Open the test stand high-pressure ON/OFF valve.

(3) Using the outlet flowmeter valve and the reducing valve, establish an indicated flow, equivalent to a true ambient flow of 60 litres/min together with an inlet pressure of 55 lb/in^2.

(4) Note the suction indicated on the test stand manometer. The reading should not exceed 1·0 in. wg.

(5) Raise the regulator inlet pressure to the appropriate value stipulated in Table 1.

(6) Draw a true ambient flow of 120 litres/min and note the suction indicated on the test stand manometer. The reading should not exceed 2·6 in. wg.

Emergency pressure test

20. With the regulator mounted and connected as for the previous test, the procedure is as follows:—

Note . . .

A continuous noise from the regulator, when the emergency button is deflected or pressed, is permissible provided that it ceases when the button is centralized or released and a demand flow is taken from the regulator.

(1) Disconnect the piezometer tube from the connection labelled SUCTION and connect to the PRESSURE connection.

(2) Set the regulator shut-off valve to ON, the air inlet control to 100% OXYGEN and the emergency button central.

(3) Open the test stand high-pressure ON/OFF valve and, using the reducing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

(4) Using the outlet flowmeter valve, draw a true ambient flow of 10 litres/min from the regulator.

(5) Deflect the emergency button to the left and note the pressure indicated by the test stand manometer. Repeat the test with the emergency button deflected to the right. In both instances, the outlet pressure should be between 1·5 and 2·5 in. wg.

(6) Centralize the emergency button and then press it in fully. The outlet pressure should be not less than 10 in. wg.

(7) Increase the outlet flow to 60 litres/min (true ambient), deflect the emergency button to the left and then to the right, noting the outlet pressure with the button in each position. The pressure should be not less than zero.

Air/oxygen ratio tests

21. With the regulator mounted and connected as for the previous test, the procedure is as follows:—

(1) Set the regulator shut-off valve to ON, the air inlet control to NORMAL and the emergency button central.

(2) Open the test stand high-pressure ON/OFF valve and, using the reducing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

(3) Close and clamp the chamber door, and switch on the altimeter vibrator.

(4) Using the outlet flowmeter valve in conjunction with the inlet flowmeter valve, raise the chamber altitude to the altitudes specified in Table 2 and maintain the chamber at each altitude while drawing the corresponding breathing flow from the regulator. At each altitude and corresponding breathing flow, note the added air (inlet flowmeter reading). After correction (inlet flowmeter correction graphs), the inlet flows should be within the limits stipulated in Table 2.

Note . . .

The vacuum valve must be used to obtain chamber altitudes of 30000 ft and above, and the valve must be closed before taking flowmeter readings.

TABLE 2

Air/oxygen ratio test

Chamber altitude (ft)	Breathing flow (true ambient litres/min).	Added air (true ambient litres/min).	
		Min.	Max.
10 000	10	0	9.4
15 000	30	14·0	27·0
20 000	30	12·0	24·0
25 000	30	7·0	18·0
30 000	30	0	12·0
34 000	135	0	3·0

Safety pressure and pressure breathing tests

22. When applying these tests, the specified chamber altitudes should be obtained without being exceeded. Should a chamber altitude be exceeded inadvertently, establish the specified altitude from an altitude well below that required. The vacuum valve of the test stand must be used to obtain chamber altitudes of 30 000 ft and above, and must be closed before taking flowmeter readings. A small demand flow should be drawn from the regulator when raising the chamber altitude.

23. With the regulator mounted and connected as for the previous test, the procedure is as follows:—

(1) Set the regulator shut-off valve to ON, the air inlet control to NORMAL and the emergency button central.

(2) Open the test stand high-pressure ON/OFF valve and, using the reducing valve, apply the appropriate inlet pressure (Table 1) to the regulator.

(3) Close and clamp the chamber door, and switch on the altimeter vibrator.

(4) Using the outlet flowmeter valve, draw a true ambient flow of 10 litres/min from the regulator and observe the test stand manometer. At a manometer reading of zero, the chamber altitude should be not less than 11 000 ft (9000 ft for pre-mod G1111 regulators).

(5) Raise the chamber altitude to 14 000 ft (12 000 ft for pre-mod G1111 regulators) and, using the inlet and outlet flowmeter valves, draw a true ambient flow of 10 litres/min while maintaining the specified altitude. The outlet pressure (water manometer reading) should be within the limits stipulated in Table 3.

(6) Maintaining the altitude specified in sub-para. (5), draw a true ambient flow of 70 litres/min from the regulator and note the outlet pressure; this should be not less than that stipulated in Table 3.

(7) Raise the chamber altitude to 30 000 ft, establish a true ambient flow of 10 litres/min and note the outlet pressure. The pressure should be within the limits given in Table 3.

(8) Maintaining the altitude specified in sub-para. (7), increase the outlet flow to 70 litres/min (true ambient flow) and note the outlet pressure. The pressure should be not less than that quoted in Table 3.

(9) Raise the chamber altitude to 40 000 ft, establish a true ambient flow of 10 litres/min and note the outlet pressure. The pressure should be within the limits specified in Table 3.

(10) Close the outlet flowmeter valve and, three seconds after zero flow is attained, note the outlet pressure. The pressure should not exceed that obtained for a 10 litre/min flow by more than 1·5 in. wg (Table 3).

(11) Adopting the procedure outlined in sub-para. (9) and (10), check the oulet pressure for a 10 litre/min flow and the pressure increase at zero flow, at the altitudes specified in Table 3. The pressure should be within the limits stipulated in the table.

TABLE 3

Safety pressure and pressure breathing tests

Altitude (ft)	Positive pressure for 10 litres/min flow (in.wg)		Max. increase (above pressure for 10 litres/min flow) at zero flow (in.wg)	Min. positive pressure for 70 litres/min flow (in.wg)
	Min.	Max.		
12 000 (pre-mod G1111 regulators)				
14 000 (post mod G1111 regulators)	0·05	0·9	—	0·05
30 000	0·2	1·2	—	0·1
40 000	—	2·2	1·5	—
41 000	1·8	—	1·5	—
50 000	14·8	17·7	1·5	—

Chapter 1-2

STANDARD SERVICEABILITY TESTS
(for use when an approved test stand is not available)

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TABLE 1

List of tools, test equipment and supplies

Nomenclature	Part No.	Ref. No.
Test rig for pressure demand oxygen regulators. Refer to AP 112T-01123-1	-	-

TABLE 1 (cont'd)

Nomenclature	Part No.	Ref. No.
Inlet adapter, straight	OP. 10073	6D/1647
or		
Inlet adapter, elbow	OP. 310	6D/1648
Rubber cuff	OP. 18518	6D/2770
Clips, hose, 2 off	-	28E/20104
Bridge universal	-	10S/9553163
Multimeter set CT 498A	-	5QP/1057049
20 to 29V d. c. supply	-	-
Breathing oxygen test supply	-	-
(14 bars (200 lbf/in^2) pressure)	-	-

TABLE 2
List of materials

Nomenclature	Ref. No.	Specification	NATO Code
Leak test solution	33C/1788	-	-
Paper, absorbent	32B/1312	-	-

Introduction

1. The tests detailed in this chapter are to be applied using the test rig described in AP 112T-01123-1. The tests are similar to those contained in Chap. 1-1, but are less comprehensive due to the limitations of the test rig. The tests detailed in Chap. 1-1 should be applied where possible, and this alternative procedure adopted only when an approved test stand is not available.

2. The tests should be applied before a regulator is installed in an aircraft, when the serviceability of a regulator is in doubt and at the appropriate examination periods at Equipment Depots.

WARNING...

(1) MANY MATERIALS, PARTICULARLY OIL AND GREASE, ARE SUBJECT TO SPONTANEOUS COMBUSTION WHEN EXPOSED TO UNDILUTED OXYGEN UNDER PRESSURE. PRECAUTIONS MUST BE TAKEN, THEREFORE, TO EXCLUDE OIL, GREASE, DUST AND METAL PARTICLES FROM THE REGULATOR.

(2) CLEANING AND DEGREASING OF OXYGEN EQUIPMENT COMPONENT PARTS MUST BE DONE STRICTLY IN ACCORDANCE WITH THE INSTRUCTIONS CONTAINED IN AP 107D-0001-1, CHAP. 4.

EXAMINATION

3. Prior to commencing the tests, the regulator is to be examined as follows:-

(1) Examine generally for cleanliness and damage. A regulator which is contaminated with oil or grease must be disposed of in accordance with current Service procedure.

(2) Check the air inlet shutter control, emergency button, and the shut-off valve for full and free movement.

(3) Examine the mounting plate inscriptions for legibility. If re-touching is to be undertaken, use white paint (Ref. No. 33B/2204725).

(4) Check the modification state of the regulator. For brief details of modifications, refer to Modification Record (Chap. 1-3).

PARTICULARS OF TESTS

4. Unless otherwise specified:-

(1) The regulator must be located in the test chamber so that the mounting panel is uppermost and horizontal.

(2) The high-pressure supply to the regulator must be breathing oxygen.

(3) The test values specified are related to conditions of normal room temperature and pressure.

(4) Solutions for leak testing are to be as specified in AP 107D-0001-1, Chap. 2-2. Precautions must be taken to prevent the solution causing blockage in small components such as fine gauze filters, and to prevent the solution entering the regulator and contacting the operating diaphragm. All traces of the solution are to be removed after each test.

5. The magnetic indicator must be in the negative line of the electrical supply, with the regulator casting earthed via the negative lead. A 1·0A fuse must be incorporated in the positive line of supply.

CAUTION...

The decimal is shown by a comma in test values quoted in newly introduced metric units; e.g., 10,5 bars also for continental units hitherto in common usage; e.g., 4,5 litres/min. The full point, however, is retained for British Standard units.

PREPARATION

6. (1) Apply the test rig leak tests (AP 112T-01123-1).

(2) Set the altimeter to 1013,3 mb.

(3) Ensure that the manometer scales are set to zero.

(4) Unless already fitted, connect the inlet adapter to the regulator shut-off valve.

TEST PROCEDURE

WARNING...

BEFORE OPENING THE TEST RIG VALVE D, ENSURE THAT THE PRESSURE CONTROLLER SELECTOR IS TURNED FULLY COUNTER-CLOCKWISE AND THAT EITHER VALVE G OR VALVE H (AS SPECIFIED IN THE TEST PROCEDURE) IS FULLY OPEN. VALVE D MUST NOT BE OPENED WITH BOTH OF THESE VALVES CLOSED.

Capacitance tests

7. With the regulator disconnected from the test rig, and using the universal bridge, apply the capacitance test as follows:-

(1) Check the capacitance between the socket RED terminal and the regulator casting; the capacitance should be not less than 0·7 microfarads.

(2) If it is required to check the capacitance between the regulator socket BLUE terminal and the regulator casting, it will be necessary to isolate the magnetic indicator. This can be done by removing the front panel securing screws and detaching the panel sufficiently to break the electrical contacts in the circuit to the indicator. The capacitance should be as specified in Op. (1).

Regulator exercising and flow indicator tests (fig. 1)

8. (1) Employing the inlet adapter, connect the regulator inlet to the high-pressure inlet connector in the test chamber.

(2) Connect the tube from the piezometer adapter to connection W.

(3) Close the suction and pressure valves of the water manometer.

(4) Ensure that all rig control valves are closed and that the pressure controller selector is turned fully counter-clockwise.

(5) Start the vacuum pump. Observing manometer M 2, open valve C, evacuate the reservoir to 24 380 m (80 000 ft) and then close the valve.

(6) Connect the regulator outlet to the piezometer adapter by means of the rubber cuff and the two hose clips.

(7) Set the regulator shut-off valve to ON, the air inlet control to 100% OXYGEN and the emergency button central.

(8) Ensure that valve D is closed fully, then open valve A and rotate the pressure controller selector slowly clockwise until the test rig pressure gauge indicates the appropriate pressure (Table 3).

(9) Close and clamp the chamber door.

(10) Open valve G fully, then open valve F and establish an indicated flow of 10 litres/min.

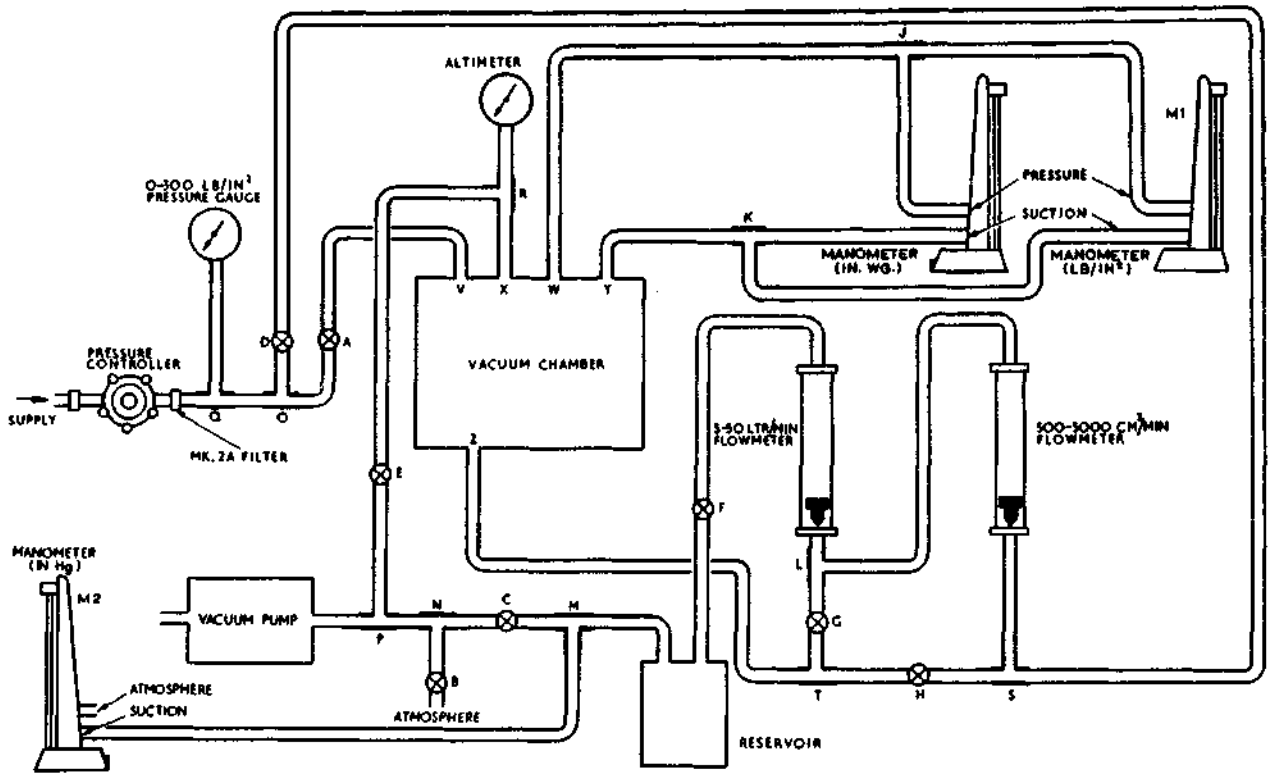

Fig. 1 Schematic arrangement of test rig for pressure demand oxygen regulators

TABLE 3

Regulator inlet pressures

Regulator	Inlet pressure (bars)	(lbf/in²)
Mk. 17 E	10,5	150
Mk. 17F and 17G	6,5	95

(11) Open valve E and raise the chamber altitude to 13 700 m (45 000 ft). Close the valve and shut down the vacuum pump.

(12) Close and open valve F six times at approximately normal breathing rate.

(13) Close valves F and G, open valves B and E, to restore ground level conditions within the chamber and then open the chamber door.

(14) Connect the electrical plug to the regulator socket and the earth lead from the chamber socket to the earthing terminal on the back of the regulator panel.

(15) Switch on the 28V d. c. supply to the vacuum chamber.

(16) Open valve G, then open valve F slowly until both the regulator indicator and the slave indicator give indication of full flow. Observe the reading of the 5 to 50 litres/min flowmeter; the flow should be less than 20 litres/min.

(17) Close valve F and observe the indicators. The indicators should 'snap' to the 'no flow' position when the flow falls to zero.

(18) Set the air inlet shutter to NORMAL and repeat Op. (16); the flow, in this instance, should be less than 25 litres/min.

(19) Close valves F and G, switch off the power supply and disconnect the plug and earth lead from the regulator. Leave the regulator connected to the rig for the safety pressure and pressure breathing tests.

(20) Close all test rig control valves.

Safety pressure and pressure breathing tests

9. The regulator should be connected to the test rig as for the previous test.

(1) Ensure that the shut-off valve of the regulator is set to ON, the air inlet shutter to 100% OXYGEN and the emergency button central.

(2) Ensure that all rig control valves are closed and then start the vacuum pump.

(3) Open valve C, evacuate the reservoir until the reservoir manometer (M2) indicates 24 380 m (80 000 ft) and close the valve.

(4) Disconnect the piezometer tube from connection W, open both valves of the water manometer and then reconnect the piezometer tube.

Note. . .

If vibration of the regulator mechanism occurs during the tests, and it can be arrested by varying the flow and then returning to the flow specified, the regulator is acceptable. If vibration persists after this remedial action, or if it can be initiated by simulating a breathing cycle, then the regulator is unserviceable.

(5) Close and clamp the chamber door and switch on the chamber altimeter vibrator. Ensure that valve D is closed, then open valve A and adjust the pressure controller to obtain the appropriate inlet pressure (Table 3).

(6) Open valve G and regulate valve F to obtain an indicated flow of 10 litres/min.

(7) Open valve E slowly, evacuate the test chamber until the water manometer indicates zero and regulate the flow by means of valve F to maintain a true ambient flow of 10 litres/min. Equivalent indicated flows for a true ambient flow of 10 litres/min at various altitudes are given in

Table 4. Under the conditions stipulated, the chamber altitude should be not less than 3 350 m (11 000 ft).

TABLE 4

Equivalent indicated flows

(m)	(ft)	True ambient flow (litres/min)	Equivalent indicated flow (litres/min)
1520	5 000	10	9,1
3050	10 000	10	8,3
4570	15 000	10	7,5
6100	20 000	10	6,8
7620	25 000	10	6,1
9140	30 000	10	5,4
10 000	35 000	10	4,8
12 200	40 000	10	4,3

(8) Regulate valve F, as necessary, to obtain a true ambient flow of 10 litres/min. (Refer to Table 4 for the equivalent indicated flow).

(9) Open valve E slowly and increase the chamber altitude to 4270 m (14 000 ft) and regulate the flow by means of valve F to maintain a true ambient flow of 10 litres/min. Under these conditions, the outlet pressure should be not less than 0,125 or greater than 2,24 mb (0·05 to (0·9 in wg).

(10) Increase the chamber altitude to the values stipulated in Table 5 and, at each altitude, establish a true ambient flow 10 litres/min and check the regulator outlet pressure. At the altitudes of 12190 m (40 000 ft) and above,check the pressure increase at zero flow. The pressure should be within the limits stated in the Table.

Emergency pressure test

10. The regulator should be connected to the test rig as for the previous test.

(1) Ensure that the regulator shut-off valve is set to ON and that the air inlet shutter is set to 100% OXYGEN. Set the emergency button central.

(2) Ensure that valve D is closed, then open valve A and adjust the pressure controller to obtain the appropriate inlet pressure (Table 3).

TABLE 5

Safety pressure and pressure breathing test values

Chamber altitude (m)	Chamber altitude (ft)	Equivalent indicated flow for 10 litres/min true ambient flow (litres/min)	Positive pressure for 10 litres/min true ambient flow				Maximum pressure increase (above pressure at 10 litres/min true ambient flow) at zero flow	
			Min (mb)	Min (in wg)	Max (mb)	Max (in wg)	(mb)	(in wg)
4270	14 000	7,6	0,125	0·05	2,24	0·9		
9140	30 000	5,4	0,5	0·20	3,0	1·2	-	-
12 200	40 000	4,2	-	-	5,5	2·2	3,73	1·5
12 500	41 000	4,2	4,5	1·80	-	-	3,73	1·5
15 240	50 000	4,2	36,8	14·80	44,0	17·7	3,73	1·5

(3) Open valve G, then regulate valve F and draw a flow of 10 litres/min from the regulator.

(4) Deflect the emergency button either to the left or to the right and observe the water manometer. The outlet pressure should be not less than 3,7 or greater than 6,2 mb (not less than 1·5 or greater than 2·5 in wg).

(5) Move the emergency button to the opposite side and observe the manometer. The pressure should be within the limits specified in Op. (4).

(6) Depress the emergency button fully and observe the manometer. The pressure should be not less than 25 mb (10 in wg).

(7) Close valves F and G, and leave the regulator connected for the outwards leak test.

Outwards leak test

11. With the regulator connected as for the emergency pressure test:-

(1) Ensure that valves D,G and H are fully closed. Open valve A, then rotate the pressure controller selector slowly clockwise until the test rig pressure gauge indicates the appropriate inlet pressure (Table 3).

(2) Set the air inlet control to NORMAL, the emergency button central and the regulator shut-off valve to ON.

(3) Press the emergency button straight in until the water manometer indicates 25 mb (10 in wg) and then release the button.

(4) Rotate the pressure controller selector fully counter-clockwise and disconnect the regulator from the high-pressure inlet connector, allowing the regulator gauge reading to fall to approximately zero, but leaving the pressure trapped within the regulator.

(5) Observe the time taken for the pressure to fall from 24 to 19 mb (9·5 to 7·5 in wg). The time taken should be not less than 8 s.

(6) Reconnect the high-pressure inlet connector for the electrical tests.

Electrical continuity tests

12. With the regulator connected to the test rig as for exercising and with the appropriate supply pressure (Table 3) delivered to the regulator inlet,

proceed as follows:-

(1) Ensure that valve D is closed, then open valve A and adjust the pressure controller to obtain the appropriate inlet pressure (Table 3).

(2) Set the regulator shut-off valve to ON and the air inlet control to 100% OXYGEN Deflect the emergency button to one side to close the contact points.

(3) Using the multimeter set to measure resistance, check the resistance between the regulator socket RED terminal and the BLUE terminal. The maximum permissible resistance is 1·2 ohms.

(4) Set the emergency button central and close valve A so that the regulator contacts open.

(5) Check the resistance between the regulator socket BLUE terminal and the regulator casting. The resistance should be not less than 445 or greater than 500 ohms.

(6) Rotate the pressure controller selector fully counter-clockwise and close all control valves on the test rig.

Relief valve flow test

13. With the regulator outlet connected to the piezometer adapter:-

(1) Ensure that all test rig control valves are fully closed and the pressure controller selector rotated fully counter-clockwise.

(2) Set the air inlet control to NORMAL and the emergency button central. The shut-off valve should be set to OFF.

(3) Connect the piezometer tube to connection W and ensure that the water manometer valves are closed.

(4) Open valve H and then open valve D.

(5) Rotate the pressure controller selector slowly clockwise until the mercury manometer (M1) indicates 101 mb (1·47 lbf/in^2). The regulator relief valve should vent freely.

(6) Rotate the pressure controller selector fully counter-clockwise and close valves D and H. Leave the regulator connected for the inwards leak test.

Inwards leak test

14. With the regulator connected to the test rig as for the relief valve flow test, the procedure is as follows:-

(1) Disconnect the piezometer tube from connection W and connect to connection Y.

(2) Open the two valves on the water manometer.

(3) Set the regulator shut-off valve to OFF, the air inlet control to 100% OXYGEN and the emergency button central.

(4) Open valve G, then exercising caution, slowly open valve F until the water manometer indicates a suction of 3,8 mb (1·5 in wg).

Note...

If the gauge reading of 3,8 mb (1·5 in wg) should be exceeded inadvertently, relieve the excess suction by first selecting NORMAL on the air inlet control and then returning the control to 100% OXYGEN.

(5) Close valve F and check the time taken for the manometer reading to fall from 3,25 mb (1·3 in wg) suction to zero. The time should be not less than 1 min.

(6) Disconnect the piezometer tube from connection Y and reconnect to connection W.

(7) Close all valves of the test rig.

High-pressure leak test

15. (1) Mount the regulator in the test chamber so that the outlet is pointing downwards. Connect the regulator to the high-pressure inlet connector in the test chamber.

(2) Set the air inlet control to 100% OXYGEN, the shut-off valve to ON and the manual control to NORMAL.

(3) Ensure that valve D is closed.

(4) Open valve A and adjust the pressure controller to obtain an inlet pressure of 14 bars (200 lbf/in^2).

(5) Draw a thin film of leak test solution over the regulator outlet; the film should not rupture in less than 3 s.

Shut-off valve leak test

16. With the regulator mounted and connected as for the high-pressure leak test, the procedure is as follows:-

(1) Set the regulator shut-off valve to OFF and the emergency button to one side.

(2) Ensure that valve A is open and adjust the pressure controller to obtain an inlet pressure of 14 bars (200 lbf/in^2).

(3) Draw a thin film of leak test solution over the regulator outlet; the film should not rupture in less than 3 s.

(4) Remove all traces of the solution and dry the regulator thoroughly.

Gauge pressure-drop test

17. Mount the regulator in the test chamber with the front panel horizontal and uppermost. The connections to the regulator are the same as for the shut-off valve leak test.

(1) Set the regulator shut-off valve to ON and the emergency button central. Ensure that valve A is open and adjust the inlet pressure to 14 bars (200 lbf/in^2).

(2) Close valve A, set the regulator shut-off valve to OFF and disconnect the regulator from the high-pressure inlet connector.

(3) Note the reading of the regulator pressure gauge.

(4) After an elapsed period of 2 min, the fall in pressure, from that noted in Op. (3) should not exceed 3,5 bars (50 lbf/in^2).

(5) Set the emergency button to one side, to relieve the pressure within the regulator and then centralize.

Regulator pressure gauge calibration test

18. With the regulator connected as for the gauge pressure-drop test:-

(1) Set the regulator shut-off valve to ON and the emergency button central.

(2) Ensure that valve D is fully closed and valve A open, then rotate the pressure controller selector slowly clockwise until the test rig pressure gauge indicated 7 bars (100 lbf/in^2).

(3) Observe the reading of the regulator pressure gauge; this reading should be not less than 5,8 or greater than 8 bars (not less than 85 or greater than 115 lbf/in^2).

(4) Rotate the pressure controller selector fully counter-clockwise, close valve A and set the emergency button to EMERGENCY; when the test rig pressure gauge indicates zero, check the reading of the regulator gauge. This gauge should also indicate zero. Return the emergency button to its central position and disconnect the regulator from the rig. Fit the protective caps and return the regulator to its polythene bag.

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Chapter 1-3

MODIFICATION STATE

Mod. No.	Regulators affected	Brief details of modification	A.P. reference A.P.1275G, Vol. 2, Part 1 Leaflet No.
AI19477/52	Mk. 17 Series	Wire-locking of ON/OFF valve to the ON position at all stations permanently occupied. Fitting of blanking plug at vacant positions.	C1
G.307	Mk. 17 and 17C	Introduction of new demand valve lever assembly, lever arm bracket and counterweight lever assembly.	C5
G.310	Mk. 17 and 17C	Introduction of new pressure reducer dampener.	C6
G.315	Mk. 17 and 17C	Introduction of new demand valve assembly and new demand valve stem.	C8
G.319	Mk. 17 and 17C	Introduction of new counterweight lever and channel assembly	C11
G.328	Mk. 17 and 17C	Introduction of new pressure reducer liner.	C9
G.346	Mk. 17 and 17C	Introduction of new pressure reducer dampener and pressure reducer liner	C10
G.363	Mk. 17 and 17C	Introduction of new blinker shaft.	C12
G.365	Mk. 17 and 17C	Introduction of new inlet valve assembly.	C18
G.384	Mk. 17	Introduction of electro-magnetic blinker. Converts a Mk. 17 regulator to a Mk. 17D regulator.	C16
G.387	Mk. 17C	Introduction of insulating sleeve for spark suppressor.	C19
G.389	Mk. 17C	Introduction of electro-magnetic indicator. Converts a Mk. 17C regulator to a Mk. 17D regulator	C20
G.403	Mk. 17 and 17C	Introduction of silicone rubber diaphragm.	C23
G.495	Mk. 17D	Addition of circuit label to aneroid cover.	C24
G.498	Mk. 17, 17C and 17D	Introduction of hose clip on regulator cuff.	C26
G.1091	Mk. 17D	Introduction of relief valve assembly in place of demand valve plug, and a longer pressure reducer adjusting screw. Converts a Mk. 17D regulator to a Mk. 17E regulator.	C30

Mod. No.	Regulators affected	Brief details of modification	A.P. reference A.P.1275G, Vol. 2, Part 1 Leaflet No.
G.1111	Mk. 17D and 17E	Introduction of new aneroid assembly to increase altitude at which pressure breathing commences.	C37
G.1126	Mk. 17E	Introduction of new inlet valve assembly with redesigned nylon seat.	—
G.1138	Mk. 17E	Introduction of new blinker magnetic indicator.	—
G.1186	Mk. 17E	Identifies regulators that have been tested to an inlet pressure of 95 lb/in². Converts Mk. 17E regulator to a Mk. 17F regulator.	—
G.1190	Mk. 17D, 17E and 17F	Introduction of new neoprene cuff.	C39
G.1625	Mk. 17F	Introduction of waterproof air inlet shutter assembly (R.N. only). Converts Mk. 17F to Mk. 17G.	—
◄G.1635	17G	Introduction of an air inlet shutter stop plate and spacers.►	—

Chapter 2

DEMAND OXYGEN REGULATOR, Mk. 17

LEADING PARTICULARS

Ref. No.	*6D/1700*
Part No.	*OP.240*
Weight	*4·25 lb*
Dimensions:	
Mounting panel	*6·75 × 5·75 in.*
Depth behind panel	*4·0 in.*
Oxygen flow indicator	*Mechanical*

1. This regulator is similar to the unit described in Chap. 1, but has a mechanically operated blinker indicator in place of the electric indicator.

2. A dial blinker and linkage mechanism assembled to the pressure gauge, consists of a pivoted actuating lever with its upper arm linked to the dial hub, while the lower arm is located under the lower contact spring and positioned on the gauge actuator. Movement of the actuator is transmitted to the dial and, when a demand flow is taken from the regulator, four tear shaped fluorescent markings on the dial align with apertures in the pressure dial. When the flow ceases, the lower contact spring returns the actuating lever to its normal position and the fluorescent markings are obscured.

Chapter 3

DEMAND OXYGEN REGULATOR, Mk. 17C

LEADING PARTICULARS

Ref. No.	*6D/1730*
Part No.	*OP.660*
Weight	*4·5 lb*
Dimensions:	
Mounting panel	*6·75 × 5·75 in.*
Depth behind panel	*4·0 in.*
Oxygen flow indicator	*Mechanical with provision for an electrically-operated remote indicator if required*
Power supply (if required)	*28V d.c. (nominal)*

Introduction

1. The regulator is similar to the unit described in Chap. 1, but has a mechanically operated blinker indicator in place of the electric indicator. There is, however, provision for operating a remote electric indicator.

2. A dial blinker and linkage mechanism assembled to the pressure gauge, consists of a pivoted actuating lever with its upper arm linked to the dial hub, while the lower arm is located under the lower contact spring and positioned on the gauge actuator. Movement of the actuator is transmitted to the dial and, when a demand flow is taken from the regulator, four pear shaped fluorescent markings on the dial align with apertures in the pressure dial. When the flow ceases, the lower contact spring returns the actuating lever to its normal position and the fluorescent markings are obscured.

3. The actuator also controls the gap across the contacts which operate in the remote blinker electrical circuit. A magnetic indicator (*Ref. No. 5CZ/5003*) is used in this circuit, a diagram of which is shown in fig. 1.

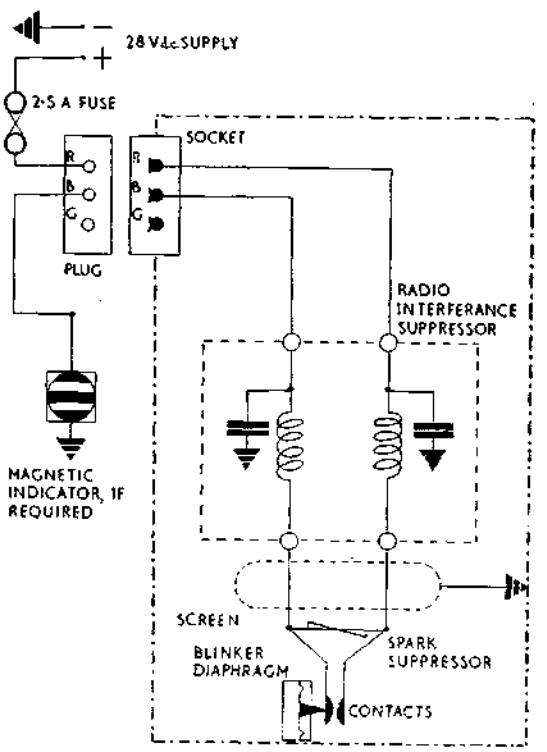

Fig. 1. Circuit diagram

Chapter 4

DEMAND OXYGEN REGULATOR, Mk. 17D

LEADING PARTICULARS

Ref. No.	*6D/1966*
Part No.	*OP.3430*
Weight	*4·7 lb*
Dimensions:	
Mounting panel	*6·75 × 5·75 in.*
Depth behind panel	*4·0 in.*
Oxygen flow indicator	*Electro-magnetic with provision for connecting two remote indicators if required.*
Power supply (nominal)	*28V d.c.*

Introduction

1. This regulator is identical to the unit described in Chapter 1.

Chapter 5

DEMAND OXYGEN REGULATOR, Mk. 17E

LEADING PARTICULARS

Ref. No.	*6D/2294*
Part No.	*OP.4820*
Weight	*4·5 lb*
Dimensions:	
Mounting panel	*6·75 × 5·75 in.*
Depth behind panel	*4·0 in.*
Oxygen flow indicator	*Electro-magnetic with provision for connecting two remote indicators if required.*
Power supply (nominal)	*28V d.c.*

Introduction

1. The Mk. 17E regulator is similar to the unit described in Chap. 1, but is fitted with a modified pressure reducer and incorporates a demand valve chamber relief valve assembly (*fig.* 1) which is fitted in place of the demand valve chamber plug.

2. The pressure reducer differs in that it has a longer adjusting screw than that of earlier marks of regulator. The longer screw acts as a stop to limit the compression of the bellows, and prevents overstressing of the bellows in the event of an excessive build-up of pressure in the reducer chamber.

3. The relief valve fitted to the demand valve chamber releases excess pressure to ambient atmosphere in the event of an excessive pressure build-up in the pressure reducer and demand valve chamber. The valve commences to relieve the pressure when it rises above 100 lb/in².

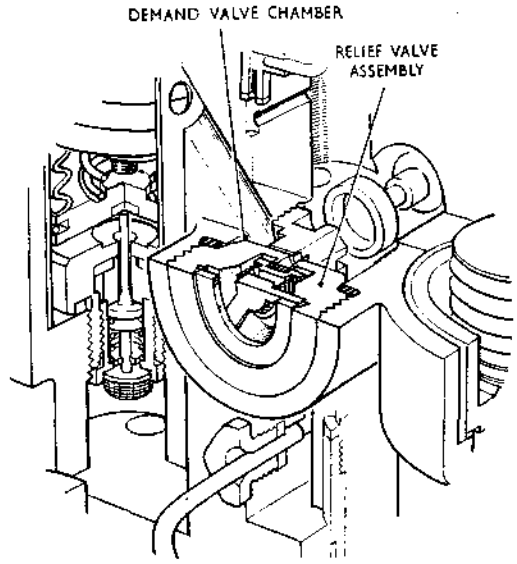

Fig. 1. Relief valve

Chapter 7

DEMAND OXYGEN REGULATOR, Mk. 17G

LEADING PARTICULARS

Ref. No.	*6D/1946806*
Part No.	*1406W000*
Weight	*4·4 lb*
Dimensions:	
Mounting panel	*6·75 × 5·75 in.*
Depth behind panel	*4·0 in.*
Oxygen flow indicator	*Electro-magnetic with provision for connecting two remote indicators if required.*
Power supply (nominal)	*28V d.c.*

Introduction

1. The Mk. 17G oxygen regulator differs from the Mk. 17F in that the air inlet shutter assembly is water-proof when in the 100% OXYGEN position, thereby facilitating underwater escape.

2. In the water-proof air inlet shutter assembly (fig.1), the rubber gasket has $\frac{7}{32}$ in. dia. holes in place of the pear-shaped slots, and the bonded attachment to the rear plate is supplemented by five moulded studs; these are pressed into holes counterbored on the reverse side of the plate. Sealing between the air inlet shutter assembly and the body of the regulator is by an O-ring (GD2005.B14). Stop pins for the lever are not fitted to the plate of this air inlet shutter; a stop plate arrests the lever movement at the 100% OXYGEN position, while at the NORMAL OXYGEN position, movement is terminated by a spacer on the adjacent attachment screw.

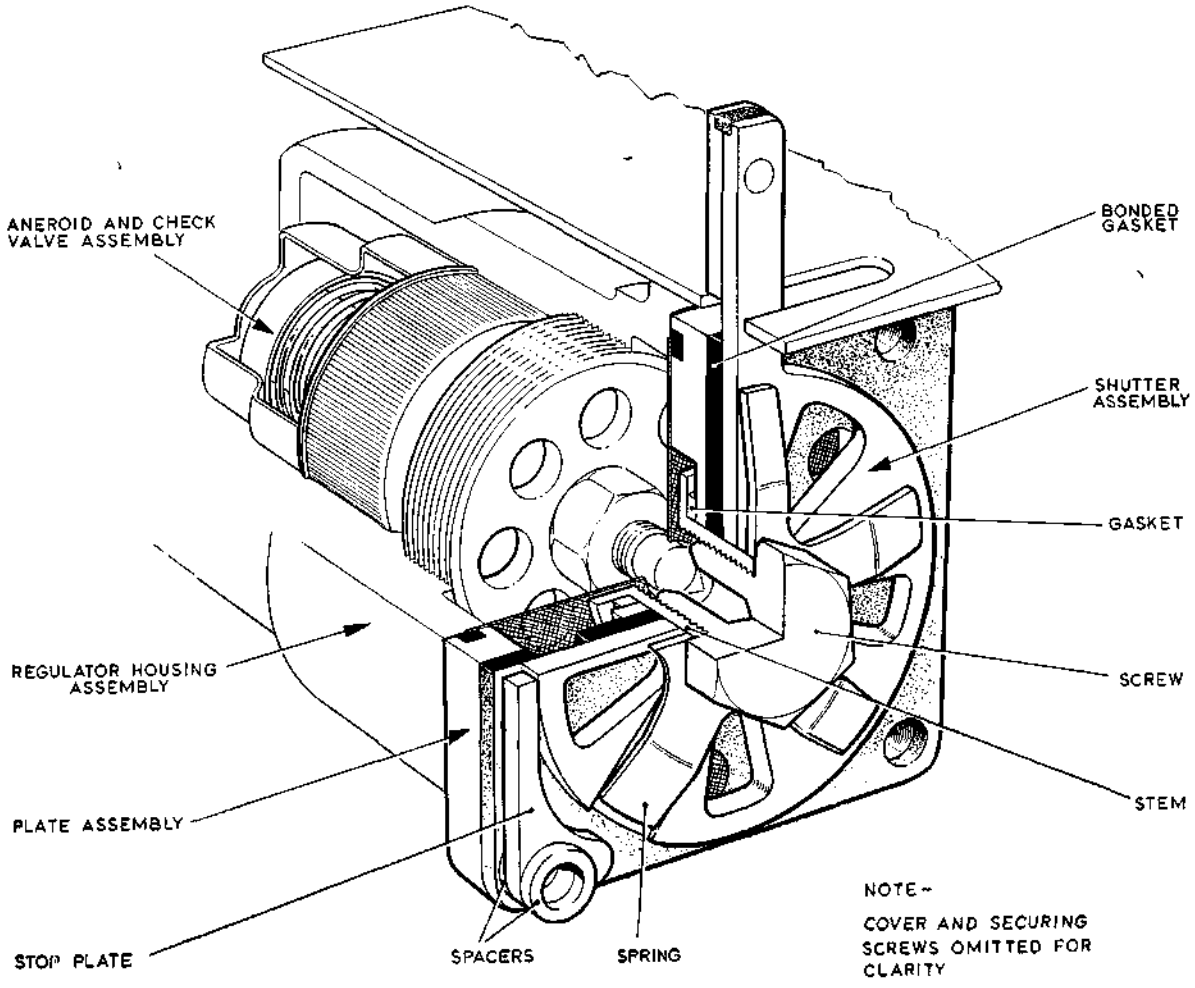

Fig. 1. Air inlet shutter assembly—Mk. 17G regulator

ILLUSTRATED PARTS CATALOGUE

INTRODUCTION

1. This schedule contains a list of assemblies sub-assemblies and components applicable to the equipment.

2. NP. RN. in column 4 or 6 indicates that the item is not provisioned and is included to assist in identification of parts.

3. This publication will be amended periodically. It cannot however be kept up to date with each modification as it is introduced and users should read in conjunction with appropriate modification leaflets.

4(a) Items available at 4th line only are marked so in column 4, the remaining items are available at both second and fourth line.

(b) Where class of store is shown prefixed by a figure 2, these items are available at second and fourth line.

5. The Interservice index sheet where included provides a cross reference to obtain management code which should prefix the full NATO service number.

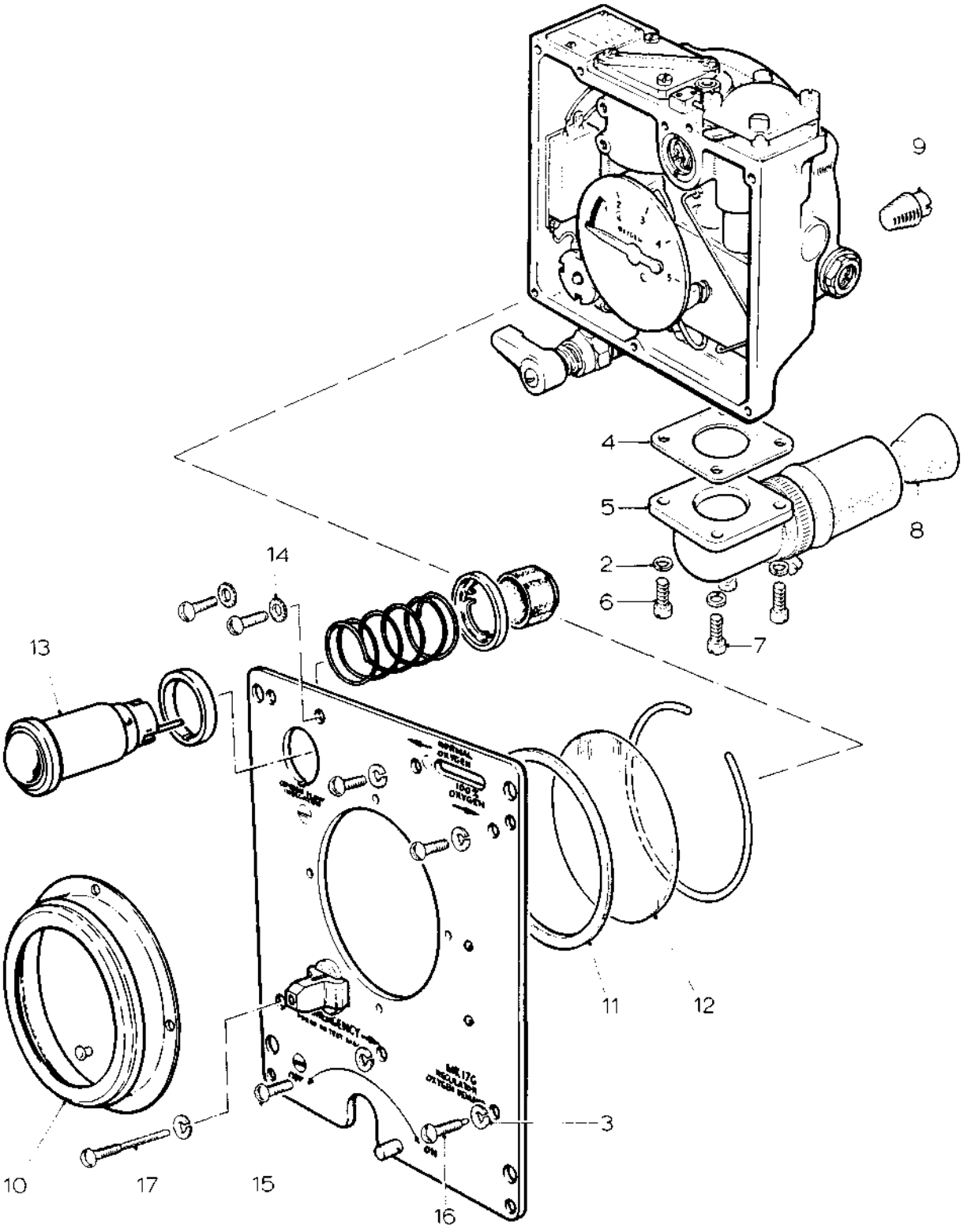

Fig.1 Demand oxygen regulator, Mk.17G

MAIN EQUIPMENT OXYGEN REGULATOR, MK.17G

(1) Item No.	(2) Ref. No.	(3) Part No.	(4) 1 2 3 4 5 6 7 Description	(5) No. Off	(6) Remarks	(7) C of E	(8) Plate/ Cct Ref
1	6D/1660-99-194-6806	1406 W000	REGULATOR OXYGEN MK.17G	1		P	
2	6D/1725	OP 10429	. WASHER LOCK	17		2C	
3	6D/2593	OP 10430	. WASHER LOCK	14		2C	
4	6D/1723	793524-1/N	. GASKET, OUTLET RUBBER	1		2C	
5	6D/1722	792523-1/N	. OUTLET	1		2C	
6	6D/1724	OP 10413	. SCREW	3		2C	
7	6DD/692	OP 11316	. SCREW	1		2C	
8	6D/2063	B26/001	. BUNG RUBBER size 'M'	1		2C	
9	6D/1726	PB 23847-1/N	. PLUG, SHIPPING	1		2C	
10	6DD/1583	711808-1/N	. BEZEL	1		2C	
11	6D/2587	778408-1/N	. GASKET, RUBBER	1		2C	
12	6D/2588	778409-1/N	. GLASS DIAL	1		2C	
13	5C2/5003	C5165Y MK.14 ISSUE 12.	. INDICATOR, MAGNETIC	1		2C	
14	6DD/1731	AGS 2034/B	. WASHER	2		2C	
15	6D/2590	OP 10421	. SCREW	5		2C	
16	6D/5305-99-103-9721	OP 11252	. SCREW, SET	1		2C	
17	6D/5305-99-103-9720	OP 11253	. SCREW, SET	1		2C	

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