OPERATION & MAINTENANCE MANUAL

for the

TWO DIVER, SURFACE CONTROL, HP/LP AIR / IN TRANSIT CASE, PROTECTIVE FRAME

Part No: PP033AP

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CONTENTS

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1.0 SAFETY NOTICE

1.1 This unit must only be operated by suitably qualified personnel.

Read the instructions thoroughly before operating this equipment.

1.2 Only genuine manufacturer's spare parts may be used and the substitution of parts from other manufacturers will invalidate the warranty and may cause damage to the equipment. When ordering spare parts, please quote the serial number of the assembly and the part numbers required.

1.3 This panel has been designed to supply air to breathing apparatus, for diving, and the manufacturers will not be responsible for its use for any other purpose.

1.4 The user must make him/herself familiar with and observe national legal requirements concerning the safe use and maintenance of the equipment. The manufacturers ensure that the equipment complies with such regulations on delivery but it remains the responsibility of the user to comply with the legal requirements in use.

1.5 It is the responsibility of the user to establish the flow and pressure of air required for the breathing apparatus to be employed and to ensure that the supply is adequate for the use envisaged. This responsibility includes the provision of an adequate reserve air supply.

COMPRESSED AIR IS POTENTIALLY DANGEROUS

THIS EQUIPMENT MUST BE USED CORRECTLY

MIS-USE COULD CAUSE SERIOUS INJURY

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2.0 TECHNICAL SPECIFICATION

2.1	Inlet Pressure	L.P. 15 BAR maximum (220 psi) H.P. 350 BAR maximum (5075 psi)
2.2	Hose Connections	LP inlet 3/8" BSP male HP inlet 1/4" BSP male Diver supply 3/8" BSP male Pneumo 1/4" BSP male
2.3	Overall External Dimensions	Length 730 mm (29”) Width 610 mm (24”) Height 380 mm (16”) Weight approximately 40kg (88lbs)
2.4	Pipework	H.P. 8mm x 1mm stainless steel L.P. 10mm x 1mm stainless steel

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3.0 GENERAL DESCRIPTION

3.1 The **DIVEX** two-diver, Surface Control, H.P./L.P. air panel will supply low pressure breathing air to two divers working simultaneously, to a depth of 60 metres in fresh or salt water.

3.2 The panel contains four completely separate high pressure lines, two for each diver. Non-return valves ensure that the air to one diver cannot be diverted to the other. As a back-up, one L.P. inlet line is fitted, which can supply both divers with air. The supply is not independent to each diver in this mode.

3.3 Each diver's depth can be monitored using the pneumo gauges which measure the hydrostatic pressure in an open ended hose from the panel to each diver.

3.4 The controls are packaged within a strong plastic transit case.

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4.0 INSTALLATION

(Refer to Drawings PP033101 & PP033102).

Using a high pressure air supply.

4.1 Ensure all on/off valves are in the **OFF** position.

4.2 Ensure the H.P. / L.P. regulator controls are turned fully anti-clockwise.

4.3 Connect the H.P. hose assembly to the high pressure air cylinders, ensuring that the cylinder valves remain in the **OFF** position.

4.4 Connect the diver's air line from the umbilical to the divers L.P. outlet on the panel.

4.5 Connect the diver's pneumo hose from the umbilical to the panel pneumo connection.

4.6 Connect the diver's end of the umbilical to the appropriate breathing apparatus.

4.7 Connect the divers communications interconnection adaptor to the communication panel and attach the umbilical as per the umbilical instructions.

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5.0 PRE-DIVE CHECK

5.1 With all lines connected and the diver dressed in all his equipment but holding the face/mask helmet, turn on the H.P. cylinder.

5.2 Turn on the H.P. inlet valve slowly (3).

5.3 Read the H.P. inlet pressure (4). Ensure that there is adequate cylinder pressure.

5.4 Use the H.P ./ L.P. regulator (1) to set the correct L.P. pressure for the diver's breathing apparatus.

5.5 Slowly open the 1/4 turn diver supply outlet valve (2).

5.6 Confirm with the diver that an adequate air supply is being received at the mask/helmet.

5.7 The diver can now proceed to enter the water.

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6.0 OPERATION

6.1 The panel works automatically but the operator should continuously monitor the H.P. / L.P. air supply and the L.P. supply to the diver (s).

6.2 When the diver is descending and ascending, the control panel operator may have to adjust the H.P. / L.P. regulator (1) depending on the mask/helmet configuration.

6.3 Under conditions of very low ambient temperature or when using inadequately filtered "wet" air, icing could occur within the H.P./L.P. regulator. This could be indicated by fluctuating or falling low pressure as shown on the LP gauge (5). If any signs of icing are noticed diving should be terminated immediately.

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7.0 PNEUMO OPERATION

7.1 The divers' depths can be read from the pneumo gauges (13).

7.2 Turn on the pneumo valve (6) to supply air to the pneumo hose in the umbilical and allow the air to flow for enough time to ensure it is bubbling out of the open, diver end. (Usually confirmed by the diver via the comms).

7.3 When the air has bubbled out of the hose end, close off the supply valve (2) and read the hydrostatic pressure (shown as diver depth) on the pneumo gauge (13).

7.4 The depth must be checked periodically using the above method, particularly if the diver is changing depth whilst working. When his work is completed and the diver is returning to the surface, the gauge will automatically read his decreasing depth without the operator supplying more air to the pneumo hose.

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8.0 CYLINDER CHANGE OVER

8.1 Slowly turn on the reserve air supply via the H.P. inlet valve (7). Confirm there is an increase in pressure on the H.P. gauge (4).

8.2 Turn off the original air supply at the H.P. inlet valve (3).

8.3 Purge the H.P. hose to the cylinder to be removed. Disconnect the cylinder and replace it with a charged H.P. air cylinder.

8.4 Slowly turn on the new air cylinder.

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9.0 AUXILIARY LOW PRESSURE INLET

The panel has the facility for an auxiliary low pressure inlet. This low pressure air supply must not exceed 15 Bar. Connect the supply hose to the L.P. inlet and open the valve (8) slowly. This supply is connected to both diver outlets.

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10.0 LOW H.P. WARNING

10.1 The system comprises a battery pack (9), pressure switch, warning On/Off switch (10), red warning LED (11) and a high frequency buzzer (12). During normal operation, the On/Off switch (10) must be in the On position. The pressure switch is set to operate when the H.P. supply pressure falls below 50 Bar. When this occurs, the pressure switch illuminates the warning LED (11) and the buzzer (12) sounds continuously. The panel operator will establish which H.P. supply is low by finding the illuminated LED (11). The buzzer (12) may then be cancelled by switching the warning switch (10) Off while supply cylinders are changed over. It is important that the warning switch (10) is returned to the On position after completion of the cylinder change.

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11.0 MAINTENANCE

11.1 Very little maintenance is required and with the exception of the H.P. inlet valves (3 & 7) and the L.P. safety valve (8), all components are factory assembled with no user serviceable parts.

11.2 Periodically inspect the panel for damage or signs of wear.

11.3 Check for air leaks by listening or by pressurising the panel, closing the valves and observing any pressure drop on the gauges. If a leak is suspected, remove the panel from its case and test for the leak with a liquid soap and water solution. Tighten any pipe connections only with the panel **de-pressurised.**

11.4 **General Instructions for the Removal of any Component**

Depressurise the system. Remove panel from case. Undo nut unions and remove the relevant piping. Remove the component. Repair or replace component. Remake all threaded joints using Locite 542 Hydraulic Seal or equivalent. Ensure that all mating surfaces and olives are clean. Do not over tighten the nut unions. Test for leaks. Return panel to case.

11.5 **L.P. Safety Valve**

This has been factory set at 14 BAR (205 psi) and rarely requires replacement. Should the safety valve malfunction (stick open or relieve at under 205 psi). remove it from the panel, disassemble and inspect for damage or ingress of a foreign body. If there is evidence of damage - replace with a new valve. Ensure previously noted procedures relating to cleanliness, sealant and re-assembly are adhered to.

Procedure for re-adjusting pressure.

1. Remove locking plug.

2. Pressurise system and note pressure at which valve cracks.

3. Turn the adjusting screw clockwise or anti clockwise to increase or decrease pressure respectively.

4. Once set, de-pressurise and then re-pressurise the system to check cracking pressure.

5. Replace locking plug.

11.6 **H.P. Panel Valve**. Refer to following parts list and drawing **U1011**.

These can be serviced in situ.. Remove rubber handle by releasing the retaining nut. Unscrew the spindle nut and retract the spindle complete. Remove and inspect the valve seat. If it is undamaged, refit, If damaged, renew. Clean all items with a high quality industrial wiper. Re-assemble the valve, fitting a new Teflon spindle seal, O Ring and Copper Washer. Lubricate with light a smear of Molybdenum-Disulphide grease or any acceptable breathing air quality grease (e.g. Vaseline).

H.P. valve recommended spares **(Service kit DD051201)**

Part Number	Description	Qty.
DD051311	Handle retaining nut	1
DD051310	Spring	1
DD051322	Rubber handle	1
DD051309	Nylon washer	1
DD051323	Spindle nut	1
DD051307	Teflon spindle seal	1
DD051308	O Ring	1
DD051306	Spindle	1
DD051305	Valve seat assembly	1
DD051312	Copper washer	1
DD310302	Panel mounting nut	2
DD310307	Stainless steel washer	1
DD310301	Valve body	1

11.7 **H.P. Non-Return Valve.** Refer to following parts list and drawing **PP033001.**

Test the HP non-return valves (19) by pressurising the panel then disconnecting one H.P. hose at a time and opening the corresponding valve checking for air loss from the inlet connection. If there is any air escaping, the faulty non-return valve should be replaced.

11.8 **L.P. Non-Return Valve**

These are factory sealed units and must be replaced if failure occurs.

11.9 **H.P. Regulator**

Servicing must be carried out by an approved engineer, trained by the manufacturer in the correct maintenance of the regulator (4). If no local approved engineer is available, the units must be returned to **DIVEX** for service.

The only permissible routine service is to clean the filter, located between the regulator and the H.P. inlet.

Remove the panel from the case. Locate and remove the filter. Unscrew the end pieces and remove the filter element. Clean and replace all items in reverse order.

Ensure spill valve exhaust port is kept open.

11.10 Gauges

These should be inspected on a regular basis to check for fluid loss. Also ensure that the pointer returns to zero when the pressure is released. The gauges should be calibrated in accordance with national regulations.

Damaged gauges should be replaced.

When replacing any components ensure that the previously noted procedures regarding cleanliness, sealants and re-assembly of nut unions are adhered to.

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12.0 MAINTENANCE SCHEDULE - 6 MONTHLY

12.1 Inspect lid and outer casing for damage. Check hinges and catches for correct operation.

12.2 Remove H.P. Panel Valve. disassemble as described in Section 11.5 Inspect. Wipe clean with a high quality industrial wiper, lubricate with approved grease and re-assemble.

12.3 Check for free movement of 90° Diver Outlet Valves, Pneumo Valves and L.P. Isolator Valve. Section 11 for replacement.

12.4 Test H.P. Regulator by pressurising the system until the safety relieve valve "blows" at 205 PSI. (Should the safety valve not function correctly refer to section 11.4). When reducing pressure (turning valve anti-clockwise) listen for the release of air through the Spill Valve.

12.5 Inspect all gauges for leakage of fluid and check that the needle returns to zero when the system is depressurized.

12.6 Pressurise complete system and listen for leaks.

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13.0 APPENDICES

Drawing:	PP033001	Fit-Out Schematic
	PP033101	Diver Air Panel Assembly
	U1011	H.P. Control Valve spare parts

13.1 Spares List for PP033001 (Fit-Out Schematic).

Item	Divex Part No.	Description	Qty.
1	GP341	GAUGE, 6” – 230ft	2
2	DD320003	GAUGE, 63mm, ¼” BSP(M)	2
3	DD320007	GAUGE, ¼” BSP(M)	2
4	RP213	REGULATOR	2
5	DD400303	ADAPTOR, ¼” BSP Male - Male	2
6	DD401128	SEAL, BONDED, ¼” BSP	14
7	DD400304	ADAPTOR, 3/8” BSP Male - Male	3
8	DD401129	SEAL, BONDED, 3/8” BSP	11
9	DD310312	VALVE, ¼” NPT(F)	2
10	VB214	VALVE, BALL, 3/8” BSP(F)	2
11	VB212	VALVE, BALL, 3/8” BSP(F)	1
12	DD360135	VALVE, DD ROUND, ¼” NPT(F)	4
13	VR208	VALVE, RELIEF, ¼” NPT(M)	2
14	FJ233	TEE, ¼” NPT(F)	2
15	DD310384-1	10mm x 1.0mm, St. St. TUBE	As Req.
16	DD310389-1	8mm x 1.0mm, St. St, TUBE	As Req.
17	DD400661	10L EQUAL CROSS	2
18	F28865	FILTER, St. St. ¼” NPT(F)	2
19	DD310319	VALVE, NON-RETURN, ¼” NPT(F)	4
20	DD401087	8S – ¼” NPT STUD ELBOW	10
21	DD401028	10L – ¼” NPT STUD ELBOW	9
22	DD401073	10L – 3/8” BSP(T) STUD ELBOW	5
23	DD310321	VALVE, NON-RETURN, 3/8” BSP(F)	2
24	DD400026	ADAPTOR, 3/8” NPT – 3/8” BSP	2
25	DD400283	10L – 3/8” BSP(T) MALE STUD	6
26	DD401034	8S EQUAL ELBOW	2
27	DD400824	8S S/PIPE – ¼” BSP GAUGE	2
28	DD400005	ADAPTOR, ¼” BSP(M) – ¼” NPT(M)	6
29	FP397	NIPPLE, 3/8” NPT(M) – ¼” NPT(M)	2
30	DD360328-1	PRESSURE SWITCH	2
31	DD400936	8S EQUAL TEE	2
32	DD400160	8S SWIVEL RUN TEE	2
33	DD400272	10L – ¼” NPT(M) STUD	4
34	DD400810	10L S/PIPE – ¼” BSP(M)	2

		GAUGE	
35	TM216	HOSE, LP AIR, ¼” BORE	As Req.
36	DD400573	8S – ¼” NPT(M) STUD	2
37	FJ217	ELBOW 90°, ¼” NPT(M) – 4 JIC	2
38	DD332017	HOSE END, 4 - JIC	4
39	FJ204	ADAPTOR, ¼” NPT(F) – 4 JIC	2
40	PP032309	CONNECTION BLOCK, 5 PORT	1
41	PP032310	CONNECTION BLOCK, 4 PORT	1
42	DD310312-PN	NUT, PANEL MOUNT	2
43	FE034	ELEMENT, FILTER, 40–55 MICRON	2
44	DD400273	10L – 3/8” NPT(M) STUD	1
45	DD400306	¼” BSP MALE - MALE	2
46	DD332328	CRIMP	4
47	FP290	¼” NPT PLUG	2
48	FP310	3/8” NPT(F) TEE	1