

Chapter 7**10 LITRE REMOVABLE LIQUID OXYGEN PACKAGE**
(Part No. 1015Z000)**LIST OF CONTENTS**

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LEADING PARTICULARS

<i>Ref. No.</i>	6D/2886
<i>Dimensions, overall (approx.)</i>	13.5×13.5×16.8 in.
<i>Weight</i>	20 lb
<i>Container assembly</i>	OP.18629
<i>Combined filler, build-up, vent and relief valve</i>	OP.7290
<i>Pressure opening and pressure closing valve</i>	OP.16751/3
<i>Contents gauge control unit</i>	1215X000
<i>Vent connection</i>	256000-2
<i>Outlet connection</i>	199000-2

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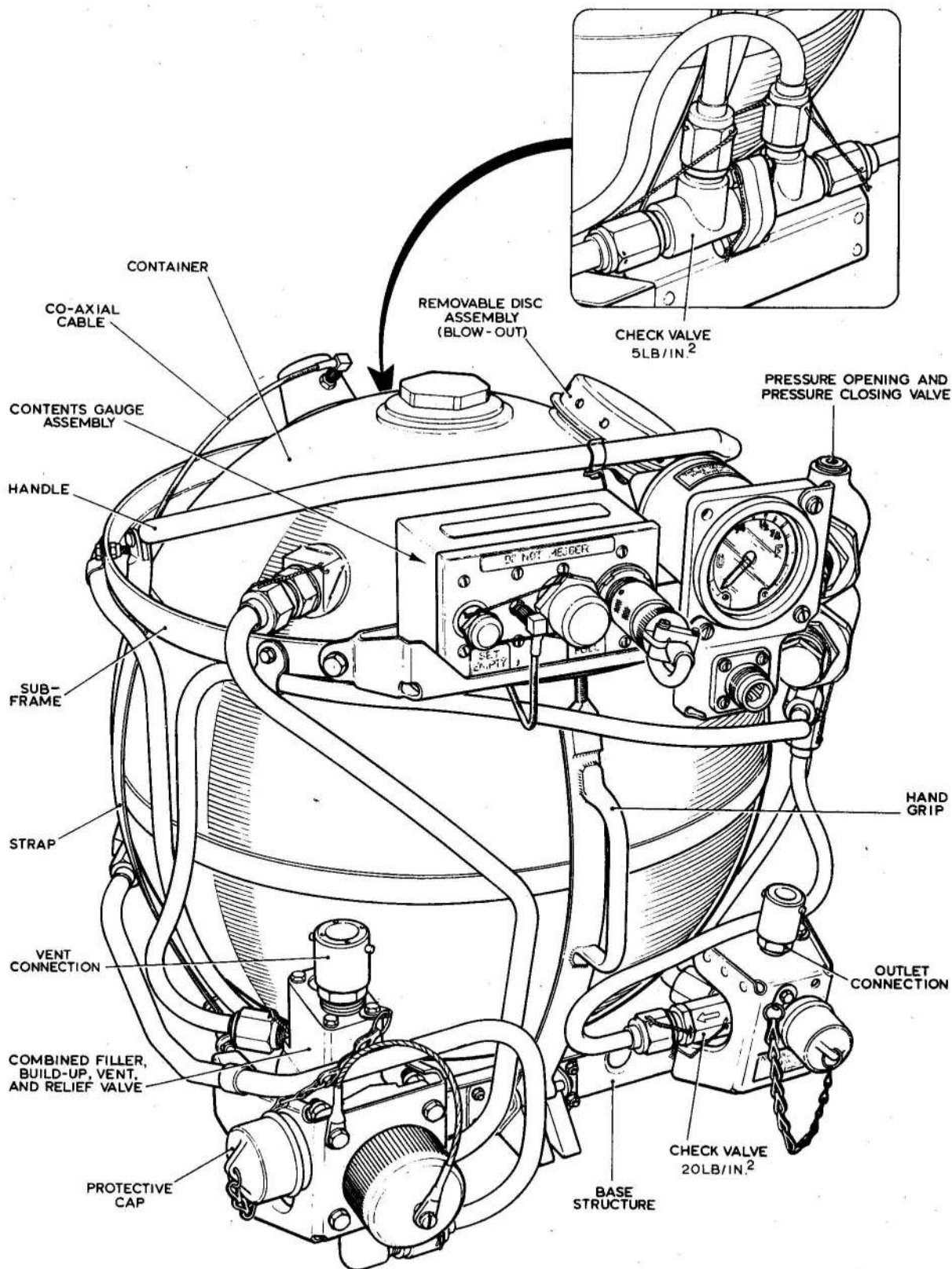


Fig. 1. 10 litre removable liquid oxygen package

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Introduction

1. The 10 litre removable liquid oxygen package (fig. 1) incorporates all the components of a liquid oxygen converter system in a single self-contained unit. Through the medium of quick-disconnect couplings, the package can be readily connected to, or disconnected from, the oxygen system of certain aircraft.

DESCRIPTION

2. A spherical, liquid oxygen container (Sect. 3, Chap. 1) is supported by a triangular base structure assembly, attachment to this assembly being by a circular sub-frame and four straps. A combined filler, build-up vent and relief valve (Sect. 1, Chap. 6) and an outlet body are secured to the base structure assembly, while a pressure opening and pressure closing valve (Sect. 1, Chap. 5) and a contents gauge assembly (para. 8) are mounted on the sub-frame. Incorporated in the pipelines to the outlet body are two check valves (Sect. 1, Chap. 3) having operating pressures of 5 and 20 lb/in² respectively.

3. When the package is disconnected from the aircraft system, the quick-disconnect receptacles are sealed by protective caps; these are secured to the package by chains and, when a package is installed, they are located in adjacent stowage plugs. Handling of the package is facilitated by a hinged handle attached to the sub-frame and a handgrip integral with the forward strap.

Supporting structure**Base structure assembly**

4. The base structure is a riveted assembly having a flanged ring, front and rear base members and two side members as the principal structural components. The side members also serve as runners for the purpose of assembling the package to a mounting wedge (Part No. 1000Z00) fitted to the aircraft. Brackets riveted to each end of the front base member are for mounting the combined filler, build-up, vent and relief valve, and the outlet body. Forked brackets, at the mid-positions of the front and rear base members and the two side members, provide hinged attachments for the four straps, the hinge pins being secured by washers and split pins. The flanged ring provides a seating for the container, protection for the exterior surface being provided by rubber strips bonded to the ring.

Sub-frame and straps

5. The sub-frame is a light alloy ring having rubber strips bonded to it to provide a seating which bears on to the upper surface of the container. Four holes drilled through the ring receive the threaded end-fittings of the four straps, two of these being secured by washers and stiff-nuts, while the remaining two are secured by fork-end assemblies. The fork-end assemblies have the additional function of providing attachments for the hinged handle.

6. Each strap is of 20 swg light alloy and has a rubber strip bonded to the inner side to pro-

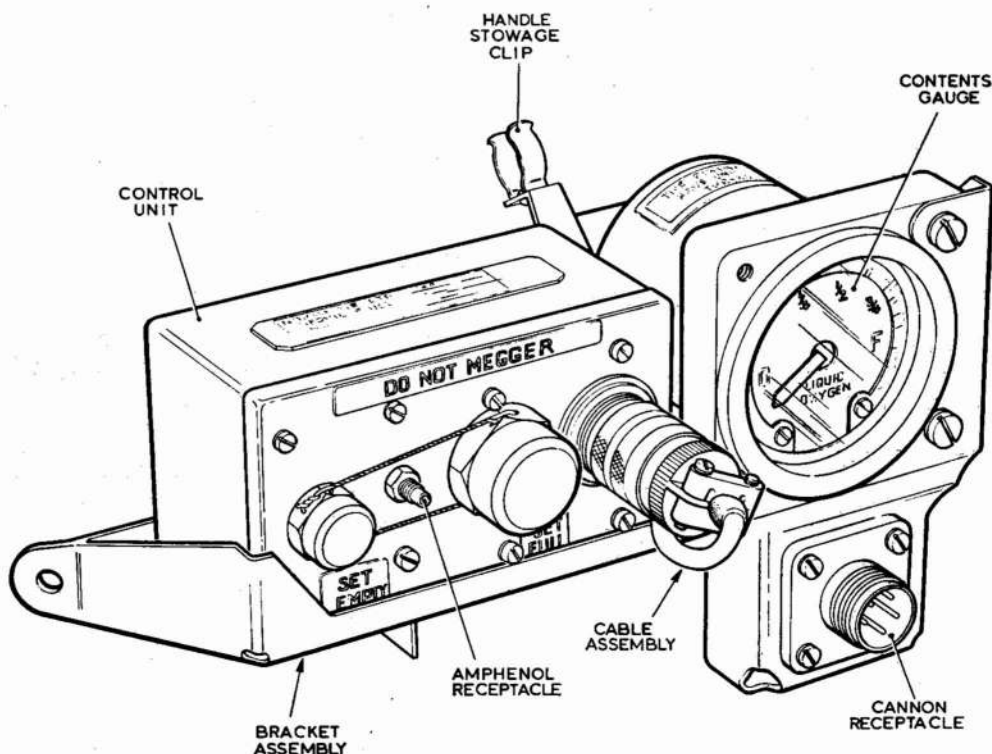


Fig. 2. Contents gauge assembly

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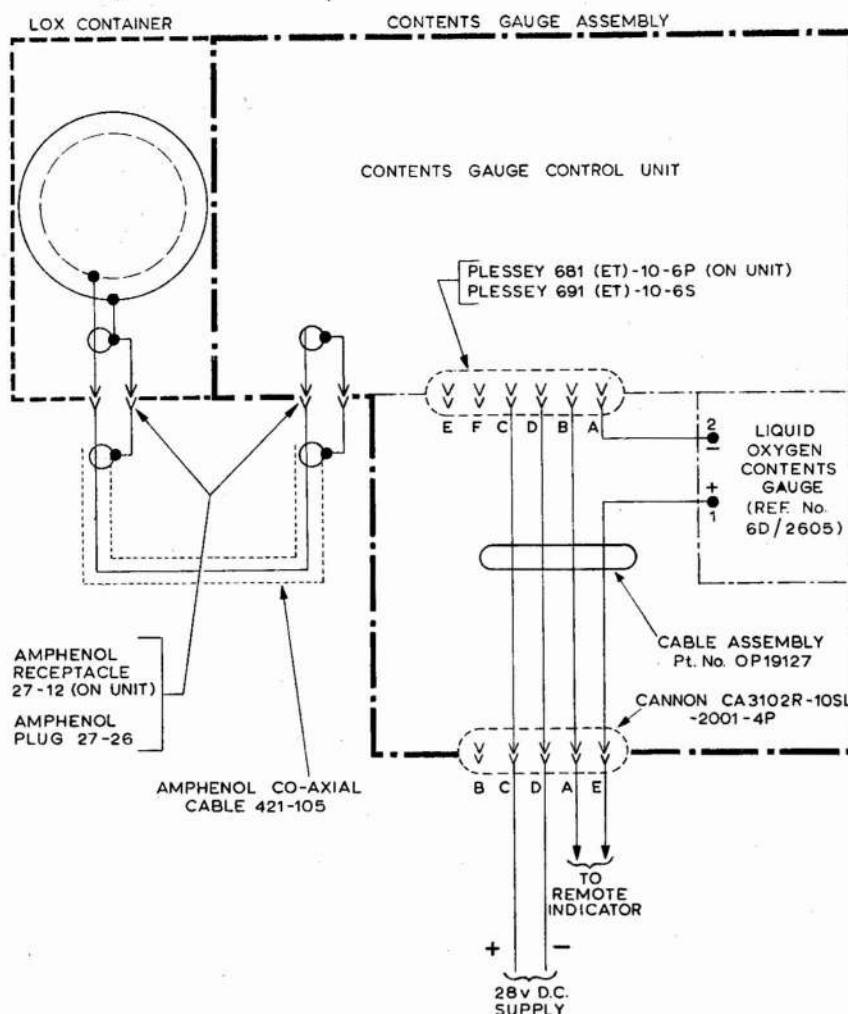


Fig. 3. Wiring diagram

test the surface of the container. A hinge is formed at one end by bending the strap to an eye and then brazing, while the threaded end-fitting is brazed to the opposite end. The centre strap differs from the remainder in that it incorporates a handle.

7. A bracket bolted to the front of the sub-frame mounts the components of the contents gauge assembly. The pressure opening and pressure closing valve is also bolted to the sub-frame, a packer being interposed between the frame and the valve body.

Contents gauge assembly

8. The contents gauge assembly (fig. 2) consists of a bracket on which are mounted a control unit (Sect. 2), and a contents gauge (Sect. 2, Chap. 2). These units are secured by screws and washers, anchor nuts being riveted to the bracket for attachment of the control unit, while the gauge securing screws screw into the gauge case. A clip on the bracket provides a stowage position for the package lifting handle.

9. Electrical connection is made through a Cannon receptacle which is mounted on a bracket below the contents gauge. Electrical inter-connection (fig. 3) between the Canon re-

ceptacle, contents gauge and control units is by a cable assembly (Part No. OP.19127). The co-axial cable from the liquid oxygen container is connected to the control unit through an Amphenol receptacle mounted on the front face.

Liquid oxygen connections

10. Liquid oxygen connections on the package consist of two quick-disconnect plugs which mate with quick-disconnect receptacles in the aircraft installation. One plug (Part No. 256000-2) is assembled to the vent of the combined filler, build-up vent and relief valve; the other (Part No. 199000-2) is a self-sealing connection incorporating a spring locking ring and is fitted to the outlet body.

OPERATION

11. The operation of the package consists of filling, build-up (converting the liquid oxygen to gaseous oxygen) and gauging the contents of the container. The description which follows should be read in conjunction with the schematic diagram (fig. 4).

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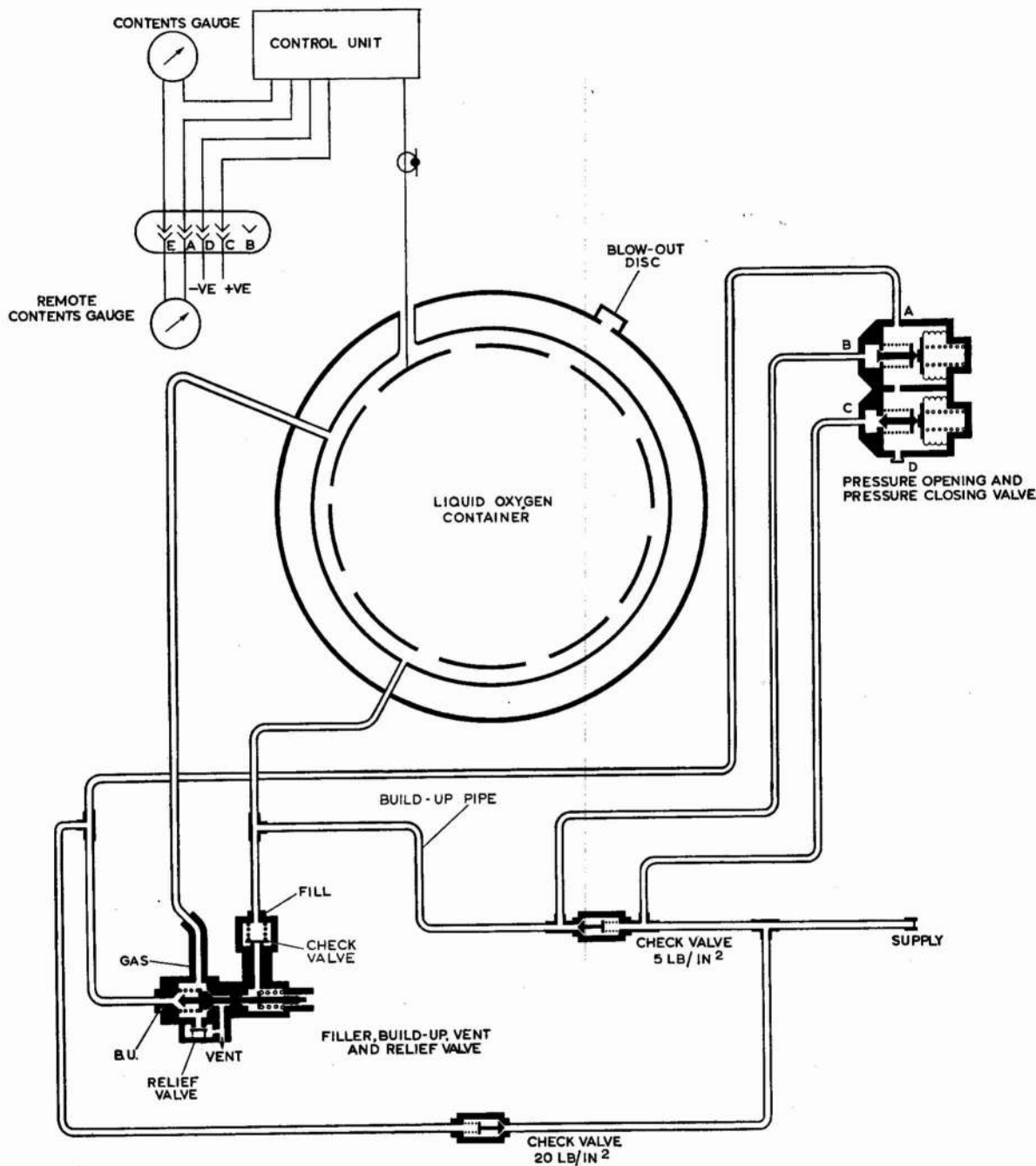


Fig. 4. Schematic diagram

Filling

12. When the connector of a ground filling hose is connected to the filling connection on the combined filler, build-up, vent and relief valve, a probe on the connector depresses the shaft within the valve, thereby closing the build-up valve and opening the vent valve; the unit is thus in the vent condition. Liquid oxygen passes into the valve under pressure, unseats the check valve and is discharged from the FILL connection of the valve through a pipe connected to a connection on the lower side of the container. A pipe from the upper side of the container is connected to a GAS connection on the combined filler, build-up vent and relief valve, hence gas within the container passes through the open vent valve.

13. When the filling hose connector is disconnected, the combined filler, build-up, vent and relief valve returns to the build-up position; that is, the vent valve closes and the build-up valve opens; the filling line to the container is closed by the check valve within the unit.

Build-up

14. In the build-up condition, with the container full, liquid oxygen passes, from the lower connection on the container, into the build-up pipe which connects with connection B of the pressure closing valve, the valve at this stage being open. The liquid vapourizes and the pressure rises, and gaseous oxygen leaves the pressure closing valve through connection A from which a pipe conveys the gas to the build-up (BU) connection on the combined filler, build-up, vent and relief valve. The oxygen passes through the open build-up valve and then, through the GAS connection to the top of the container.

15. The gas pressure continues to rise, assisted by the boiling-off of liquid oxygen which results from the entry of the warmer gas, until at a pressure of 165 lb/in², the pressure closing valve closes. Demands made from the supply at this stage causes a reduction of pressure in the pipeline downstream of the 5.0 lb/in² check valve. The check valve opens and allows a liquid supply to pass into the outlet pipeline. The liquid absorbs heat and vapourizes, and under normal conditions, passes into the aircraft system as gaseous oxygen. If a heavy demand is made, vaporization is assisted by a superheater coil fitted in the aircraft system on the downstream side of the package.

16. If an immediate demand is not made, pressure continues to rise in the gas phase until, at a pressure of 180 lb/in², the pressure opening valve opens. Gaseous oxygen passes from connection C, by-passes the 5.0 lb/in² check valve, and enters the outlet pipeline. At this stage, a demand is met by the gaseous supply at high pressure. A continuous demand results in a fall in pressure so that the pressure opening valve closes. When the supply pressure falls 5.0 lb/in² below that in the build-up pipeline, the 5.0 lb/in² check valve opens and there is a

direct flow of liquid oxygen from the container. This reduces the build-up pressure and consequently the pressure closing valve opens, allowing a further flow of liquid oxygen into the build-up pipe to vaporize and build up pressure.

17. After a heavy demand has been made, liquid oxygen remaining in the superheater coil vaporizes and causes the pressure to rise until relieved by the 20.0 lb/in² check valve; the gaseous oxygen then passes to the build-up side of the system.

18. Should the pressure in the container exceed 200 lb/in², the excess pressure is vented through the relief valve incorporated in the combined filler, build-up, vent and relief valve. Protection against an uncontrolled rise in pressure, resulting from a ruptured inner container, is afforded by a blow-out disc in the outer container, the disc being designed to rupture under this condition.

Contents gauging system

19. The contents gauging system is one in which the quantity of liquid oxygen is measured by utilizing the difference in dielectric constant between liquid and gaseous oxygen.

20. An electrical shell and an inner container of the container assembly form two plates of a variable capacitor, the capacitance being proportional to the quantity of liquid oxygen in the container. A coaxial cable connects the capacitor to the control unit where it forms one arm of an a.c. bridge, the supply for the bridge being derived from an oscillator in the unit. The bridge compares the capacitance, representing the container and its contents, with a standard capacitance, and gives an a.c. output proportional to the capacitance of the container and its contents. The a.c. signal from the bridge is amplified and rectified, and emerges as a d.c. output to operate the contents gauges, one on the package and the other in the aircraft system.

INSTALLATION

21. Prior to installing the package, ensure that it has been filled and that there is no evidence of leaks. The following instructions are complementary to those given in the relevant aircraft air publication to which reference must be made.

(1) Do not remove the protection caps from the vent and supply plugs until immediately prior to connecting the hoses. New packages are pressurized with Argon by the manufacturers. This pressure must not be released until immediately before the package is to be filled, otherwise it will be necessary to purge the package before the initial filling.

(2) When assembling the package to the mounting wedge in the aircraft, ensure that the red lines on the side members of the base structure register with the red lines on the mounting wedge before locating the eye bolt and tightening the wing nut. ►

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- (3) Wipe the plugs and the hose receptacles with clean, dry, lint-free cloth to remove all traces of moisture, oil and dirt.
- (4) Mate each hose receptacle with its plug and rotate the sleeve clockwise until the pins in the plug engage with the holes in the sleeve. Correct engagement is made evident by a metallic 'click' and should be confirmed by examining the pins.
- (5) Fit each protective cap to its stowage plug.
- (6) Connect the electrical socket to the receptacle on the contents gauge assembly.

Post-installation checks

22. After the package has been installed, apply the following checks:—

- (1) Check the supply connection for evidence of leaks.
- (2) Check the readings of the package and remote contents gauges; these should indicate F (full).

◀Note . . .

When the package has been standing and is fully stabilized, the gauges may read high. This is normal and on no account should any adjustment be made.▶

- (3) Check the reading of the system pressure gauge; the reading should be between 150 and 200 lb/in².
- (4) Refer to the relevant aircraft air publication for any additional checks that may be specified.

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 package.

SERVICING

Filling

23. The procedure for filling the container prior to installation is as follows:—

Note . . .

Reference should be made to Part 1, Sect. 3, Chap. 3 for general information on filling liquid oxygen containers.

- (1) Connect a 28V d.c. supply to pins C and D (positive to pin C and negative to pin D) using a socket which also commons pins A and E of the electrical receptacle.

Caution . . .

The control unit will be damaged if the polarity of the supply is reversed.

- (2) Remove the cap from the filler head of the combined filler, build-up, vent and relief valve.

Caution . . .

Before connecting the filling hose connector to the filler head, ensure that both components are thoroughly clean and dry.

- (3) Purge the filling hose (Part 1, Sect. 3, Chap. 3), and then connect to the filler head. Continue the filling operation until the contents gauge pointer indicates F (full).
- (4) Disconnect the filling hose connector and fit the cover to the filler head immediately to prevent atmospheric moisture condensing inside the filler head.
- (5) Disconnect the electrical supply socket.

◀Note . . .

After filling, a slight transitory leak may occur from the vent, but should cease within 10 min. (approx.); this is acceptable.▶

Draining

24. To drain the container, proceed as follows:—

- (1) Relieve the pressure in the package by fitting the special adapter (Part No. TE.11230) to the filler head.
- (2) Connect the quick-disconnect end of a supply hose assembly (Part No. OP.7390) to the outlet plug and insert the opposite end in a suitable Dewar-type flask.
- (3) Establish the build-up condition by removing the special adapter (sub-para. (1)). Liquid oxygen will then flow from the drain hose.
- (4) When the flow ceases, relieve any residual pressure in the package as in sub-para. (1) and then disconnect the drain hose.

Purging

25. The package should be purged if it has remained empty for a period in excess of 2 hours, when the presence of moisture is suspected and at the periods specified in the Servicing Schedule. Purging is to be carried out in accordance with the general instructions contained in Part 1, Sect. 3, Chap. 3.

26. To purge the package, the special adapter (Part No. TE.11230) must be connected to the filler head and the purging gas supply connected to the adapter. The gas flow rate and period of purging will be found in Part 1, Sect. 3, Chap. 3. When the package has been purged, it should be filled and the cover fitted to the filler head.

Component renewal

27. In general, component renewal is straightforward and, except for the container, detailed instructions are unnecessary. After fitting a new component, apply the appropriate standard serviceability tests (App. 1). If a contents gauge control unit is renewed, the control unit and container are to be matched (para. 30).

Removing the container

28. The procedure for removing the container is as follows:—

- (1) Drain the package (para. 24).
- (2) Disconnect the coaxial cable assembly from the contents gauge control unit and the container, release the cable from the clip assemblies and remove from the package.
- (3) Remove the handle.
- (4) Disconnect the two pipes connected to the pressure opening and pressure closing valve, and the two pipes connected to the T-piece fitted to the valve. Remove the two bolts, washers and stiffnuts, and remove the valve and packer from the sub-frame.
- (5) Detach the P-clip from the contents gauge assembly mounting bracket.
- (6) Remove the bolts, washers and stiffnuts, and remove the contents gauge assembly from the sub-frame.
- (7) Detach the three pipe clips from the sub-frame.
- (8) Disconnect the two pipes from the container outlet T-fitting.
- (9) Disconnect and remove the pipe interconnecting the container with the GAS connection of the combined filler, build-up, vent and relief valve. Remove the union and the gasket from the container.
- (10) Disconnect the two pipes from the connections on the top of the 5.0 lb/in² check valve, and detach the double pipe clip on the outlet side of the valve.
- (11) Unscrew the two-fork-end assemblies, and remove the nuts and washers securing the strap assemblies. Lift off the sub-frame and remove the container.
- (12) Fit the appropriate blanks to all open pipe unions, adapters and connections.

Refitting the container

29. A high standard of cleanliness is essential when assembling components of liquid oxygen converter systems. Oil, grease and dirt must not come into contact with the components, and it is equally important to prevent the entry of moisture. The sequence of operations for assembling the container to the package is as follows:—

- (1) Assemble the T-fitting to the container outlet, using new gaskets (Part No. AN.901-6A) on either side of the fitting, and secure with the bolt (Part No. OP.19163). Leave the bolt temporarily hand tight.
- (2) Support the container assembly on the

base structure and arrange so that the top and bottom plugs are on the vertical centre-line.

(3) Position the sub-frame over the container with the two anchor nuts located at the front of the package and the tongues of the four straps entered in the attachment holes on the frame.

(4) Fit washers (A.G.S. SP.126D) and stiffnuts (A.G.S. A125/D) to the front and rear tongues. To the remaining tongues, fit a packer (Part No. OP.19094) curved face downwards, and a fork-end assembly (Part No. OP.1909200). The fork-end assemblies and stiffnuts should be left temporarily hand tight.

(5) Connect the pipe assembly (Part No. ◀1015Z010▶) to the container T-fitting and tighten the union nuts. This pipe connects with the FILL connection of the combined filler, build-up, vent and relief valve.

(6) Connect the pipe assembly (Part No. O.P.1931400) to the container T-fitting and tighten the union nut. This pipe connects with the 5.0 lb/in² check valve.

(7) Assemble a new gasket (Part No. AN.901-6A) to the union (Part No. AN.815-6D) and screw the union into the upper adapter on the container. Tighten the union.

(8) Connect the pipe assembly (Part No. OP.18940) to the union (sub-para. (7)) and to the GAS connection of the combined filler, build-up, vent and relief valve. Tighten the union nuts.

(9) Ensure that the sub-frame is parallel to the base structure and that the clearances between the pipes and the container are not less than 0.125 in. Tighten the nuts and fork-end assemblies securing the sub-frame, in diametrical sequence, to a maximum torque load of 20 lb in.

(10) Tighten the bolt securing the T-fitting to the container.

(11) Mount the contents gauge assembly on the sub-frame and secure with bolts (AGS.A102/1/D), washers and stiffnuts (A.G.S.125D); the nuts are required only at the end lug attachments.

(12) Fit the packer (Part No. OP.19240) to the sub-frame and then bolt the pressure opening and pressure closing valve, and the packer, to the sub-frame using bolts (AGS.A102/16/B) washers (AGS. SP126B) and stiffnuts (AGS. A125/B).

(13) Connect the pipe assembly (Part No. OP.18944) to connection C of the pressure opening and pressure closing valve, and to the top connection on the outlet side of the 5.0 lb/in² check valve. Clip the pipe to the sub-frame using two P-clips (AS. 3180/5B), bolts (AGS.A102/1/B) and washers (AGS. SP126/B). Tighten the union nuts.

(14) Connect the pipe assembly (Part No. ◀1015Z030▶) to the top connection on the inlet side of the 5.0 lb/in² check valve and

tighten the union nut. Secure the double pipe clip on the outlet side of the check valve with a bolt (AGS. A102/1B), washer (AGS SP.126/B) and stiffnut (AGS. A125/B).

(15) Connect the pipe assembly (Part No. ◀1015Z030▶) to connection B of the pressure opening and pressure closing valve, and tighten the union nut.

(16) Connect pipe assemblies (Part No. ◀1015Z020 and 1015Z050▶) to the T-piece assembled to the pressure opening and pressure closing valve. Tighten the union nuts. Secure the pipe assembly (Part No. ◀1015Z020▶) with P-clips, one to the gauge mounting bracket and the other to the sub-frame. Secure the P-clips as in sub-para. (13), but using two washers at the sub-frame attachment, one on either side of the frame.

(17) Ensure that there is a minimum clearance of 0.125 in. between all pipes and the container, and a minimum clearance of 0.25 in. between all unrestrained pipes.

(18) Wire-lock the bolt securing the T-fitting to the container and also all pipe unions and pipe adapters. Use wire (Ref. No. 30A/3339).

(19) Purge the package (para. 25) and then apply the standard serviceability tests (App. 1). Unless the unit is required immediately for installation, it should be stored in the filled condition.▶▶

Matching the contents gauge control unit to the container

30. The procedure for matching the contents gauge control unit to the container will be found in Sect. 2.

Appendix 1

STANDARD SERVICEABILITY TESTS

for

10 LITRE REMOVABLE LIQUID OXYGEN PACKAGE

(Part No. 1015Z000)

Introduction

1. The tests detailed in this appendix should be applied before the package is installed in an aircraft as a new replacement unit, when the serviceability of the package is in doubt and at the appropriate examination periods at Equipment Depots.

Test equipment

2. The test equipment required for the tests is as follows:—

(1) Test rig (fig. 1). The test rig shown in fig. 1 is one which will eventually be introduced for testing liquid oxygen systems. Pending its introduction, the components of the rig essential for the tests detailed in this appendix should be connected as shown by the full lines. The test equipment is as follows:—

- (2) 28V d.c. electrical supply
- (3) Liquid oxygen dispenser or suitable refilling equipment
- (4) Tester, insulation resistance, Type C (Ref. No. 5G/152)

- (5) Suitable capacitance bridge or variable air capacitor (Ref. No. 6C/3234)
- (6) Special adaptor (Part No. 1508K000) for variable air capacitor.
- (7) Supply hose assembly (Part No. OP.7390)
- (8) Vent hose assembly (Part No. OP.7380)
- (9) Vent adaptor (Part No. TE.11230)
- (10) Scales capable of reading to 50 lb.
- (11) Coil ($\frac{5}{16}$ in. o.d. $\times$ 20 s.w.g. light alloy pipe 80 ft long).

Particulars of tests

3. All tests are to be applied at normal room temperature ($+15^{\circ}\text{C}$) and pressure (29.92 in. Hg.), and oxygen used for the tests must be to aviation breathing standards. Soap solution for 'no leakage' tests must be prepared in accordance with the instructions given in Part 1, Sect. 2, Chap. 1. Particular care must be taken to prevent the solution entering the package or the test equipment, and all traces of the solution must be removed after each test. A ground dispenser operating at a pressure of 50 lb/in² should be used for charging the converter. If any other method is adopted, allowance must be

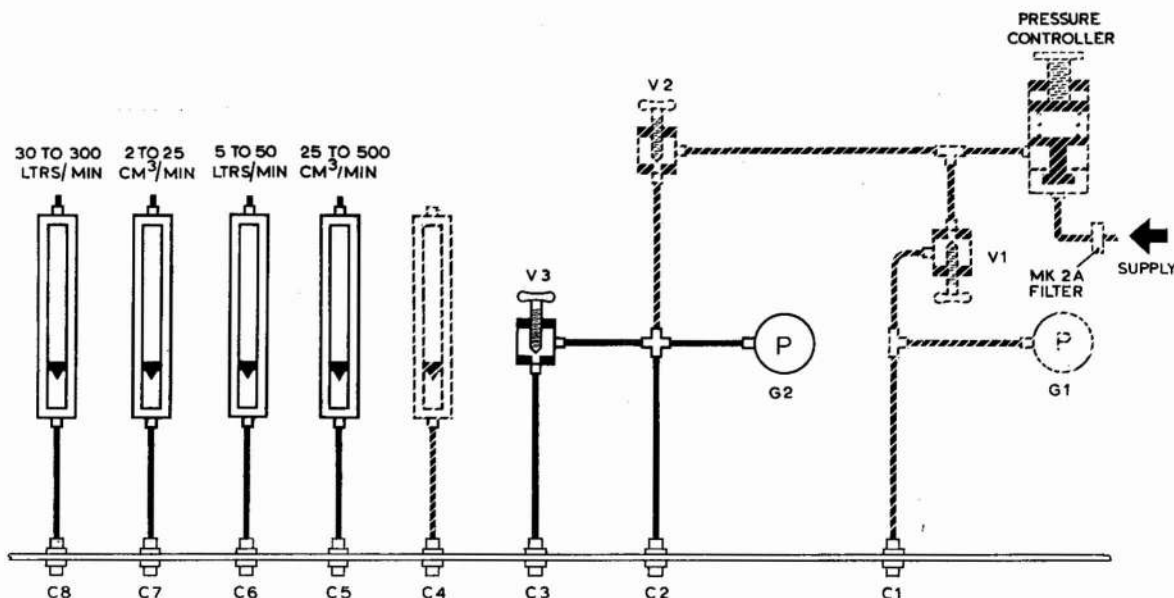


Fig. 1. Schematic diagram of test rig

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made for pressure drop between the supply vessel interior and the gauge.

TEST PROCEDURE

Preliminary checks

4. The following checks are to be applied before commencing the test procedure:—

- (1) Check and record the weight of the empty package.
- (2) Check the capacitance of the empty and unpressurized container. This may be done, using a capacitance bridge, by applying a test voltage of 100V a.c. (max.) to the coaxial connector, through the associated coaxial cable assembly, at a frequency of 10 kc/s. The capacitance should be between 360 and 390 pF. If a suitable capacitance bridge is not available, the following method can be employed:—

- (a) Adjust the SET EMPTY adjustment on the gauge control unit until the gauge reads 0 (zero).
 - (b) Disconnect the coaxial cable from the container and connect to the variable capacitor.
 - (c) Adjust the variable capacitor until the gauge reads 0 (zero). The value indicated on the variable capacitor scale is the 'empty' capacitance of the container. This value, together with the capacitance of the lead and adapter, should be between 360 and 390 pF.
 - (d) Disconnect the coaxial cable from the variable capacitor and reconnect to the container.
- (3) Check the supply and vent hose assemblies for correct mating and locking with their respective plugs on the package, and ensure that they can be disconnected easily.

Insulation test

5. To apply the insulation test, proceed as follows:—

- (1) Disconnect the coaxial cable from the control unit.
- (2) Using the insulation resistance tester, check the insulation resistance between the centre pin and the body of the coaxial connector. The resistance should be not less than 400,000 ohms.
- (3) Reconnect the coaxial cable to the control unit.

Filling and pressure build-up tests

6. (1) Connect a 28V d.c. supply (positive to pin C and negative to pin D) using a socket which also commons pins A and E of the receptacle.

Caution . . .

The control unit will be damaged if the polarity of the supply is reversed.

- (2) Connect the supply hose assembly to the outlet plug on the package, connect the opposite end of the supply hose to the coil (para. 2, sub-para. (11)) and connect the coil to the test rig connection C2 (fig. 1).
- (3) Interconnect the test rig connections C3 and C6.
- (4) Ensure that all test rig valves are closed.
- (5) Connect the filling hose of the dispenser to the filler head and then check the following:—

- (a) The time taken to fill the converter and for the pressure to build up to 140 lb/in² (Gauge G2). This should be accomplished in not more than 10 minutes. Continue timing the build-up of pressure until the supply pressure is 155 lb/in². The rise from 140 to 155 lb/in² should be attained in 5 minutes.

Note . . .

Prior to filling, the package should be either pre-cooled or have just been emptied.

- (b) Weigh the package and determine the weight of liquid oxygen by subtracting the empty weight of the package (para. 4, sub-para. (1)). The weight of the liquid should be between 24.75 and 25.25 lb.
- (6) Check the capacitance of the full container when the normal operating supply pressure (170 lb/in²) is achieved. The capacitance may be checked, using a capacitance bridge, by applying a test voltage of 100V a.c. (max) to the coaxial connector, through the associated coaxial cable assembly, at a frequency of 10 kc/s. The capacitance should be between 430 and 470 pF. If a suitable capacitance bridge is not available, the following method can be employed:—
 - (a) Adjust the SET FULL adjustment on the control unit until the contents gauge indicates F (full).
 - (b) Disconnect the coaxial cable from the container and connect to the variable capacitor.
 - (c) Adjust the variable capacitor until the gauge reads F (full). The value indicated by the variable capacitor, together with the capacitance of the adapter and lead, should be between 430 and 470 pF. The difference between the empty and full capacitance values should be 75 ± 5 pF.

- (7) Adjust valve V3 to obtain a flow between 20 and 23 litres/min. Maintain this flow for 30 minutes and check the gas pressure (Gauge G2) during this period. The pressure should be between 145 and 170 lb/in².

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(8) Close valve V3 and then check the pressure. The pressure should be between 155 and 165 lb/in².

Leak tests

7. With the package operating at a supply pressure between 145 and 170 lb/in² (Gauge G2) apply the following leak tests:—

- (1) Connect the vent hose assembly to the package plug and, using an adapter, connect the opposite end of the hose to the test rig connection C5.
- (2) Observe the leakage from the vent and relief valves indicated by the 25 to 500 cm³/min flowmeter. The leakage should not exceed 200 cm³/min.
- (3) Disconnect the vent hose assembly from the test rig, connect the vent adapter (Part No. TE11230) to the filler head and connect the appropriate end of the adapter to the test rig connection C7.
- (4) Observe the leakage from the filler head coupling indicated on the 2 to 25 cm³/min flowmeter. The leakage should not exceed 10 cm³/min.
- (5) Apply soap solution to the screwed connections of the package and check for evidence of leaks. There should be no leakage.
- (6) Remove all traces of soap solution and dry the connections thoroughly. Disconnect the package from the test rig.

Package emergency demand test

8. The procedure for applying the package emergency test is as follows:—

- (1) Fill the package, disconnect the filling hose and fit the filler head cover.
- (2) Connect the supply hose assembly to the outlet plug on the package, connect the opposite end of the hose to the coil (para. 2, sub-para. 11) and connect the coil to the test rig connection C2.
- (3) Interconnect test rig connections C3 and C8.
- (4) Allow a period of 20 minutes to elapse, then open valve V3 to obtain a flow of 180 litres/min (indicated on the 30 to 300 litres/min flowmeter).
- (5) Maintain this flow for 5 minutes and then check the delivery pressure. The pressure should not be less than 100 lb/in² (Gauge G2).
- (6) Leave the package connected to the test rig for the sustained delivery (normal) demand test.

Sustained delivery (normal) demand test

9. With the package connected to the test rig as for the previous test, proceed as follows:—

- (1) Regulate valve V3 to obtain a flow of 60 litres/min.

(2) Maintain this flow for 10 minutes, then check the delivery pressure. The pressure should be not less than 100 lb/in² and should recover to a value of 150 lb/in².

(3) Disconnect the package from the test rig. ▶▶

◀ Contents indication tests

10. With a 28V d.c. supply connected to the control unit as described in para. 6 (1) the procedure is as follows:—

- (1) Disconnect the coaxial cable from the container and connect to the variable air condenser.
- (2) Adjust the variable air condenser until it indicates the empty capacitance value stamped on the container, less the capacitance of the adapter fitted to the condenser. The gauge pointer should indicate zero and, if necessary, the SET EMPTY adjustment on the control unit should be adjusted to obtain this reading.
- (3) Adjust the variable air condenser until it indicates the full capacitance value stamped on the container, less the capacitance value of the adapter on the condenser. The gauge pointer should indicate F (full) and any necessary adjustment to obtain this indication should be made on the SET FULL adjustment of the control unit.
- (4) Reconnect the coaxial cable to the container and ensure that the pointer of the contents indicator is within the zero band painted on the dial.
- (5) Replenish the container with 10 litres (25 lb) of liquid oxygen and ensure that the pointer is within the F (full) band.

Notes . . .

- (1) If adjustments are made to the control unit, it must be established, by applying empty and full setting checks consecutively, that the settings can be obtained without further adjustment.
- (2) Temperature stabilization may result in a slight increase in contents indication; this is permissible. ▶

Evaporation loss test

11. This test need be applied only if a break is suspected in the vacuum of the container lining.

- (1) Fill the package with liquid oxygen, disconnect the filling hose and fit the vent adapter (TE.11230) to the filler head.
- (2) Allow the package to stand undisturbed for 3 hours, then weigh and record the weight. After the package has been standing for 24 hours, again weigh and record the weight. The weight decrease should not exceed 2 lb 8 oz.

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