OPERATING AND MAINTENANCE MANUAL

for the

ULTRAFLOW 501 17B HELMET

(Part No: A10320)

(Intentionally Blank)

APPROVAL SHEET

DIVEX					
MANUAL NUMBER:	OM063				
ADVITIUM NUMBER:	P1884-OM-402				
DOCUMENT TITLE:	ULTRAFLOW 501 17B HELMET				
REV	**DATE**	**BY**	**CHECK**	**APP**	**COMMENTS**
0	19/05/1999	PGB	JB	RTW	Original Doc
1	23/10/2000	SAT	RTW	RTW	ECN 3311
2	01/07/2002	FB	RTW	RTW	ECN 3859
3	16/07/2010	D. ALLAN	C. CRAWFORD	C. CRAWFORD	ECN 13654
4	06/10/2010	D.ALLAN	C.CRAWFORD	C.CRAWFORD	ECN 13835
ORIGINAL ISSUE DATE:	17 June 1992				
ORIGINAL DOCUMENT BY:	Donald Campbell				
CHECKED BY:	Hamish Simpson				
APPROVED BY:	Hamish Simpson				

(Intentionally Blank)

TABLE OF CONTENTS

(Intentionally Blank)

INDEX OF FIGURES

Page

CHAPTER 1
None

CHAPTER 2

CHAPTER 3

CHAPTER 4
None

CHAPTER 5
None

CHAPTER 6
None

CHAPTER 7

CHAPTER 8
None

(Intentionally Blank)

PREFACE

The following address should be used in all communications with the manufacturer:

Divex Ltd
Enterprise Drive
Westhill
Aberdeen
AB32 6TQ
United Kingdom

Telephone +44 (0)1224 740145
Facsimile +44 (0)1224 740172
Email info@divexglobal.com
Web www.divexglobal.com

1.1 NATIONAL APPROVALS AND MARKINGS

1.1.1 ULTRAJEWEL 501 17B HELMET MARKING: CE 0088

Divex Limited declares that this Personal Protective Equipment is in conformity with the provisions of Articles 10 and 11 of the EUROPEAN DIRECTIVE 89/686/EEC as a CATEGORY 3 DEVICE and is manufactured under a Quality System approved by Lloyd's Register Q.A. (Notified Body No. 0088).

EC TYPE APPROVAL CONDUCTED BY:

SGS United Kingdom Ltd
Ellesmere Port
Cheshire
United Kingdom
CH65 3EN

NOTIFIED BODY No. 0120

1.1.2 NATIONAL APPROVALS

The Divex Limited Quality Management System has been approved by Lloyd's Register Quality Assurance Limited to BS EN ISO 9001.

APPROVAL CERTIFICATE No. 850495

(Intentionally Blank)

CHAPTER 1 INTRODUCTION

CONTENTS

Page

1.1 INTRODUCTION

The Ultraflow 501 diver's helmet for open circuit air and Heliox diving operations and consists principally of Ultraflow 501 demand regulator fitted to a conventional DSI Superlite 17B Helmet. Ultraflow 501 is suitable for depths down to 50msw on air and 500msw on Heliox.

CHAPTER 2 GENERAL DESCRIPTION AND FUNCTION

CONTENTS

Page

2.1 HELMET ASSEMBLY

This manual covers the maintenance of the Ultraflow 501 Demand Valve and the operation of a converted Superlite 17B Helmet with Ultraflow 501.

For maintenance of the “Superlite” standard components then refer to the appropriate DSI manual.

2.2 ULTRAFLOW 501 DEMAND REGULATOR

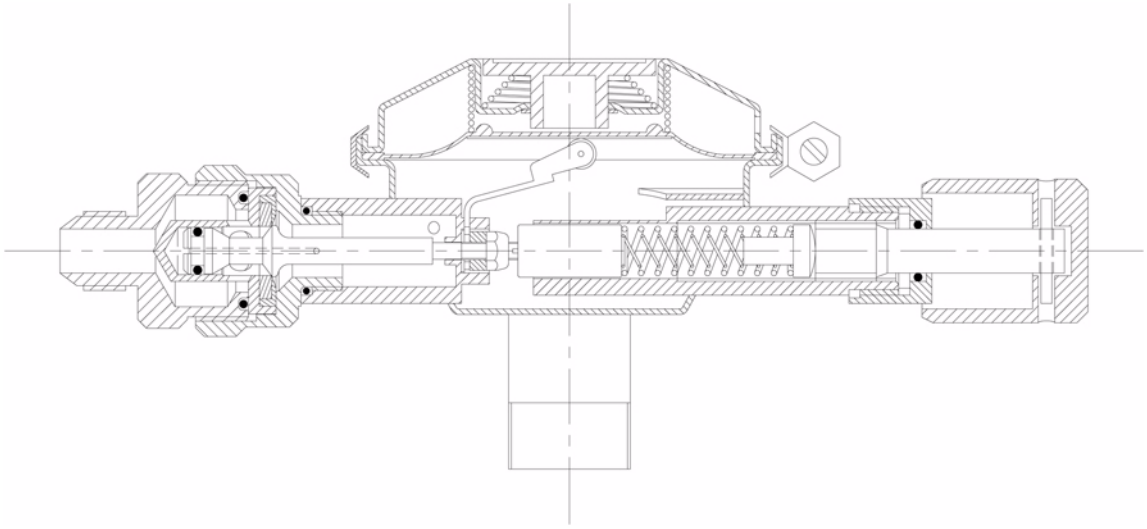


Fig 2.1 Ultraflow 501 Demand Regulator

The Ultraflow 501 is a balanced design of demand regulator which gives excellent gas flow over a wide range of supply pressures.

The components of the inlet valve consist of a 316 SS housing, a brass seat retainer with a specially developed valve seat material and the brass inlet valve which connects to the roller lever.

In the closed position the supply pressure acts on both the valve and an O-ring on the balanced piston part of the stem. The balanced piston is inside the seat retainer and the pressure on the other side of the piston is equalised to the divers side of the inlet valve via a small hole in the stem connected to a point sensing the pressure in the regulator body.

The balance piston is slightly smaller in diameter than the inlet valve and this tends to keep firmly closed using the supply pressure itself. As the diver inhales, this reduces the pressure in the regulator body which reduces the closing balance force enabling the diaphragm acting on the roller lever to easily lift the valve off of its seat.

At the end of the inhale cycle, the dial-a-breath springs will reseat the valve and restore the rest configuration with supply pressure again holding the valve.

2.3 ULTRAFLOW 501 INLET VALVE ASSEMBLY

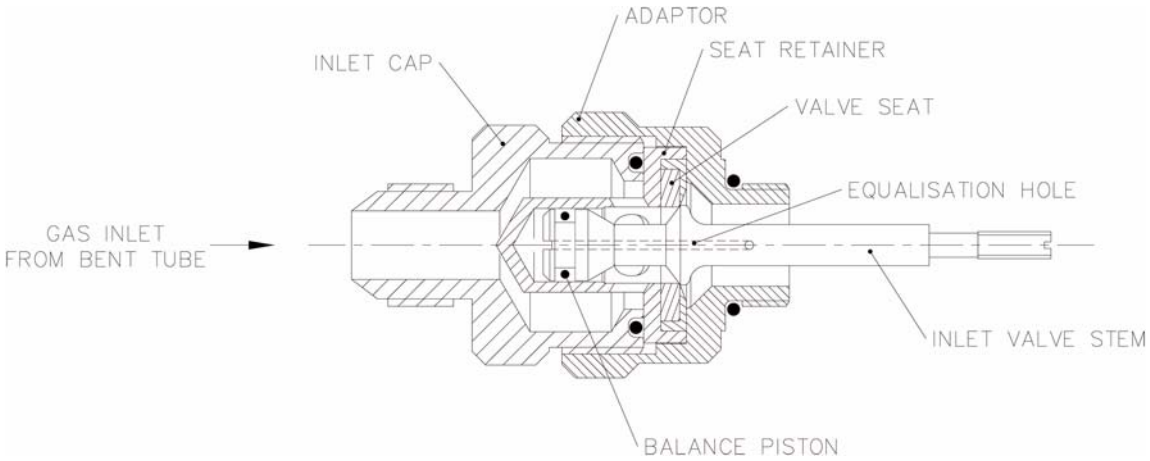


Fig 2.2 Ultraflow 501 Inlet Valve Assembly

NOTE

That the “dial-a-breath” adjustment is crucial to easy breathing. If it is over-tightened, a large force will be required to lift the inlet valve, requiring a considerable effort on the part of the diver during inhalation.

Similarly, if there are large gas supply pressure changes, the pre-load set by the “dial-a-breath” must be altered. Thus, changes in gas supply pressure over bottom, produced by either a change in the actual gas supply pressure or a change in the divers depth, will require “dial-a-breath” adjustment.

As the regulator inlet valve assembly is balanced, the “dial-a-breath” movements are minimal for small pressure changes compared to a standard DSI regulator.

2.4 MODIFICATIONS FROM THE STANDARD DSI SUPERFLOW REGULATOR

The inlet tube which penetrates the helmet body is increased to 22m ($^{7}/_{8}$") bore compared to the Superflow's $^{3}/_{4}$" bore.

The large swirl plate in the bottom box is also removed and the "dial-a-breath" tube is turned down in the area of the milled flat. Both of these changes allow better gas flow through the regulator.

The diaphragm is changed for one which has a larger centre disc and more flexible material. This improves the effective action of the diaphragm.

Diaphragm DE024 (510-553) is replaced with a diaphragm with a larger backing plate 35mm DE057. This provides a diaphragm having 1.9 time greater effective area.

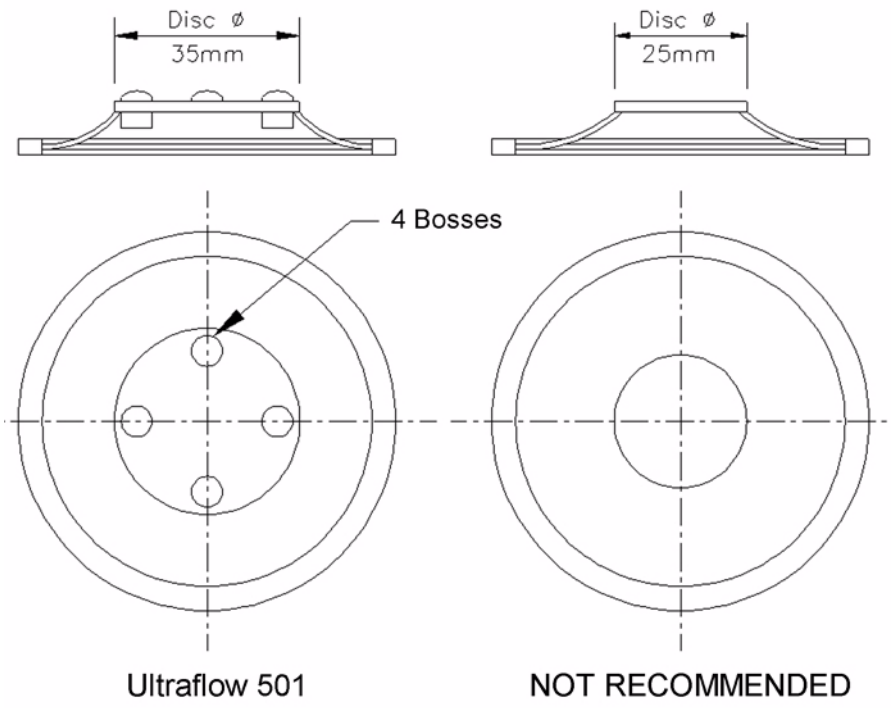


Fig 2.3 Ultraflow 501 Diaphragm

The lever on which the diaphragm acts is of the roller end type and none of the other types should be used. The roller type provides least resistance to movement. The roller type is DE058 (545-038).

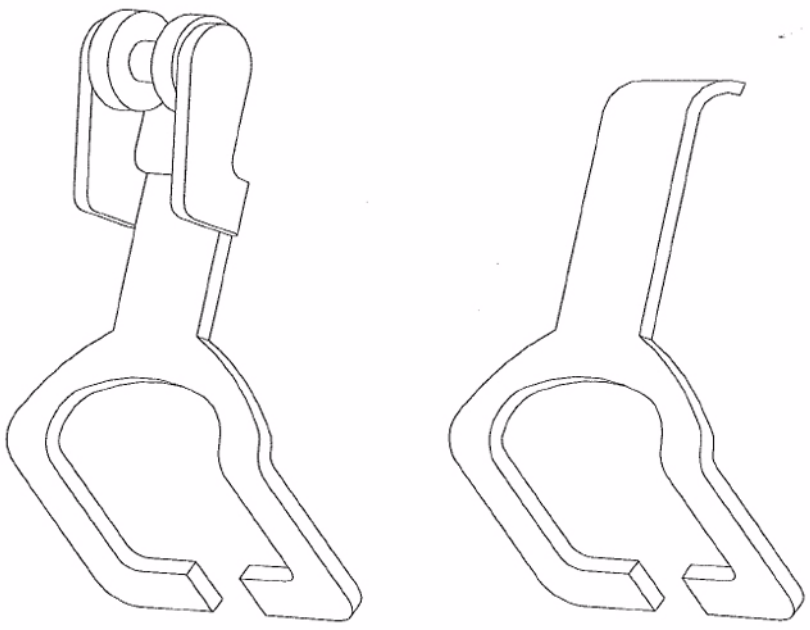


Fig 2.4 Ultraflow 501 Lever

The side block / bent tube assembly as supplied by Divex is modified by the replacement of the Standard DSI Teflon Washer with an O-ring (Divex Part No. RT011) which improves gas flow at this point, together with the special bent tube assembly (Divex Part No. DM2009C) to interface with the Ultraflow 501 Inlet Valve.

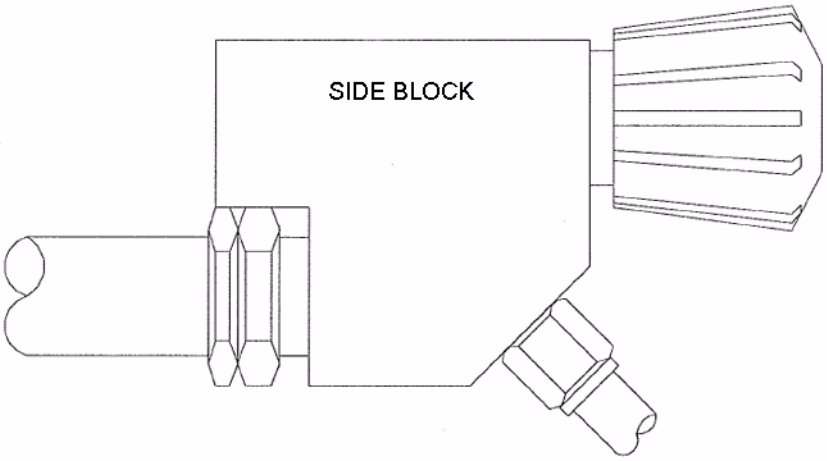


Fig 2.5 Ultraflow 501 Side Block

NOTE

(A) From 1991 onward, the Check Valve and fitting DE121 (555-118) are manufactured as one. Current Check Valve is Part No. DE189.

CHAPTER 3 SERVICE AND MAINTENANCE OF ULTRAFLOW 501 DEMAND REGULATOR

CONTENTS

Page

3.1 ULTRAFLOW DISASSEMBLY

To be read in conjunction with Fig 3.5, page 16.

1. Remove the cover Clamp Screw (Item 29) and Cover Clamp (Item 15) lift the Cover (Item 13) off with Spring (Item 34 and pull out the Diaphragm (Item 11).

2. The “dial-a-breath” control is removed by backing the knob (Item 27) out until the Nut (Item 25) is exposed enough to use a wrench. The knob (Item 27) Nut (Item 25), O-ring (Item 28), Washer (Item 24) and Shaft (Item 23) all come out as one.

   The knob (Item 27) may be removed from the shaft (Item 23) by punching out the Lock Pin (Item 26). A $^{3}/_{32}$” diameter punch should be used. The O-ring (Item 28) and Washer (Item 24) remain on the shaft (Item 23) and may now be removed. Tilt the helmet so that the Spacer (Item 22), Spring Set (Item 21) and Piston (Item 20) fall out of the adjustment Shaft Tube of the Regulator Body (Item 8).

3. Remove the Bent Tube Assembly from the Inlet Valve Assembly.

4. Remove the complete Inlet Valve Assembly from the Demand Regulator Body (Item 8), using a wrench on the Ultraflow Adapter Flats (Item 3).

5. The Inlet Valve Assembly can now be carefully pulled away from the Demand Regulator Body leaving the Valve Stem (Item 1) in place in the Regulator.

6. The Valve Stem can be removed from the Regulator by removing the Nut (Item 19). Use a straight slot screwdriver to rotate the Valve Stem (Item 1) while Retaining Nut (Item 19) is held with the correct spanner from the DSI Service Tool Kit.

7. Undo the Nut (Item 9) which secures the inlet tube to the helmet. Remove the Regulator Body (Item 8). Nut (Item 9) and O-ring (Item 10). All parts should be thoroughly cleaned and parts replaced as indicated with O-rings being lubricated only with Christo-Lube fluorinated grease before installation.

3.2 ULTRAFLOW 501 ASSEMBLY

To be read in conjunction with Fig 3.5, page 16.

During re-assembly of the Demand Regulator, replace all questionable and damaged parts with new. Lubricate all O-rings and threaded metal parts lightly only with Christo-Lube fluorinated grease.

1. Install the Inlet Valve Stem (Item 1) in the regulator body. Fit the Washer (Item 16), Lever (Item 17) and Spacer (Item 18) on to the Shaft of the Inlet Valve Stem. Screw the nut on to the threaded end of the Inlet Valve Stem until the Inlet Valve threads protrude slightly (about 2 threads past the Nut). Use a straight slot screwdriver and special DSI spanner for this operation.

CAUTION

The Lock Nut (Item 19) is a Nyloc Nut and should always be replaced with new if removed from the Inlet Valve.

2. Assemble the Ultraflow Adapter (Item 3), Seat Retainer (Item 4) and Inlet Cap (Item 2).

3. Install the Piston (Item 20), Spring Set (Item 21) and Spacer (Item 22) into the Adjustment Tube of the Regulator Body. Generously apply Christo-Lube fluorinated grease to this assembly.

4. Thread the main adjustment Shaft (Item 23) into the tube. Slide the washer (Item 24) and O-ring (Item 28) onto the adjustment shaft (Item 23). Slide the packing Nut (Item 25) onto the shaft and tighten in onto threaded tube of the Regulator (Item 8).

5. Fit the knob (Item 27) onto the adjustment Shaft (Item 23) and align the holes for the Retaining Pin (Item 26).

CAUTION

Support the adjustment knob (Item 27) while tapping Retaining Pin (Item 26) to prevent damage to the Shaft (Item 23) and Body (Item 8).

6. Assemble the Bent Tube Assembly to the Inlet Valve Assembly.

NOTE

The sealing washer should be Divex Part No. RT011, which improves flow characteristics.

Adjust the Regulator as described in 3.3.

3.3 ADJUSTMENT

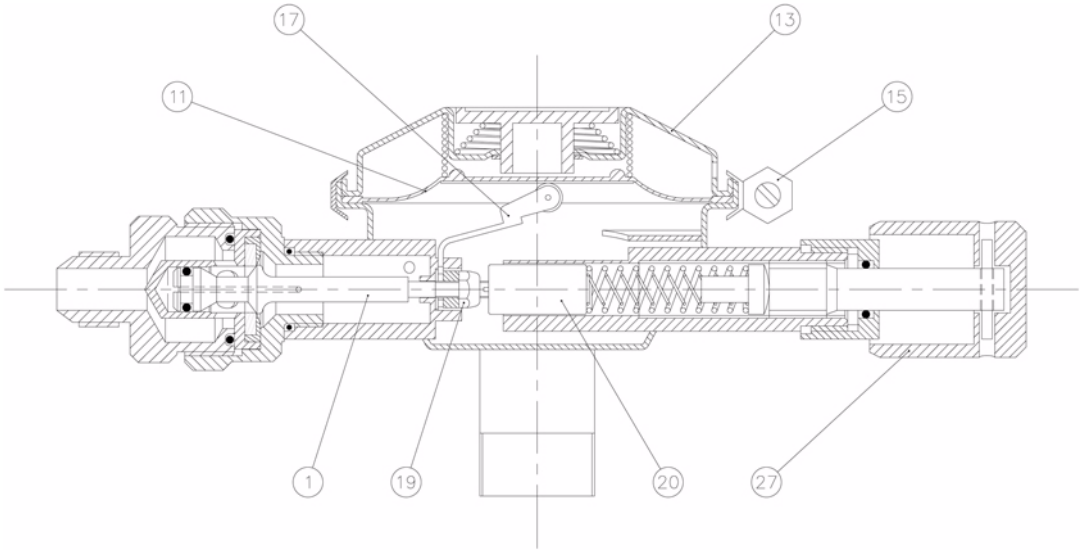


Fig 3.1 Ultraflow 501 Regulator

1. Remove the Clamp (Item 15), Cover (Item 13), Spring (Item 34) and Diaphragm (Item 11).

2. Fully loosen the “dial-a-breath” (Item 27) by turning counter-clockwise to the stop.

3. Insert the DSI service tool between the Inlet Valve Stem (Item 1) and the Piston (Item 20) as shown in Fig 3.1. The blade of this tool should be aligned with the small slot in the end of the stem. This prevents rotation of the stem

4. Connect to a gas supply and set pressure between 10-15 BAR.

NOTE

For operational gas supply pressures, refer to Regulator Setting Guidelines in Chapter 8 of this manual.

5. Tighten the “dial-a-breath” (Item 27) until free flow has just stopped. Depress the roller fork (Item 17) a few times to allow the valve stem to centralise.

6. Adjust the Nut (Item 19) until there is 4-5mm of freeplay at the end of the Lever (Item 17).

7. Remove the DSI service tool from the Inlet Valve Stem.

NOTE

The regulator will require the “dial-a-breath” turned in 1 to 2 turns to compensate for the thickness of the DSI tool.

8. Check that there is still 4-5mm of freeplay at the end of the Lever (Item 17).

9. Shut the gas supply to the regulator and vent the remaining gas in the side block by pushing the Lever (Item 17).

10. Turn the Nut (Item 19) 90^{o} in a clockwise direction using the DSI spanner.

11. Repeat steps 4, 8, 9 and 10 until the valve stem has rotated through 360^{o}.

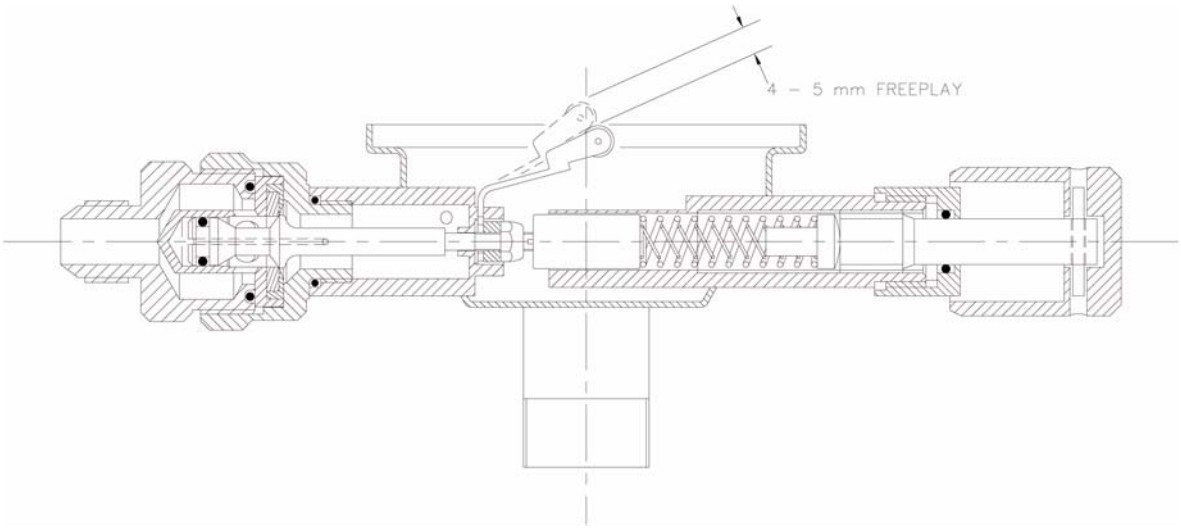


Fig 3.2 Ultraflow 501 Adjustment

12. If there is less than 4-5mm freeplay at the end of the Lever (Item 17) or the regulator freeflows, repeat steps 3 to 11 until there is a minimum 4-5mm of freeplay at the end of the Lever (Item 17) in all 90^{o} increments of the valve stem movement.

13. Refit the diaphragm (Item 11) and Cover (Item 13), holding cover firmly in place by hand.

14. Depress the Purge Button in the centre of the Cover (Item 13) ensuring that there is clearance between the Button and the Diaphragm. If the Lever height requires adjustment, it must be bent, as described in paragraphs 15 and 16 below.

15. To decrease the Purge Button clearance, grip the Lever with the first finger of the right hand under the Lever and with the thumb on top, push down to bend the roller end of the Lever upwards.

NOTE

It is essential that undue stress is not placed on the lower arms of the Lever, as this will distort the blades resulting in spongy operation.

16. To increase the clearance, place the “disc end” of the DSI service tool inside the Regulator, under the Lever as shown in Fig 3.3.

    The Lever may then be bent down to the desired height by hand (i.e. roller projects approximately 1mm above the top edge of the demand regulator body and this should be checked using a straight edge).

CAUTION

Do not bend the Lever too far.

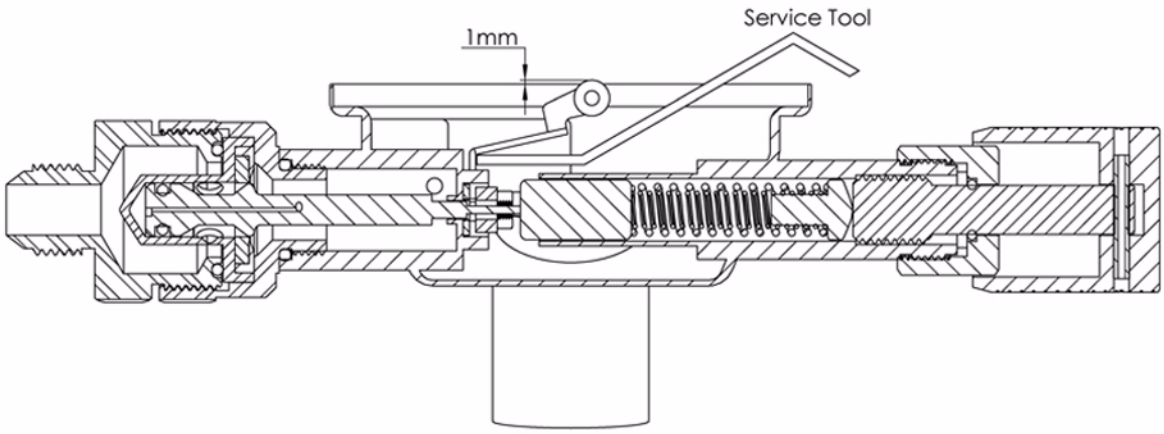


Fig 3.3 Ultrajewel 501 Level Position

17. Replace the Diaphragm with Bias Spring and Cover and re-test the regulator as follows:

    - Tighten the “dial-a-breath” fully and connect to a gas supply of recommended pressure.

    - Depress the Purge Button gently. If there is no gas flow, dismantle the Regulator and re-check adjustment as described in paragraphs 1 to 10 above.

18. Re-set the “dial-a-breath” by unscrewing the “dial-a-breath” knob until the Regulator freeflows then tighten one (1) full turn.

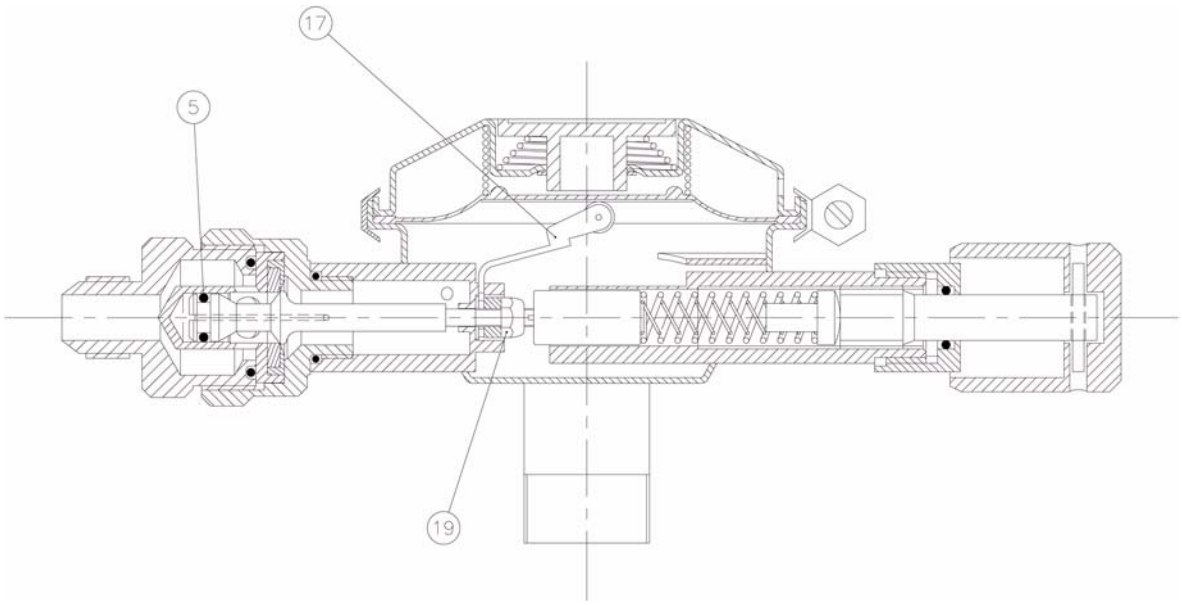


Fig 3.4 Ultraflow 501 “Dial-a-breath” Adjustment

NOTES

(1) It is not permissible to loosen the Nut (Item 19) more than one eight of a turn to adjust the Lever height. If the nut is loosened beyond this amount, the regulator will not flow to its maximum rate.

(2) It is essential that all Regulator parts should be free from dirt and rubber components should be inspected for any sign of deterioration.

(3) All internal parts should be lightly lubricated with Christo-Lube fluorinated grease, especially O-ring.

(4) The two opposing blades on the bottom of the Lever (Item 17) must be accurately aligned with each other and be free from tool marks or burrs.

3.4 ULTRAFLOW 501 REGULATOR

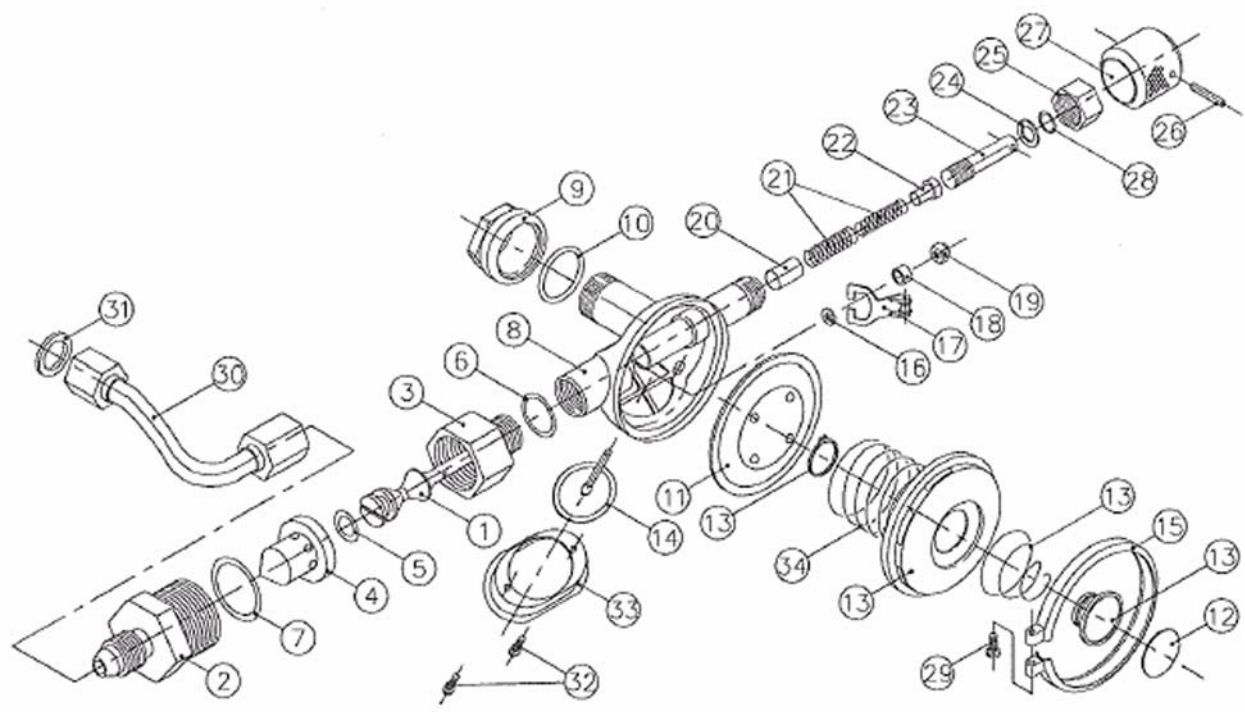


Fig 3.5 Ultraflow 501 Exploded Assembly

ITEM NO	DESCRIPTION	PART NO	QTY	TORQUE SETTINGS	
				INCH POUNDS	NM
1	Valve Stem	D1995	1	-	-
2	Inlet Cap	D1996	1	100	11.3
3	Adapter	D1996	1	40	4.5
4	Valve Seat Retainer	D1998	1	-	-
5	O-ring	E13991	1	-	-
6	O-ring	RN014-7	1	-	-
7	O-ring	RN017-7	1	-	-
8	Ultraflow Body	D1434A	1	-	-
9	Nut	D1433	1	-	-
10	O-ring	RN214-7	1	-	-
11	Diaphragm	DE057	1	-	-
12	Decal (Ultraflow 501)	T14753	1	-	-
13	Cover Assembly (Black)	D1149	1	-	-
14	Mushroom Valve	DE028	1	-	-
15	Clamp	DE069	1	-	-
16	Washer	DE067	1	-	-

ITEM NO	DESCRIPTION	PART NO	QTY	TORQUE SETTINGS	
				INCH POUNDS	NM
17	Roller Lever	DE058	1	-	-
18	Spacer	DE068	1	-	-
19	Nut	DE025	1	-	-
20	Piston	DE062	1	-	-
21	Spring Set	D13800	1	-	-
22	Spacer	DE063	1	-	-
23	Shaft	DE064	1	-	-
24	Washer	DE019	1	-	-
25	Packing Nut	DE065	1	40	4.5
26	Retaining Pin	DE021	1	-	-
27	Adjustment Knob	DE066	1	-	-
28	O-ring	DE020	1	-	-
29	Screw	DE022	1	8	1.0
30	Bent Tube Assembly	DM2009C	1	100/100	11.3/ 11.3
31	O-ring	RT011	1	-	-
32	Retaining Screw	DE076	1	-	-
33	Whisker Adapter	DE096	1	-	-
34	Biasing Spring (Light Yellow)	D1158	1	-	-

(Intentionally Blank)

CHAPTER 4 SERVICE AND MAINTENANCE OF SIDE BLOCK

CONTENTS

4.1 SERVICE AND MAINTENANCE OF SIDE BLOCK

Maintenance of the Side Block with regard to Divex equipment consists of checking the condition of the O-ring at the top of the bent tube assembly. If there is any doubt about the condition, replace.

For maintenance on the remainder of the side block refer to the DSI Manual.

CHAPTER 5 SERVICE AND MAINTENANCE OF ORAL NASAL MASK

CONTENTS

Page

5.1 SERVICE AND MAINTENANCE OF ORAL NASAL MASK

Remove the Oral Nasal Mask first removing the nose block device by unscrewing the knob and removing the packing nut and O-rings. Pull the nose block device out of the oral nasal. Unscrew the outer nuts on the communications posts and remove the microphone wire lugs.

Grasp the oral nasal and slowly pull of the regulator mount nut and the connector. The oral nasal is now out of the headgear and can be inspected. Replace if necessary noting that a light coat of silicone lubricant will preserve the rubber.

Re-assembly is the reverse of the above sequence.

CHAPTER 6 ROUTINE MAINTENANCE

CONTENTS

6.1 MAINTENANCE SCHEDULE

6.1.1 24 HOURS

- Clean and inspect mask or helmet, inside and out.
- Check operation of all moving parts.
- Check neckdam for tears or deterioration which could lead to damage (helmets only).
- Refer to DSI Manual for detailed procedures.

6.1.2 MONTHLY

- Inspect oral nasal for signs of deterioration.
- Inspect and adjust demand regulator.
- Lubricate packing on nose clearing devise as described in DSI Manual.
- Test Check Valve on main supply connection as described in DSI Manual.

CHAPTER 7 SUPERLITE 17B EXPLODED PARTS

CONTENTS

7.1 SUPERLITE 17A / B EXPLODED PARTS

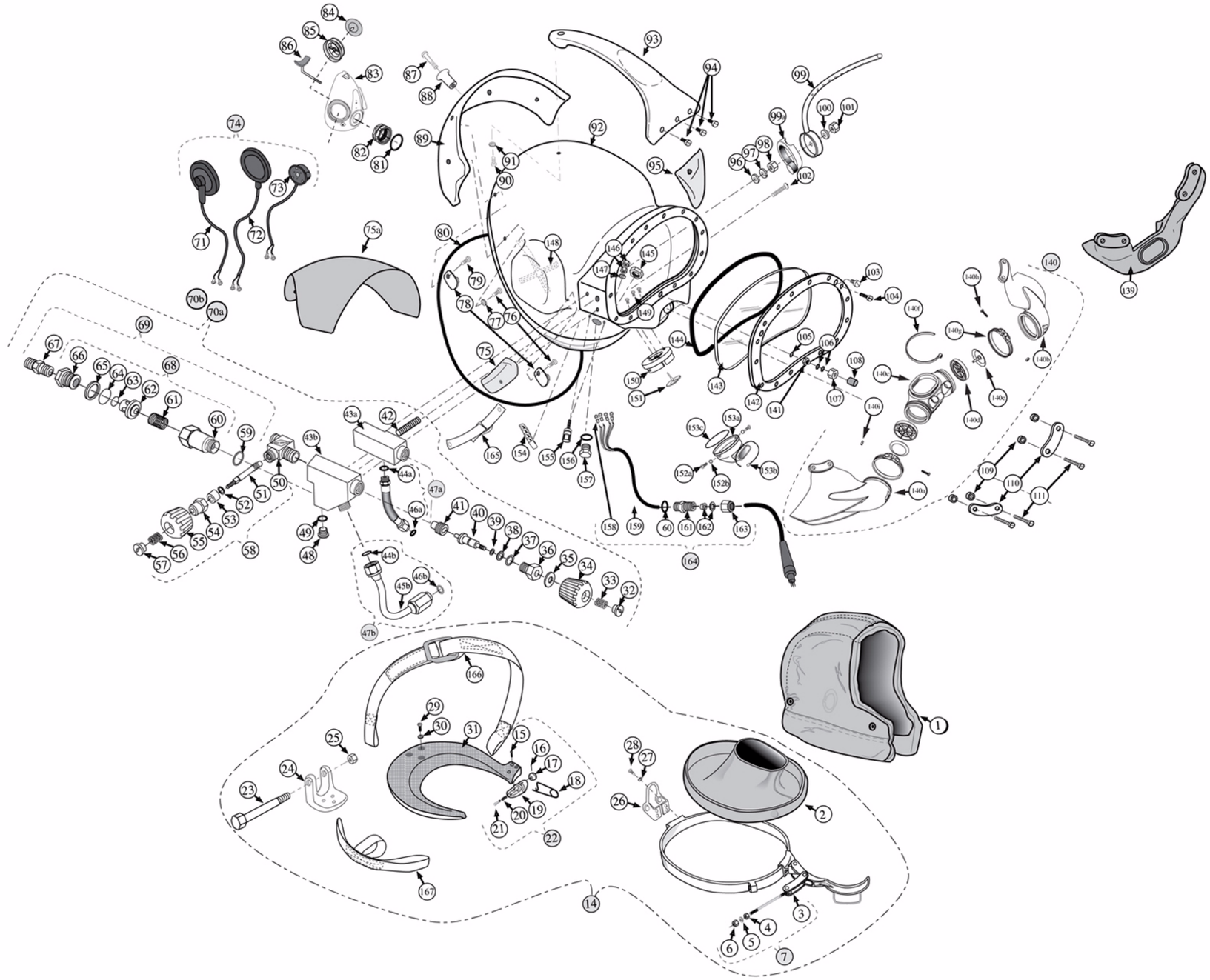


Fig 7.1 Superlite 17A / B Exploded Parts

NOTE

This drawing relates to the standard 17A / 17B proprietary helmet supplied by DSI. If your helmet is fitted with the Divex Demand or Jewel Exhaust Valve, please refer to applicable sections within this manual.

7.2 SUPERLITE 17A / B HELMET PARTS LIST

NO	PART NO	DIVEX PART NO	DESCRIPTION
1	510-521	DE044	Head Cushion
	510-523	DE152	Replacement Foam
2	510-533	DE045	Drawstring Neck Dam
3			Neck Clamp (Order Comp. see #7)
4	530-317	DE171	Nut
5	530-415	DE173	Washer
6	530-320	DE172	Nut, Lock
7	505-055	DE102	Neck Clamp Assembly
8-13	Not used	-	-
14	505-008	DE101	Neck Clamp Yoke Assembly Comp.
15	530-066	DE1471	Screw
16	530-601	DE021	Retaining Pin
17	550-255	DE281	Knob
18	535-900	DE164	Safety Pin
19	560-051	DE282	Latch Catch Body
20	535-808	DE283	Spring
21	550-257	DE284	Plunger
22	505-010	DE1311	Latch Catch Assembly, Pull Pin
23	530-034	DE1801	17B Hinge Bolt, Electropolished
24	560-026	DE126	Hinge
25	530-028	DE286	Nut
26	540-157	DE234	Rear Hinge Tab, Electropolished
27	530-406	DE047	Washer
28	530-025	DE048	Screw
29	530-080	DE1491	Screw
30	530-530	DE174	Washer
31	520-117	DE104	Urethane Yoke
	520-060	DE2805	Fiberglass Yoke
32	550-019	DE093	Locknut
33	535-802	DE177	Spring
34	520-524	DE035	Knob, Control
35	520-030	DE036	Washer
36	550-020	DE181	Bonnet
37	510-015	DE037	O-ring
38	520-031	DE038	Washer
39	510-010	DE016	O-ring
40	550-022	DE156	Valve Stem
41	550-023	DE040	Seat Assembly
42	550-024	DE182	Stud
43a	N/A	N/A	A Side Block
43b	550-029	DE125	B Side Block
44a	N/A	N/A	O-ring

NO	PART NO	DIVEX PART NO	DESCRIPTION
44b	520-033	DE083	O-ring (teflon)*
45b	555-154	DE039	Bent Tube Assembly*
46a	N/A	N/A	O-ring
46b	510-012	DE030	O-ring*
47a	N/A	N/A	Reg. Hose Assembly with O-rings
47b	555-155	DE155	Bent Tube Assembly with O-rings*
48	550-095	DE005	L.P. Plug, with O-ring
49	310-003	DE2702	O-ring
50	550-140	DE1851	Emergency Valve Body
51	550-138	DE1581	Stem
52	540-095	DE1571	Washer
53	520-024	DE0411	Packing
54	550-091	DE1841	Packing Nut
55	520-525	DE0351	Knob, Control
56	535-802	DE177	Spring
57	550-019	DE093	Locknut
58	505-070	DE0781	Emergency Valve Assembly
59	510-483	DE043	O-ring
60	Body		Order complete see Loc #68. For replacement parts order kit #525-330, Divex Part Number DE162.
61	Spring		
62	Poppet		
63	O-ring		
64	O-ring		
65	Wiper		
66	Seat		
67	555-117	DE079	Adapter, Brass, $^1/_4$" NPT/02
68	555-195	DE189	One-Way Valve
69	505-060	DE1321	One-Way Valve Assembly
70a	N/A	N/A	"A" Side Block Assembly Complete
70b	505-024	DE1341	"B" Side Block Assembly Complete
71	515-005	DE077	Earphone Right
72	515-006	DE042	Earphone Left
	510-542	DE924	Earphone Cover Set
	515-008	DE195	Speaker
	520-015	DE34386	Speaker Protector
73	515-009	DE097	Microphone
74	515-030	DE086	Communications Set
75	560-023	DE123	Starboard Weight
75a	520-054	DE1041	Visor
76	530-070	DE159	Screw
77	530-540	DE094	Washer
78	545-027	DE051	Snap Tab

NO	PART NO	DIVEX PART NO	DESCRIPTION
79	530-078	DE1710	Screw
80	510-446	DE050	O-ring
81	510-211	DE120	O-ring
82	550-038	DE122	Nut, Regulator Mount
83	510-747	DE006	Mask, Oral / Nasal (Silicone)
84	510-550	DE004	Valve, Oral / Nasal Intake
85	520-020	DE150	Body, Oral / Nasal Intake Valve
86	545-015	DE003	Nose Block Device
	510-575	DX2374	Nose Block Pad
87	530-090	DE160	Alignment Screw
88	550-339	DE186	Alignment Sleeve
89	560-005	DE130	Rear Weight
90	530-070	DE159	Screw
91	530-540	DE094	Washer
92	520-065	DE098	Helmet, Fiberglass
93	560-014	DE191	Handle
94	530-040	DE052	Screw
95	560-019	DE124	Port Weight
96	530-535	DE175	Washer
97	530-415	DE173	Washer
98	530-317	DE171	Nut
99	545-016	DE080	Air Train
99a	510-762	DE0801	Air Train Gasket
100	530-535	DE175	Washer
101	530-317	DE171	Nut
102	530-050	DE010	Screw
103	530-052	DE014	Screw, Port Plug Screw
104	530-035	DE013	Screw
105	510-010	DE016	O-ring
106	510-008	DE015	O-ring
107	555-180	DE190	Packing Nut
108	550-062	DE161	Knob, Nose Block
109	550-061	DE108	Spacer
110	540-015	DE106	Plate
111	530-045	DE017	Screw
112	545-022	DE073	Regulator Body*
113	550-060	DE062	Piston*
114	535-807	DE018	Spring Set*
115	550-059	DE063	Spacer*
116	550-057	DE064	Shaft*
117	520-032	DE019	Washer*
118	510-011	DE020	O-ring*

NO	PART NO	DIVEX PART NO	DESCRIPTION
119	550-055	DE065	Packing Nut*
120	550-053	DE066	Knob, Adjustment*
121	530-601	DE021	Retaining Pin*
122	510-553	DE024	Diaphragm*
123	545-018	DE023	Cover Assembly*
123a	535-905	DE2810	Retaining Clip*
123b	540-055	DE2811	Cover*
123c	535-810	DE2812	Spring, Purge Button*
123d	520-017	-	Purge Button*
123e	520-078	-	Purge Button Sticker*
124	530-030	DE022	Screw*
125	545-020	DE069	Clamp*
126	530-303	DE025	Nut*
127	550-052	DE068	Spacer*
128	545-038	DE058	Roller Lever*
129	530-506	DE067	Washer*
130a	550-046	DE187	Inlet Nipple "A"*
131b	550-050	DE071	Jam Nut "B"*
132b	550-048	DE059	Inlet Nipple "B"*
133	510-014	DE027	O-ring*
134	545-026	DE026	Inlet Valve*
134a	510-580	DE0261	Valve Seat*
134b	530-505	DE061	Washer*
135	535-804	DE060	Spring*
136	510-552	DE028	Exhaust Valve*
137	505-026	DE1351	Demand Regulator Assembly "A"*
138a	505-027	DE099	Demand Regulator Assembly "B"*
138b	505-028	DE2793	Regulator Adjustment Knob Assembly*
139	510-554	DE107	Whisker^{TM}, Rubber (Pre 2004)
140	525-759	DE1463	Quad-Valve^{TM} Exhaust
140a	510-786	DE34825	Starboard Whisker^{TM}
140b	510-787	DE34826	Port Whisker^{TM}
140c	510-760	DE34824	Quad Valve Exhaust Main Body
140d	520-200	DE1185	Whisker^{TM} Exhaust Valve Insert
140e	510-776	DE732	Exhaust Valve
140f	520-042	DE2729	Tie Wrap
140g	520-118	DE22160	Tri / Quad Valve Whisker Clamp
140h	530-008	DE22161	Brass Screw
140i	530-009	DE22162	Brass Nut
141	550-116	DE1716	Nose Block Guide
142	560-070	DE193	Port Ret. Assembly

*Please refer to section 3.4.

NO	PART NO	DIVEX PART NO	DESCRIPTION
143	520-004	DE012	Face Port
	520-128	DE0121	Face Port, pre 1979
144	510-260	DE011	O-ring
145	550-040	DE087	Nut
146	530-308	DE090	Nut
147	530-525	DE089	Washer
148	540-054	DE054	Earphone Retainer
149	530-032	DE2726	Screw

NO	PART NO	DIVEX PART NO	DESCRIPTION
150	550-063	DE095	Exhaust Body
151	510-561	DE081	Exhaust Valve
152	530-021	DE076	Screw
152a	530-019	DE17572	Screw, Quad Exhaust
152b	510-007	DE17573	O-ring, Quad Exhaust Screw
153a	560-530	DE17570	Exhaust Cover, Quad Exhaust
153b	520-042	DE2729	Tie Wrap, Quad Exhaust
153c	510-033	DE17571	O-ring, Quad Exhaust

NO	PART NO	DIVEX PART NO	DESCRIPTION
154	515-061	DE1733	Terminal Block
155	515-035	DE031	Communications Post
156	510-481	DE032	O-ring
157	550-043	DE088	Plug
158	515-049	DE2794	Terminal
159	515-045	DE070	Waterproof Conn, Male
160	510-481	DE032	O-ring
161	555-175	DE084	Packing Gland

NO	PART NO	DIVEX PART NO	DESCRIPTION
162	520-113	DE0341	Ferrule Set
163	555-178	DE085	Packing Nut
164	505-047	DE1767	W.P. Connector Assembly
165	505-130	DE1099	Chin Strap
166	505-134	DE1097	Strap Guide
167	505-138	DE1098	Yoke Strap
	525-620	DE1441	Took Kit (not shown)

*Please refer to section 3.4.

CHAPTER 8 RECOMMENDED SUPPLY PRESSURES

CONTENTS

8.1 RECOMMENDED SUPPLY PRESSURES

The operation of the Ultraflow 501 Helmet is no different from that of a standard DSI Superlite 17B Helmet and optimum diver breathing resistance can be achieved by rotation of the Demand Regulator adjustment knob.

8.1.1 RECOMMENDED SUPPLY PRESSURE FOR AIR DIVING APPLICATIONS

To assist users of the Ultraflow 501 Helmet to gain maximum diver comfort and safety, it is recommended that the following minimum overbottom supply pressure settings are provided at the supervisors panel. The maximum overbottom settings should not exceed 20 barg.

DIVING DEPTH MSW	SURFACE SUPPLY PRESSURE (BARG)	
	300’ Umbilical	600’ Umbilical
10	10	10
20	10	10
30	10	10
40	11	12
50	13	14

8.1.2 RECOMMENDED SUPPLY PRESSURE FOR MIXED GAS DIVING APPLICATIONS

To assist users of the Ultraflow 501 Helmet to gain maximum comfort and safety, it is recommended that the following minimum supply pressure settings are provided in the Diving Bell. This pressure setting should not exceed 20 barg.

BELL DEPTH	DIVER SUPPLY (BELL)
MSW	BAR
30-150	10
151-180	11
181-215	12
216-250	13
251-280	14
281-315	15
316-350	16
351-400	17
401-430	18
431-460	19
461-480	20
481-500	20

(Intentionally Blank)

CHAPTER 9 KIRBY MORGAN SUPERLITE 17B HELMET MANUAL

(Intentionally Blank)

SuperLite® 17B Helmet
Operations and Maintenance Manual

KMDSI Part # 100-001

Kirby Morgan Dive Systems, Inc.
1430 Jason Way
Santa Maria, CA 93455, USA
Telephone (805) 928-7772, FAX (805) 928-0342
E-Mail: KMDSI@KirbyMorgan.com, Web Site:www.KirbyMorgan.com

Manual prepared by Marine Marketing and Consulting, Dive Lab, Inc., and KMDSI.

NOTE: This manual is the most current for the SuperLite® 17B Helmet. It is page dated March 2013. Future changes will be shown on page III and the changed pages will carry the date of change. Previous manuals may not reflect these updates.

⚠ WARNING

Diving with compressed breathing gas is a hazardous activity. Even if you do everything right there is always the danger that you may be killed or injured. No piece of diving equipment can prevent the possibility that you may be killed or injured any time you enter the water.

The SuperLite®-17A/B helmet is CE Approved and meets or exceeds all performance and testing requirements of all government and non-government testing agencies throughout the world. It is approved for use on all commercial and military work underwater.

Document Number 130311001

Warranty Information

Kirby Morgan Dive Systems, Inc. warrants every new mask, helmet, or KMACS 5 Air Control System to be free from defects in workmanship for a period of three hundred sixty five (365) days from date of purchase. This warranty covers all metal, fiberglass, and plastic parts. This warranty does NOT cover rubber parts, communications components, or head cushions. In addition, due to the electrolytic nature of underwater cutting and welding, chrome plating cannot be warranted when the diver engages in these activities.

Should any part become defective, contact the nearest authorized KMDSI dealer. If there is no dealer in your area, contact KMDSI directly at (805) 928-7772 x 229. You must have a return authorization from KMDSI prior to the return of any item, Upon approval from KMDSI, return the defective part, freight prepaid, to the KMDSI plant. The part will be repaired or replaced at no charge as deemed necessary by KMDSI.

This warranty becomes null and void if:

1) The product is not registered with KMDSI within ten (10) days of purchase.

2) The product has not been properly serviced and/or maintained according to the appropriate KMDSI manual. In addition, the user is responsible to ensure that all product updates as recommended by KMDSI have been performed.

3) Unauthorized modifications have been made to the product.

4) The product has been abused or subjected to conditions which are unusual or exceed the product's intended service.

NOTE: Be sure to complete the enclosed warranty card and return it to KMDSI immediately. No warranty claims will be honored without a satisfactorily completed warranty card on file at KMDSI.

Record Of Changes

It is the responsibility of the owner of this product to register their ownership with Kirby Morgan Dive Systems, Inc., by sending the warranty card provided. This card is to establish registration for any necessary warranty work and as a means of communication that allows KMDSI to contact the user regarding this product. The user must notify KMDSI of any change of address by the user or sale of the product.

All changes or revisions to this manual must be recorded in this document to ensure that the manual is up to date. Quantities marked in parenthesis.

Change Number	Date	Description of Change
1	03/11/2013	Updated torque specs

⚠ WARNING

Diving with compressed breathing gas is a hazardous activity. Even if you do everything right there is always the potential for serious injury or death. No one piece of diving equipment can prevent the possibility that you may be injured or killed any time you enter the water. We do not herein make any effort to teach the principles of diving. The information in this manual is intended for users of Kirby Morgan helmets and persons that maintain or service Kirby Morgan helmets.

Table Of Contents

Definition of Signal Words Used in this Manual

For your protection, pay particular attention to items identified by signal words in this manual. These terms are identified as, CAUTION, WARNING AND DANGER. It is especially important for you to read and understand these sections.

⚠ DANGER

This word indicates an imminently hazardous situation, which if not avoided, could result in death or serious injury.

⚠ WARNING

This word indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.

⚠ CAUTION

This word indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

If English is not your native language and you have any difficulty understanding the language of any warnings as they appear in the manual, please have them translated.

⚠ WARNING

Este é um aviso importante. Queira mandá-lo traduzir.

⚠ WARNING

Este es un aviso importante. Sirvase mandario traducir.

⚠ WARNING

Quest è un avviso importante. Tradurlo.

⚠ WARNING

Ceci est important. Veuillez traduire.

⚠ WARNING

Diese Mitteilung ist wichtig. Bitte übersetzen lassen.

If you have any questions concerning this manual or the operation of your helmet, contact KMDSI (805) 928-7772 or by Email at info@KMDSI.com or Dive Lab Inc. (850) 235-2715 or at Divelab@aol.com

IMPORTANT: A word about this manual. We have tried to make this manual as comprehensive and factual as possible. We reserve the right, however, to make changes at any time, without notice, in prices, colors, materials, equipment, specifications, models and availability. Since some information may have been updated since the time of printing, please contact your local KMDSI dealer if you have any questions. Periodically KMDSI Operations and Maintenance Manuals are reviewed. Any updates/changes will be posted on the KMDSI website and may be downloaded for insertion/correction.

Important Safety Information: This SuperLite® 17B diving helmet is intended for use by trained divers who have successfully completed a recognized training course in surface supplied diving

⚠ WARNING

Follow all the instructions in this manual carefully and heed all safety precautions. Improper use of this diving helmet could result in serious injury or death.

⚠ WARNING

Kirby Morgan Dive Systems, Inc. (KMDSI) warns all divers who use Kirby Morgan diving helmets or masks to be sure to use only KMDSI original parts from a KMDSI authorized dealer. Although other parts, O-rings and fittings may appear to fit your Kirby Morgan diving helmet or mask, they may not be manufactured to the same standards maintained by KMDSI. The use of any parts other than KMDSI original parts may lead to equipment failure and accidents.

⚠ WARNING

Diving in waters that are chemically, biologically, or radiologically contaminated is extremely hazardous. Although Kirby Morgan diving helmets may be adapted for use in some contaminated environments, special training, equipment, and procedures are necessary. Do not dive in a contaminated environment unless you have been thoroughly trained and equipped for this type of diving.

Read this manual before using or maintaining the helmet, even if you have experience with other diving helmets. **If you have purchased the helmet new from a dealer, be sure to send in the warranty registration card so we may keep you informed of any safety notices that affect this product**. If you resell or loan this helmet to another diver, be sure this manual accompanies the helmet and that the person reads and understands the manual. In addition to the manual a log book should be used to log all repairs, maintenance and use.

⚠ WARNING

This helmet was completely checked and should be ready to dive as it was shipped from the factory. However, it is always the diver's responsibility to check all the components of the helmet prior to diving.

⚠ WARNING

Diving is a life threatening occupation. Even if you do everything right you can still be killed or injured. None of the models of Kirby Morgan helmets or masks can prevent accidents, injuries or death due to improper training, poor-health, improper supervision, improper job requirements, improper maintenance or acts of God.

⚠ WARNING

Any and all fiberglass repairs done to this helmet MUST be done by a KMDSI factory trained repair facility. Painting is not recommended by KMDSI. Furthermore, many diving companies will not allow painted helmets to be used because painting can mask previous fiberglass damage. KMDSI certified technicians are not responsible for certifying helmets free from damage during annual overhauls.

⚠ WARNING

Helmet shells can be re-gel coated by authorized/certified KMDSI trained technicians that have received fiberglass training by KMDSI. Helmets that are to be painted for cosmetic purposes, should be first, certified free of fiberglass damage by an authorized KMDSI technician certified in fiberglass repair. A log entry should be made in the helmet log that the helmet was free of damage prior to painting. Keep in mind other KMDSI technicians can refuse to work on helmet shells that have previously been painted or repaired by non KMDSI certified persons.

This manual is supplied to the original purchaser of this helmet. If you have any questions about the use of the helmet or you need another copy of this manual, contact KMDSI or your nearest KMDSI dealer. It may also be downloaded free from the KMDSI website at www.KirbyMorgan.com.

⚠ WARNING

KMDSI helmets and masks are intended for underwater use only and should only be used by qualified divers that have received proper training in the use of this type of equipment. KMDSI helmets and masks should not be used or worn without the appropriate life support systems, such as air or gas supplies and support personnel as described in this manual.

⚠ WARNING

KMDSI helmets and masks should never be used for motor sport racing, aviation / space craft use, or for chemical warfare use. The helmet must never be used by persons in poor physical condition, by persons with previous head, neck, or back injuries which could be aggravated by its use. The helmet should not be used by persons under the influence of drugs or alcohol. Furthermore, infants, children, or persons under the age of 18 should never wear KMDSI helmets and masks. Failure to pay heed to the above could result in serious injury or death.

⚠ WARNING

Do not use KMDSI masks or helmets in currents exceeding 3.0 knots Use in currents greater than 3 knots may allow water to enter the exhaust valve, possibly causing regulator flooding. This could lead to drowning.

⚠ WARNING

Surface-supplied diving can be a strenuous activity. The SuperLite®-17B weighs approximately 30 lbs. KMDSI recommends that persons with a previous neck or back injury seek professional medical approval prior to engaging in surface supplied diving operations using the SuperLite®-17B. Use of the SuperLite®-17B with a pre-existing physical/ medical condition may result in death or serious injury.

If you have any questions regarding the use, maintenance, or operation of this helmet, contact KMDSI at (805) 928-7772, fax: (805) 928-0342, or e-mail: info@kirbymorgan.com.

Components requiring lubrication, should only be lubricated with oxygen compatible lubricants such as Christo-Lube®, Flourolube, or Krytox®. Lubricants must be used sparingly and should not be mixed with other lubricants.

The information contained in this manual is intended to aid the user in optimizing the performance of this helmet. The application of some of this information will depend on the diving situation and the use of associated equipment. Many countries have specific laws and rules regarding commercial diving. It is important for the user to understand the rules, regulations, and philosophy imposed by the governing, regulating bodies whenever using commercial diving equipment.

⚠ WARNING

Never use the helmet without first completing all pre-dive maintenance and set up procedures. Failure to complete all pre-dive checks could result in helmet failure due to problems with the incorrect set-up of the equipment. This could lead to serious personal injury or death.

⚠ WARNING

Always read the Material Safety Data Sheet (MSDS) for any chemical - adhesive, cleaning agent, or lubricant - used on your Kirby Morgan helmet. Some of these chemicals may cause serious bodily injury or death if used improperly or without the proper personal protective equipment.

Whenever KMDSI helmets or masks are used in European Countries, which have adopted the C.E. certification programs, they must only be used with C.E. certified components. Diving operations should only be conducted within the limits of the operational specifications, and in accordance with the rules and regulations established by the governing authority in the specific country or geographical location where the diving operations are being conducted. If you have any questions concerning this manual or the operation of your helmet, contact KMDSI (805) 928-7772 or at KMDSI@KirbyMorgan.com or Dive Lab Inc. (850) 235-2715 or at Divelab@aol.com

STOP!
BEFORE GOING FURTHER-

This manual will refer to location numbers in specific drawings, or in the exploded view, which is in the back of this manual. These numbers are called "location" numbers. They are used to find the referred to parts in the drawings in this manual only. They are not the part number. Next to the exploded drawing is a list of the "location" numbers that match the Kirby Morgan part numbers along with the name of the part. Always check the part number when ordering to make sure it is correct. When ordering, always specify the helmet model number and serial number as well.

Chapter 1
General Information KMDSI Products

1.1 Introduction

The Kirby Morgan Corporation was started in 1965. The copper and brass "Heavy Gear" or "Standard Dress" helmets were the first helmets manufactured by the company. Over the years Kirby Morgan designed, manufactured and sold many different helmets and masks for commercial divers.

Staying active in commercial diving has contributed to the successful design innovations of KMDSI products. This may be the primary reason for the acceptance of our designs by professional divers.

Bev Morgan has designed more than fifty-seven diving helmets and over 40 diving masks. All employees of KMDSI participate as part of the Kirby Morgan design team. It would not be possible for us to supply the commercial, military, scientific, and public service diving industries with our equipment, without the team of people that make up Kirby Morgan Dive Systems, Inc. (KMDSI)

We feel it is important for the reader to understand that we at KMDSI consider ourselves as only part of the process along the path in diving equipment design. We welcome all input from our customers. The thinking of many good divers, diving equipment engineers, diving medical specialists, diving organization administrators and their supporting personnel has contributed to the current state of the art of diving.

Each piece of gear we manufacture has in it some of the thinking of those who have gone before us. To all those people who gave something of themselves to the men and women who work underwater, we express a thank you.

We have a strong commitment to providing the best diving equipment and service possible. This thinking has been the policy of Kirby Morgan Dive Systems, Inc. and we will continue to take this approach to our work.

Bev Morgan, Chairman of the Board Kirby Morgan Dive Systems, Inc.

Our extensive dealer network makes it easy to obtain genuine Kirby Morgan replacement parts, as well as technical assistance worldwide.

KMDSI has always concentrated on designing and manufacturing diving equipment that allows most repairs, inspections, and all routine maintenance to be performed by the user. Most routine preventative and corrective maintenance can be accomplished by the user utilizing this manual, the KMDSI Tool Kit (P/N 525-620) and common hand tools. Technician training is available through Dive Lab Inc. Information can be obtained on line at **www.divelab.com** or by telephone at 850-235-2715.

1.2 Full-Face Masks and Manifolds

KMB 18 A/B

CE *approved and* CR™ *marked*

The **KMB 18B Band Mask** frame is constructed of hand laid fiberglass. The head harness is a molded, strong tear resistant neoprene rubber.

The hood, which attaches to the mask frame with welded stainless steel bands, provides warmth for the divers head as well as pockets for the earphones. The communications connections can be either a male waterproof plug in type or bare wire posts. Both this mask and the KMB 28B feature the new Tri-Valve™ Exhaust System.

The **KMB 28B Band Mask** (not shown) is very similar to the KMB 18, with many parts on the KMB 18B being interchangeable with the KMB 28B. The major difference between the 18 and 28 is the material of the mask frame itself. The KMB 18 has a fiberglass frame (yellow) while the KMB 28B frame is an extremely durable injection molded plastic (black).

Other differences include:
1) The main exhaust body of the KMB 28 is part of the frame itself and uses a #545-041 main exhaust cover
2) no comfort insert is required on the 28
3) the face ports for the 18 and the 28 differ slightly in size.

Both the KMB 18 and KMB 28 are CE approved.

The **EXO Full Face Mask** is designed for both surface supplied and scuba diving. By enclosing the divers eyes, nose and mouth, the EXO permits nearly normal speech when used in conjunction with most wireless, and all hard wire underwater communication systems.

The **EXO BR (BALANCED REGULATOR)** shown here is designed to meet or exceed recommended performance goals in both scuba and surface supplied modes and is CE approved. It meets and surpasses European standards for regulator performance.

EXO BR

CE *approved and* CR™ *marked*

The Balanced Regulator helps reduce the work of breathing for the diver by balancing the intermediate air pressure against the valve sealing pressure inside the regulator. This enables the regulator to instantly adjust to changes in line pressure. The balanced regulator is adjustable for a wide range of intermediate pressures between 90 PSIG – 250 over ambient pressure (6.2 – 17 bar).

Both models have a modular communications design that permits rapid and simple maintenance. The optional Hard Shell provides surfaces for mounting lights, cameras etc.

SuperMask M-48
w/ Scuba Pod

CE *approved and* CR *marked*

The **SuperMask M-48** is an innovative new design in a full-face mask. It provides the diver with all the comfort of a full-face mask with the convenience of changeable second stage regulators as well as the ability to use a snorkel without having to remove the mask.

The mask is comprised of two major components, the mask frame and the interchangeable lower pod. The removable lower pod is a feature unique to the SuperMask full-face mask. When diving, the pod is easily removed and replaced on the mask, providing the diver the capability to buddy-breathe, snorkel, use an octopus or perform an "in water" gas switch.

With the pod sealed to the mask, the flexible, silicone pod cover allows the diver to quickly place the regulator mouthpiece into the mouth or dive with it free of the mouth for communications. With the mouthpiece in, the regulator may be used without the pod being sealed to the mask.

The mask may also be used surface supplied when used with the proper accessories. We are currently developing several different pod configurations for both open circuit and rebreather use. For further information, see the Frequently Asked Questions (FAQ) area on our web site at **www.KirbyMorgan.com/FullFaceMasks/M48.html.**

SuperMask M-48
w/ Rebreather pod

CR *marked*

KMACS-5
w/ No Communications

KMACS-5
w/ Communications

The **Kirby Morgan Air Control System-5 (KMACS)** is a lightweight, portable control box for use in surface supplied air diving operations. The KMACS-5 controls the diver's air supply, communications and monitors the diver's depth. It allows two divers clear push-to-talk (two wire) or round robin (four wire) communications. The KMACS-5 is also available without communications.

The air supply can be either from a low-pressure compressor or high-pressure cylinders. The adjustable first stage regulator reduces the high-pressure air and supplies low pressure through the umbilical to the diver's breathing system.

High pressure yokes permit U.S. standard scuba cylinders or DIN equipped cylinders to be used. Low-pressure air supply fittings allow for a compressor to be used as the primary air source.

A complete pneumo system with dual reading gauges (both US Standard and Metric) is provided for each diver's air, as well as a shut-off/bleed system that uses two high-pressure feed lines which allows changing of used cylinders without interruption of the diving operation. Optional shut off valves allow the isolation of each diver's air supply.

The Communication Set is a multipurpose intercommunication system that provides reliable and clear communications between a topside operator (tender) and one or more surface-supported divers, recompression chambers, or other submersible systems.

1.3 Kirby Morgan Diving Helmets

All Kirby Morgan diving helmets and masks are manufactured by Kirby Morgan Dive Systems, Inc. (KMDSI). Each step of the manufacturing process is carefully controlled to assure the customer of a high quality, durable helmet that will function properly for many years.

There are eight models of Kirby Morgan diving helmets currently in production. They are the SuperLite®-17B, (MK-21- U.S. Navy version), SuperLite® 17C the SuperLite® 27, and Kirby Morgan models 37, 37SS, 47, 57, and 77. All are CR™ marked.

The **SuperLite®-17 A/B** was first developed in 1975 and quickly set a new standard for diving helmet design. Many large and small commercial diving companies, military organizations, scientific divers, and public safety divers are successfully using this design around the world. This helmet is CE marked.

The SL-17 A/B helmet system consists primarily of two major components: the neck dam/yoke assembly, and the helmet. To don the helmet, the diver first slips the angled neck dam with the attached yoke over their head. The helmet is lowered onto the diver's head with the help of a tender, then the yoke hinge tab is hooked onto the alignment screw on the rear weight. The neck clamp is then slipped onto the helmet and locked. The locking system not only seals the neck dam to the helmet but also secures the front of the yoke, fastening the helmet to the diver's head.

The SuperLite®-17A/B shares many common breathing system parts with all Kirby Morgan helmets and masks. The breathing system was man-tested to 1600 FSW by the University of Pennsylvania and approved by the U.S. Navy for surface-supplied diving to 190 FSW with air and 300 FSW with mixed gas. It surpasses all requirements of all governing agencies and it is approved for commercial diving through out the world.

SuperLite® 17A/B

CE *approved and* CR™ *marked*

Kirby Morgan 37

CE *approved and* CR™ *marked*

Yoke and Latch Catch Assembly

Neck Pad and Sealed Pull Pins.

Other features that are common to all Kirby Morgan helmets include:

* Face port and retainer ring
* Communications components
* Oral nasal mask
* Nose block device
* Air train defogger

The **Kirby Morgan 37** Commercial Diver's Helmet represents what we at Kirby Morgan consider to be a turning point in modern diving helmet design. The helmet consists of two major assemblies: the helmet shell/helmet ring assembly and the neck dam/neck ring assembly.

The helmet comes with the large tube SuperFlow® 350 adjustable demand regulator which provides an easier breathing gas flow during peak work output. A quick change communications module is available with either bare wire posts or a waterproof connector.

The helmet ring houses the sealed pull pins and provides protection for the bottom end of the helmet. The diver is also provided with an internally adjustable chin support. This custom fit and balance seats the helmet comfortably for long periods of time even when working in the face down position.

The **SuperLite® 27®** Commercial Diver's Helmet has all the same features of the KM37 on a smaller, low volume shell design. This helmet is often preferred by persons with smaller heads.

The chrome plated machined brass helmet neck ring houses the sealed pull pins and provides protection for the bottom end of the helmet. Like the SL-17K, 37 and 17C, the diver is provided with an internally adjustable chin support. This support, along with the adjustable neck pad on the locking collar, gives the diver a comfortable, secure, custom fit.

The quick-change communications module, available with either bare wire posts or a waterproof connector, allows for easy, efficient maintenance of the helmets communications.

The helmet also features the SuperFlow® 350 large tube adjustable demand regulator. The helmet is available in the umbilical over the shoulder, "B" configuration only.

SuperLite® 27®

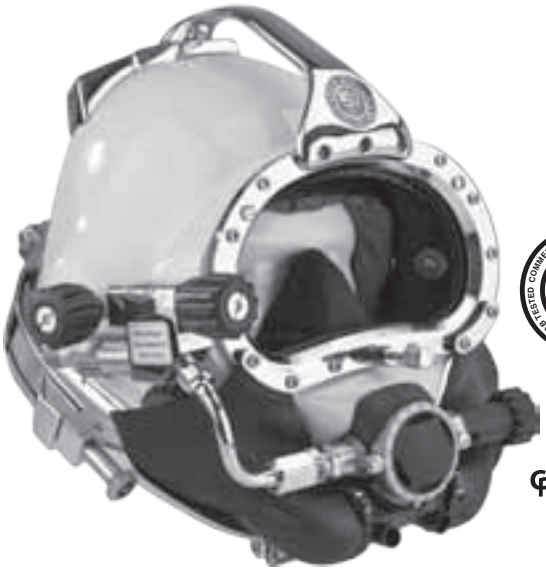
CE *approved and* CR™ *marked*

Kirby Morgan 47

CE *approved and* CR™ *marked*

The **Kirby Morgan 47** offers the ultimate in a high performance breathing regulator. This helmet has an entirely new breathing system, oral nasal mask, and water ejection system. The REX Demand Valve, with it's fully adjustable balanced piston is a breakthrough design that exceeds the requirements of all government or other testing agencies.

It has the best work-of-breathing performance when compared to ANY other commercial diving helmet. The Kirby Morgan 47 Dive Helmet has been tested and meets or exceeds European CE requirements and is fully commercially rated. In all other respects, this helmet is nearly identical to the Kirby Morgan 37.



marked

The **Kirby Morgan 57** helmet features our revolutionary new SuperFlow® 450 Stainless Balanced Regulator. It's machined from a stainless steel casting for the ultimate in performance and reliability.

Like all KMDSI regulators on our helmets and Band Masks, we use only regulators that are specifically designed for surface-supplied diving, that will perform over the wide range of pressures delivered by low pressure compressors. An ordinary SCUBA regulator mounted on a diving helmet is not capable of delivering the gas you need at heavy work loads. This commercially rated fully diver adjustable regulator delivers all the breathing gas you might require for the most demanding work underwater.

The **Kirby Morgan 57** also includes our Quad-Valve™ Exhaust System. It's recommended for diving in biologically contaminated water, when you're properly trained and equipped, using recommended procedures. This new exhaust has exceptionally low exhalation resistance that you must experience to appreciate.

⚠ WARNING

Before attempting any diving in any type of contaminated water, a complete diving and topside course in hazardous materials emergencies should be completed. The divers and the topside team must be properly trained and have the proper safety equipment. All helmets and suits can leak water under certain conditions. Divers should use extreme caution when diving in contaminated waters.

approved and *marked*

The **Kirby Morgan® 77** represents the first in a new generation of stainless steel diving helmets that provide an alternative for the diver who prefers a metal helmet. The helmet features a stainless steel version of our new REX® regulator, which offers the best performance of any Kirby Morgan system.

It has the best work-of-breathing performance when compared to ANY other commercial diving helmet. The Kirby Morgan 77 Dive Helmet has been tested and meets or exceeds European CE requirements and is fully commercially rated.

The advantages of this all stainless steel helmet include the following:

• No refinishing required if the surface is scratched or gouged.

• Faster production of helmets for customer delivery.

• Elimination of threaded inserts for securing the port retainer to the helmet shell.

• No need to remove the handle to remove the port retainer.

• One piece sideblock includes both the free-flow valve and the Emergency Gas System valve.

• The helmet ring is an integral part of the helmet.

CE *approved and* CR™ *marked*

The **Kirby Morgan 37SS** features an all stainless steel shell, as well as a stainless sideblock, helmet ring, bent tube, handle, and other key components. The SuperFlow® 350 is standard on this helmet.

The Kirby Morgan 37SS features a quick change communications module, available with either bare wire posts or a waterproof connector, and allows for easy, efficient maintenance of the helmet's communications.

The advantages of this stainless steel helmet include the following:

• Rugged helmet shell and other components

• No refinishing required if the surface is scratched or gouged

• Elimination of threaded inserts for securing port retainer to helmet shell

Chapter 2
Description & Operational Specifications - SuperLite®-17B

⚠ WARNING

This manual is our effort to explain the operation, maintenance and use of the SL 17. We do not herein make any effort to teach the principles of diving. It is our assumption the reader is a qualified diver. We highly recommend that all divers should train under controlled conditions, in the use of any commercial diving helmet that they have not previously used, or trained in, prior to use on the job.

This section includes a detailed description of the SuperLite®-17 as well as important operational specifications.

2.1 CR Marking

The helmet meets or exceeds all standards established by Dive Lab of Panama City, Florida, and is CR (Commercially Rated) marked.

2.2 CE Certification

The helmet has been tested and conforms to the performance requirements as set forth in Annex II of Directive 89/686/EEC and, as far as applicable, the EN 250:2000, EN 250/A1:2006 and EN 15333-1:2008 (class B). It is fully CE marked with demand regulator SuperFlow® and oral nasals P/N 510-690 and P/N 510-747.

Category of PPE: III

⚠ WARNING

The helmet has been tested with air and CE certificates for use with air up to 50 meters. Compressed air must be compliant with the EN 12021.
All the tables reporting the technical data and the pressure of use are relative to compressed air.

2.2.1. CE Marking

On the frame of the helmet the CE mark is affixed.

EN250:2000
EN250/A1:2006
EN15333-1:2008
CLASS B

KIRBY MORGAN®

KIRBY MORGAN DIVE SYSTEMS, INC.
1430 Jason Way,
Santa Maria, CA 93455

HELMET MODEL: _____

YEAR OF PRODUCTION: _____ CE 2049

CE Mark

In the mark the data reported are the following:

1. the name and the address of the manufacturer;
2. harmonized reference standard: EN 250:2000, EN 250/A1:2006 and EN 15333-1;
3. Helmet model;
4. the year of production;
5. CE marking: CE;
6. number of notified body.

⚠ CAUTION

The user cannot:
• remove the mark from the frame of the helmet;
• modify or counterfeit the data reported on the mark.

⚠ CAUTION

The mark must be visible and legible throughout the life of the PPE. If the mark deteriorates or is not legible the user should contact the manufacturer.

2.2.2. Notified Body

The Notifying Body is:	Eurofins-Modulo Uno S.p.A.
Address:	Via Cuorgne, 21-10156 Torino, ITALY
Identification number:	2049

2.3 Product Specifications

Weight: 29.03 pounds
Helmet Shell: Fiberglass, polyester resin, and carbon fibers
Control Knobs: Polyurethane
Lens: Clear polycarbonate
Neck Dam: Neoprene
O-Rings: Buna-N
Head Cushion: Nylon bag filled with #4 Polyester foam
The recommended lubrication type for breathing gas mixtures containing oxygen percentages greater than 50% is Christo-Lube®, Krytox®, Tribolube® and Halocarbon. Helmet gas train components being used with gas mixtures containing less than 50% oxygen can be lubricated with food grade silicone lubricant such as Dow Corning®111.

⚠ DANGER

Never use aerosol-propelled sprays near the face port of any Kirby Morgan diving helmet. The propellant used in these aerosols can invisibly damage the face port and cause it to shatter on impact from any strong blow. If the face port fails underwater, injury or death may result.

If you have any questions regarding proper set-up, operation, or maintenance of your SuperLite®-17 contact KMDSI (850) 928-7772 or at salesinfo@KirbyMorgan.com or Dive Lab Inc. (850) 235-2715 or at Divelab@aol.com

2.4 Regulator Performance

The regulator on the SuperLite®-17B offers very good performance. The helmet has been tested at Dive Lab in Panama City, Florida, as well as by other the United States Navy's Experimental Diving Unit and other independent testing laboratories.

2.5 Cage Code

The cage code for identifying KMDSI products for U.S. government purchase purposes is 58366.

2.6 Operational Specifications & Limitations

-Umbilical minimum I.D. 3/8" (9.5 mm) of not more than two sections, total length not to exceed 600 feet (183m).

Every model of KMDSI helmets and masks undergo extensive type testing to fully document the performance capability and required supply pressures when using various umbilical and pressure combinations. All users should take the time to become knowledgeable on supply requirements to insure proper performance and for the comfort and safety of the diver.

The required supply pressures for the SL-17 equipped with the SuperFlow® 350 regulators are listed in the appropriate supply pressure tables in Appendix 3.

The supply pressures listed in the supply tables were derived by breathing simulator trials. There are two tables used for the SuperFlow® and SuperFlow® 350 regulators. It is important that users understand how to use the tables. For further information on supply requirements for the SL-17 or any Kirby Morgan helmet or mask check the Kirby Morgan website at www.kirbymorgan.com.

⚠ WARNING

When the helmet is used for air diving in countries that conform to C.E. regulations it must be used to a maximum depth of 164fsw (50msw). I.A.W. EN 15333-1.

⚠ WARNING

The demand regulator and side block assemblies have a maximum design pressure of 250 psig (17.2 bar) over the ambient pressure, higher pressures could lead to component failure resulting in serious injury.

⚠ DANGER

Decompression diving always involves the risk of decompression sickness. Omitted decompression due to a loss of the breathing gas supply or other accidents can cause serious injury or death. Use of a SL 17 cannot prevent this type of injury.

⚠ WARNING

It is important for the user/diver to take excessive currents into consideration. The Quad-Valve™ Exhaust PN#525-759 is now standard on the SuperLite 17B. Unlike the old latex double exhaust, the quad system is not limited to a maximum depth of 150 FSW (46 msw) due to exhalation pressure.

-Temperature Limitations: Use at water temperatures below 33°F (1°C) requires the use of hot water shroud PN# 525-100 and hot water to help prevent icing of the demand regulator.

NOTE The Hot Water Shroud (Part #525-100) in conjunction with hot water to the diver should be used whenever diving operations are conducted using HEO_2 at water temperatures less than 60°F (15.56°C) for the comfort of the diver.

KMDSI further recommends that the shroud be used in conjunction with hot water to the diver whenever diving operations are conducted using air or mixed gas, in waters colder than 33°F (1°C) to reduce the possibility of demand regulator icing.

NOTE: Usually the greatest danger of demand regulator icing will be encountered on deck when the surrounding air temperature is less than 32°F (0°C). This effect is primarily due to the refrigeration effect of breathing air pressure reduction, and the addition of moisture from the divers exhalation coming in contact with the topside air temperature.

If diving where the water temperature is 33°F (1°C) or warmer but the topside air temperature is below freezing, (32°F (0°C) icing of the demand regulator is possible. To help eliminate the possibility of freezing on the surface, warm water should be run over the exterior of the demand regulator prior to water entry, if the hot water system is not used.

Only equipment certified and tested according to EN 250/E DIN 58 642 may be used with the SL 17 helmet when conducting diving operations in European EC compliant countries.

The umbilical assembly should be composed of good quality diving hose that meets industry standards. Generally, gas hose will be married to the communications wire, pneumofathometer hose, and strength member in a manner that will allow the strength member to receive all the strain. There are also good quality umbilicals available that are assembled at the factory using a twisted method which does not require marrying.

Regardless of the system used, the umbilical is the diver's life line and should always be of excellent quality and maintained carefully.

⚠ WARNING

Gas systems used to supply Kirby Morgan helmets and masks must be capable of supplying gas to the diver at the required pressure and flow rates as stated in the operational specifications. The use of unregulated gas sources is extremely dangerous.

The use of standard SCUBA type regulators is unacceptable, as there are no provisions for adjusting the intermediate pressure to the diver. Only proven systems that allow for varying the gas supply pressure to the diver should be used for umbilical diving.

2.7 Helmet Features

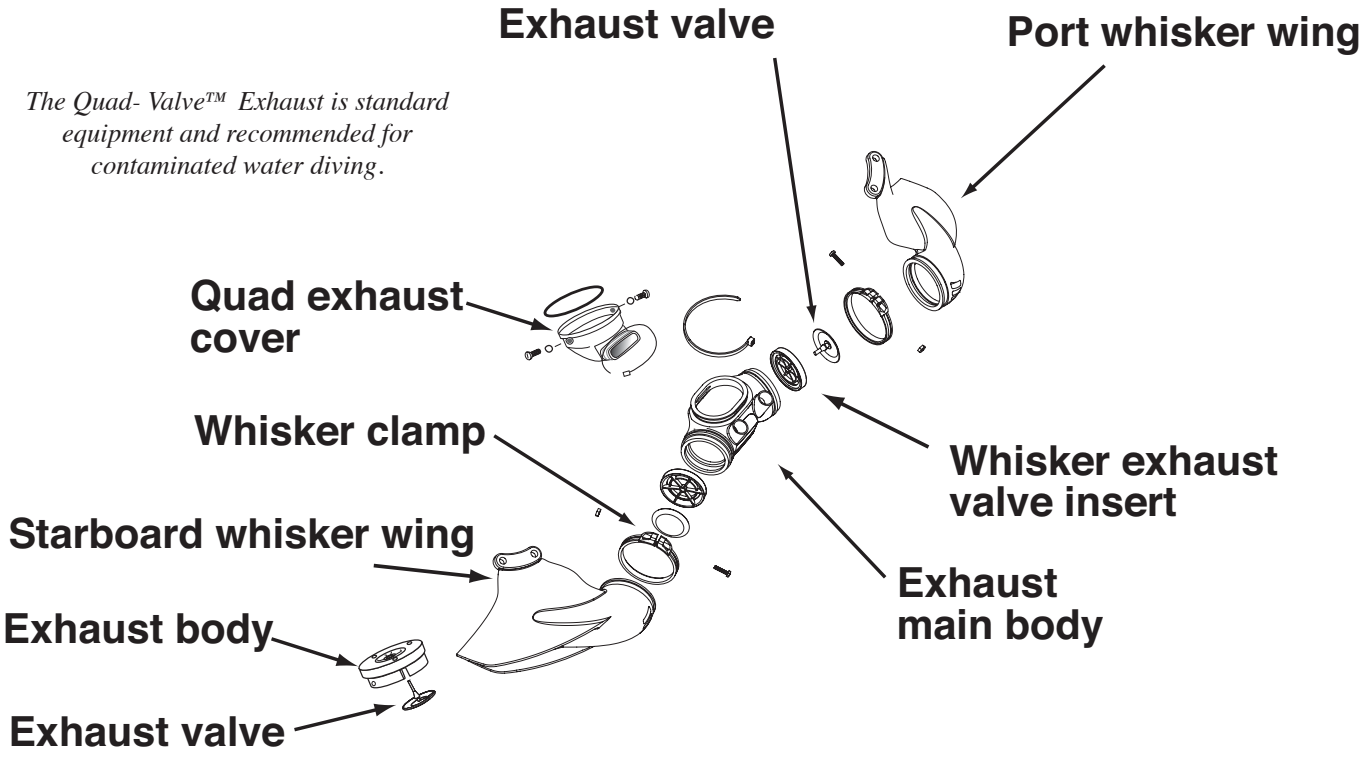
All Kirby Morgan diving helmets are manufactured by hand. Each step of the manufacturing process is carefully controlled to assure the customer a high quality, durable helmet that will function properly.

The SL 17 was developed in the late 1970s and it is still one of the most popular diving helmets in the world, a tribute to its timeless design.

The SL 17 incorporates an innovative locking system and the SuperFlow® adjustable demand regulator which provides an outstanding breathing gas flow during peak work output.

The helmet consists of two pieces: the helmet shell/helmet ring and the neck dam/yoke assembly. The head cushion and yoke gives the diver a secure fit in the helmet. The fit and balance seats the helmet comfortably for long periods of time even when working in the face down position.

The Quad- Valve™ Exhaust is standard equipment and recommended for contaminated water diving.



The SL 17 is configured to receive the umbilical over the shoulder.

In the past, the optional Double Exhaust System (Part # 525-102) was available to reduce the possibility of back flow of water and contaminants into the helmet. This system has been used successfully for diving in biologically contaminated environments for many years. To further reduce the possibility of water intrusion regardless of the exhaust system being used, the diver should avoid working in an inverted position.

The double exhaust was replaced by the Quad-Valve™ System. The unique design of the Quad-Valve™ helps keep exhalation resistance low while maintaining excellent watertight integrity.

⚠ WARNING

Before attempting any diving in any type of contaminated water, a complete diving and topside course in hazardous materials emergencies should be completed. The divers and the topside team must be properly trained and have the proper safety equipment. All helmets and suits can leak water under certain conditions. Divers should use extreme caution when diving in contaminated waters. For more information see the book "Diving in High-Risk Environments" by Steven M. Barsky.

⚠ CAUTION

When diving in heavy current (i.e. exceeding 3 knots) the single exhaust system on all KMDSI masks/helmets could allow water to enter, due to turbulence/eddying. It is important for the user/diver to take excessive currents into consideration. The Quad-Valve™ Exhaust system will help prevent water intrusion when diving in heavy currents. Unlike the old double exhaust, the Quad-Valve™ does not limit the diving depth.

The Quad-Valve™ exhaust system is now standard equipment for the SL 17. This superior exhaust system has exceptionally low exhalation resistance, and helps to keep the helmet free of contaminants in polluted water. The Quad-Valve™ isolates the breathing system from the surrounding water with a four valve, low breathing resistance design (Patents Pending).

The Quad-Valve™ is designed to couple the regulator exhaust with the helmet main exhaust and route them into a single plenum chamber, mounted between the regulator body and main exhaust body. The exhaust gas then must pass through either one of two (or both) exhaust valves that are part of the bubble deflector (whisker wing). By having an exhaust valve in both sides of the bubble deflector, exhalation resistance is minimized, while still helping to maintain the isolation of the main helmet and regulator exhaust valves.

Other helmet features which are common to all KMDSI helmets include:

- the face port and retainer ring
- basic communications components
- the oral nasal mask
- the nose block device
- the air train
- most demand regulator components

Many of the breathing system components on these helmets are also compatible with the KMB 18B and 28B. This helps reduce the inventory of spare parts that must be carried by commercial diving companies.

Each step of the manufacturing process is carefully controlled to assure the customer of a high quality, durable helmet that will function properly. The following is a general description of the features of the SL 17.

1) The fiberglass shell face port (or view port) area remains unchanged. The side block and bent tube assembly that transports air/gas to the demand regulator from the side block are also the same. Most of the components in these areas are interchangeable between the 17B and models 27, 37, 47, and 57.

2) The neck dam on the SL 17 is secured by the neck clamp. Replacement neck dams install easily.

3) The head cushion attaches just inside the bottom of the helmet, keeping it in place when the diver dons the hat. The standard head cushion consists of a brushed nylon bag with an open cel polyester foam inside. Only genuine Kirby Morgan SL 17 head cushions should be used to ensure proper operation and comfort.

4) The handle that is fitted to the top of the SL 17 and the port weight are areas that can be used as mounting brackets for lights, TV cameras, etc.

2.8 General Description

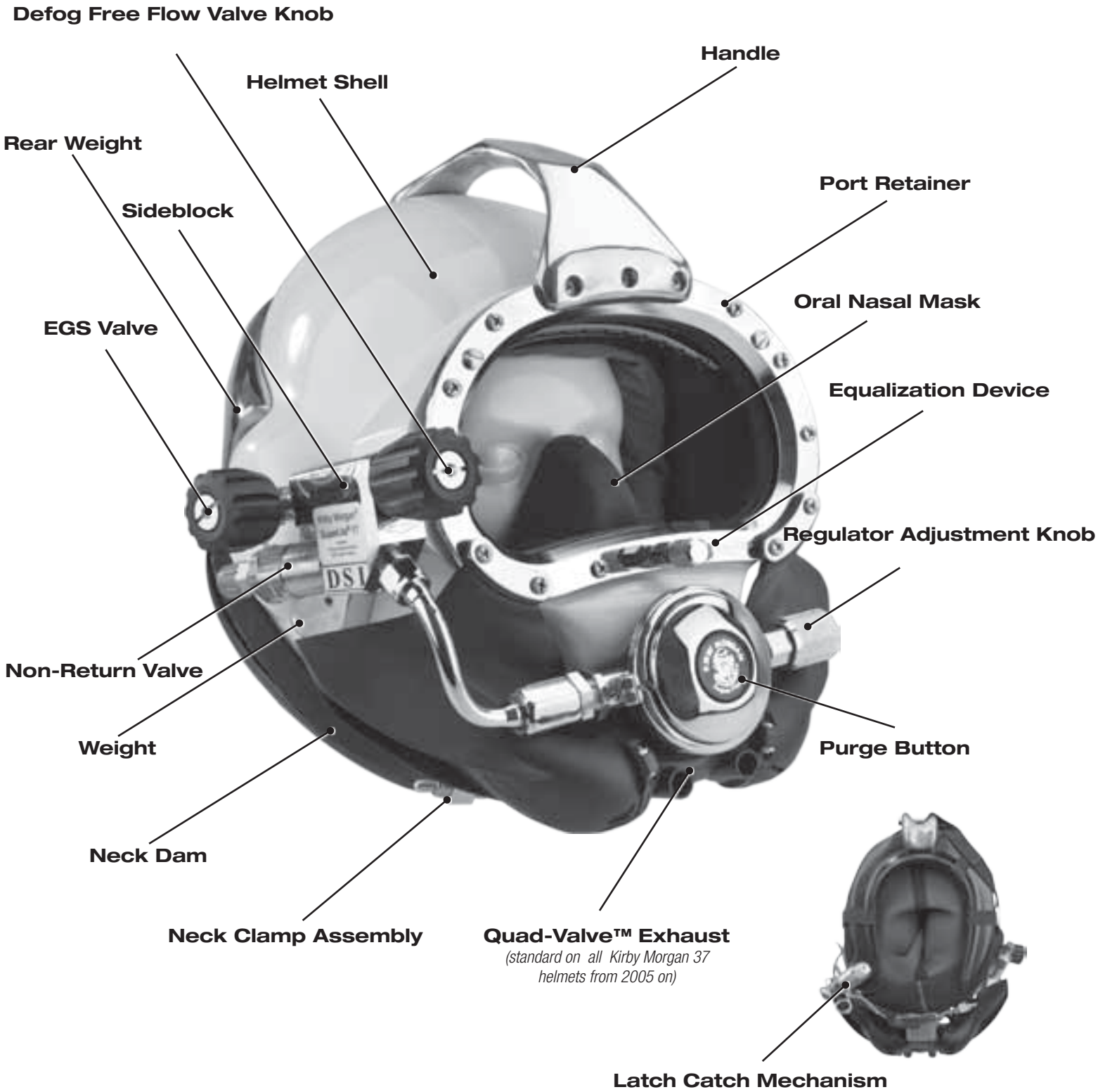
2.8.1 Helmet Shell

The helmet shell is fabricated of noncorrosive, rigid fiberglass which will not carry an electrical charge. This shell is the central structure for mounting all the components that make up the complete helmet. It is designed to allow easy replacement of parts when necessary. Any repair to the helmet shell must be done at an approved KMDSI repair center.

2.8.2 Gas Flow Systems

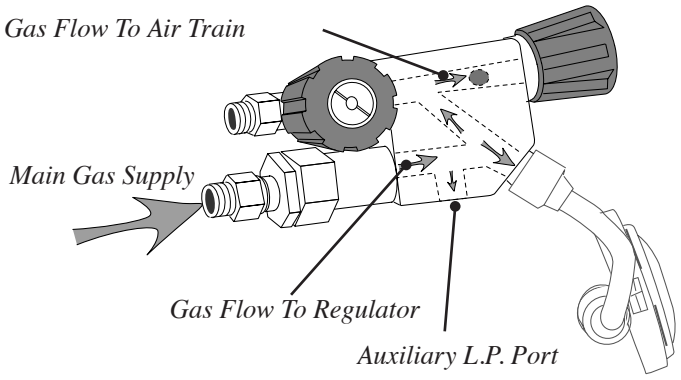
The main gas supply flow from the umbilical enters the system at the adapter and flows through the one way valve to the interior of the side block. The one way valve or "non-return" is a very important component.

It prevents the flow of gas out of the helmet to the umbilical in the event of a sudden lowering of pressure in the supply hose. This can happen due to an accidental break in the hose or a fitting near the surface. Not only would the Auxiliary gas be lost if the one way valve failed (concurrent with a hose or fitting break on deck), but the diver could suffer from a serious "squeeze" that could cause injury or death.



The SuperLite® 17B helmet

Although we have selected the valve for its reliability and quality, inspection and maintenance of this valve must be done regularly. It is very easy to disassemble and inspect. (A rebuild kit for this valve is Part #525-330).



⚠ WARNING

The one way valve must be tested daily, prior to the commencement of diving operations. Failure of one way valve could cause serious injury or death. Follow the procedures for testing the valve in this manual.

The emergency gas comes from a tank of compressed gas worn by the diver. It enters the system through the Emergency Gas valve when the diver turns the control knob on. The flow then enters the side block.

Both sources of gas flow through the same passage in the side block body to two exits. One exit is always open to supply gas to the demand regulator assembly. The other exit is to the defogger valve (free-flow valve) assembly.

The diver controls the flow of gas through the defogger system with the control knob. The gas enters the helmet and flows through the air train which directs the gas onto the face port to help eliminate or clear fogging of the faceplate that forms from the diver's warm breath.

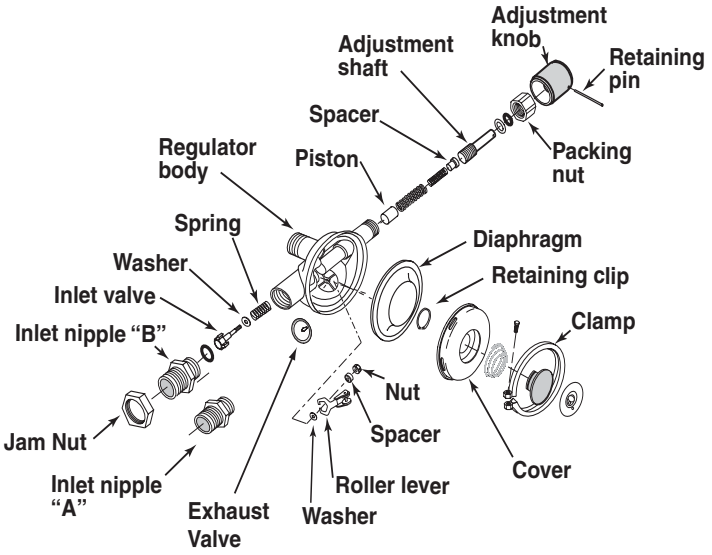
The flow continues out through the water dump (helmet exhaust) valve, or into the oral nasal by means of the valve, then into the regulator and out through the regulator exhaust to the Quad-Valve™ whiskers. The diver can breathe from this flow of gas if the demand regulator malfunctions.

Returning to the side block assembly: the other passage for gas is to the demand regulator. It goes to a bent tube assembly that connects to the inlet nipple of the demand regulator. The flow of gas in the demand regulator assembly is controlled by the inlet valve that supplies gas to the diver on inhalation "demand" only, and shuts off during the exhalation cycle.

The SuperFlow® demand regulator senses the start of the divers inhalation and opens the inlet valve, matching the diver's need. The regulator continues to match the diver's inhalation as the rate increases, peaks, then ebbs and stops.

When the diver exhales, the supply gas stays off as the exhalation gas flows through the regulator body, out the regulator exhaust valve, through the Quad-Valve™ whiskers, and out into the water. The whiskers deflect the exhaust bubbles away from the face port to keep the diver's view clear.

All KMDSI Helmets and Band Masks are equipped with a multi-turn demand regulator adjustment knob. This adjustment knob allows the diver to make corrections to compensate for a wide range of incoming gas supply pressures. **See the section in this chapter regarding appropriate supply pressures.**



The SuperFlow® Demand Regulator

⚠ DANGER

Never connect the main gas supply hose from the diving station/umbilical to the emergency valve. There is no one way valve in the emergency valve. If this mistake is made, any break in the supply hose could possibly result in a "squeeze".

This could result in serious injury or death.

The adjustment knob operates by simply increasing or decreasing the amount of spring bias tension on the demand regulator inlet valve. The adjustment knob has a range of approximately 13 turns from full in to full out. The intent of this bias adjustment device is strictly to allow the diver to make adjustments for variations in umbilical supply pressure.

This adjustment device is not intended as a minimum-maximum device. Minimum and maximum applies to supply pressure only. The adjustment knob should be adjusted by the diver to be at the easiest breathing setting at all times. The exact number of turns required is dependent on the supply pressure.

Diving a KMDSI helmet or BandMask® with a bias setting greater than that just necessary to keep the demand valve from free flowing increases the work of breathing and reduces the diver's ability to perform heavy work.

⚠ CAUTION

The regulator adjustment knob should be adjusted to the easiest breathing setting at all times. Adjusting the regulator further in than necessary to keep from free-flowing increases breathing resistance.

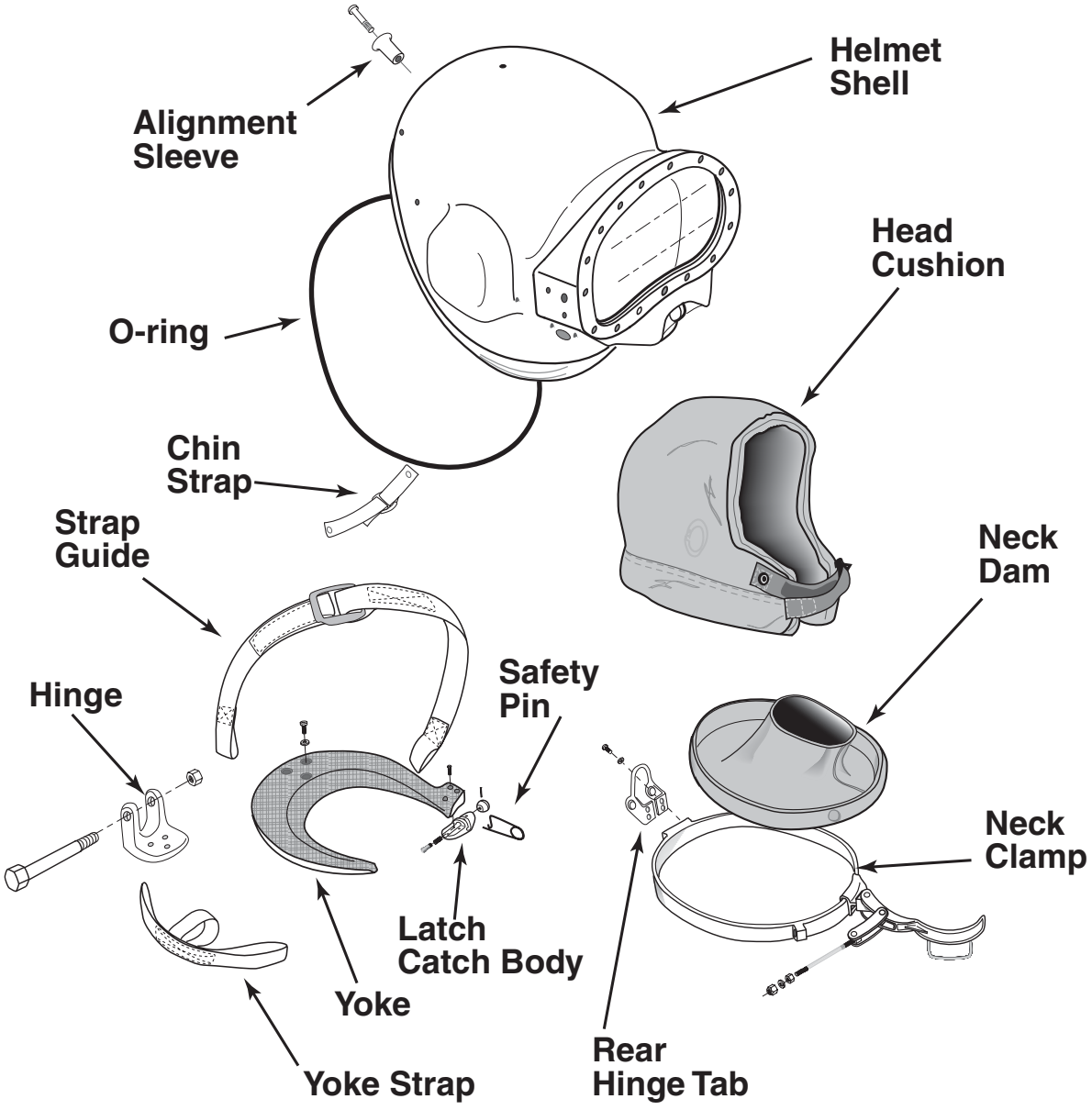
The side block on the helmet is drilled and tapped to accept low-pressure inflator hoses. This allows the diver the capability to inflate variable volume dry suits. It is tapped with a 3/8-24 thread orifice, standard for American first stage scuba regulator's low-pressure auxiliary fittings.

The port is shipped plugged at delivery. This inflation capability does not significantly interfere in any way with the breathing characteristics of the regulator during normal use providing a limiting hose is used. When using a dry suit inflation hose, the hose should be equipped with a flow restrictor (P/N 555-210) to limit flow in the event the hose ruptures or is severed.

⚠ WARNING

The side block inflator port is intended for dry suits only. When using the side block low-pressure inflator port, only good quality hoses and fittings should be used and must incorporate an in-line flow restrictor to reduce gas flow in the event of hose failure. Any hose or fitting failure in this arrangement will subject the diver to a decreased air supply. Do not use the side block inflator port for any purpose other than attaching a dry suit hose.

The KMDSI Restrictor Adaptor, KMDSI Part #555-210.



The Neck Dam and Neck Clamp Assembly

⚠ WARNING

When using the side block low pressure inflator port, the diver should only use high quality hoses with an integrated flow restrictor or a KMDSI flow restrictor PN# 555-210. All hoses must have an in-line restrictor to reduce the gas flow in the event of hose failure.

Do not use fitting adapters. Standard adapters do not provide an adequate flow restriction. The use of many off the shelf adapters on the side block assembly could expose the low pressure hose fittings to excessive stress. Any failure of an inflation hose will subject the diver to a decreased supply pressure.

2.8.3 Emergency Gas Supply System (EGS)

KMDSI strongly recommends that the working diver carry an independent supply of compressed gas (or air) fitted with a first stage regulator and hose that is connected to the inlet of the Emergency Gas Valve (EGV).

The KMDSI Overpressure Relief Valve, (part number 200-017) is fully adjustable and rebuildable and has been designed to relieve any over-pressurization of the first stage regulator greater than the desired setting.

Every bailout (Emergency Gas System or EGS) first stage regulator must be fitted with an overpressure relief valve to prevent over pressurization of EGS L.P hose and possible total loss of emergency supply gas in event of regulator failure.

⚠ WARNING

Be sure the Emergency air/gas first stage regulator is fitted with a relief valve for over-pressurization of the emergency gas supply hose. A leaky first stage can overpressure the hose resulting in hose rupture. This would cause a loss of the entire emergency gas supply, with possible serious injury or death.

The over-pressure relief valve should be installed on every first stage used for bailout.

KMDSI Part #200-017

NOTE: This valve can be adjusted for various relief pressures.

2.8.4 Helmet Attachment to the Diver

On the SuperLite®-17 A/B, the helmet shell has an O-ring seal around the base of the fiberglass rim. The helmet is held in place on the diver's head by the yoke/neck clamp, which mounts on the diver's neck and seals to the bottom rim of the helmet.

The adjustment of this clamp is critical to the safe use of the helmet. Periodic adjustments to the clamp MUST be made as the neck dam ages or if you convert to a dry suit mount. The adjustment should always be checked if the yoke clamp assembly is used on different helmets. YOU SHOULD NEVER HAVE TO FORCE THE CLAMP SHUT.

⚠ WARNING

Do not dive unless the latch catch is properly engaged and the strap guide and yoke strap are in position. Failure to use these devices to properly secure the helmet on the diver's head could lead to drowning, which may result in severe personal injury or death.

The head cushion is made from layers of open cell foam inserted in a head shaped nylon bag. Adding or subtracting foam layers from the bag can adjust the fit of the head cushion. The head cushion must be adjusted correctly for the helmet to fit properly.

2.8.5 Sealing Arrangement

The neck dam is available in several sizes and is fabricated in a cone shape. The neck dams on all SuperLite®-17A/Bs are made of foam neoprene.

The neck dam seals against the diver's neck. The fit of the neoprene neck dam may be made larger by trimming 1/4" off the circumference. Only trim a

maximum of 1/4” at a time; trimming too much will result in a loose fit.

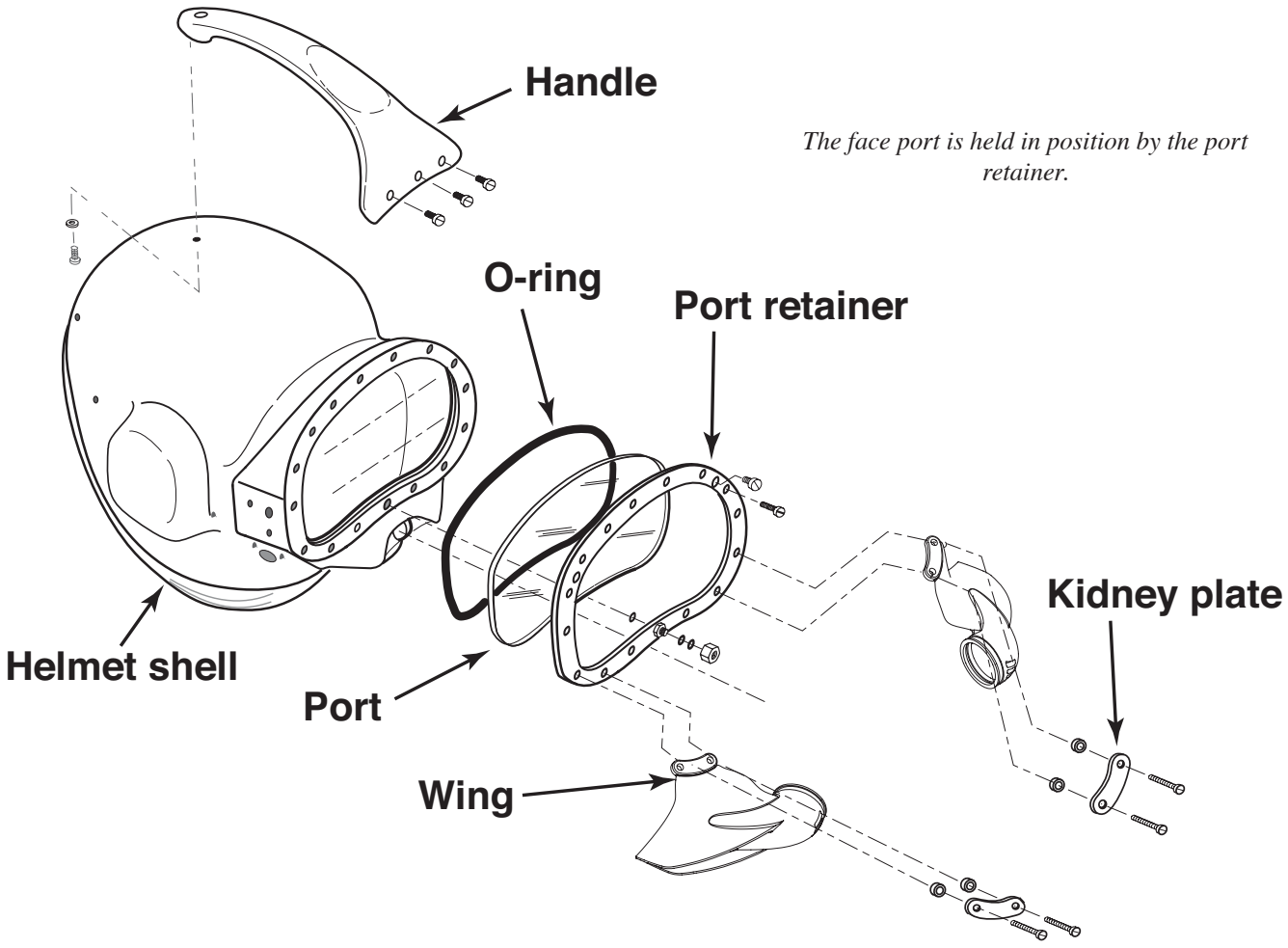
NOTE: If you must trim the neck dam, be careful not to trim off too much material. The neck dam must fit snugly. While it may be a slight bit uncomfortable out of the water, and may feel snug, once in the water the neck dam will loosen slightly.

⚠ WARNING

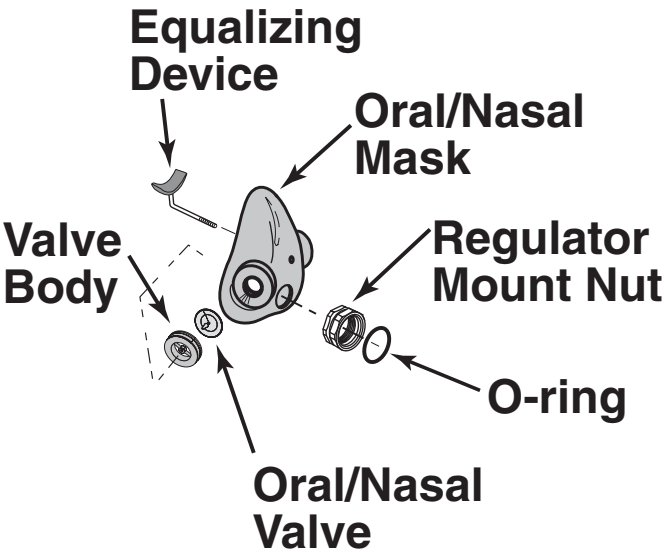
Pulling the neck dam over the diver’s head can be difficult. Stretching (expanding) the seal and placing it part way over the head can help reduce the force needed to install the seal. Proper training is necessary to install the neck seal over the diver’s head and onto their neck. Although the possibility is very remote, injury may result if this procedure is not done properly. If a diver does not know how to don the neck dam, they must seek proper instruction before proceeding.

2.8.6 Reducing Carbon Dioxide

It is important to minimize the volume of air/gas space that the diver is breathing through. Carbon dioxide (CO2) can build up if proper flushing does not occur. A silicone oral nasal mask is located inside the helmet that fits over the diver’s nose and mouth.



The face port is held in position by the port retainer.



The oral nasal mask, valve, and equalizing device.

The oral nasal attaches to the regulator mount nut. This separates the breathing gas flow from the rest of the dead-air space inside the helmet, subsequently reducing the potential for carbon dioxide buildup.

⚠ WARNING

Always be sure the oral nasal valve is properly mounted in the oral nasal mask. If the valve is mounted improperly or is absent this can lead to a higher CO_2 level inside the helmet. A higher CO_2 level can cause dizziness, nausea, headaches, shortness of breath, or blackout.

2.8.7 Communications

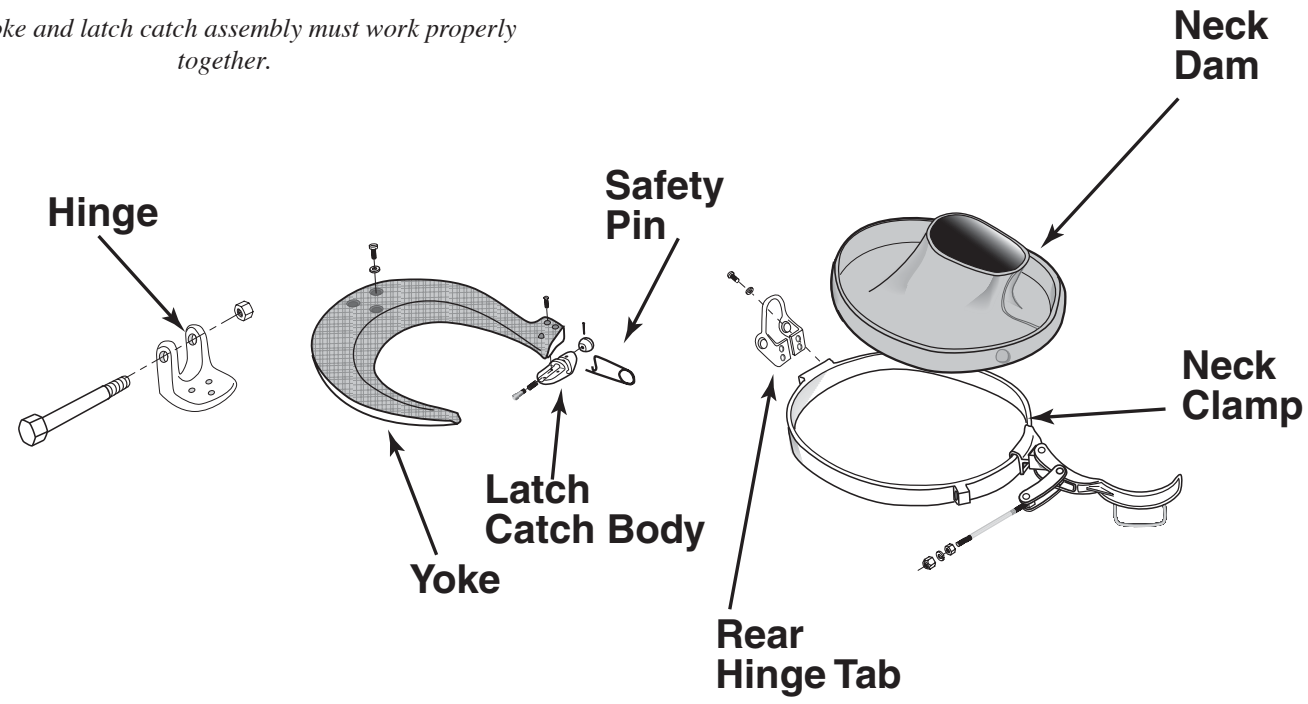
In the SL 17, both earphones and microphone are wired in parallel to the communications system. The communications can be equipped with either a waterproof connector, or binding posts for bare wire connection.

Electrical signals are sent to, and received from, the surface through the umbilical wires. An amplifier boosts the signals to the desired volume for the surface and the diver.

2.8.8 Equalizing the Middle Ear

A nose block device allows the diver to block their nose to provide an overpressure in their middle ear for equalization. The blocking pad on the inside of the oral nasal mask is attached to a shaft which passes through a packing gland to the outside of the helmet.

The yoke and latch catch assembly must work properly together.



A knob attached to the end of the shaft can be pushed in to slide the pad under the diver's nose.

When not needed, the knob is pulled out so the pad does not rub under the diver's nose. The pad may also be turned upside down (to provide more clearance under the diver's nose) by rotating the shaft.

2.8.9 Face Port or Viewing Lens

The face port or viewing lens is extremely strong clear polycarbonate plastic which is easily removable for replacement of the lens. An O-ring, located under the lens, seals the lens to the fiberglass helmet shell.

⚠ DANGER

The port retainer screws must be tightened to proper torque specifications per the instructions in this manual. See Appendix 1 for proper torque specifications. Do not over tighten. This could lead to helmet flooding and drowning could result.

2.8.10 Latch Catch Assembly, Pull Pin

The latch catch assembly includes the pull pin and safety pin. The purpose of this assembly is to ensure that the neck clamp assembly remains securely fastened around the base of the helmet, so the helmet remains on the diver. This arrangement functions in a similar manner to the old "dummy pin" on a heavy gear helmet.

All SuperLite®-17A/B & U.S. Navy MK-21 Mod. 0 & Mod. I Helmets sold by KMDSI now have the Pull Pin Latch Catch Assembly", Part Number 505 -010 (brass) or 505-011 (chrome)on the helmet to lock the Yoke in position. The mounting system for the Pull Pin Latch Catch Assembly is identical to the old style Push Pin Latch Catch Assembly, # 505-015 which is now obsolete.

Each Pull Pin Latch Catch Assembly is shipped with a Safety Pin, Part Number 535-900 which we recommend be used when the user requires a two step release system on the helmet. It can be used with or without a cord attached to prevent loss of the Safety Pin when not in use. All Pull Pin Latch Catch Assemblies, P/N 505-010 or 505-011, which are sold as spare or replacement parts include this Safety Pin, P/N 535-900.

The Latch Catch is designed so that in the event that the pin is pulled and the yoke drops down, the neck clamp will remain closed. It's like two separate locks.

Old latch catch assembly. This device should not be used any longer.

Current latch catch assembly with safety pin.

2.9 Accessories

2.9.1 Eye Protection for Welding

The Welding Lens assembly (Part #525-403) or the new Weld Shield Assembly (Part #525-400) may be installed on the port retainer using the predrilled and tapped holes that are provided. These holes are plugged with blanking screws when a new helmet is shipped from the factory.

The weld lenses are standard 2 x 4 1/2 inches or 4 1/2 x 5 1/2, identical to the lenses used in topside welding hoods. They may be replaced quickly without tools.

The KMDSI Welding Lens for the SuperLite®-17 (KMDSI Part #525-403)

⚠ CAUTION

Be sure to use only the specific mount screws provided with the weld lens assembly. Longer screws can damage the port retainer mounting inserts and cause the face port O-ring to leak.

The KMDSI Weld Shield Assembly (KMDSI Part #525-400)

2.9.2 Hot Water Shroud

KMDSI manufactures a hot water shroud kit for the SL 17. The shroud completely encases the side block, bent tube assembly, and demand regulator to provide efficient gas heating for especially deep or cold dives. Heating the diver's breathing gas is especially important in cold water or when breathing mixtures of helium and oxygen.

The hot water shroud is recommended for deep mixed gas diving.

2.9.3 Special Regulator Tools

Four special tools are available for internal adjustment of the demand regulator assembly (105); the inlet valve holder, regulator adjustment wrench, socket wrench and castle wrench. These three wrenches make regulator adjustment much easier. The tools come in a convenient, wallet sized pouch with instructions. (Part #525-620). This tool kit ships standard with every Kirby Morgan helmet and band mask.

The Regulator Tool Kit, Part #525-620.

2.10 Helmet Transport And Storage

- the kind of package is a cardboard box with air filled pillows with styrofoam inserts to stabilize the helmet;
- the weight of the box is usually 40 pounds (18 Kg);
- the package dimension is 18 × 18 × 15 inches (460 × 460 × 380 mm);
- one helmet is packed per box;
- the helmets are sent to dealers by plane and truck. Depending on how the dealer wants it sent.

Packaging Step 1

Packaging Step 2

Packaging Step 3

Packaging Step 4

Packaging Step 5

Packaging Step 6

2.10.1 Helmet Carrying Bag

To help protect your SL 17, the helmet carrying bag should be used to transport and store your helmet between jobs.

The KMDSI Helmet Bag, Part #500-901.

The KMDSI bag is made from extra heavy duty, black, ripstop nylon. The bottom of the bag is padded for additional protection. Grommeted drain holes allow the bag to breathe. The bag is also equipped with large carrying straps and side pockets. The bag is not intended for shipping your helmet as air cargo. The part number for the bag is Part #500-901.

2.11 Use of Kirby Morgan Original Replacement Parts

Users of Kirby Morgan life support equipment are cautioned to always use Kirby Morgan original replacement parts. Parts manufactured by third party companies can cause accidents.

Look for the Kirby Morgan logo on Kirby Morgan products. This is your assurance that you are getting genuine Kirby Morgan replacement parts.

Chapter 3
Operating Instructions

⚠ WARNING

This manual is our effort to explain the operation, maintenance and use of the SuperLite®-17B. We do not herein make any effort to teach the principles of diving. It is our assumption the reader is a qualified diver. We highly recommend that all divers should train, under controlled conditions, in the use of any model of commercial diving helmet that they have not previously used or trained in, prior to use on the job.

3.1 Introduction

This section provides advice on how to use the SuperLite®-17B. The use of these diving helmets will vary with the type of work and environmental conditions. The basic procedures of donning and removing these helmets will be similar for every job.

A proper training program in a calm, clear body of water should be undertaken. If the diver has not used the SuperLite®-17B before, they must not dive with these helmets without proper training.

However, divers that are familiar and trained in the use of previous Kirby Morgan masks; i.e., KMB 8, 9, 10, 18, 28, the Navy MK. 1 mask, Navy MK. 21 helmet, or the Navy Mk. 22 mask, or other Kirby Morgan helmets, will find that all Kirby Morgan diving helmets and masks have the breathing system controls located in the same position. The operation of this helmet will also be similar. The diver must be tended at the surface at all times by a trained, qualified commercial diving tender.

3.2 Design Purpose

All Kirby Morgan diving helmets are designed for use with an umbilical.

The umbilical is usually composed of at least a gas or air supply hose and communication wire, assembled with waterproof tape (and in some umbilicals wound similar to strands in a rope) to form a single unit. Some umbilicals also have included a hose for hot water, a pneumofathometer hose, and a strength member, such as a cable or strong line.

It is strongly recommended that the air/gas umbilical be married to a strength member in a manner that allows the strength member to receive the strain. This will help reduce the possibility of umbilical and umbilical fitting fatigue and possible failure.

⚠ WARNING

Kirby Morgan diving helmets are not intended for use with a self contained gas supply (scuba). There is no provision for surface swimming once the scuba air supply is depleted. This could lead to suffocation or drowning, which could be fatal.

The diver must be tended at the surface at all times by a trained, qualified commercial diving tender.

The umbilical is the diver's lifeline to the diving control station.

The diver must be tended at the surface at all times by a trained, qualified commercial diving tender. Never dive without a qualified tender holding your diving hose.

The diving control station can be at the surface, in a diving bell, or in a submerged habitat. The diving control station is the center of the air/gas supply, communications with the diver, and diving procedures. The station can be as simple as a tender with a set of "phones" (communication amplifier), or as complex as a control van in the midst of a saturation system.

⚠ WARNING

Decompression diving always involves the risk of decompression sickness. Omitted decompression due to loss of gas supply or other accidents can cause serious injury or death. The use of the KM 37 or 57 cannot prevent this type of injury.

KMDSI manufactures a complete Air Control System, the KMACS 5™ with or without integrated communications as well as pneumofathometer. This portable system can be operated on either a high pressure air supply or on a low pressure compressor. The Air Control System has a specially designed high pressure regulator that reduces high pressure air and provides an adequate flow to support divers to a depth of 130 FSW (40 msw)

The helmet demand regulator and side block assemblies have been designed to operate with a supply pressure from 90 p.s.i.g. (6.2 bar) over ambient pressure to 225 p.s.i.g. (16 bar) over ambient pressure. This wide operating range allows flexibility when using various gas supply systems.

⚠ WARNING

High pressure supply regulators and associated piping systems for surface supplied diving with Kirby Morgan helmets and masks must be capable of delivering a minimum of 4.5 acfm to the diver at depth. Only systems that can deliver the required gas flow should be used.

When using a high-pressure console, for maximum breathing performance it is desirable to maintain an over bottom supply pressure of 150-165 p.s.i.g. (10.2 bar) when diving to depths of 100 FSW (30 msw), and 175-200 p.s.i.g. (11.2-13.6 bar) over bottom when diving to depths in excess of 100 FSW (30 msw). With the many different gas supply console configurations in use, it is important to ensure that the gas supply system used, is capable of supplying the helmet with the necessary pressure and flow of gas to allow the diver to work safely and efficiently. See Table 1 in Section 2.5 as a guide to supply pressure requirements.

When using a low-pressure compressor (200-225 p.s.i.) follow the recommendations in Table 2 in Section 2.5 for optimum performance.

In countries that have adopted C.E. standards only C.E. certified supply systems and components may be used in conjunction with the helmet.

3.3 First Use of Your Kirby Morgan Diving Helmet

When you first receive your Kirby Morgan diving helmet, carefully unpack it and examine it for any damage that may have occurred during shipment. Use the inspection sheet provided to ensure that no damage has occurred. The purchaser must contact the freight carrier and/or the KMDSI dealer if the helmet has been damaged in shipment.

Be sure to complete the enclosed warranty card and return it to KMDSI immediately. No warranty claims will be honored without a correctly completed warranty card on file at KMDSI.

⚠ WARNING

KMDSI must have your current address to ensure that you receive all safety notices and other important information concerning the helmet. Please notify KMDSI of any change of address.

3.4 Initial Adjustments to Your Helmet

Before using the helmet for the first time, it must be checked and adjusted for proper fit. There are several adjustments that must be made to provide a more comfortable fit when wearing the helmet.

3.4.1 Head Cushion

The fit of the helmet is primarily determined by the layers of open cell foam that fill the head cushion bag.

The center top/rear foam in the SuperLite®-17B is very dense to reduce compression and spring-back. This reduces the tendency of the helmet to ride up when underwater. Do not replace this rigid foam with a soft foam. A softer foam is used on the sides and around the bottom of the head cushion.

The diver's head can be moved forward into the oral nasal mask by adding layers of additional foam at the rear of the head cushion. The diver's head can be moved up or down in the helmet by decreasing or increasing the foam pads at the top of the head cushion.

Usually, a diver with a small head will use all the foam that comes with a new hat. A diver with a larger head will need to remove a layer of foam in the center top and back of the head cushion. The foam may be cut with scissors to provide a better fit, or more foam

The head cushion must fit properly. You can add or remove foam to adjust the fit.

can be added to give a tighter fit.

The head cushion fit is extremely important. A proper fitting headliner keeps the nose and mouth securely in the oral nasal allowing a good seal and providing maximum regulator performance and CO2 washout.

On the SuperLite®-17B there is a chin strap separate from the head cushion bag. The chin strap bolts directly to the helmet and is secured around the outside of the head cushion in the chin area. Ensure the chin strap is used.

If the chin strap is not fastened or positioned properly, the helmet can float up on the diver's head. This can make the helmet very uncomfortable and may pull the oral nasal mask away from the face. Addition-

⚠ WARNING

On older SuperLite®-17B helmets the chin strap is part of the head cushion. All helmets should be changed to have the chin strap bolt directly to the helmet.

Old style head cushions with chinstraps may be used, but the chin strap that is bolted to the helmet MUST be used. We recommend that the old head cushion chin strap be removed (i.e., cut off) to prevent confusion.

ally, in the unlikely event the helmet was separated from the neck clamp/yoke assembly, the helmet will be retained.

3.4.2 Adjusting the Neck Dam

If your helmet is new, or any time you replace the neck dam, it must be adjusted to fit you. New neck dams are cone shaped and will probably be too tight if not properly trimmed.

Trim the neck dam until it is still snug. (You can also stretch it by sliding it over a SCUBA tank and allowing it to sit overnight.) If you still cannot get the proper fit by stretching the neck dam, it must be trimmed further. Do not trim more than 1/4 inch at a time.

⚠ WARNING

Never dive with a neck dam that is too tight. A neck dam that is too tight could cause the diver to pass out due to pressure on the carotid artery in the neck. This could lead to severe personal injury or death.

Trim the neck dam until it is still snug. Trim only a maximum of 1/4 inch off the circumference of the neck dam at a time. When you are done, the neck dam must be tight enough so that it does not leak. This may feel a bit snug out of the water, but will be more comfortable underwater once the neoprene compresses from increased pressure.

Trim the neck dam with the largest, sharpest scissors available, in order to make as few cuts as possible. There must be no jagged edges on the neck dam or it may eventually tear. Sew and/or glue the edge of the original seam to keep the stitching from unraveling.

As the neoprene neck dam ages, it will become looser, due to a natural breakdown of the cells. This is particularly true if the helmet is locked in and out of a bell or saturation system. As the neck dam becomes worn it will need replacement to ensure that it seals properly.

A neoprene neck dam that is too large may be tightened up by cutting a wedge out of the open end. Glue the cut back edges back together using wet suit cement, then sew the glued seam together. Be sure to allow the modification to the neck dam 24 hours to dry and solvents to off gas.

⚠ CAUTION

Avoid trimming neoprene neck dams too much. Neoprene neck dams will loosen over time as they are used and the cells of the foam neoprene break down. If you trim the neck dam too much it will be too loose and will leak. Trim the neck dam until it is snug, then stretch it before use.

⚠ WARNING

Do not breathe the fumes from uncured neoprene cement. These fumes are dangerous and can cause unconsciousness. They can also cause long term damage to body tissue. Read and follow all precautions listed on the neoprene cement can. Allow neoprene cement to cure for a minimum of 24 hours before using the helmet.

New neck dams must be adjusted so that they fit properly.

3.5 Pre Dress-In Procedure

Before dressing in for a dive, inspection of the helmet systems must be made to be sure it is in proper working order. This must be done well in advance of the dive so any problems can be fixed without delaying the dive. The following steps are part of the recommended daily maintenance.

3.5.1 Pre-Dive Visual Inspection

Visually inspect the exterior and interior of the helmet.

1) The demand regulator cover assembly should not have excessive dents or dents deeper than 1/4". The purge button must operate freely and should have no less than 1/16" and no more than 1/8" inward travel before gas flow is heard.

⚠ WARNING

There must be no holes in the neck dam. If there are any holes in the neck dam the helmet could leak or flood. In addition, the demand regulator will not operate properly. Drowning could result.

2) The neck dam must not be torn or punctured, and properly trimmed to fit.

3) Inspect the O-ring on the bottom of the helmet shell. The O-ring must be in place and undamaged.

4) Inspect the bent tube that supplies breathing gas to the regulator. There must be no dents or kinks in the assembly, or visible signs of damage.

5) Inspect the face port. It must be in good condition.

6) Be sure the communications wires are hooked up and tested.

7) Inspect the oral nasal mask. Make sure it is on the regulator mount nut properly and the valve is installed properly.

8) Make sure the head cushion is properly fastened inside the helmet.

9) Check the screws on the port retainer . They must be adjusted to the proper torque setting specifications noted in Appendix 1 of this manual.

Binder head screws are used in this application for their self locking characteristics. Overtightening may strip out the threaded inserts in the helmet shell.

10) Make sure the head cushion is properly fastened

⚠ WARNING

The O-ring on the base of the helmet shell on the SuperLite®-17B must be in place and in good condition. Without a proper functioning O-ring the helmet will leak and possibly flood. Drowning could result.

(snapped) inside the helmet to the snap tabs.

11) Make sure the chin strap is the new version that bolts directly inside the helmet with tab bolts. If the older system is used where the chin strap is part of the head cushion, replace it as soon as possible.

12) Make sure the strap guide and yoke strap that help secure the helmet are in place and in good condition.

⚠ WARNING

All parts on Kirby Morgan diving helmets must be adjusted to their proper torque specifications. See Appendix 1 for a complete listing of torque specifications for each part. Failure to adjust parts to the recommended specifications could lead to helmet failure and accidents. This could be fatal.

3.6 Preparing the Helmet for Diving

3.6.1 Clean Face Port

Thoroughly clean the face port with a soft cloth and a mild liquid detergent solution. DO NOT USE ANY AEROSOL SPRAYS ON THE POLYCARBONATE PORT!

3.6.2 Check Moving Parts

Check all moving parts, such as the regulator adjustment knob, the defogger control knob, emergency (EGS) knob, and the nose block device knob and the yoke/neck clamp parts to ensure smooth and proper operation.

Inspect the yoke/neck clamp and latch catch mechanism. They must engage and disengage properly. If the Yoke/Neck Clamp Assembly has been used with a different helmet, it MUST be readjusted to fit the current helmet.

3.6.3 Check Communications

Check the communications system for proper operation. Put the helmet on and talk to an assistant on the amplifier. If you are by yourself, with the helmet off take the helmet near the amplifier and tap on each earphone and the microphone, listening to the taps on the amplifier/speaker.

Talk into the amplifier/speaker feeling the vibration on each earphone and the microphone with your fingertips. Check the fit and tightness of the comm module mount nut.

3.6.4 One-Way Valve Check

The one-way valve must be tested daily, prior to commencement of diving operations. There are two ways to test the valve

1) Prior to attaching (or pressuring up) the umbilical, close the emergency valve knob, attach and pressure up the emergency hose. Shut off the defogger control knob and screw in the adjustment knob on the regulator all the way.

2) With the emergency hose pressurized, turn on the emergency valve knob. If any gas escapes out the end of the adapter, the one-way valve is faulty and must be rebuilt or replaced. A one-way valve repair kit is available for rebuilding these valves (Part # 525-330).

You can test the one-way valve either by attempting to suck air through the valve with the steady-flow valve open, or by connecting the bail-out to the main supply (with the steady flow and regulator adjustment closed) and opening the emergency valve to check for back-flow.

3) You can also test the one-way valve by opening the steady-flow valve and attempting to suck air back through the one-way valve. This is also a good way to test.

⚠ WARNING

Never dive if the one-way valve is not operating properly. If the hose or breathing gas/air fitting breaks near the surface a serious injury could result to the diver's lungs and/or eyes. In extreme cases this could be fatal. The one-way valve must be tested daily prior to the commencement of diving operations. Failure of the one-way valve could cause serious injury or death.

3.7 Emergency Gas System (EGS)

If the diver's main gas supply fails, the diver must have another source of gas that will enable them to return to the dive station or to a point where a normal gas supply can be reestablished. For this reason, an emergency gas supply (bailout) cylinder must be used on all dives. The bailout cylinder is normally worn on the back using a combination backpack and lifting harness.

⚠ WARNING

Do not dive without a diver worn Emergency Gas System. If the main gas supply is lost, you will have nothing to breathe and may drown.

Diver donning a complete bail-out system.

Most commercial divers wear a harness (separate from the weight belt) that is used for several purposes. The harness is fitted with large metal rings (usually brass or stainless steel).

The umbilical is hooked into one of these rings to keep any strain off the helmet. In addition, the rings on the harness are used to hang tools and other equipment. Usually the harness is also designed to provide a means of lifting an unconscious diver from the water. This harness is the best method of securing the emergency breathing gas to the diver.

A small tank can be mounted horizontally on the lower rear or front, while larger tanks are usually mounted vertically in the center back similar to a Scuba diver's tank. Some harness designs incorporate a cloth enclosure into which the tank fits. The entire tank, valve, and regulator are enclosed in fabric. This helps to prevent snagging.

⚠ WARNING

Never dive without attaching the umbilical to some type of harness or clip on the diver's body. Never allow the umbilical to pull on the helmet directly or the diver could suffer a neck injury.

The diving harness must have a provision for attaching the emergency gas supply and a place to attach the diver's umbilical.

The umbilical should always be attached to the harness to avoid a direct pull on the diver's helmet.

When determining the size of the emergency gas cylinder to use, several factors must be considered. The divers depth, the length of time the diver may be without the main gas supply, and the gas consumption rate. Regardless of the cylinder used, it should be of sufficient volume to allow the diver to ascend at a normal rate or transit to a point where a normal gas supply can be reestablished.

⚠ WARNING

A standard SCUBA submersible pressure gauge must be connected to the high pressure port on the first stage so that the diver can monitor their emergency supply.

Use a good quality first stage for your emergency gas supply.

In European countries that have adopted C.E. certification, only C.E. certified cylinders are allowed to be used and must have a minimum charged capacity available to the diver of 1400 N/l (50 scf). The emergency gas supply must only be fitted with a KMDSI first stage regulator and have a KMDSI over pressure relief valve installed (Part # 200-017).

The relief must be adjusted to start lifting at approximately 20 p.s.i.g. (1.4 bar) above the regulator intermediate setting. The purpose of the relief valve is to allow pressure to vent off in the event the first stage regulator develops a leak or creeps. Without a pressure relief valve, the hose could rupture and the emergency gas supply would be lost.

The emergency air/gas tank must be fitted with a good quality first stage regulator to reduce the pressure to less than 225 p.s.i.g. (16 bar) ambient diver pressure. The KMDSI SuperFlow® First Stage SCUBA regulator (Part #305-161) is an excellent device for this use.

These regulators reduce the tank pressure to approximately 145 p.s.i.g. (9.9 bar). Other quality high performance Scuba regulators may also be used. Connect the first stage hose with a set of quick disconnecting locking sleeves to the emergency valve assembly located on the side block.

The first stage regulator must have at least two low pressure ports. One port is used for the connector hose to the emergency valve and the second is used to install an overpressure relief valve (Part #200-017). If the first stage develops a leak, the full pressure of the tank could be placed on the low pressure hose. This could cause the hose to burst. The overpressure relief valve will bleed off any leak.

An over-pressure relief valve must be installed on the first stage used for the Emergency Gas Supply.

Make sure the emergency valve knob is turned off, otherwise the emergency gas supply will be used up without the diver's knowledge. Once the emergency supply hose is connected, the tank valve is turned on to pressurize the hose. In the event of an emergency due to a loss of the main gas supply, the emergency valve knob located on the side block is turned on supplying gas to the side block assembly and the regulator.

⚠ WARNING

Never dive without an over pressurization relief valve installed on the EGS regulator (1st stage). Without the relief valve if the EGS regulator develops an internal leak, or carries-away, the full pressure of the EGS cylinder would be placed on the low-pressure EGS hose and the Emergency Valve. This could cause the low-pressure hose to burst resulting in the complete loss of the EGS system.

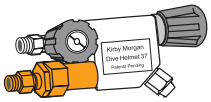
There are several possible ways to configure your emergency gas system, although at KMDSI we only recommend one method. The configuration we recommend is as follows:

Cylinder Valve Open - EGS Valve on Helmet Closed

This is the only method that we recommend. The advantages of this method are as follows:

- You only need to open one valve to activate your emergency supply.
- There is little danger of flooding your first stage regulator and ruining it.

Possible Emergency Gas Supply Cylinder & EGS Valve Configurations

Configuration	Cylinder Valve	EGS Valve	Advantages/Disadvantages
			
Configuration 1 (Regulator pressurized)	**On**	**Off**	**Advantages** **• One valve to open** **• First stage won't normally flood** **Disadvantages** **• If hose or first stage leaks some or all EGS gas will be lost**
Configuration 2* (No pressure in regulator)	**Off**	**On**	**Advantages** **• One valve to open** **• No loss of gas from cylinder if hose leaks or regulator leaks** **Disadvantages** **• First stage will flood and must be serviced after each day of diving**
Configuration 3* (Regulator pressurized then cylinder valve closed)	**On momentarily then Off**	**Off**	**Advantages** **• No loss of cylinder gas if hose or regulator leaks** **Disadvantages** **• Two valves to open in emergency** **• Slow leak on long dive may result in flooded 1st stage** **• If dive depth exceeds pressure in first stage, first stage will flood**
Configuration 4*	**Off**	**Off**	**Advantages** **• No use of cylinder gas unless emergency occurs** **Disadvantages** **• Regulator will flood and need service daily** **• Two valves to open in emergency**

*** Requires ability to reach cylinder valve without difficulty**

There are risks with each method of configuring your bail-out system. There is a risk that if you have the bail-out bottle on and the emergency valve on the helmet closed, that the emergency gas could be lost if the hose or the first stage itself develops a leak. However, KMDSI believes that this method poses the least amount of risk for the diver.

Probably the most serious problem with any of the other possible configurations is that the first stage will almost certainly flood if it is not pressurized while you are underwater.

If the regulator floods and is not promptly serviced, it will not perform properly when you need it in an emergency. As a diver, you always must decide how much risk and what types of risk you are willing to expose yourself to when you dive. It's up to each individual to make an informed choice regarding how to configure your bail-out system.

Always be sure to check the pressure in your bail-out bottle before you dive.

KMDSI strongly recommends the use of a submersible pressure gauge with every bail-out system. Not only does this make it very easy to check your emergency gas pressure prior to diving, it also allows you, in most cases, to periodically check the pressure in your system while you dive. In this way, if you have a leak, you will probably figure it out and will be able to take appropriate action.

⚠ WARNING

Some divers, keep the EGS gas cylinder valve shut during the dive. Their rationale being; in the event of an emergency, they will simply open the EGS cylinder valve thus eliminating any EGS air/gas unknowingly being lost due to either a 1st stage failure or EGS hose failure.

KMDSI strongly recommends never diving with the EGS cylinder valve shut. The reasoning behind this is twofold. First, with the EGS cylinder valve open, gas is immediately available in the event of topside gas interruption via the EGS valve on the side block simply by opening it. Secondly, and most importantly, if the EGS regulator (1st stage) is not pressurized, during descent it is possible that sea water will leak through the first stage intermediate circuit and regulator, causing failure of the EGS regulator and resulting in possible injury or death.

⚠ WARNING

Never connect the main gas supply hose from the diving control station to the Emergency Gas valve assembly (EGS). If this is done there is no one-way valve protection for the diver in the event of damage to the umbilical or related equipment. The diver could be exposed to a serious "squeeze". This can result in serious personal injury or death.

⚠ WARNING

Never connect a high-pressure hose directly to the EGS valve assembly, as this will transmit the full pressure of the tank to the side block. The side block is not designed for high pressure and may burst. This may result in severe personal injury or death.

3.8 Setting Up to Dive

3.8.1 Flushing Out the Umbilical

Before connecting the umbilical to the helmet, the umbilical must be flushed out to remove any dirt, moisture, or other debris. Connect the topside umbilical end to the topside diver control console. Ensure there is no pressure in the divers umbilical.

Carefully uncap the helmet end of the umbilical and hold securely while pointing in a safe direction, then slowly bring up gas pressure to approximately 25-40 p.s.i.g. (1.7-2.7 bar). Allow the gas to flow for at least 15 seconds. If it is not going to be used immediately, the umbilical should be recapped.

3.8.2 Connecting the Umbilical to the Helmet

When you connect the hose to the helmet be sure to use a wrench to hold the adapter, or inlet fitting, and a second wrench to turn the swivel fitting on the hose. If this is not done, the adapter will turn inside the one-way valve. If this happens repeatedly the threads will wear and the valve will need to be replaced.

The connection between the hose and the helmet must only be made up "snug". Excessive force will deform and ruin the adapter. A second wrench must be used when the helmet is disconnected as well, otherwise the adapter and/or the one-way valve assembly may become loose and fail to make a seal.

⚠ WARNING

If the one-way valve or the adapter is loosened this will allow breathing gas to leak out of the breathing system. This could also result in a loss of all pressure to the helmet, leaving the diver with nothing to breathe.

If you are using waterproof connectors for your communications, take extra care in handling these pieces. To connect the male and female parts, align the large pin on the male connector with the yellow mark on the female connector. Press the two connectors together until you hear a distinct "pop". Do not twist the connectors. Tape the two connectors with a bit of electrical tape to prevent them from pulling apart.

To separate the connectors remove the tape, grasp them at the thickest part, place your thumbs against each other, and push apart until the connectors are disconnected.

Connecting the umbilical to the helmet.

Always use two wrenches to connect the umbilical to the adapter. Use the correct size wrenches whenever possible to avoid damage to the fittings.

Connecting the waterproof connectors.

Do not twist the connectors. Do not pull them apart by pulling on the thin part of the wires.

3.8.3 Opening the Breathing Gas Supply to the Helmet

Prior to turning on the air supply for the helmet, check to see that the free flow valve is closed and the regulator adjustment knob is all the way in.

Slowly bring up the gas pressure to the helmet to 150 (10.2 bar). Slowly back out on the regulator adjustment knob until a slight free flow develops, then turn the adjustment knob in (clockwise) until the free flow just stops.

To properly check the breathing system you must completely don the helmet.

Make sure that the regulator adjustment knob is screwed in and the steady-flow valve is closed before opening the air supply to the helmet.

3.8.4 Fogging Prevention

A thin film of anti-fogging solution may be applied to the interior of the polycarbonate face port prior to the dive to help prevent fogging during the dive. A mild liquid dish washing soap, or other commercially available anti-fogging solutions, may be applied with a soft rag to the interior of the port.

The diver should use a solution which has been found satisfactory in the past. *However, do not use an aerosol spray on the polycarbonate lens.* The propellants in some aerosol dispensers cause damage to the lens.

⚠ WARNING

Never use any aerosol propelled sprays near the face port of the any Kirby Morgan helmet or band mask. The propellant used in these aerosols can invisibly damage the polycarbonate face port and cause it to shatter upon impact from any strong blow. If the face port fails underwater the helmet will flood and drowning may result.

3.8.5 Donning The SuperLite®-17B

All donning procedures must be done by the diver until they are thoroughly at home with the helmet. This will train for familiarity. However, the tender must be present to assist the diver and check to ensure that the diver has properly donned their equipment. It is impossible for the diver to see whether they are properly dressed in once the helmet is on their head.

⚠ WARNING

The tender must always be present to assist the diver while dressing and whenever the diver has their helmet on their head while they are out of the water. It is difficult for the diver to walk while they are dressed in and they can stumble and fall, resulting in serious personal injury.

Donning the yoke and neck dam.

If the yoke/neck clamp assembly is connected to the helmet, it must be removed before you can don the helmet. To release the neck clamp, you must first remove the safety pin that engages the latch catch assembly.

Pull the pull pin knob out, away from the helmet. While holding the knob out, lift the neck clamp handle up and out to release the tension on the clamp. Swing the handle forward, toward the front of the helmet. Slide the yoke/neck clamp assembly backwards away from the helmet until the rear hinge tab disengages from the alignment sleeve.

As a diver, to don the yoke assembly, hold the yoke/neck clamp in your hands in front of your body. Swing the neck clamp assembly up towards your chest. Lift the entire unit over your head until the opening for the yoke is positioned at the back of your neck. Slide the yoke forward until it is centered on your neck.

Reach over your head and insert the four fingers of each hand in the opening of the neck dam. Keep your thumbs on the outside of the neck dam. Spread the neck dam by pulling against the palms of each hand. Pull the neck dam over your head.

The tender must ensure the neck dam is turned so that the top edge is up and folded down (out) away from the diver's neck.

Spread the neck dam and pull it over your head.

Adjust the neck dam so that it is turned up and out.

The neck dam is always turned up against the diver's neck. This is very important! With the neck dam turned down, the helmet will vent air from the neck dam causing the regulator to free flow. This will make the helmet very uncomfortable.

With the diver holding the helmet, the tender should now connect the quick disconnect fittings for the bailout supply. Open the regulator adjustment knob and the defogger control knob for a steady flow from both just prior to the diver dressing into the helmet.

The diver should place the helmet face port down and locate the tab on the end of the chin strap of the head cushion. Loosen the tab completely. Grab the base of the helmet with both hands while you hold the head cushion open. Lift the helmet over your head and carefully lower it.

Reach up inside the front of the helmet and tighten the chin strap until it is just snug. The chin strap tightens on the outside of the chin cushion. It does not sit against the diver's chin directly.

Push your head into the rear of the helmet. Then, pull the helmet down and from side to side until it is comfortable on your head. Position the chin strap under your chin.

Locate the ends of the chin strap before you put the helmet on your head.

Spread the head cushion so that it is easier to don the helmet.

Pull the strap down and back towards the divers right until it is snug, but comfortable. Reach up inside the helmet and fasten the strap under the divers chin by attaching it to the Velcro tab on the right side of the head cushion.

Take care to prevent the end of the strap from becoming fastened between the helmet shell and the neck dam. Tucking the end into the helmet will ensure this. In particular, the tender should watch for this. Make sure the chin strap bolts directly to the helmet. If not,

⚠ CAUTION

Be sure to fasten the chin strap. If the chin strap is not fastened properly, the helmet will float up on the diver's head. This can make the helmet very uncomfortable.

Lift the helmet over your head.

The rear hinge tab must engage the alignment sleeve.

⚠ WARNING

If the hinge tab is not mounted on the alignment sleeve correctly, the yoke/neck clamp assembly could come off. Helmet flooding may occur. Drowning and death may result if the helmet floods.

Close-up detail of hinge tab engaging alignment sleeve.

replace it at the earliest opportunity.

Tilt your head back and push the entire yoke/neck clamp assembly backwards on your neck. This is to engage the hinge tab on the alignment sleeve. The front edge of the neck clamp should be under and past the front edge of the helmet. Keep your head tilted back, and lift the front of the helmet up with one hand.

The tender must locate the rear hinge tab on the back of the yoke. Lift the rear hinge tab out away from the helmet and up until it can slide over the alignment sleeve on the back of the helmet. Slide the tab over the sleeve.

The diver must hold the helmet down while the clamp is swung to their right to fully engage it against the bottom of the helmet. Note how the tender is supporting the clamp mechanism with their left hand.

The pull pin must properly engage the bail on the neck clamp.

The clamp is swung to the diver's left. Once it passes "over-center" it will close easily,

The safety pin must be installed prior to every dive.

The tender next grasps the handle on the neck clamp assembly and swings it to the diver's right. This action will open the clamp fully.

While the diver holds the helmet down, push up on the neck clamp assembly until the clamp is completely seated against the bottom of the helmet. DO NOT USE THE HANDLE AS A LEVER TO LIFT THE CLAMP. This will damage the clamp mechanism.

⚠ WARNING

KMDSI strongly recommends the utilization of the safety pin, Part # 535-900. This pin is inserted just below the cam-lock bail.

If a safety pin is not used, there is a possibility the clamp on the yoke latching system could be inadvertently opened during the course of the dive by unintentional depression of the plunger lock. Helmet flooding, drowning and death may result.

NOTE: KMDSI recommends that all old style "push style" pin latch catch assemblies be replaced with new Pull Pin Latch Catch part# 505-010. The old push pin latch catch assemblies are no longer available nor are replacement parts.

Additionally the pull type latch catch should also employ the use of the safety pin to avert accidental opening of the latch catch during diving operations. (Additional guidance is available by contacting Dive Lab Inc. at (850) 235-2715 or E-Mail DiveLab@aol.com.)

NOTE: If you are ready to dive, ensure the tender installs the safety pin before you enter the water.

While maintaining pressure on both the helmet and the clamp, swing the clamp handle to the diver's left until it passes "over-center" and closes. Open the latch catch assembly by pulling out on the pull pin.

Lift up on the yoke assembly until the latch catch engages the bail on the neck clamp handle, and release the pull pin. The spring loaded pull pin should bottom in the latch catch assembly capturing the handle bail.

The helmet is now locked into place and the diver can test the breathing system properly.

If used, the yoke strap is now placed over the top of the helmet (but under the handle) and secured in place. The yoke strap is standard on all 17B helmets shipping after January 2004. It's use is strongly recommended.

The yoke strap is positioned underneath the handle on the helmet.

The loop on the adjustable end of the strap slides over the yoke on the diver's right side. Tighten the yoke strap by pulling down on the free end to help ensure the helmet stays on properly.

3.8.6 Testing the Breathing System

Test the defogger system by turning on and off the defogger control knob. The regulator should be adjusted by turning the adjustment knob out until a slight steady flow starts, then back in until the flow just stops.

Next, the demand regulator system is checked for proper function: breathe in and out. Inhalation and exhalation effort should be nearly unnoticeable. Press in on the purge button in the regulator cover. This should produce a strong burst of breathing gas.

The diver must be satisfied that their helmet is working properly before they enter the water.

3.8.7 Sealing Integrity Check

If there is any doubt that the helmet is sealing properly, perform the following test prior to diving.

Turn the supply gas off at the dive control system and bleed the umbilical.

To perform this test, the diver must have an assistant standing by. The assistant should be in control of the gas supply console in the event the diver needs air or they must be ready to lend a hand. The diver must be next to the dive control manifold so that the air may be turned on instantly, or the diver must be ready to run a hand between their neck and the sealing neck dam in order to pull the neck dam away from the neck to allow breathing.

⚠ WARNING

Do not perform this test unless the diver and their tender are stationed immediately adjacent to the diver's air manifold and you are certain the air is on to the manifold. If the diver is unable to flow air to the helmet, either through the umbilical or the bailout, they may not be able to remove the helmet easily.

To break the seal in this situation, the diver must put their hand between the neck dam and the neck, and pull the neck dam away from the neck. A tender must be standing by to assist the diver in removing the helmet if needed. Suffocation could result.

With the neck dam and yoke on the diver's neck, the helmet is installed and the yoke is closed. When the diver attempts to inhale, a suction on the neck dam is formed, indicating they are achieving a good seal. The diver must then turn the air on immediately so that they can breathe. If the diver does not turn the air on they will not be able to breathe, unless the neck dam is pulled away from their neck.

3.9 Diving Procedures

3.9.1 Standing By to Dive

The diver may wear the neck dam yoke assembly without discomfort if they are standing by to make a dive. However, the helmet itself must always be the last thing put on before the diver enters the water. Everything else must be ready to go before the diver puts the helmet on so they won't have to support the weight of the helmet while out of the water.

3.9.2 Attaching the Umbilical to the Harness

The umbilical must now be hooked to the diver's harness by means of a suitable clip that is bound to the umbilical. Some divers and companies prefer a quick release clip and others prefer a clip that is screwed together so the diver cannot easily remove it from their harness. The securing of the umbilical keeps the pull of the hose at the diver's harness and not on the helmet.

The umbilical must be properly attached to the diver's harness.

⚠ WARNING

Never dive without attaching the umbilical to some type of harness or clip on the diver's body. Never allow the umbilical to pull on the helmet directly or the diver could suffer a neck injury.

3.9.3 Diver Dons Helmet

The diver dons the helmet as per this chapter.

3.9.4 Diver Check Gas Flow Systems

The diver must check out the breathing system themself as the tender finishes dressing them. Operate the defogger valve, the demand regulator, and the purge button to assure yourself of proper operation before entering the water.

3.9.5 Communications Check

The communications system, sending and receiving, should be checked at this point.

The communications system must be functioning properly throughout the dive.

3.9.6 Diver Ready

The diver is now ready to enter the water. They should be assisted to the water if needed. If a welding lens is being used, make sure it is hinged up all the way if the diver is making a jump entry. We do not recommend jump entries. A quick overall inspection by the tender is done and the diver is given the OK.

3.9.7 Water Entry and Descent

The tender must make sure there is a sufficient length of umbilical clear if the diver is using a jump entry. There must be no chance of the umbilical hanging up when the diver jumps. Also, the defogger valve should be turned on to overpressure the helmet to prevent the possibility of water pressure from inverting the helmet exhaust valve when hitting the water.

The diver must report to the surface immediately after the entry. It's a good policy to descend 10 or 20 FSW (3-6 MSW), pause and check the regulator adjustment knob to ensure adjustment for the least breathing resistance.

The purpose of this adjustment knob is to allow the diver the ability to compensate for variations in umbilical supply pressure. This adjustment device operates by simply increasing or decreasing the amount of spring bias tension on the demand regulator inlet valve.

This adjustment device is not intended as a minimum-maximum device. Minimum and maximum applies to supply pressure only. The adjustment knob should be adjusted by the diver to be at the easiest breathing setting at all times.

Diving a KMDSI helmet or band mask with a bias setting greater than that just necessary to keep the demand valve from free flowing increases the work of breathing and reduces the diver's ability to perform heavy work.

Then the diver checks in with the surface before descending to the job. If a closed bell is being used, the diver enters the water from the bell and pauses for a short time outside the trunk until they are sure all systems are operating properly.

During the decent the communications must be checked again and the diver supply pressure should be adjusted as necessary to maintain the required over-bottom pressure. It may be necessary for the diver to readjust the demand regulator by means of the adjustment knob once at the work site to compensate for the variation in umbilical supply pressure.

3.10 Emergency Procedures

3.10.1 Flooding

In the event of partial or complete flooding, the diver may clear the helmet quickly by tilting the helmet down and activating the defogger control knob. Pressing in on the manual purge button in the center of the regulator cover will evacuate water from the regulator, if any remains.

The water dump valve is located under the regulator. By placing this valve in the lowest position on the helmet, water will exit more easily.

After clearing, cautiously check for additional flooding. If the helmet continues to take on water, return to the diving station, swimming with the water dump valve positioned at the lowest part of the hat: that is with the diver's face forward and slightly tilted down. Keep the free flow knob on. This increases the air/gas pressure slightly inside the hat and keeps the water out. Any incoming water is automatically purged.

3.10.2 Inhalation Resistance

If breathing becomes difficult, adjust the demand regulator adjustment knob, for easier breathing by rotating the adjustment knob counter clockwise. If the breathing does not get noticeably better, press the purge button in the regulator cover. If a surge of gas does not flow with this action, open the emergency valve.

If the flow is noticeably better, immediately notify topside that you are on emergency gas. Insure your umbilical is clear and return to the stage or decent line. The diver should stay in communication with topside personnel and make preparations to abort the dive. The console operator should check to ensure the supply pressure to the diver is at the proper pressure.

3.10.3 Gas Flow Stops

A stop of flow in the demand regulator usually indicates the main gas supply has stopped. The diver should first open the emergency valve by turning the knob. If there is still no flow from the demand regulator, the defogger valve knob should be opened. Keep in mind that if the defogger valve is left open, the bailout bottle will drain very quickly, particularly if the diver is deep.

Immediately notify topside, check to insure your

umbilical is clear and return to the diving station using the emergency breathing supply. Avoid making a rapid ascent if at all possible.

Once at the surface, or inside the bell, the diver may remove the helmet if needed. Never ditch the helmet underwater unless conditions absolutely require that.

⚠ DANGER

Rapid ascent is dangerous. It can lead to air embolism or decompression sickness. Air/gas embolism can cause immediate loss of consciousness and/or death. Even on a no decompression dive, a rapid ascent may cause decompression sickness. A diver must only make a rapid ascent when they are in immediate danger of death by drowning or asphyxiation.

⚠ DANGER

Ditching the helmet underwater must be avoided. If the diver ditches the helmet underwater they will not be able to see. In many instances, even if the air supply is interrupted, topside will be able to get it back on line quickly. Do not ditch the helmet underwater unless you are completely out of breathing gas and it is impossible to return to the surface due to entanglement of your equipment or similar circumstances.

3.10.4 Demand Regulator Free Flow

If the demand regulator free flows, adjust the knob in (clockwise) until it stops. If the free flow cannot be stopped, the dive should be aborted. Even if there is no serious problem to the diver, the dive should be aborted and the problem with the regulator corrected.

3.11 Post Dive Procedures

3.11.1 Removing the Equipment

After the diver is well clear of the water they may remove the helmet. If the diver is working out of a stage they must not remove the helmet until the stage is on deck.

3.11.2 Removing the Helmet

On the SuperLite®-17 A/B, the tender must first remove the safety pin before you can remove the helmet. Slide the pin out and away from the latch catch. Release the yoke safety strap.

The tender should assist the diver by pulling out on the pull pin knob on the latch catch assembly. This will allow the let the yoke to fall away. Next grab the handle on the neck clamp assembly and pull outwards away from the helmet, until the handle is in front of the diver's face. This action will break the seal of the neck dam around the base of the helmet and the neck dam and clamp will fall away from the bottom front of the helmet.

While having the diver tilt their head back, reach behind the back of the helmet and lift the rear hinge tab off the alignment sleeve in the back of the helmet.

When you're wearing the helmet, once the neck clamp is open, you must reach underneath the front of the helmet and loosen the chin strap that holds the helmet in position. Then, lift the helmet over your head using both hands, one on either side of the helmet to support its weight.

⚠ WARNING

Never remove the diving helmet while you are in the stage. If you fall out of the stage with the helmet off but still attached to your harness it may be very difficult to swim. Drowning may result.

After the helmet is removed, the tender can take it from the diver and carefully lay it aside, on a soft surface, such as a coil of the umbilical.

Next, reach in and spread the neck dam, pulling against the sides of the neck dam with the palms of both hands. Lift the neck dam over your head. Slide the yoke backwards away from your neck to remove it.

The diver's harness and EGS cylinder is then removed. The emergency gas supply hose may be disconnected while the diver leaves the helmet on or while they hold the hat after removal. The quick disconnect makes this procedure very easy.

Once you have removed the helmet, spread the neck dam to remove it.

3.11.3 Storage of the Helmet Between Dives

The helmet should be maintained per the daily maintenance section in Chapter 6. Also, check the Dive Lab post dive checklist A2.4 at www.divelab.com.

If the helmet is not going to be used for a period of time, the head cushion, should be removed. The head cushion should be dried and replaced in the hat before storage. The regulator adjustment knob should be unscrewed all the way out (counterclockwise) until the next dive.

When the helmet is completely dry, or the diver is ready to leave the job, the helmet should be stored in the carrying bag to protect it.

If the head cushion becomes wet it may be dried out by removing it from the helmet, squeezing excess water out, and letting the head cushion hang dry or putting it in a clothes drier on air dry only.

⚠ WARNING

Use only the air dry setting when drying head cushion foam in a drier. Use of a higher setting could cause the foam to melt or start a fire.

Chapter 4
Troubleshooting

4.1 General

Kirby Morgan diving helmets are highly reliable life support equipment which should not malfunction if proper preventative maintenance procedures are followed. Most problems encountered in using the helmet can be easily remedied. The following information covers most potential operating difficulties.

4.2 Communication Malfunction

Symptoms	Probable Cause	Remedy
No sound at either com box or helmet.	**Communications box not on.**	**Activate switch and adjust volume.**
	Communications incorrectly hooked up.	Switch terminal wires.
	Communications not hooked up.	Plug into terminals.
	Communicator not functional.	Replace communicator.
	Broken/damaged communications wire	Check continuity replace wire or umbilical.
	Battery Dead	Recharge / use alternate D.C. source.
Communications weak or broken up.	Terminals in communications module corroded.	Clean terminals with wire brush. Terminals should be bright, shiny metal.
	Battery weak.	Recharge / use alternate D.C. source.
	Loose wire.	Clean and repair.
Communications only work when wire is wiggled back and forth.	Break in diver's communication wire.	Splice wire if damage is minor. Replace wire if damage is major.
Communications only work when connector is wiggled back and forth.	Break in waterproof connector.	If connector is suspect, remove from line and test line for integrity prior to replacing connector.
Diver speech weak or can't be heard.	Microphone in helmet dead or damaged.	Replace microphone as per manual.

4.3 One Way Valve Malfunction

Symptoms	Probable Cause	Remedy
One way valve allows back-flow.	Foreign matter in valve.	Disassemble valve, clean and rebuild. Replace if needed.
One way valve doesn't flow any gas.	Foreign matter in valve.	Disassemble valve, clean and rebuild. Replace if needed.

4.4 Side Valve Malfunction		
Symptoms	**Probable Cause**	**Remedy**
Defogger can't be shut off. Helmet free flows through defogger.	Seat assembly damaged or debris under seat.	Clean and/or replace seat assembly. Check - clean side block seal area.
	Sideblock damaged by debris	Replace sideblock.
Defogger valve will not flow gas.	No air in umbilical.	Turn air on to diver's supply topside.
	Foreign matter in side block or one way valve.	Disassemble side block one way valve and clean.
Defogger valve knob hard to turn.	Valve stem bent.	Replace valve stem.

4.5 Water Leakage Into Helmet		
Symptoms	**Probable Cause**	**Remedy**
Water leakage into helmet.	Exhaust valve damaged or stuck open.	Seat or replace valve.
	Binding posts or connector seal damaged.	Remove posts, clean and reseal with RTV sealant.
	Diaphragm damaged or not seated properly.	Seat or replace diaphragm.
	O-ring in neck dam ring damaged or missing.	Replace o-ring.
	Port retainer screws loose.	Tighten screws.
	Neck dam torn or damaged.	Replace neck dam.
	Hair caught between o-ring and base of helmet.	Remove hair from this space.
	Head cushion or chin strap caught under o-ring at neck dam.	Clear cushion or dam
	Regulator assembled improperly.	Check for proper assembly.

4.6 Demand Regulator Malfunction

Symptoms	Probable Cause	Remedy
Regulator continuously free flows.	Adjustment knob not screwed in.	Screw in adjustment knob.
	Bent tube damaged causing mis-alignment of adjustment nipple.	Check the inlet nipple and soft seat. Replace as necessary.
	Supply pressure too high.	Adjust supply pressure lower than 225 p.s.i. over ambient.
	Regulator out of adjustment.	Adjust regulator
Regulator continuously free flows when underwater only.	Neck dam turned down, or too large for divers neck.	Neck dam must be turned up. Replace neck dam with proper size.
	Hair caught between o-ring and base of helmet.	Clean hair out.
	Neck dam torn.	Repair or replace neck dam.
	Poor seal in neck dam ring Assembly	Replace O-rings
Regulator is hard breathing.	Adjustment knob screwed too far in.	Screw adjustment knob out.
	Supply pressure too low.	Increase supply pressure.
	Regulator improperly set up.	
Regulator does not supply gas.	Gas supply pressure too low.	Increase supply pressure to minimum required for depth.
	Regulator is out of adjustment.	Adjust regulator
	No gas in umbilical	Turn diver's gas supply on topside.
	Blockage in breathing system.	Disassemble regulator, clean, and adjust.

4.7 Emergency Gas Supply Valve

Symptoms	Probable Cause	Remedy
Bail-out bottle drained without diver opening EGS valve	Stem fails to seat in valve body.	Replace EGS valve body.
	Debris under sea causing leakage.	Service valve.
	Leaking over-pressure relief valve on bail-out regulator.	Service valve.
	Leaking bail-out regulator on bottle.	Service regulator.
	Leak in supply line 1st stage	Service regulator.
Knob difficult to turn.	Stem bent.	Replace stem.
Valve will not flow gas.	Foreign matter in valve.	Disassemble, clean, and reassemble.
	Stripped control knob.	Replace knob.

Chapter 5
Inspection and Maintenance

5.1 Routine Maintenance

Routine and preventative maintenance is critical and must be done on a regular basis. All parts and components of the helmet have a useful service life and eventually will require replacement. Some items, when properly maintained, can go many years before replacement becomes necessary. Each helmet or mask should have a logbook that tracks the usage, maintenance and repairs.

It is essential to safety of the user that a routine and periodic schedule of maintenance, inspection, and testing be carried out. Helmets should be inspected pre-dive on a daily basis. Helmets in continuous use around the clock should be rotated out every 24 hours and have a daily pre-dive inspection performed. Post dive cleaning and inspections should be completed each time helmet or mask use is finished for the day. To minimize the spread of germs, sanitizing should be performed after use, and in between use by different divers. Sanitizing procedures and recommended solutions are described and explained in the General preventative section of each KMDSI helmet and mask manual. If the user is in doubt about the serviceability or has questions in general, please contact your local KMDSI authorized repair facility or KMDSI at Tel. 805-928-7772. Check the Dive Lab website at www.divelab.com for the most up-to-date maintenance procedures.

KMDSI Maintenance Checklist are located on the KMDSI and Dive Lab websites. The checklists are intended for all helmet and mask models. There are also checklists for the KMB-18/28 band masks which are done up the same as the helmet checklists.

A2.1. All SL and KM helmets (all models) Recommended Annual Maintenance Inspection and Overhaul
A2.2. Monthly Maintenance
A2.3. Daily Set-Up and Functional Checklist
A2.4. Supervisor's Equipment Checks Prior to Entry
A2.5. Supervisor's Equipment Checks In-Water
A2.6. Post Dive Cleaning

5.1.1 Daily Pre-Dive Maintenance A2.3

The helmets and masks should be set up in accordance with the Daily Set-Up and Function Checklist A2.3. The checklist can be laminated placed on a clipboard and checked off with a grease pencil. Completion should be logged in both the supervisors log and the helmet or mask log book. The daily pre-dive is minimum daily checks KMDSI recommends. The daily pre dive may be modified to suit the needs of the user providing the basic intent of the checklist is being completed in a manner with the original intent.

5.1.2 Daily Post Dive Maintenance A2.6

The helmets and masks should be cleaned in accordance with the A2.4 checklist The checklist can be laminated placed on a clipboard and checked off with a grease pencil. Completion should be logged in both the supervisor's log, and the helmet or mask log book. The daily pre-dive is minimum daily checks KMDSI recommends. The daily post-dive may be modified to suit the needs of the user providing the basic intent of the checklist is being completed in a manner consistent with the original intent.

5.1.3 Supervisors Equipment Checks A2.4 and A2.5

These checks should be conducted by the diving supervisor or by persons designated by the supervisor in accordance with company policy.

5.2 Monthly Maintenance

A monthly inspection should be performed IAW the A2.2 checklist on a monthly or as directed by the A2.2 and / or anytime serviceability of the helmet or mask is in doubt. Helmets or masks used in contaminated waters or for welding, burning, and jetting operations will require service and inspection more frequently. If a situation arises that casts any doubt as to the serviceability of a part or component it should be replaced.

Use the appropriate manual for the model helmet or mask being serviced.

5.3 Yearly Maintenance

5.3.1 Overhaul/Inspection Checklist A2.1

The A2.1 checklist procedure fulfills all requirements for complete inspection. The checklist should be performed at least annually and or more often if daily and monthly inspections reveal signs of excessive corrosion, contamination, improper operation or signs of damage or if the helmet log shows the unit had previously been used in a questionable environment. The daily and monthly inspections will determine the necessity for overhaul with greater accuracy than

simply placing a number of hours on the overhaul schedule. All O-ring's, exhaust valves, and soft goods should be replaced at least once a year. In between overhauls the soft goods can be cleaned inspect and reused providing a careful inspection reveals no damage or deterioration. Again, logged questionable previous diving environments will be determining factor as well. The A2.1 checklist should be filled out and retained in the maintenance files and provides an excellent record of maintenance. All maintenance should be annotated in the helmet log.

The Overhaul Checklist Procedure A2.1 is intended to aid persons performing routine overhauls of KMDSI SuperLite® Helmets and Band Masks. The checklist should be used in conjunction with the applicable Operations and Maintenance Manual for the model helmet being serviced and is primarily intended to guide and document the maintenance as it is completed. Specific detailed procedures for each section of this checklist can be found in the Operations and Maintenance Manuals. This checklist when completed should be retained in the equipment maintenance files and the helmet or mask log book should be updated. The checklist's are intended to be used for all models of KMDSI SuperLite® and KM Helmets and band masks. All KMDSI helmet and band mask manuals can be downloaded free at www.kirbymorgan.com.

Chapter 6
General Preventative Maintenance

6.1 Introduction

This section covers the preventative maintenance necessary on the SuperLite®-17 diver's helmet, models both A&B. A helmet that is kept clean and in good repair will offer far better service to the user. This helmet is designed for easy access to all areas for proper inspection and servicing. Numbers appearing in parenthesis below are "location" numbers that are used in the blow apart illustration at the rear of this manual.

6.2 Required tools, Cleaning Agents, Lubrication

All KMDSI helmets and masks are designed with the professional diver in mind. Most maintenance can be performed by the diver using common tools and this manual. There are some repairs however, that must be accomplished only by KMDSI authorized repair facilities. This includes fiberglass and helmet neck clamp repairs, and face port inserts. For technical assistance please telephone your nearest authorized dealer or call KMDSI at (805) 928-7772.

Every diver should carry sufficient tools and spare parts to maintain their helmet in top working condition. It is very important to use wrenches of the correct size rather than adjustable wrenches when possible. Adjustable wrenches tend to slip and can round the edges of soft brass parts. The following wrenches and tools are required to maintain the SL 17:

Torque wrench with the following attachments:
1 3/8 inch crows foot
7/16 inch open end wrench
9/16 inch open end wrench
5/8 inch open end wrench
11/16 inch open end wrench
3/4 inch open end wrench
13/16 inch open end wrench
7/8 inch open end wrench
1 inch open end wrench

Torque screwdriver and these attachments:
1/8, 1/4, and 3/8 inch flat blade screwdrivers
#2 Phillips blade screwdriver
7/64 inch Allen wrench driver
9/64 inch Allen wrench driver

Tools required to do proper maintenance on the SL 17.

5/32 inch Allen wrench driver

Open end wrenches in the following sizes:
3/8 inch
7/16 inch
9/16 inch
3/4 inch
7/8 inch
1 inch

Two adjustable wrenches, 6 & 8 inches in length.
3/8 inch flat blade screwdriver with a notch in the center of the tip.
1/4 inch flat blade stubby screwdriver
2 needle nose pliers
diagonal cutting pliers
slip joint pliers
3/32 inch punch
putty knife
O-ring removal tool
KMDSI regulator repair tools: Part #525-620
ball peen hammer
Whisker Clamp Replacement Kit: Part # 525-032
tie wraps: Part # 520-042
Silicone lubricant
Loctite® 222 Thread locker
#320, 400, 600 wet/dry sandpaper
rubbing compound
automotive wax
clean rags

6.2.1 Component and Parts Cleaning

The helmet and components should only be cleaned using a mild solution of dishwashing soap such as JOY ™ or Dawn ™ hand dishwashing soap.

Parts that have corrosion should be washed and scrubbed with a nylon bristle brush and then soaked in a solution of 50% white vinegar and water for 30-60 minutes followed by a light brushing and a good fresh water rinse. Helmet liners and rubber components should be cleaned using a mild soapy solution followed by a good rinsing and air-dried.

DO NOT use hair dryers or high heat to dry the rubber or fabric components, high temperatures will severely reduce their serviceability. To clean parts heavily encrusted with salt we recommend a dilute solution of white vinegar and a toothbrush.

6.2.2 Component and Parts Lubrication

All helmets are lubricated at KMDSI with Christo-Lube®. Helmets used for air diving or diving or with oxygen mixtures containing less than 50 % oxygen can be lubricated with food grade silicone such as Dow Corning® 111 or equivalent.

Do not use aerosol spray or lubricants. Many aerosol propellants will damage plastic. Avoid lubricant contact with plastic parts.

⚠ WARNING

Never use any aerosol propelled sprays near the face port of Kirby Morgan helmets. The propellent used in these aerosols can invisibly damage the polycarbonate face port and cause it to shatter upon impact from any strong blow. If the face port fails underwater the helmet will flood and drowning may result.

NOTE: All parts on the helmet that require lubrication must be lubricated sparingly with the appropriate lubricant.

Silicone lubricant is not recommended for helmets used with oxygen. (Avoid mixing lubricants to preclude incompatibility).

⚠ WARNING

Kirby Morgan diving helmets are lubricated for use with oxygen rich mixtures as they come from the factory.

Only lubricants such as Krytox®, Fluorolube®, Tribolube® or Christo-Lube® are acceptable for oxygen service. Care must be taken to avoid contamination of gas system components with hydrocarbons when air is used as a breathing medium. Contamination of Kirby Morgan masks and helmets with hydrocarbons can lead to fire or explosions when this equipment makes contact with high oxygen partial pressures.

⚠ WARNING

All parts on Kirby Morgan helmets and masks must be adjusted to their proper torque specifications. See Appendix 1 for a complete listing of torque specifications for each part. Failure to adjust parts to the recommended specifications could lead to helmet failure and accidents. This could be fatal.

6.2.3 Teflon® Tape

All pipe thread fittings used on our helmets, masks and components require sealing with Teflon® tape. **DO NOT USE LIQUID SEALANT**. When installing Teflon® tape on pipe threads, apply the tape starting two threads back from the end of the fitting.

Apply the tape in a clockwise direction under tension. $1^1/_2$ wraps is all that is needed. Applying more than $1^1/_2$ wraps of tape is not recommended. The use of more than $1^1/_2$ wraps could cause excess Teflon® tape to travel into the breathing system.

⚠ WARNING

Do not allow any excess Teflon® tape to cover the end of the pipe thread fittings. Loose pieces of Teflon® tape can interfere with the performance of helmet components and may block the diver's air supply. This could lead to death through suffocation.

⚠ WARNING

Use only thin Teflon® tape to avoid damage to threads.

6.2.4 RTV Sealant

Certain components used in KMDSI helmets and masks use RTV adhesive / sealant to provide bonding and sealing. KMDSI recommends Dow Corning® ™ RTV 732 multi purpose sealant or equivalent. When sealant is applied the user must use care to insure excess sealant is wiped clean so as not to interfere with other components. Sealant should be allowed to cure for 24 hours before equipment is used.

6.2.5 Thread Locker

KMDSI recommends Loctite® 222 as the thread locking compound that should be used on components that call for a thread locker. Threads should be clean and dry prior to applying thread locker. Avoid Contact with Polycarbonate Plastics (Face Port)

Ensure that all excess thread locker has been removed. Allow thread locker to cure for at least 3 hours prior to using the component.

6.3 General Cleaning & Inspection Procedures

Each diver must establish their own minimum standards for the care of their helmet. We offer recommendations here with the suggestion that the diver establish for themself what is necessary to provide a good working unit. Use of the helmet in fresh water will require a timetable for maintenance procedures different from that when the helmet is used in salt water.

Using the helmet in sea water while jetting in sand will necessitate increased maintenance. Use of the helmet in a heavy oil and/or chemical environment may make it necessary to replace rubber parts to assure proper function. Regardless, all helmets should be disassembled, (with the exception of the weights) cleaned and inspected for damage. All soft goods (o-rings, exhaust valves, and diaphragm) should be should be changed in accordance with the Dive Lab Checklist A2.1. Any parts that have excessive wear or corrosion should be replaced.

NOTE: Certain fuel oils and/or chemicals will cause premature degradation of soft goods and seals by making them become soft, swell or break down. Upon exiting the contaminant, KMDSI recommends a thorough external decontamination/washing of the helmet/neck dam yoke as soon as feasibly possible, followed by a vigilant inspection of the interior of the helmet to ensure that no contaminant has entered.

Pay particular attention to the following parts prior to re-use; the Quad-Valve™ assembly, demand regulator diaphragm, demand regulator exhaust valve, communications post(s) or communications connector assembly, and neck dam.

⚠ WARNING

If in doubt about the serviceability of a part, repair or replace it immediately. Use only Genuine Kirby Morgan replacement parts. The use of unauthorized parts may result in injury or death to the user.

⚠ WARNING

Do not use solvents or bleach for cleaning. These agents are toxic and use of them may result in injury or death to personnel and damage to equipment.

⚠ WARNING

Wear eye protection to prevent cleaning and germicidal cleansing solutions from contacting eyes. If contact occurs, rinse eyes with copious amounts of water and consult medical help immediately.

⚠ WARNING

Cleanliness is imperative in maintaining and handling Kirby Morgan masks and helmets. All tools, parts, and components must be kept free of oil, lubricant, rust, and other contamination. Foreign substances within an assembly may result in equipment failure and possible injury or death to personnel.

⚠ WARNING

Different brands of lubricant should never be mixed. Ensure all old lubricant is removed prior to applying new lubricant.

6.3.1 O-Ring Removal/Inspection/Cleaning and Lubrication

Strict cleanliness and proper lubrication are extremely important during O-ring installation. Comply with the following instructions to ensure proper installation:

NOTE: Ensure all parts are clean throughout the assembly procedure. Dirt or loose particles in the O-ring groove can cause leaks in the seal and damage to the O-ring, reducing its life. During cleaning of equipment, carefully clean O-ring grooves, using a soft bristle brush and mild soap solution.

O-Ring Removal:

Do not use screwdrivers or hard metal picks to remove O-rings. When possible, only use fingers to remove O-rings. If an O-ring fits too tightly in its groove to be removed using the fingers, use the appropriate tool from an O-ring removal kit (brass pick).

A plastic cable tie makes an effective O-Ring removal tool. Use of an appropriate tool helps prevent scratching the O-ring groove, which can cause leakage or premature failure of the seal.

O-Ring Inspection:

If during routine corrective maintenance O-rings are to be reused, only reuse O-rings that pass a visual inspection. Inspect for deformities or compression set, hardening or brittleness, nicks or cuts, pits or blisters, or any other signs of damage. Cut and discard damaged O-rings and replace them with new ones.

O-Ring Reuse:

All O-rings and soft goods should be replaced whenever scheduled overhauls are being completed. During routine repairs or maintenance in between the overhauls, O-rings and soft goods may be reused after cleaning provided a careful inspection reveals no wear or damage.

Place the O-rings in a cleaning basin, cover with mild mild soap solution, and brush gently with a soft bristle brush to remove all traces of old lubricant and contamination. Rinse cleaned O-rings with fresh water and wipe clean with lint-free cloths, then allow to air dry, carefully inspect for cracking, cuts, abrasions and deformities. Replace O-rings if any damage is found or suspected.

6.3.2 General Cleaning Guidelines

Cleaning and sanitizing of the helmet should be accomplished upon completion of use and/or prior to storage. Clean is defined as free of dirt, rust particles, lubricant and oil and other contaminants as viewed by the unaided eye.

Sanitizing is defined as eliminating germs and microorganisms. Sanitizing should be accomplished post use or prior to use by another user. KMDSI recommends sanitizing be accomplished any time the unit is to be used by another person during the mission or operation.

NOTE: The Sanitizing Procedure should be accomplished if possible between uses by different users during the same operation.

⚠ WARNING

Always sanitize the helmet prior to use by another person. Failure to do could result in the transmission of communicable diseases, some of which may cause long term disability or death.

6.3.2.1 Mild Soap Solution for General Cleaning and Leak Detector Use

Maintenance procedures include cleaning with a general-purpose solution of a mild diluted hand dishwashing soap such as Joy or Palmolive. Cleaning solution is prepared by mixing approximately one teaspoon of soap to 1/2 gallon of warm fresh water. This solution may also be used as a leak detector solution. Place all parts and components in a clean washbasin or sink and immerse in soap solution.

To properly sanitize the demand regulator between use by different divers, the regulator cover and diaphragm must be removed, as well as the oral nasal mask. These items must be submerged in sanitizing solution and agitated as directed in the sanitizing procedure. Use a spray bottle and spray the interior of the demand regulator with the sanitizing solution, too. Allow all parts to be wetted for a minimum of 10 minutes before thoroughly rinsing with fresh water.

The microphone and interior of the helmet should also be wiped down with a clean rag which has been dampened in sanitizing solution. Follow this after 10 minutes with a clean rag which has been dampened in fresh water.

Allow parts/components to soak for at least five minutes, and then scrub using a nylon brush. Carefully brush all surfaces, paying close attention to O-ring grooves and threaded surfaces ensuring all lubricants are removed. Regardless of the soap used, all components must be thoroughly rinsed post cleaning to remove all traces of soap.

After cleaning, allow the regulator, diaphragm, and cover to dry before reassembling.

6.3.2.2 Acidic Cleaning Solution and Procedures

Metal parts that have visible corrosion should first be cleaned using the soap solution scrubbed with a nylon bristle brush, then soaked in a solution of 50% white vinegar and water for less than 60 minutes. They may also be placed in a ultrasonic sink followed by a light brushing and thorough rinsing with fresh water and air-dried. If corrosion is such that 50/50 vinegar will not clean components, it will be best to replace the components.

6.3.2.3 Germicidal Cleaning Solutions and Procedure

Sanitizing of the oral-nasal mask/regulator of KM 37 is accomplished using one of four approved germicidal cleansing solutions. There are four examples of solutions shown below, along with the necessary ordering information and mixing instructions.

In almost all cases, germicidal solutions must be diluted. See the manufacturer's directions for use.

NOTE: Ensure helmet liner and cushion are removed prior to sanitizing the oral-nasal mask/ regulator.

1. SaniZide Plus: P/N: 34805 (spray) or 34810 (gallon)**,** Ready to use; do not dilute.

SAFETEC of America, Inc
1055 E. Delavan Ave.
Buffalo, NY 14215 USA
1-800-456-7077

2. Advance TBE: P/N: AD160 (spray) or AD1128 (gallon), Infection Control Technology): Ready to use.

Infection Control Technology
1751 So. Redwood Rd.
Woodscross, UT 84087 USA
1-800-551-0735

3. Bi-Arrest 2: P/N: BP201 (4 ounces) or BP 222 (32 ounces), Infection Control Technology. Mix two pumps of the concentrate with 16 ounces of fresh water.

Infection Control Technology
1751 So. Redwood Rd.
Woodscross, UT 84087 USA
1-800-551-0735

4. Confidence Plus: P/N: 10009971 (32 ounces) Mix one ounce of concentrate with one gallon of fresh water.

Mine Safety Appliances 1-800-MSA-2222

Sanitizing Procedure:

Unless otherwise directed, use the following procedure to disinfect the oral-nasal mask/regulator:

1) Wet or immerse all components to be sanitized. Allow components to stay in contact with the solution for at least 10 minutes.

⚠ CAUTION

Germicidal cleansing solutions must be carefully diluted if required in accordance with the manufacturer's recommendation. If solution is not of the recommended strength, it will not act as an effective disinfectant. Failure to thoroughly rinse germicidal cleansing solution from diving equipment may result in lung irritation and/or long-term degradation of rubber and silicone components of this equipment.

2) If the solution appears to be drying, apply more solution to keep it wet for the full 10 minutes.

3) After 10 minutes, thoroughly rinse components under running potable water.

NOTE: The purpose of this procedure is to sanitize the components exposed to each of the divers. KMDSI recommends sanitizing be accomplished daily in between use by different divers, after each use, or when future use is anticipated within the mission (job) period. KMDSI defines "A mission is defined as use of the helmet over a seven-day period."

6.4 Daily Maintenance

The following steps must be performed daily at the completion of diving operations.

1) Disconnect the helmet from the diving hose and EGS cylinder. Make sure the air is off and the breathing system of the helmet is unpressurized. To vent the system, open the defogger valve knob and emergency gas valve knob until all gas flow stops.

2) Place a protective cap over both the air inlet and the emergency valve inlet to prevent foreign matter from entering the valves.

Cover the air inlet and emergency gas valve openings with dust caps when not in use.

⚠ WARNING

Never disconnect any hose from the helmet unless all gas has been vented from the hose first. If the hose is disconnected with pressure in the line the fittings may be damaged. In addition, the hose can whip about causing injury to anyone standing nearby.

3) If the head cushion is wet, remove it from the helmet and rinse it with fresh water. The head cushion is fastened into the helmet with snap tabs and pulls out easily. To ensure that the head cushion is dry for future use you may want to remove the head cushion foam. However, do not remove the foam unless it is absolutely necessary. The head cushion will dry properly without removing the foam.

4) If the head cushion is wet, the chin cushion is probably wet, too. Like the head cushion, the chin cushion is fastened into the helmet with snaps. Remove it from the helmet, rinse it with fresh water, and allow it to dry.

5) Remove the earphones from the retainer clips. Avoid getting water on the oral nasal microphone and earphones. Remove the earphone covers from the earphones so they can dry completely.

Remove the foam for the head cushion if wet.

Uncover the earphones so they may dry.

Wash the microphone with a mild solution of soapy water, followed by a rinse with fresh water.

6) Wash the exterior of the helmet with a mild soapy

water solution. Rinse the exterior of the helmet thoroughly with fresh water. Turn the defogger valve knob, emergency valve knob, and regulator adjustment knob while rinsing to prevent salt from accumulating under these valves.

7) Remove the regulator cover, clamp and diaphragm, and wash the interior of the regulator with a mild solution of soapy water. Run water through the air delivery tube located in the oral nasal.

Do not depress the purge button while rinsing the regulator as this action will permit foreign matter back into the inlet valve and seat.

8) Wash the interior of the helmet and oral nasal mask with a soapy water solution and rinse with fresh water.

9) Screw the demand regulator adjustment knob all the way out. This will prolong the life of the inlet valve seat and keep the internal adjustment correct. Close the emergency valve and steady flow valves.

10) Lubricate the shaft of the nose block device with silicone lubricant.

11) Rinse the neck dam assembly and allow to dry. Remove the O-ring from the bottom of the helmet, clean and lubricate.

⚠ WARNING

Avoid patching a torn or punctured neck dam. If the patch comes off underwater the helmet could flood and/or cause the demand regulator to freeflow. Serious injury, drowning or death may result. A damaged neck dam should be replaced.

The neck clamp and latch catch must operate properly. They must be regularly inspected and serviced.

12) If the neck dam is damaged it should be replaced.

13) Operate the neck clamp and latch catch as you rinse these items with clean, fresh water.

14) Wipe all surfaces with a clean, dry towel to remove water droplets and allow to dry.

The nose block O-rings must be regularly lubricated.

The o-ring on the base of the helmet must be in good condition.

6.5 Monthly Inspections

6.5.1 Quad-Valve™ Exhaust System

The exhaust system on your helmet requires regular attention. It should be inspected and serviced every month.

1) Remove the whisker clamps (or tie wraps) that secure the whiskers.

2) Carefully cut the tie wrap that connects the Quad exhaust cover to the exhaust main body.

3) Remove the two screws that hold the Quad exhaust cover to the exhaust body.

4) Remove the Quad exhaust cover and inspect the exhaust valve.

Inspect the exhaust valve for cracks or tears, replace if needed. Lubricate the valve with a small amount of silicone lubricant. Rub the lubricant into the valve thoroughly leaving no excess lubricant to collect sand or other debris.

⚠ WARNING

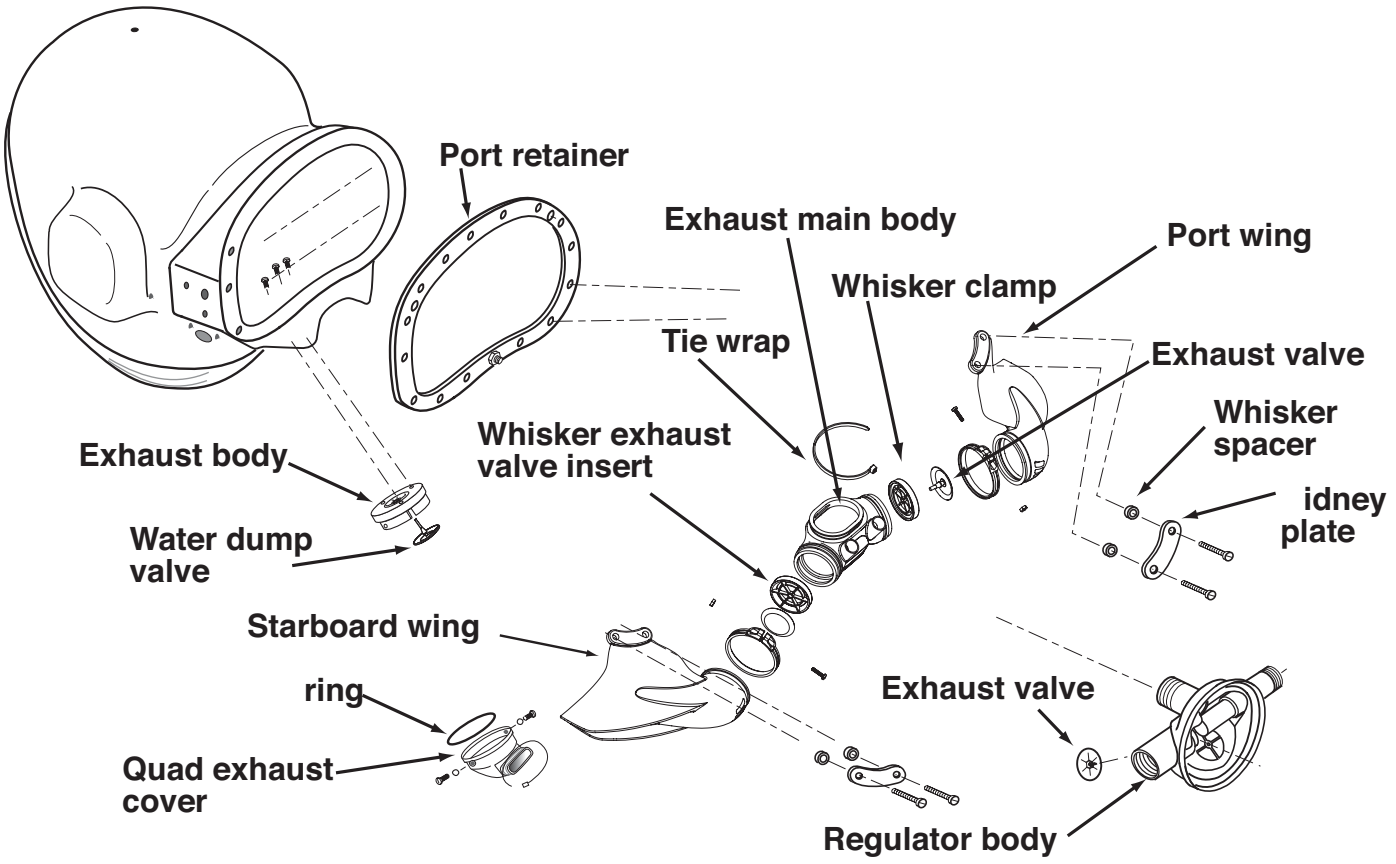
Use only KMDSI original replacement spares when repairing your helmet. The use of other manufacturer's parts will interfere with the performance characteristics of your life support equipment and may jeopardize your safety. Additionally, any substitutions will void all warranties offered by KMDSI.

5) Reinstall the Quad exhaust cover so that it connects to the exhaust main body and the exhaust body.

6) Install the screws and tighten to "12" inch pounds.

7) Install the tie wrap that fastens the exhaust main body to the Quad exhaust cover and tighten until snug.

8) Install the whisker clamps properly and tighten. See Chapter 7 for this procedure.



The Quad-Valve™ Exhaust System

6.5.2 Emergency Valve Assembly
Without gas to the helmet, check "exercise" the Emergency Gas Supply valve ensuring the valve operates smoothly. Replacement/overhaul guidance will be found in Chapter 7 of this manual.

6.5.3 Steady Flow/Defogger Valve
Without gas to the helmet, check, i.e., "exercise" the Steadyflow/Defogger valve ensuring the valve operates smoothly. Replacement/overhaul guidance will be found in Chapter 7 of this manual.

6.5.4 Bias Device Adjustable Section of Demand Regulator
Remove the regulator cover clamp, cover and diaphragm and inspect the interior of the regulator body for corrosion and contamination. Carefully inspect the diaphragm for cuts, tears and deterioration. If any damage is present replace the diaphragm, per Chapter 7 of this manual.

Attach an air source to the umbilical adapter and set the supply pressure to between 135-150 p.s.i.g. (9.3-11.4 bar). Adjust the regulator knob out, until a slight free flow develops, then, adjust in until the free flow just stops and check the lever play. It should be between 1/16" – 1/8" (1.5 – 3.0 mm). Adjust if necessary, per Chapter 7. Reinstall the diaphragm, the cover and the clamp.

6.5.5 Neck Clamp and Yoke Assembly
Inspect the neck clamp and yoke assembly and test for proper operation per Chapter 8 of this manual.

6.5.6 Latch Catch Mechanism
Inspect the latch catch mechanism and test for proper operation per Chapter 8 of this manual.

Chapter 7
Breathing System Maintenance and Repairs

7.1 Introduction

This chapter covers the maintenance and repair of all components of the breathing system. The breathing system includes the one way valve, the emergency valve, the side block, the bent tube assembly, the demand regulator, and the oral nasal mask.

The breathing systems on all Kirby Morgan helmets and masks are simple and highly reliable. The fact that they can continue to operate when the components are not in a well-maintained condition can cause divers to become complacent about maintenance.

Your life depends on the correct function of this equipment!

While Kirby Morgan helmets and masks are simple to maintain, like any type of life support equipment, they do require regular periodic maintenance to function properly.

All parts disassembled should be thoroughly cleaned using the methods described in the Appendix in the rear of this manual. Components that require the use of lubricants, sealing and thread locking compounds should also be maintained.

Most fasteners have a torque value, it is imperative that all fasteners which have a torque value be tightened to the torque specifications as outlined by the procedure, or as listed in appendix 1. If in doubt as to the proper torque setting, contact your local authorized repair facility or KMDSI.

7.2 One Way Valve

NOTE: The one-way valve assembly should be disassembled, cleaned and the three O-rings should be replaced at least annually. Damaged and/or corroded parts should be replaced. A repair kit is available for replacement parts (525-330).

7.2.1 Disassembly Of The One Way Valve

Tools Required:
Soft Jaw Vice
1 inch Open End Wrench Attachment on Torque Wrench

Never use pliers to work on the one way valve.

⚠ CAUTION

Use two wrenches or hold the hex part of the body in a vise while removing or turning the seat with a wrench. Do not use pliers on the main body of the one-way valve. You may damage the valve if pliers are used.

(If no vise is available use a backup 1 inch open end wrench)

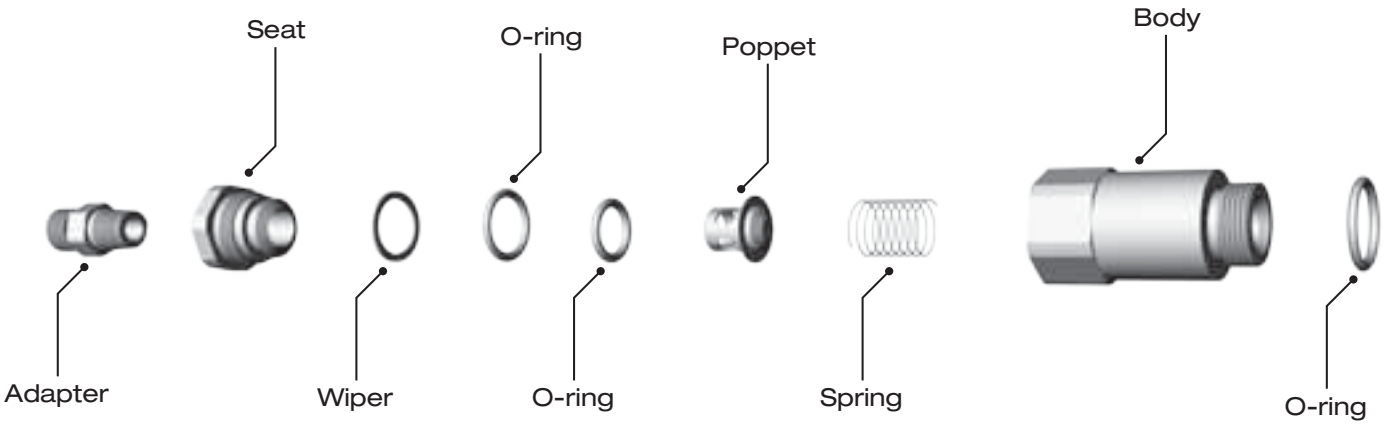
To disassemble and inspect the one way valve assembly:

1) The one way valve assembly must be removed from the side block. Use the open end wrench to remove it.

2) After the one way valve has been removed, use two wrenches or hold the hex part of the body in a soft jaw vise while removing the seat with a wrench.

As the seat is removed, the wiper and the O-ring will slide out in place in a groove on the seat. The poppet and the poppet O-ring usually come out in the seat being followed by the spring.

The only functional part remaining in the valve body is a non-moving, pressed-in cage. The function of the cage is to prevent the poppet O-ring from blowing out of place during high flows. Do not attempt to remove the pressed in cage.



Correct assembly order of the one way valve.

3) Inspect the body interior for foreign matter of any type and clean, if necessary. Clean in accordance with the cleaning instructions in Chapter 6. If corrosion is present, clean using the acidic solution as outlined in Chapter 6.

4) Inspect the seat, wiper, O-ring, poppet O-ring and poppet for wear, replace if necessary. Be sure each part is clean and all components are lightly lubricated with the appropriate lubricant. A repair kit is available for replacement parts. (Part #525-330)

5) Be careful to wipe the poppet and poppet O-ring thoroughly, removing nearly all excess lubricant to prevent foreign materials from sticking to these components.

6) Replace the spring.

7.2.2 Reassembly of the One Way Valve

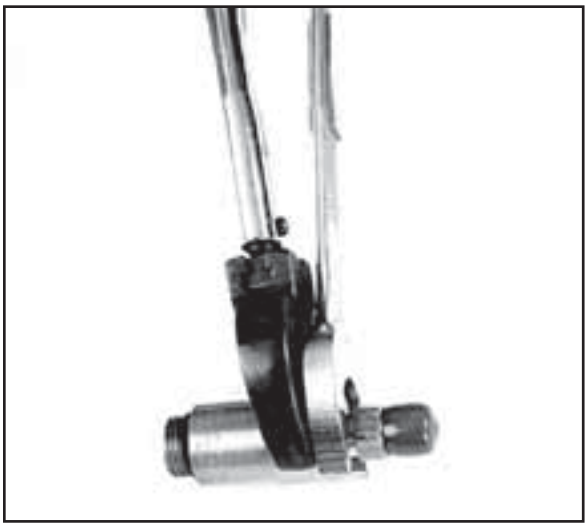
1) Slide the new O-ring over the poppet.

2) Insert the new spring into the valve body, followed by the poppet.

3) Next, install the new O-ring and new wiper on the seat. Thread the seat into the valve body.

4) Tighten the seat to 150 inch lbs. (17 Newton meters) with a torque wrench while holding the body in a soft jaw vice or wrench.

5) If the adapter has been removed, it must be cleaned and wrapped with Teflon® tape.



Tighten to 150 inch lbs. (17 Newton Meters) with a torque wrench.

6) Test the operation of the valve.

7) Place the new O-ring on the end of the one way valve assembly and reinstall the valve assembly in the side block. Tighten to 150 inch lbs. (17 Newton Meters) with a torque wrench.

⚠ WARNING

Do not allow any Teflon® tape to cover the end of the adapter, or to enter the one-way valve. Loose pieces of Teflon® tape can interfere with the performance of the one-way valve or the regulator and may block the diver's air supply. This could lead to death through suffocation.

7.3 Side Block Assembly
7.3.1 General
The side block should be overhauled at least annually, or whenever components show signs of wear, damage or do not function smoothly or properly. Minimum replacement components during overhaul includes all O-rings. A repair kit is available for replacement parts (Part #525-311).

The side block does not require removal from the helmet each time an overhaul is being conducted providing inspection of the internal passages does not reveal contamination or excessive corrosion. However, the side block should be completely removed at least every three years of active use to ensure fasteners are not corroded or frozen.

The side block assembly is held in place on the helmet shell by a stud, flat washer, lock washer, nut, and a machine screw. The screw does some securing but its main function is to prevent rotation of the side block. The stud also extends into the interior of the helmet shell far enough to secure the air train by means of the washer and nut.

The air train cup that fits over the stud is made of soft brass and cannot be used for a bearing surface to mount the side block. RTV silicone rubber compound is used to form a gas tight seal between the side block and the exterior of the helmet shell.

7.3.2 Side Block Assembly Removal
Tools Required:
7/16,11/16, and 7/8 inch Open End Wrenches
11/16 and 7/8 inch Open End Wrench Attachment on Torque Wrench
1/4 inch Flat Blade Stubby Screwdriver

The bent tube assembly must be entirely removed before removal of the side block assembly is started.

1) Completely unscrew the bent tube assembly nut (14) from the side block.

2) Using two wrenches, hold the nut at the regulator end of the bent tube assembly with the first wrench. With the other wrench, loosen the jam nut by turning the wrench DOWN.

3) Unscrew the bent tube nut until it comes free, then pull the bent tube assembly straight out of the regulator inlet nipple.

Loosening the bent tube from the side block.

4) The side block assembly is ready to be separated from the helmet shell at this time.

Remove the bent tube assembly before removing the side block.

7.3.3 Separating the Side Block Assembly from the Helmet Shell

Tools Required:
Putty Knife
7/16 inch Open End Wrench
1/4 inch Flat Blade Stubby Screwdriver

1) Removal of the side block assembly requires removing the air train.

2) Remove the nut and washer that secure the air train,

You must remove the nut that secures the air train before you can proceed in removing the side block.

then the air train and air train sealing gasket.

3) The stud nut is removed next, with the lock washer and flat washer.

4) Next, the alignment screw is removed.

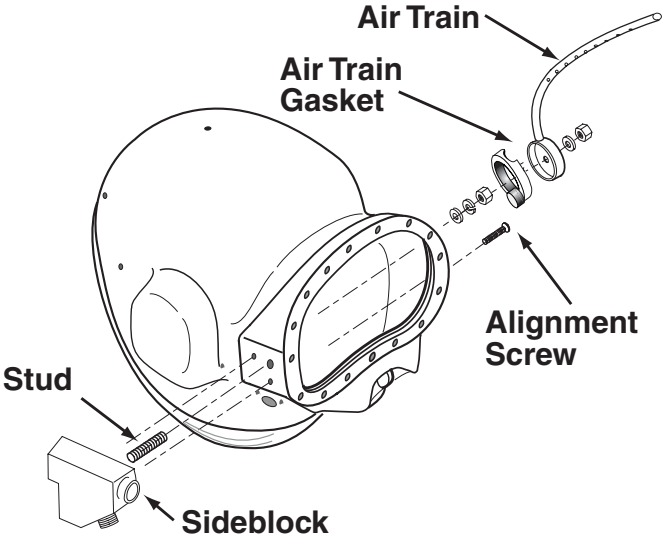
NOTE: The alignment screw is located in a recess in the fiberglass next to the stud. In older helmets without the air train gasket, this recess was normally filled with RTV. The RTV, if present, must be scraped free to reveal the screw.

5) The side block assembly is now unfastened, but held in place by the rubber sealing compound (silicone sealant) that acts as a glue. It may be necessary to rock just slightly, or pry the side block from the helmet shell. A thin putty knife can be pushed between the side block and the helmet shell to help free it.

A thin putty knife helps to remove the side block.

Do not use a screwdriver or chisel to remove the sideblock as damage to the shell could result. Be sure to peel or scrape the old silicone sealant away from both sealing surfaces before reassembling. Acetone helps remove this, but must be used sparingly since it will also remove the flat black finish inside the helmet.

6) If you plan to rebuild the side block assembly, it should be done at this time, while the side block is off the helmet. Overhaul the defogger valve and emergency valve in accordance with this chapter. Overhaul the one-way valve in accordance with this chapter.



The air train fastens to the stud that connects the assembly to the sideblock.

⚠ WARNING

Use silicone sealant in a well ventilated area. Do not breathe the fumes from uncured silicone sealant. These fumes are dangerous and can cause unconsciousness. They can also cause long term damage to body tissue. Read and follow all precautions listed on the silicone sealant tube and Material Safety Data Sheet.

⚠ WARNING

Do not dive the helmet until the sealant has had time to cure. Check the directions on the tube of sealant for curing time. If the helmet goes into the water before the sealant has cured it could leak through the side block mounting stud hole, screw hole, or air flow hole. This could lead to drowning.

⚠ WARNING

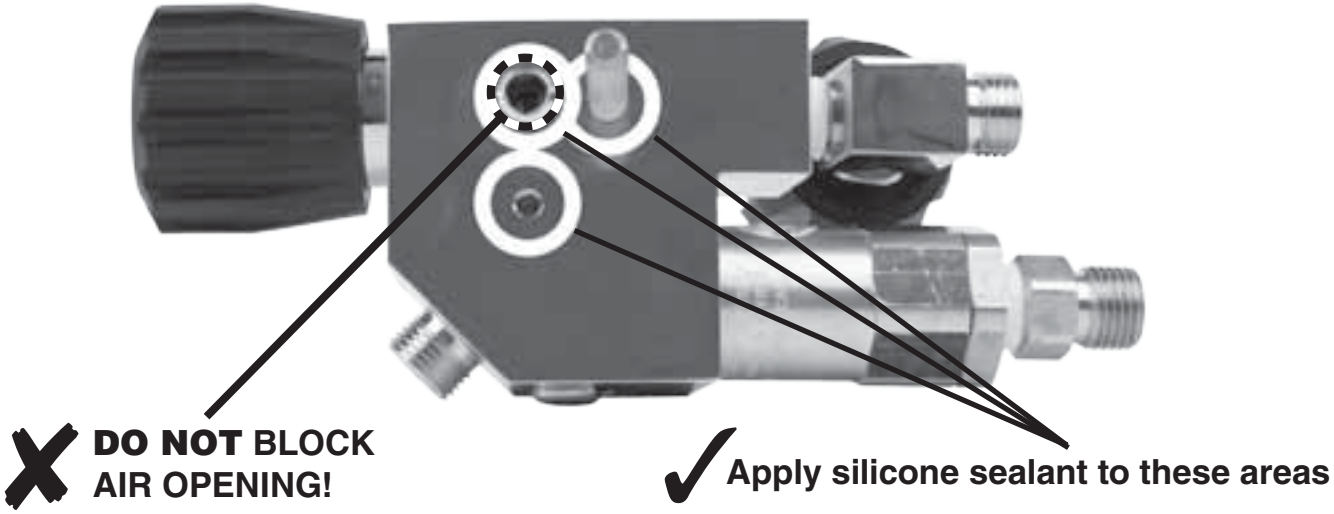
If silicone sealant is blocking the air flow into the helmet it must be cleaned out. If it is not, the diver may not be able to properly defog the helmet or clear a flooded helmet quickly. In addition, if the demand regulator is not delivering air properly, the diver cannot use the free flow system as a source of breathing air. This could lead to suffocation.

⚠ WARNING

Avoid breathing fumes from acetone and use in a well ventilated area. Breathing fumes can lead to nervous system damage, unconsciousness, and death.

⚠ WARNING

Avoid eye contact with acetone. This chemical is an irritant and may cause tissue damage.



A light application of silicone sealant must be applied to the side block prior to installation on the helmet shell. Use only Dow Corning® RTV 732 Multi Purpose sealant or equivalent.

7.3.4 Side Block Assembly Replacement

If a new side block is being installed, make sure it aligns correctly in the holes of the helmet shell by dry fitting it before applying RTV silicone sealant.

1) A light application of silicone sealant must be applied to the side block prior to installation on the helmet shell. The sealant should surround the stud, alignment screw, and air inlet on the block. Use only Dow Corning® RTV 732 Multi Purpose sealant or equivalent. This work must be done in a well-ventilated area.

Care must be taken to avoid sealant entering the air opening in the side block. Be sure to remove all excess silicone sealant before it sets up. Acetone can be used to dissolve uncured sealant, after tightening.

2) Fit the side block to the helmet shell.

3) Thread the screw through the helmet shell and lightly tighten into the side block body.

4) Slide the flat washer and the lock washer onto the stud. Run the stud nut down the stud and tighten to 35 inch pounds (4 Newton meters). **Do not overtighten**!

5) Tighten the screw to the correct torque, 20 inch pounds. Clean off all excess silicone sealant. Acetone may be used for this purpose.

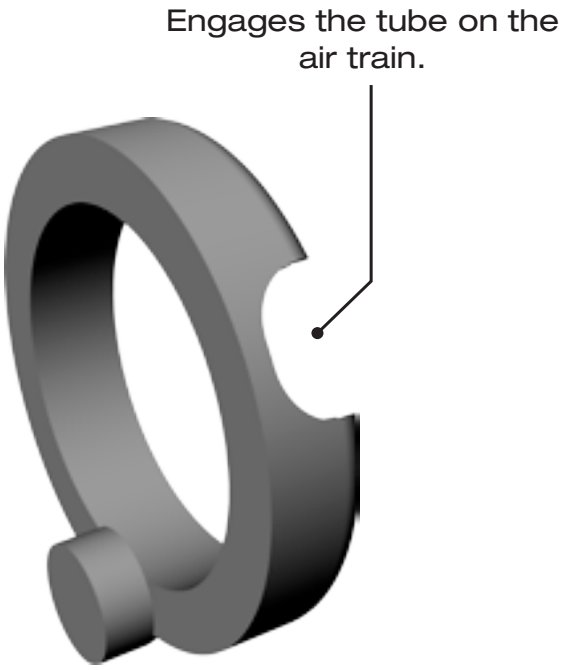
6) Place the air train gasket on the base of the air train. The knob on the base of the air train gasket is designed to cover the recessed hole where the screw that helps maintain the position of the air train is installed. Slip the air train over the stud. Align the air train with the upper edge of the view port opening in the helmet shell.

7) Place the washer on the stud and tighten the nut until the washer lays flush on the air train, 15 inch pounds. **Do not overtighten**!

8) Test the side block prior to diving to ensure that no silicone sealant is blocking the air flow to the helmet. If it is, it must be cleaned out prior to diving.

⚠ WARNING

Avoid skin contact with acetone. Wear rubber gloves. Acetone can damage the nervous system.



The air train gasket forms a seal between the air train and the interior helmet shell.

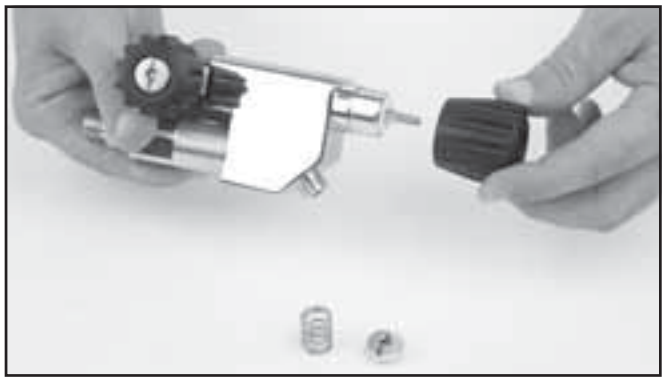
7.4 Defogger Valve

7.4.1 Disassembly of the Defogger Valve

Tools Required:
3/8 inch Slotted Flat Blade Screwdriver
13/16 inch Open End Attachment on Torque Wrench

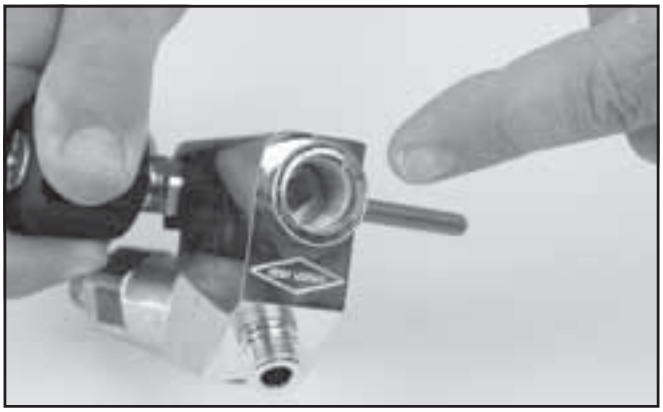
The defogger valve components are disassembled as follows:

1) First, unscrew the control knob lock nut and remove the spring, control knob, and washer.



Remove the defogger control knob.

The valve stem usually comes out with the bonnet.



The seat should be removed for inspection.

2) Next, unscrew the bonnet. Its o-ring will come off with it. The valve stem, o-ring, and washer usually come out with the bonnet and can be pushed out of the bonnet once removed from the side block.
3) If the stem remains in the side block body it can be lifted out after the bonnet is removed.

4) The seat assembly can be unscrewed from the side block body with the stem or a screwdriver.

7.4.2 Cleaning and Lubricating

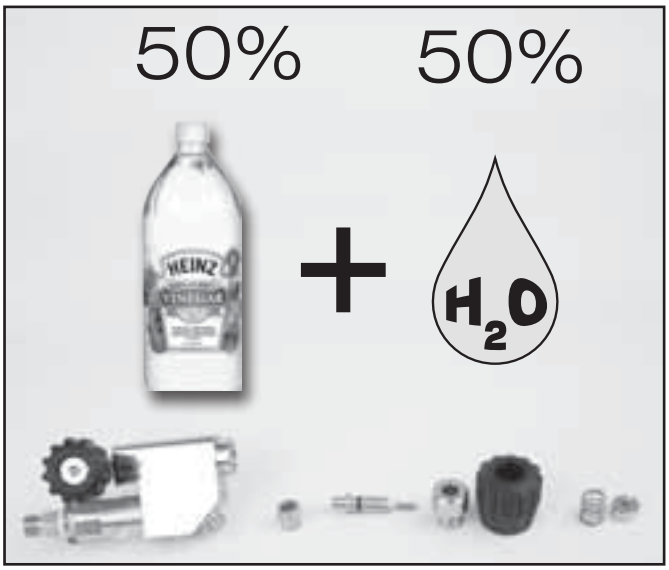
1) Clean all the metal first in the soapy water solution and then in a 50/50 dilute solution of white vinegar/water. Rinse in fresh water.

2) Check the Nylon seat for wear and/or contamination, and replace if necessary. Damage such as a rough face or cuts to the seat indicate it must be replaced.

3) The Teflon® washer and O-ring must be replaced if worn.

4) Be sure to place a light coating of proper lubricant on all internal moving parts, O-rings, and washers. However, do not lubricate the Nylon seat, as this will attract dust and debris.

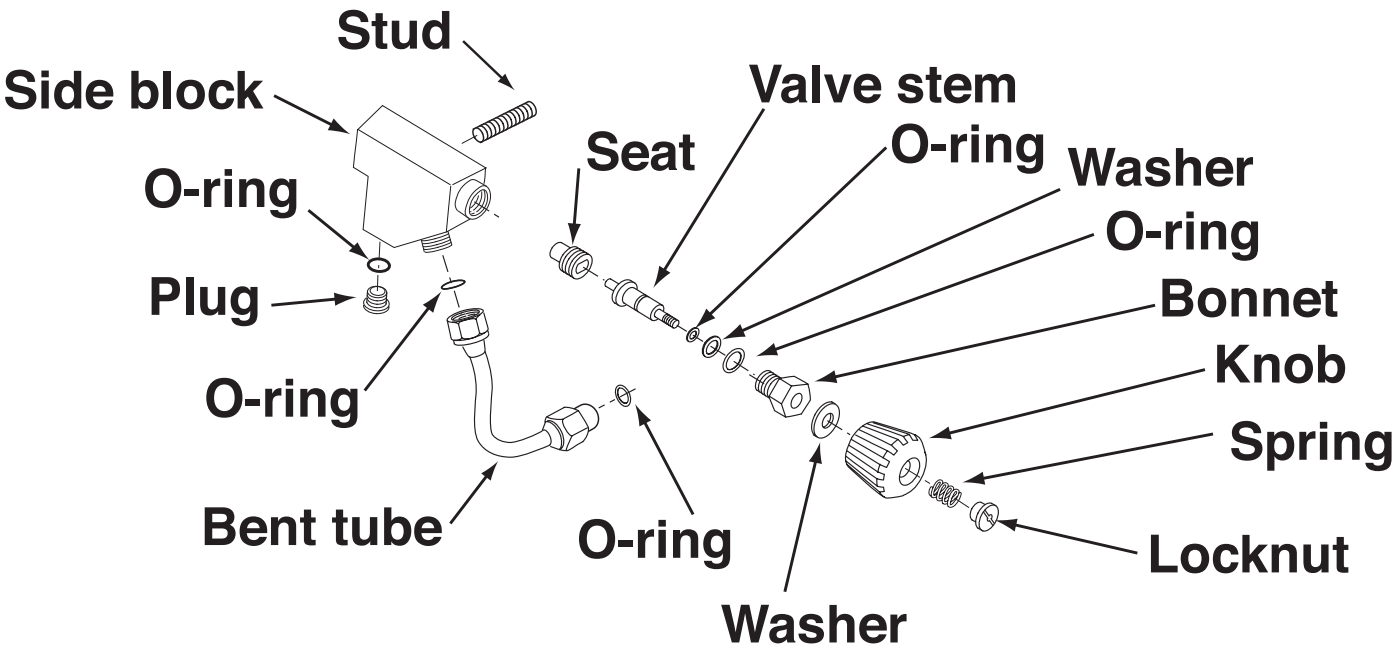
5) Inspect the seat area inside the side block and replace the block if damaged.



Clean all the metal parts to remove salts.

Note: The procedures are the same for the "A" sideblock.

The Side Block assembly and it's associated parts.



7.4.3 Reassembly of the Defogger Valve

Tools Required:
3/8 inch Slotted Flat Blade Screwdriver
13/16" Open End Attachment on Torque Wrench
Minimum recommended replacement parts during overhaul:
Washers, O-rings

1) Screw in the new seat assembly until it is even with the front of the side block body.

2) Next, install the Teflon® washer and O-ring onto the stem.

3) Insert the proper end of the stem into the seat assembly and turn clockwise until the seat lightly bottoms out. Leave the stem in place.

4) Lubricate the O-ring and install on the bonnet.

5) Slide the bonnet over the stem and thread the bonnet into the side block.

6) Tighten the bonnet with a torque wrench to 100 inch lbs.

7) Place the new Teflon® washer and the control knob on the stem and rotate the stem counterclockwise until the seat assembly tops out fully open. The control knob must turn smoothly without any binding. Binding (or "hard spots") in the rotation could be an indication of a bent stem that should be replaced. Replace the knob and or stem if the fit allows the valve to rotate loosely more than 1/8th of a turn.

8) Install the new Teflon® washer, new knob, and the spring, and locknut. Tighten the locknut until it is flush with the knob.

Note: The procedures are the same for the "A" sideblock.

7.5 Emergency Valve Assembly

The Emergency valve control knob is not interchangeable with the defogger valve control knob.

⚠ WARNING

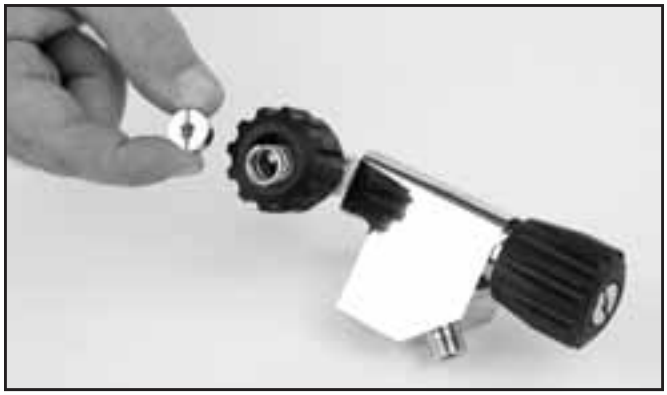
The control knob for the emergency valve and the defogger knob are not interchangeable. Use only the correct knob for the appropriate valve.

7.5.1 Disassembly of the Emergency Valve

Tools Required:
11/16 inch Open End Wrench
1 inch Open-end Wrench
Torque Wrench Attachments & Torque Wrench
3/8 inch Slotted Flat Blade Screwdriver
Soft Jaw Vice
Lubricant
Teflon® Tape

1) Remove the lock nut, spring, and knob.

2) Undo the packing nut, and remove the packing, and washer.



Remove the lock nut, spring and knob.

Undo the packing nut.

Remove the valve stem.

3) When the packing nut is free of the threads of the emergency valve body, back out the stem until it is free of the emergency valve body.

7.5.2 Cleaning and Lubricating

1) Clean all the metal parts in a soap and water solution, followed by cleaning with a 50/50 dilute solution of white vinegar/water. Rinse with fresh water. Clean all parts. See the cleaning instructions in Chapter 6.

2) Inspect the packing and washer for wear and replace if necessary. Normally the packing will last a very long time and does not require replacement as long as the valve operates smoothly and does not leak. To replace the packing place the packing nut in a vise and carefully work the packing out with a small screw driver, taking care not to damage the threads of the packing nut. Replace the washer if needed.

3) Inspect the stem seat for unevenness or wear and replace if necessary. It must also be replaced if the stem is bent. Damage will include damaged threads, rounded flats that engage the control knob. Also inspect the shaft to ensure the conical seat surface is smooth and free of corrosion or damage.

Inspect the packing and washer.

4) Check the seat in the emergency valve body for wear or unevenness, galling and corrosion. Check the seat on the emergency valve stem. To clean up the seat surface use a pencil eraser to buff the surface. Inspect all threaded surfaces for damage. Replace the emergency valve body if any damage is found.

5) To remove the emergency valve body from the side block the one way valve assembly must first be removed.

6) If the emergency valve body is then removed, clean and inspect the pipe thread and inspect for damaged threads, cracking or distortion. Replace the emergency valve if any damage is present.

Re-tape threads with Teflon® tape, 1 ½ wraps starting two threads back, tighten using good engineering practice. To reinstall the emergency valve body onto the side block, the one-way valve assembly should not be installed.

7.5.3 Reassembly of Emergency Valve

1) Lightly lubricate the stem threads in the body as well as the bonnet threads.

2) Replace the washer and packing on the stem, then lightly lubricate the stem shaft and threads.

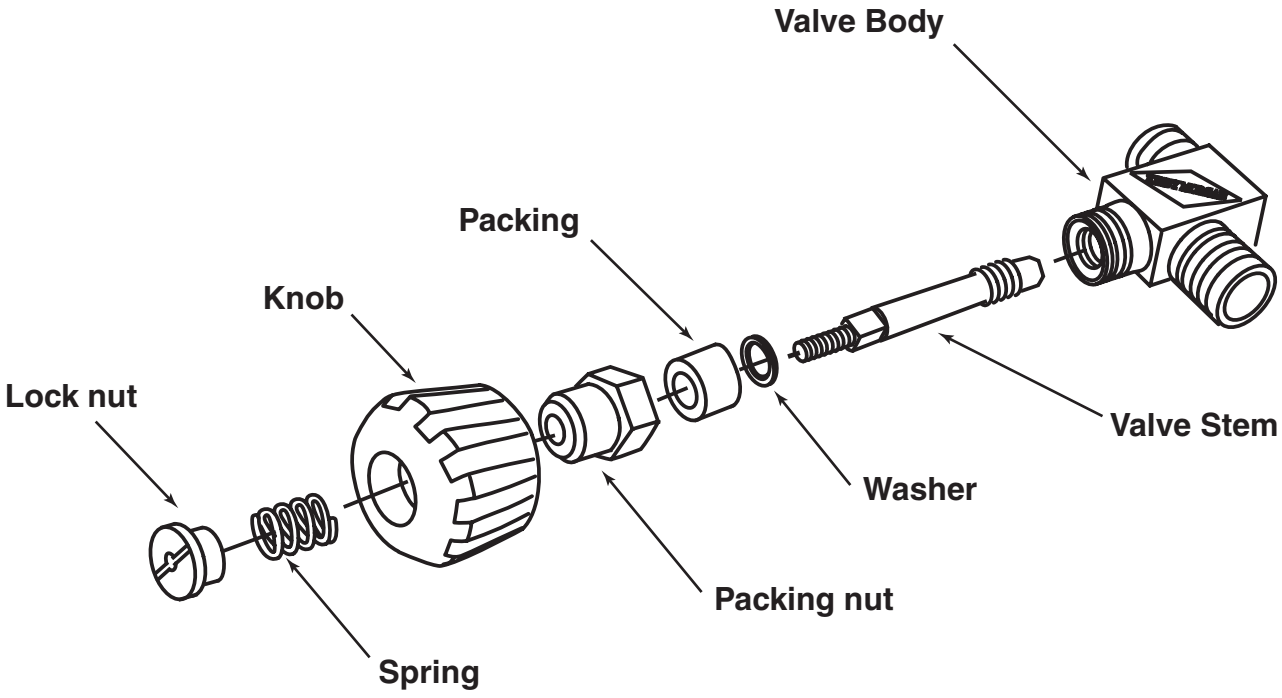
Installing the packing nut on the valve stem.

NOTE: There are two different packing (s) and washers supplied in the kit (525-311), for rebuilding both the older style and the newer high flow emergency gas valve. Match the removed packing and washers to the new ones supplied and discard the others.

3) Holding these components in place on the stem, screw the stem into the emergency gas valve body.

4) Rotate the stem until it is seated all the way in then, back it out -1/2 turn.

5) Thread the packing nut onto the emergency valve body. Run the nut in and tighten slightly with a wrench.



The emergency valve

⚠ WARNING

The control knob for the emergency valve and the defogger knob are not interchangeable. Use only the correct knob for the appropriate valve.

6) Inspect the emergency gas valve knob for wear and damage. Ensure the flats that engage the valve stem shaft are not rounded, cracked or damaged. The valve knob should not have rotational play greater than 1⁄16 of a turn.

NOTE: This knob is not interchangeable with the defogger valve knob.

7) Place the emergency gas valve knob onto the stem and rotate the stem all the way out, then back again. The rotation must be smooth. If "hard spots" or unevenness are felt during the rotation, the stem may be bent and could need replacement.

8) Tighten the packing nut with a torque wrench until moderate resistance is felt when turning the knob. Torque to 50 inch pounds after seating.

9) Place the spring, and locknut onto the stem securing the knob.

10) Tighten the locknut until its top is flush with the top of the knob. The assembly is now complete and ready for testing.

NOTE: At this time, with the valve separated from the sideblock, testing of the emergency gas valve is easily accomplished by attaching the valve, by itself in the shut position, on to the bail-out whip from the first stage. Pressurized to a minimum 135 p.s.i.g. (9.3 bar) using the EGS Cylinder and dropping it into a bucket of clean water a minimum 30 seconds to check for leaks.

⚠ WARNING

Use only thin Teflon® tape when installing the Emergency Gas Supply valve in the side block. Thick tape can lead to thread damage, which may make it impossible to install the EGS valve in the side block properly. This could lead to a loss of breathing gas.

11) Before wrapping the threads with pipe tape, check the fit of the valve assembly pipe threads to the mating threads of the side block. There should be 2 turns of hand make up before needing to use a wrench.

If there is less make up, call your nearest KMDSI dealer or Dive Lab for advice.

12) Before installing the valve assembly, wrap the pipe threads with 1 ½ turns of Teflon® tape starting after the first thread. Apply the tape with slight tension to allow the tape to fill into the threads.

Hand tighten the valve, then continue an additional 1 ½ to 2 turns with a wrench keeping in mind the proper alignment of the control knob to the side block. Also, there should be at least one male thread visible. Check to be certain the valve is tight by trying to loosen the fit by hand.

DO NOT TIGHTEN THE VALVE BODY TIGHTER THAN NECESSARY! OVER TIGHTENING MAY OVERSTRESS THE PART AND CAUSE THE PART TO FAIL.

It is NOT necessary to have the control knob for the emergency gas supply valve perfectly "square," i.e., at a 90 degree angle to the side block. Any angle is acceptable provided that 1) the valve handle can be turned easily and 2) the diver can locate the handle easily.

7.5.4 Leak Testing the EGS Valve

1) Attach supply whip from the EGS first stage to EGS helmet valve.

2) Ensure the defogger valve knob is open and the EGS Valve is shut.

⚠ WARNING

A leaking Emergency Gas Valve assembly can cause the diver to exhaust their entire EGS (bailout) without their knowledge. This may lead the diver to mistakenly assume their EGS supply is available when it is not. This could lead to panic or drowning in an emergency. Any worn or damaged components must be replaced.

A submersible pressure gauge should always be used with the EGS system to help minimize this risk.

3) Pressurize EGS Valve to a minimum of 135 p.s.i.g. (9.3 bar) using the EGS cylinder as supply. Allow system pressure to stabilize, and then shut the EGS supply cylinder valve. Note time and final stabilized system pressure.

4) Perform the leak check for minimum of five minutes, using the mild soapy solution, per Chapter 6. Ensure there is no gas flowing or pressure drop in the system. There should be no visible signs of external leakage if the valve is operating properly.

7.6 Bent Tube Assembly

7.6.1 General

The bent tube assembly provides breathing gas flow from the side block assembly to the regulator assembly. Both ends of the bent tube assembly disconnect for complete removal. The O-ring and the Teflon® O-ring should be replaced during normal overhauls or any time these components are deemed unserviceable.

These components do not require replacement during field repairs providing a careful visual inspection does not reveal wear or damage. All soft goods should be carefully cleaned in accordance with Chapter 6 prior to inspection for reuse.

7.6.2 Removal of the Bent Tube Assembly

Tools Required:
11/16 inch Open-end Attachment on Torque Wrench
7/8 inch Open-end Attachment on Torque Wrench
7/8 inch Open-end Wrench

1) Always start removal of the bent tube at the side block end. The free swiveling mount nut on this end of the bent tube can be unthreaded completely and can slide down the tube.

2) The inlet nipple has a jam nut that locks the mount nut in place. With one wrench, hold the bent tube mount nut. With another wrench, turn DOWN the jam nut, backing it away from the mount nut. The mount nut can then be rotated until free of the regulator inlet nipple threads. It can be pushed up the bent tube.

3) With the two mount nuts free; the bent tube assembly can be pulled straight out of the regulator inlet nipple. The bent tube assembly can be rotated back and forth to aid removal.

Always start removal at the side block end.

Loosening the jam nut.

7.6.3 Inspection of Bent Tube Assembly

Clean the bent tube in accordance with Chapter 6. The O-ring at the regulator end should be cleaned and inspected whenever the bent tube is removed.

Replace the bent tube if it is excessively scratched dented or compressed deeper than 1/8 inch. If the helmet has been used for burning jobs, carefully check for erosion of the metal or severe corrosion. Replace if any erosion is present or integrity is in question. Keep in mind the bent tube is a critical component that routs breathing gas to the helmet systems.

Replace the O-ring on the bent tube if it is worn or damaged.

7.6.4 Installation of the Bent Tube Assembly

Tools Required:
11/16 inch Open-end Torque Wrench Attachment
7/8 inch Open-end Torque Wrench Attachment
7/8 inch Open-end Wrench
Normal minimum replacement parts during overhaul:
O-ring, Teflon® ring

1) Lightly lubricate the bent tube O-ring and install in the O-ring groove at the regulator end of the bent tube, then install new Teflon® O-ring at the side block end.

2) Push the regulator end of the bent tube assembly into the inlet nipple. Slide it in until the side block end of the tube is aligned with the threads for the mount nut.

3) Be sure the Teflon® O-ring is in place on the side block end of the bent tube, then engage the threads on the tube to the side block and hand tighten.

4) Start the "regulator to bent tube" mount nut onto the inlet nipple of the demand regulator and run it in by hand as far as it will go.

NOTE: Run the mount nut up on the inlet nipple hand tight only.

5) Using a torque wrench, tighten the bent tube assembly mount nut onto the side block to (100 inch lbs).

6) Hold the mount nut on the end of the bent tube with a wrench and tighten the jam nut against it with a torque wrench to 40 inch pounds.

⚠ WARNING

Do not wrap the bent tube with tape, ropework, springs, hose wrap, or other items. This will prevent daily inspection of the bent tube. In addition, some of these items may trap moisture, which could lead to corrosion and failure of the bent tube.

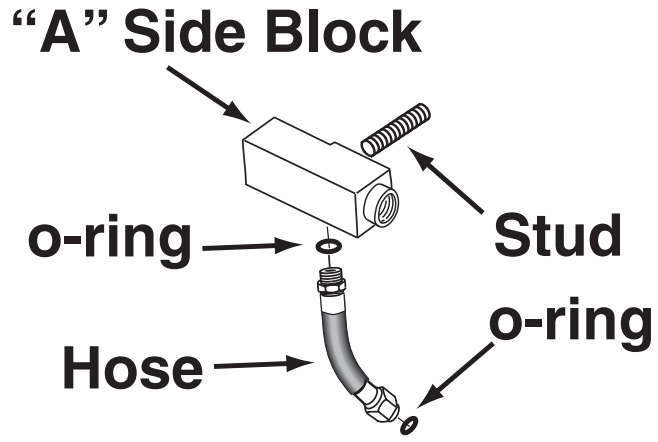
If the tube fails, this could lead to a rapid depletion of the diver's breathing gas supply. This could lead to serious personal injury or death.

7.7 Hose Assembly (SL-17A only)

The hose assembly provides for breathing gas flow from the Side Block Assembly to the regulator for the SuperLite®-17A. Both ends of the hose assembly disconnect for complete removal.

The block itself is no longer available, but replacement hoses, o-rings, and valve components are still available. The block was discontinued in 2005. If your "A" block is damaged, your helmet can be converted to a "B" sideblock with only a few additional parts.

Regardless of the hose condition it must be replaced at least every two years and o-rings should be replaced at least annually.



7.7.1 Hose Assembly Removal

Tools Required:
9/16 inch Open-end Wrench
11/16 inch Open-end Wrench
13/16 inch Open-end Wrench
O-ring Removal Tool
Torque wrench

1) Loosen the hose assembly at the regulator end first, while holding the regulator inlet nipple with a second wrench.

2) Disconnect the hose from the inlet nipple.

3) Loosen the hose at the side block connection.

4) Disconnect the hose from the side block.

7.7.2 Hose Assembly Inspection "A" style Side Block

Inspect the hose fittings for slippage and thread damage.

Inspect the hose for gouges, cuts, blisters, abrasions or any obvious signs of damage or deterioration. If the hose is worn or damaged it must be replaced.

Inspect the o-rings. If they are worn or cracked they must be replaced. Replace the hose O-ring during overhauls and/or annually.

NOTE: KMDSI recommends the hose assembly be replaced at least every two (2) years even if the condition appears good.

The hose and o-rings must be inspected on a regular basis.

7.7.3 O-Ring Replacement

1) Remove the o-ring from the side block end of the hose assembly by pinching it with your fingers and sliding it up the threaded end of the assembly. Install a new o-ring that has been lightly lubricated.

2) To remove the o-ring on the regulator end of the hose, you will need to use an o-ring pick made of brass or plastic. Care must be taken not to scratch or damage the sealing surface on the hose fitting when removing the o-ring. If the fitting is gouged it will leak breathing gas.

7.7.4 Hose Assembly Replacement

1) Thread the hose assembly into the side block and tighten with a wrench.

2) Install the hose assembly fitting onto the end of the regulator inlet nipple. Tighten the fitting while holding the nipple with a second wrench.

7.8 SuperFlow® Demand Regulator

7.8.1 General Regulator Information

While the regulator systems on all Kirby Morgan helmets are simple and highly reliable, the breathing resistance will increase if the demand regulator on your helmet is not maintained or adjusted properly. The demand regulator must receive regular maintenance to assure the best performance possible. However, in the event the demand regulator is damaged, there is always a backup supply of steady flow gas available from the defogger valve.

If the regulator does not breathe easily, the diver cannot work hard and will tire rapidly. Simply put: If the demand regulator does not work properly the diver cannot work properly. This makes the maintenance of the demand regulator assembly essential.

For the gas inlet valve and adjustment system to operate properly, the components in the demand regulator MUST be in good condition and MUST be periodically inspected and adjusted.

Four special tools, the inlet valve holder (Part #525-616), the regulator adjustment wrench (Part #525-611), the socket wrench (Part #525-612), and the castle wrench (Part #525-618) should be used to work on the SuperFlow® regulator whenever possible.

Disassembly, assembly, and adjustment can be done without these tools, but the work is much easier and the adjustment is better if these tools are used. The above 4 tools are available together along with a tool case. The "Tool Kit with Pouch" is Part #525-620. This kit is included with each new Kirby Morgan helmet that is equipped with the SuperFlow® regulator.

Tool Kit with pouch - Part #525-620.

7.8.2 SuperFlow® Demand Regulator Test for Correct Adjustment, Fully Assembled

To maintain optimum performance of the demand regulator, it should be checked for proper function and adjustment prior to commencement of diving each diving day, in accordance with the KMDSI Daily Set Up and Functional Checklist. See the Dive Lab website (www.divelab.com) for the latest procedures for set-up.

Check the regulator for adjustment and proper function with the assembly complete, and supplied with a breathing gas supply pressure of 135 to 150 p.s.i.g.

NOTE: 135 to 150 p.s.i.g. over ambient is the standard supply pressure to be used when adjusting all KMDSI helmets and band-mask equipped with the SuperFlow® regulator. See Chapter 2 for recommended pressures during use.

NOTE: When storing the helmet for any length of time, ensure that the regulator adjustment knob is turned "out" fully counterclockwise to avoid stressing the bias springs. This will prolong the life of both the inlet valve, seat, and bias springs.

1) Rotate the regulator adjustment knob in, towards the regulator body.

2) Ensure the supply pressure is connected and properly adjusted to 135 to 150 p.s.i.g.

3) Turn on the gas supply.

Set the supply pressure to between 135 and 150 p.s.i. before adjusting the regulator.

The regulator should begin to free flow once the adjustment knob is screwed out several turns.

4) Rotate the adjustment knob out counterclockwise slowly, until a slight steady flow develops.

5) Slowly rotate the adjustment knob in clockwise, until the free flow stops. Lightly depress the purge button several times and ensure the gas flow has stopped.

6) Lightly depress the purge button. There should be between 1/16" and 1/8" free travel in the button before gas flow starts. When the button is fully depressed, a strong surge of gas must be heard.

7) If the purge button travels less than 1/16" or greater than 1/8" before free flow is heard, the demand regulator requires internal adjustment, per this chapter.

7.8.3 Inspection of SuperFlow® Regulator Body Interior

Tools Required:
1/4 inch Flat Blade Attachment on Torque Screwdriver

1) Remove the demand regulator clamp by removing the clamp screw.

2) Lift off the regulator cover and diaphragm.

3) Clean the diaphragm with the soapy solution, per Chapter 6 and wipe dry. Inspect the diaphragm for holes, tears or any signs of deterioration by holding it up to a white light and stretching and pulling. Check for a good bond between the metal disc and the silicone. Replace diaphragm if any doubt exists.

4) Inspect the interior of the demand regulator body for damage, corrosion and cleanliness. Clean the interior of the regulator body if necessary.

5) Reinstall the diaphragm, cover, and clamp. Do not lubricate the diaphragm Tighten the clamp screw to the recommended torque to 12 inch pounds using a torque screwdriver.

Remove the demand regulator clamp.

⚠ WARNING

Use only replacement diaphragms manufactured by Kirby Morgan. Use of other diaphragms may degrade performance and may cause increased breathing resistance. This can lead to fatigue and the inability to work at full capacity.

NOTE: Older regulator clamps, when properly torqued, had a gap of approximately 1/32" to 1/16" between the retaining clamp surfaces when fully tightened. All new clamps when properly torqued, have little or no gap between the retaining clamp surfaces.

7.8.4 SuperFlow® Demand Regulator Bias Adjustment Servicing, Demand Regulator on the Helmet

Note: This procedure should be used when replacing the O-ring on the adjustment shaft and or cleaning and lubricating the shaft threads during field repairs of the demand regulator on the helmet. Start at the adjustment knob end of the regulator:

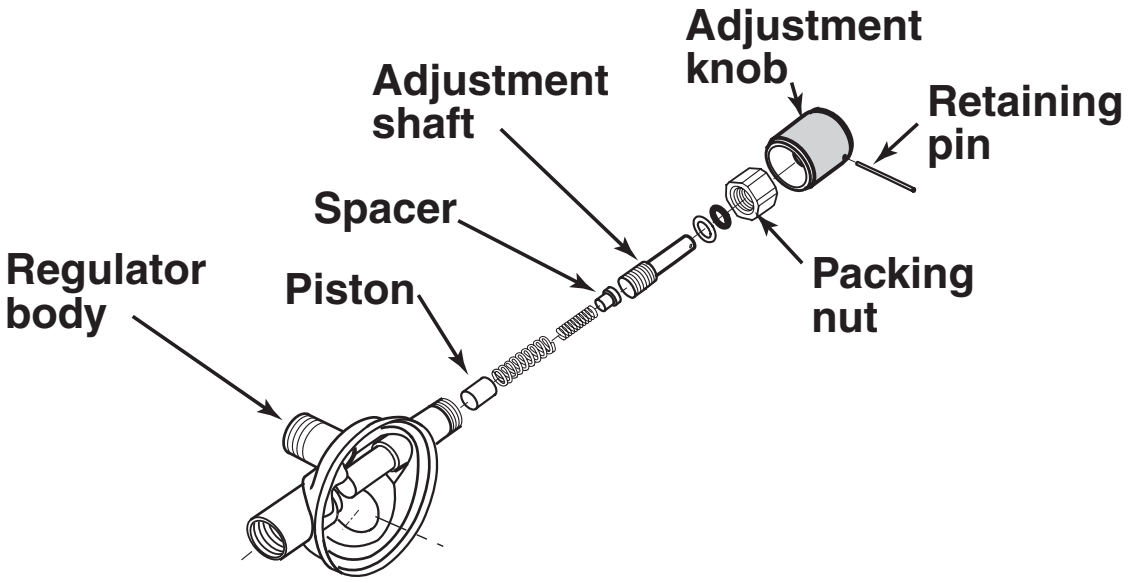
Tools Required:
3/4 inch Open-end Wrench Attachment on Torque Wrench
3/32 inch Punch & Small Block of Wood
Ball-Peen Hammer
Regulator Adjustment Tool Kit, Part #525-620
Torque Wrench

1) Unscrew the regulator adjustment knob until it stops. If the knob wobbles as you turn it, or is extremely hard to turn, the shaft is bent and needs to be replaced. Also check the alignment of the tubes in the regulator to make certain they are straight. If not, the regulator body may need to be replaced.

2) Loosen the nut, then rotate the adjustment knob counterclockwise until the adjustment knob and the adjustment shaft are free.

3) Remove the spacer, springs, and piston. At this point the threads can be cleaned and lubricated as well as the adjustment shaft.

Shake out the spacer, spring set, and piston.



The regulator adjustment mechanism on the SuperLite®-17.

Inspect the washer and o-ring.

4) Punch out the roll pin using a 3/32 punch. Use a block of wood with a 1/4" hole drilled through it to support the knob. Position the knob so the roll pin is over the hole. The adjustment knob can be held against the wood block allowing the roll pin to be driven into the 1/4" hole.

5) Remove the adjustment knob, the washer and O-ring.

NOTE: If the spacer and the spring set are stuck, this could indicate corrosion or possible saltwater intrusion into the adjustment tube and assembly, or that the adjustment tube is bent. The demand regulator should be removed from the helmet and cleaned and inspected, per this Chapter..

6) Carefully inspect all parts for corrosion, paying particular attention to threaded surfaces and the spring set. Clean and lightly lubricate parts per the instructions in this chapter.

NOTE: Carefully inspect the adjustment shaft to ensure it is straight, Check for damaged threads. Replace the adjustment shaft if any damage is found. Replace the O-ring.

7) Replace washer.

8) Replace the O-ring.

9) Inspect the inside of the adjustment tube on the regulator body to be sure there is no corrosion and the adjustment assembly can travel freely. Ensure the alignment tube is not bent or misaligned from impact, and that the threads are clean.

NOTE: If the inside of the adjustment tube is corroded, this indicates saltwater intrusion into the adjustment tube and assembly. The demand regulator requires removal from the helmet and cleaning per this Chapter.

7.8.5 Reassembly of the SuperFlow® Regulator Adjustment System

Tools Required:
3/4 inch Open-end Wrench Attachment on Torque Wrench
Silicone lubricant, or oxygen compatible lubricant if used for oxygen service.

1) Lightly lubricate the piston and spacer and place the piston back in the regulator adjustment tube, followed by the spring set, and spacer.

2) Lightly lubricate the adjustment shaft end and threads, install the washer and the lightly lubricated O-ring on the adjustment shaft.

3) Slip the packing nut over the adjustment shaft followed by the adjustment knob.

4) Hold the shaft and rotate the knob until the pin holes line up. Use the inlet valve holder from the regulator tool kit to accurately align these holes. Use the punch and wood block as described in previous step 4 on page 80 to reassemble. Using a small hammer drive the retaining pin back into place, until it is flush with the surface of the adjustment knob.

5) Screw the adjustment knob assembly clockwise back into the regulator body leaving enough packing nut exposed to get the wrench on it.

NOTE: Ensure the adjustment shaft rotates smoothly.

6) Thread the packing nut onto the regulator body (81) and tighten with the 3/4" torque wrench to 40 inch pounds) after seating, turn the knob all the way in and all the way out making sure there is no interference.

7.8.6 SuperFlow® Demand Regulator Removal from Helmet

Tools Required:
Torque Wrench and 1 1/4 inch Socket
1/4 inch Flat Blade Attachment on Torque Screwdriver
Torque Wrench and 11/16 Open-end Attachment
Torque Wrench and 13/16 Open-end Attachment
Torque Wrench and 7/8 inch Open-end Attachment
7/8 inch Open-end Wrench

1) To remove the regulator from the helmet, the bent tube should be disconnected first. The bent tube assembly should be loosened at the side block and disconnected from the regulator. It may now be swiveled out of the way or completely removed.

2) Remove the whiskers from the port retainer by removing the screws. Take care not to lose the spacers or kidney plates.

3) Remove the nose block device per Chapter 8.

Remove the whiskers from the helmet.

4) Remove the oral nasal mask.

5) The regulator mount nut is removed along with the sealing O-ring.

6) Cut the tie wrap that connects the regulator body to the Quad-Valve™ cover.

The regulator mount nut must be loosened with a wrench.

7) Now the regulator assembly can be pulled out of the helmet.

8) The center section of the exhaust whisker wing, named the exhaust main body has a tie wrap holding it in place. Remove the tie wrap then stretch the body off the regulator exhaust flange.

9) Older model double or single exhaust whiskers are removed similarly.

Remove the mount nut from the regulator.

7.8.7 Disassembly of the SuperFlow® Demand Regulator

Tools Required:
1/4 inch Flat Blade Screwdriver on Torque Wrench
7/8 inch Open-end Attachment on Torque Wrench
3/4 inch Open-end Attachment on Torque Wrench
3/32 inch Punch 7/8 inch Open-end Wrench
Small O-ring pick
Small Ball Peen Hammer
Sharp Trim Knife (X-ACTO®)
KMDSI Tool Kit Part #525-620
Silicone Adhesive Dow Corning® 732 or equivalent
Minimum Recommended Replacement Parts for Annual Overhaul:
Inlet valve Soft Seat 510-580
Adjustment shaft O-ring 510-011
Adjustment Shaft Washer 520-032
Adjustment Nut 530-303
Diaphragm 510-553
Inlet Nipple O-ring 510-014
Exhaust valve 510-552

1) Remove the regulator cover clamp screw and clamp.

2) Remove the regulator cover and the diaphragm.

3) Adjustment knob removal is started by unscrewing the adjustment knob until it stops.

4) The packing nut is now exposed enough to use a wrench on it for removal. As the nut is backed off, unscrew the knob also.

5) The O-ring and washer will remain on the adjustment shaft.

6) Tilt the regulator so that the spacer, spring set, and piston fall out of the adjustment tube of the regulator.

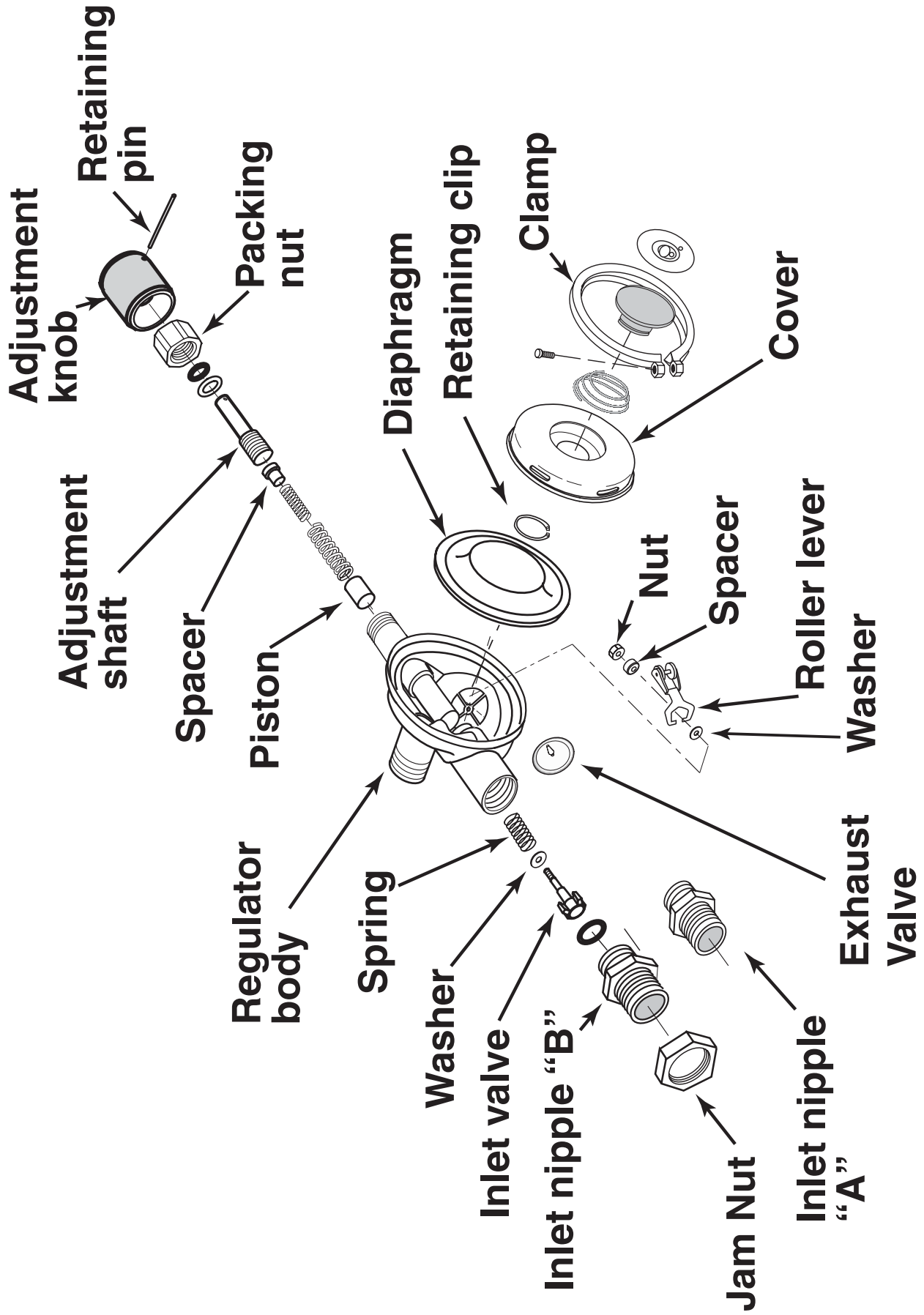
NOTE: If the spacer and the spring set are stuck, this indicates possible corrosion or saltwater intrusion into the adjustment tube or the adjustment tube may be bent. The demand regulator requires removal from the helmet and cleaning per this Chapter and This occurs if the helmet were dropped on the adjustment knob or the diver hit the adjustment knob against a rigid object. Repairs must be made by a trained KMDSI technician.

7) On the adjustment knob, drive out the roll pin using a 3/32 punch. Use a block of wood with a 1/4 ” hole drilled through it to support the knob. Position the knob so the roll pin is over the hole.

Remove the cover clamp from the regulator.

Components to the regulator adjustment assembly.

The cotter pin must be driven out with a hammer and punch.



Blowapart drawing of the SuperFlow® Regulator.

The adjustment knob can be held against the wood block allowing the roll pin to be driven into the 1/4" hole.

8) Remove the inlet nipple from the regulator body. The O-ring should be replaced if a scheduled overhaul is being performed.

9) Place the castle wrench in the inlet nipple side of the demand regulator over the soft seat of the inlet valve to prevent the inlet valve from rotating.

Install the socket wrench from the KMDSI Tool Kit (Part #525-620) through the adjustment tube and engage the adjustment nut on the inlet valve. Loosen and remove the adjustment nut by rotating the socket wrench counterclockwise.

10) Tilt the regulator and drop out the inlet valve and washer.

11) The spacer and lever will now fall out of the regulator body.

NOTE: Ensure that the washer comes out with the rest of the components.

12) Remove the exhaust valve from the exhaust flange.

The Castle Wrench and inlet valve.

⚠ WARNING

The inlet valve adjustment nut must never be reused. Reuse of the adjustment nut will not allow the regulator to maintain proper adjustment, or internal components could become dislodged casing the regulator function to fail. This could lead to drowning or death.

7.8.8 Inspection of SuperFlow® Demand Regulator Parts

After the regulator has been disassembled, clean and inspect all parts. Any parts showing signs of wear, damage or deterioration should be replaced. If this is an annual overhaul KMDSI recommends replacement of the inlet valve seat, adjustment nut, O-ring on inlet valve, O-ring on adjustment shaft, washer on the adjustment shaft. A rebuild kit is available for replacement parts (Part #525-309).

If any parts show any signs of damage, deterioration or any damaged threads, the part should be replaced. The adjustment nut must never be reused. Reuse of the adjustment nut will not allow the regulator to maintain proper adjustment.

1) Exhaust valve: Ensure the silicone exhaust valve shows no signs of damage, brittleness or any deformities. The exhaust valve should lay flat against the seat. If conducting an Annual Overhaul, the exhaust should be replaced. Ensure the seat spokes that hold the exhaust valve are smooth, even and not bent.

Slight bends in the spokes may be removed by pressing with a thumb. The exhaust valve seating area should be free of dirt and corrosion to ensure the valve can lay flat and seal properly. NEVER lubricate the valve. Lubricating the valve can allow dirt to stick to the seat causing poor performance and wet breathing.

2) Inlet valve: Check the condition of the rubber seat for wear and/or deep grooves. If the red silicone seat surface is stained to a dark color, this is an indication that the air supply being used was dirty,

Check the condition of the inlet nipple. The inlet nipple sealing edge must be in good condition, free of nicks, chipped chrome or any damage. If the inlet nipple sealing edge has nicks or missing chrome, the inlet nipple as well as the soft seat will require replacement. During annual overhaul the inlet valve soft seat should be replaced.

3) Inlet Valve Soft Seat Replacement: To replace the soft seat use a small screwdriver or O-ring pick to pry the soft seat from the chrome plated brass valve body. Using a sewing needle clean all old silicone sealant from the vent hole in the bottom of the cup area, and from the cupped area itself.

The exhaust valve must be in good condition if you intend to reuse it.

Note: Replace the entire inlet valve if any chrome is missing or if the shaft is bent or thread damage is present.

4) Dab a small amount of silicone adhesive Dow Corning® 732 or equivalent on one side of the new soft seat then press the seat into the cup area of the inlet valve assembly then using a clean cloth, wipe all excess silicone from the valve assembly.

5) Diaphragm: Check to determine if rubber has separated from the metal disc. Hold the diaphragm to a bright white light, while aggressively pulling and stretching to reveal damage, deterioration, or holes.

⚠ WARNING

Use silicone sealant in a well ventilated area. Do not breathe the fumes from uncured silicone sealant. These fumes are dangerous and can cause unconsciousness. They can also cause long term damage to body tissue. Read and follow all precautions listed on the silicone sealant tube and Material Safety Data Sheet.

Diaphragms showing any indication of damage should be replaced. The diaphragm should always be replaced during scheduled annual overhauls.

6) Inspect the whisker wings. Replace the whisker wings if they show signs of wear, aging or any damage.

The new whiskers used in the Quad-Valve™ are much more rugged than the older latex double exhaust system and will give a much longer service life and provide better breathing performance at depth. Older latex double exhaust systems should be replaced with the new Quad-Valve™ exhaust system.

7.8.9 Reassembly of the SuperFlow® 350 Demand Regulator

NOTE: Use the blow-apart in the back of the manual to help ensure correct assembly.

1) Install the new exhaust valve into the regulator and trim off any excess stem that may interfere with the movement of the lever or inlet valve.

2) Install the spring and washer on the inlet valve.

3) Press the head of the inlet valve into the castle wrench (Part #525-618). Place the spring, and washer on the inlet valve shaft then insert it into the inlet tube in the regulator body.

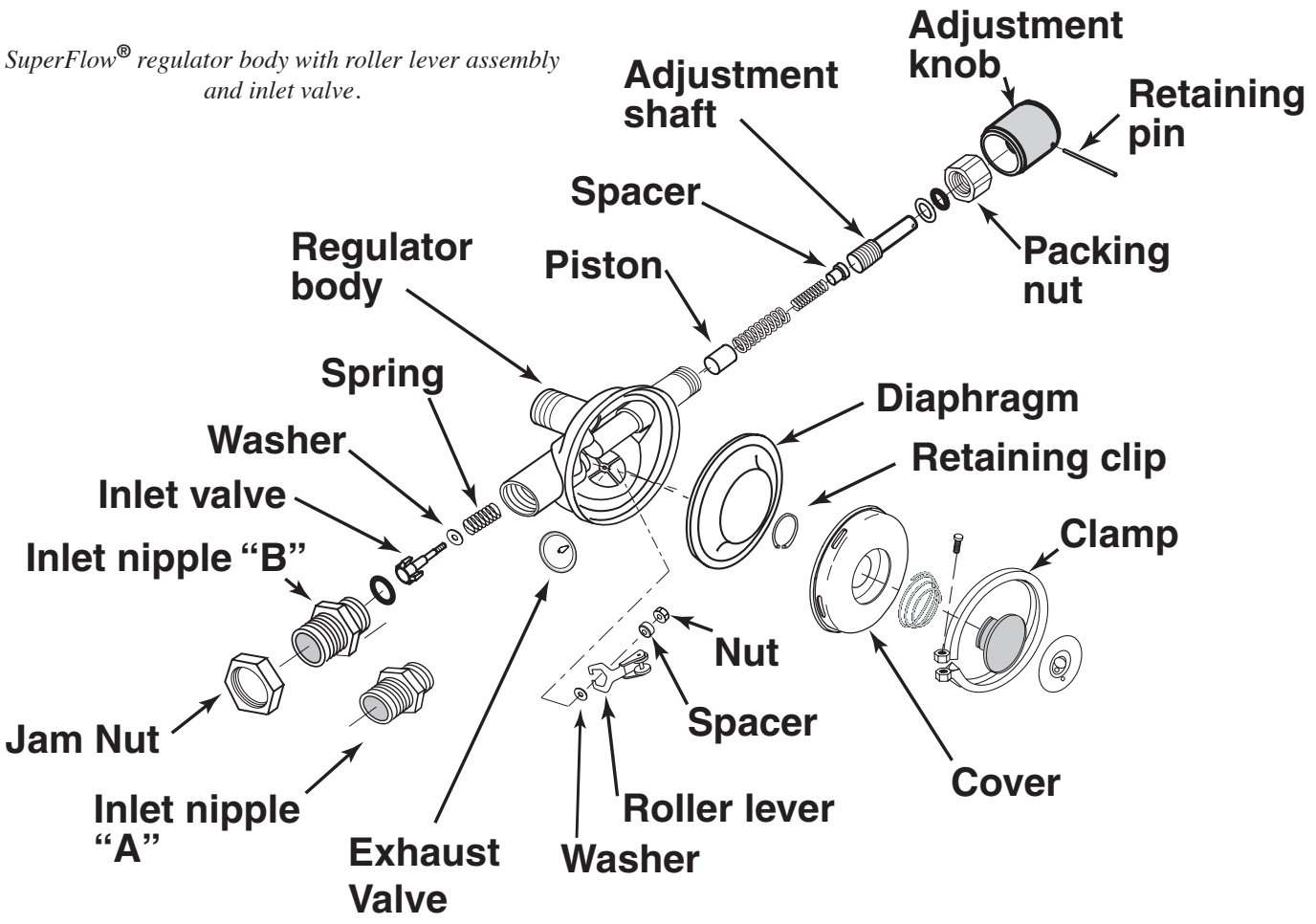
4) Push in on the castle wrench compressing the spring while forcing the threaded portion of the shaft stem into the interior of the regulator body. Place the washer and the spacer over the end of the inlet valve stem.

As an alternate procedure, the washer and spacer may be placed in the recess in the inside of the regulator body before inserting the inlet valve stem.

Trim any excess exhaust valve tail from the interior of the regulator.

5) Using the socket wrench nut driver from the tool kit, run the nut (126) onto the inlet valve stem approximately 1 1/2 to 2 turns, leaving enough slack to allow installation of the lever. With the inlet valve pressed in, the washer and spacer must be loose on the inlet valve stem so that the lever can be installed.

SuperFlow® regulator body with roller lever assembly and inlet valve.



6) Check the roller lever. The lever legs MUST be parallel to each other and free of any nicks or burrs. Check them with a straight edge and align them if necessary by carefully bending them with pliers. With the inlet valve stem depressed into the regulator body, insert the lever legs between the washer and spacer then release the pressure on the inlet valve.

7) Hold the inlet valve with the castle wrench so that it cannot rotate, tighten the nut until three threads are visible past the nut. This will be close enough for initial set up.

8) While holding the lever down, install the inlet nipple with its O-ring into the regulator body. Using the torque wrench, tighten the inlet nipple to 40 inch pounds.

9) Lightly lubricate the piston and spacer. Install the piston, spring set and spacer into the adjustment tube of the regulator body, as shown in the blow-apart drawing.

10) Reassemble the adjustment knob assembly; lightly lubricate the new O-ring then install the new washer, O-ring on the adjustment shaft.

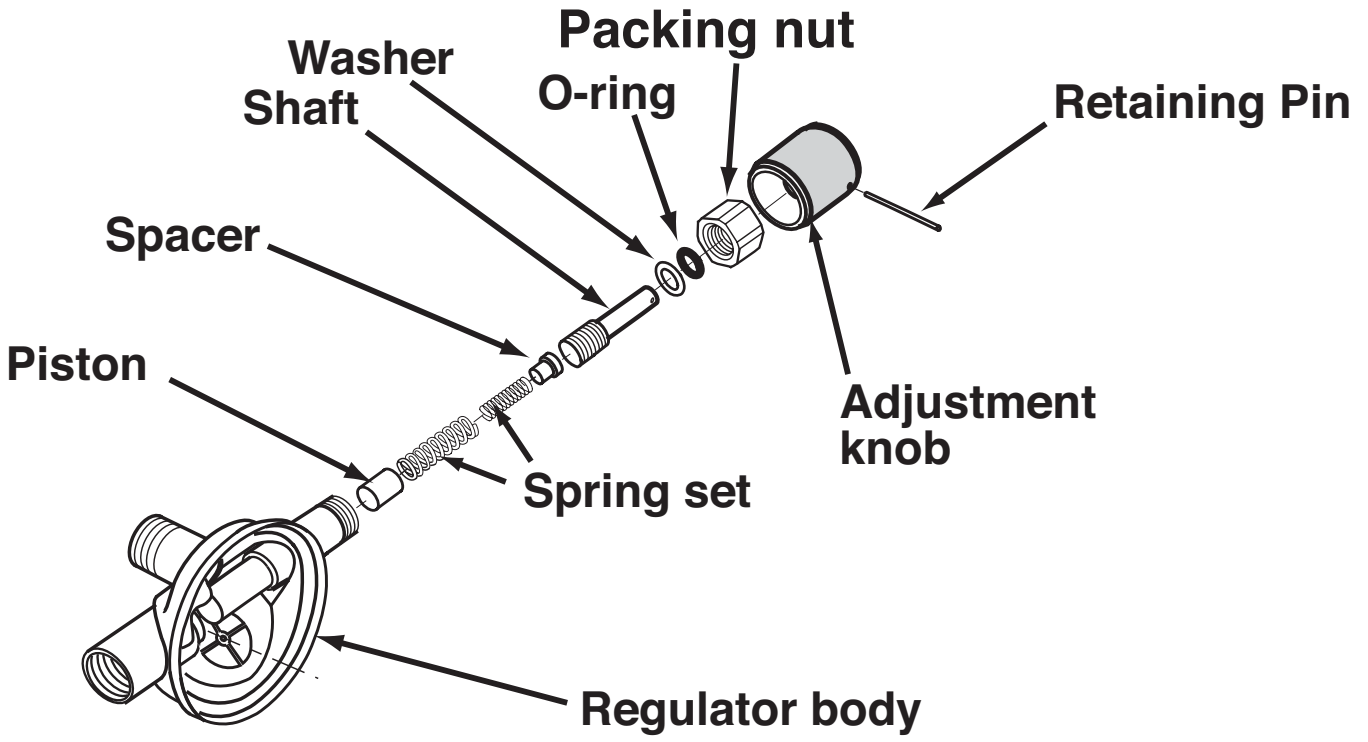
11) Slide the packing nut onto the adjustment shaft, then slip the knob onto the end of the shaft. Hold the shaft and rotate the knob until the pinholes line up.

⚠ CAUTION

Be sure that the washer and spacer that are installed on the inlet valve shaft are installed in the correct order. If they are not, the regulator will not perform properly.

Make sure the washer and o-ring are properly installed on the adjustment shaft.

Use the inlet valve holder from the regulator tool kit to accurately align these holes.



Adjustment end of the SuperFlow® regulator.

12) Install the retaining pin by tapping it in with a small hammer until it is flush with the outer surface of the knob.

13) Lightly lubricate the shaft end and the threads with the appropriate lubricant, and then thread the adjustment shaft clockwise, using the adjustment knob, into the tube until the packing nut can be started.

Back out the adjustment knob once the packing nut is engaged on the demand regulator body to access the packing nut with the torque wrench. Using a torque wrench, tighten the packing nut to 40 inch pounds after seating.

14) Rotate the adjustment knob in i.e, clockwise, several turns, then recheck the torque one more time. Ensure the adjustment shaft rotates smoothly and there is no binding.

15a) Stretch the Quad-Valve™ main exhaust body onto the exhaust flange of the regulator. (Installation of the Quad-Valve™ is covered in greater detail later in this chapter.) Rotate as needed so the port and starboard whiskers can be installed.

Next, place the exhaust valves into the exhaust valve inserts. Then place the assemblies into the main body. Install the port and starboard whiskers onto the main body and make sure the alignment is correct. Then install the whisker clamps.

15b) For the old double exhaust or single exhaust, stretch the exhaust whisker wing onto the exhaust flange of the regulator.

16) Mount the regulator to the mask or helmet. Lightly lubricate and install the sealing O-ring and thread on the regulator mount nut, hand tight.

17) If you have the 17B, install the bent tube assembly before tightening the regulator mount nut. If you have the 17A, you can attach the hose assembly last.

NOTE: KMDSI recommends replacement of the hose assembly on the 17A, at least every 2 years even if the condition appears excellent.

NOTE: If this maintenance is during an annual overhaul, replace the Teflon® ring at the side block end of the bent tube and the O-ring at the demand regulator inlet side of the bent tube.

Using the appropriate lubricant, lightly lubricate the O-ring on the bent tube assembly. Slide the O-ring end of the bent tube assembly into the regulator inlet nipple

The adjustment assembly must turn freely.

The Quad-Valve™ must be properly connected to the regulator and the quad exhaust cover.

The jam nut and bent tube must be tightened to the proper torque specification.

until the side block end is aligned with the threads for the bent tube mount nut.

Rotating clockwise, thread the large nut on the bent tube assembly onto the inlet nipple 1 to 2 threads. Ensure that the Teflon® ring is in place and engage the bent tube nut to the side block fully until it is hand tight. You may need to gently rock the regulator body and/or the bent tube to fully engage side block nut.

Next, fully engage (clockwise) the large nut on the bent tube into the regulator inlet until hand tight. This will ensure the nut is bottomed on the shoulder on the bent tube. Do not tighten further. Loosen the jam nut on the regulator inlet (counterclockwise), and engage the jam nut fully to the large nut on the bent tube. Using a torque wrench and an 7/8" open end wrench hold the large nut on the regulator end of the bent tube and tighten the jam nut to 40 inch pounds.

18) Ensuring the O-ring is in place, use a torque wrench a 1 1/4" socket and an extension, torque the regulator mount nut to 100 inch pounds. Next using a torque wrench with an 11/16" adapter, torque the bent tube nut to the side block to 100 inch pounds.

19) Attach the whisker wings to each side of the face port retainer using the screws, plates and spacers. Using a torque wrench with a flat blade screwdriver adapter, carefully torque these screws to 12 inch pounds.

20) Adjust the regulator following instructions later in this chapter.

21) Install the diaphragm, cover, clamp and screw. Tighten the screw to 12 inch pounds using a torque screwdriver.

22) If you have the 17A, connect the hose assembly to the inlet nipple. Tighten the nut on the hose with a torque wrench while holding the inlet nipple with a second wrench, to prevent it from turning. Torque to (40 inch pounds)

23) Check the regulator for proper operation and fine-tune the adjustment if necessary.

Make sure to replace the whisker spacers when you reinstall the whiskers.

Be sure to tighten the whiskers to their proper torque values.

7.8.10 Tuning the SuperFlow® Regulator

1) Remove the clamp, cover and diaphragm.

2) Screw the adjustment knob (clockwise) all the way in, towards the regulator body.

3) Pressurize the regulator to between 120-150 p.s.i.g. of supply pressure.

4) Screw the adjustment knob out (counterclockwise) until the regulator starts to free flow, then screw the adjustment knob in (clockwise) until the free-flow just stops. Depress the lever several times to ensure the free-flow has stopped.

If the free flow does not stop, the adjustment nut is too tight. If the roller lever is sloppy (loose) the adjustment nut is too loose.

5) Insert the inlet valve holding tool into the balance hole on the inlet tube. Push forward on the tool to stop the inlet valve stem from turning. Adjust the nut until there until the freeflow just stops and there is 1/16 inch (1.5 mm) to 1/8 inch (3.0 mm) of free play at the end of the lever.

6) Remove the inlet valve holder tool.

7) Put the diaphragm and cover in place, depressing the cover tightly to simulate a properly tightened clamp.

Insert the inlet valve holding tool into the balance hole on the inlet tube.

8) Depress the purge button in the center of the cover.

9) There must be 1/16 inch (1.5 mm) to 1/8 inch (3.0 mm) of free travel before the purge button actuates, resulting in a slight flow of gas. If a slight flow of gas develops with the purge button depressed less than

Push down on the regulator cover to simulate a tightened clamp.

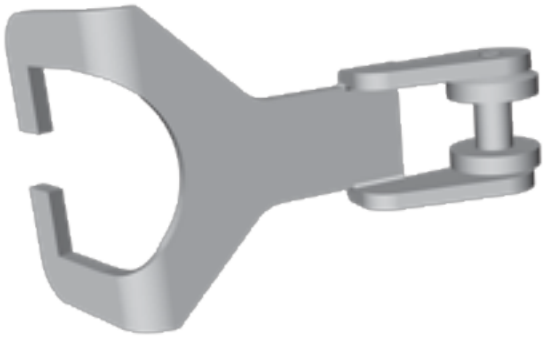
1/16 inch (1.5 mm) the lever will require bending down.

If the purge button travels further than a 1/8" (3.0 mm) before gas flow starts, the lever will require bending upward.

NOTE: Before bending the lever, double-check the adjustments. It is rare that the lever requires bending. Usually levers only require bending because of they were improperly serviced previously, or because of damage during disassembly.

10) To bend the lever up, you'll need to remove the lever and carefully place it in a vice. Grip the lever from the side with a pair of long nosed pliers and bend the roller end up with your finger. Bend it only a small amount at a time.

NOTE: Be very careful to not place undue stress on the lower arms of the lever as this will disfigure the lower blades and cause spongy operation.



Note that the legs of the lever must be properly aligned and in the same plane for the lever to work correctly.

11) To bend the lever down, place the disk end of the KMDSI 1/4 ” wrench onto the flat area of the adjustment tube within the regulator, sliding the disk as far as possible under the lever. With your finger, slightly bend the lever down over the disk to the desired height. Be careful not to bend the lever too far! Bend it slightly then check it.

12) Replace the diaphragm and the cover. Test the purge button. Continue until proper tolerances are reached.

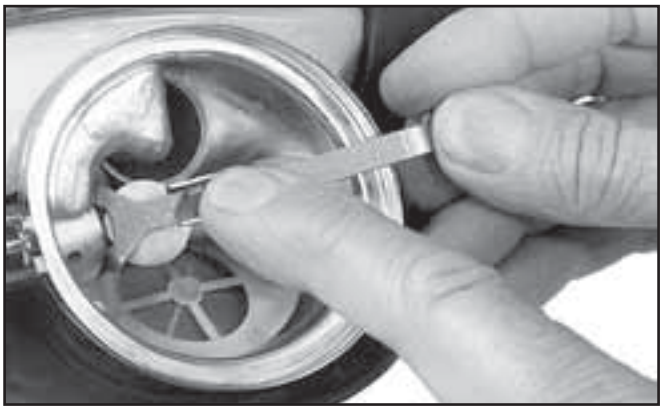
7.8.10.1 Important Notes on Regulator Adjustment

1) If a new inlet valve or soft seat has been installed, allow the regulator to sit for 24 hours with the adjustment knob turned in all the way with the rubber seat and the nipple making contact before adjusting. This will allow the soft seat in the inlet valve stem to take a set against the inlet nipple.

If the regulator is to be used immediately, be aware that the rubber seat will take a set, changing the adjustment and the regulator’s performance. This will require the readjustment of the regulator after the first day of use.

2) Normally, if the regulator free flows, the nut is too tight, and must be loosened until the lever has between 1/16” to 1/8” (1.5-3.0 mm) of free play at the end.

3) If the regulator continues to free flow after proper adjustment has been made, ensuring a correct supply pressure of 135-150 p.s.i.g. (9.3-10.1bar) both the inlet valve soft seat and/or the inlet nipple must be inspected for damage. Generally, if the inlet nipple has missing chrome or a bent or damaged sealing edge, the soft seat may not make a proper seal and may also be damaged. Best practice requires replacement of both the inlet nipple and the soft seat.



Use the disk end of the KMDSI wrench to bend the lever down.

⚠ CAUTION

The legs of the lever must be properly aligned in the same plane. If one leg is up and the other is down, the regulator will not perform properly.

7.8.11 SuperFlow® Regulator Steady Flows When Pressured Up: Special Tools Used

Tools Required:
Small flat blade screw driver.
Small jewelers screw driver or metal scribe.
Needle nose pliers.
KMDSI regulator tool kit if available.

A few words about the demand regulator: The demand regulator is rugged and reliable. However, to maintain optimum performance it should be checked prior to each diving day in accordance with the brief procedure **Demand Regulator Test for Correct Adjustment, Fully Assembled** on page 77.

If after completing the demand regulator test as outlined in this chapter, adjustment is necessary and the special KMDSI tool kit is not available proceed as follows:

1) Remove the regulator clamp, cover and diaphragm.

2) Adjust the regulator adjustment knob all the way in. Finger tight only.

3) Pressurize the regulator to between 120-150 p.s.i.g. (8.5-10 bar).

⚠ WARNING

The lock nut must always be replaced if removed from the inlet valve. The plastic material that locks the nut is not designed for multiple reuse. If the nut comes loose during a dive the regulator would free flow heavily. In the situation where the diver is using bottled breathing gas this would result in a rapid consumption of breathing gas.

⚠ CAUTION

The nut must not be loosened more than 1/8 turn to lower the height of the lever. If more adjustment is necessary the lever should be bent downward. If the nut is loosened more than 1/8 turn the lever will not have enough travel for proper flow rates.

4) If the regulator is not free flowing, slowly back out on the adjustment knob until a slight free flow is heard and then rotate the adjustment knob in (clockwise) 1/4 turn and depress the purge button momentarily. Repeat this procedure until the gas flow stops.

If the regulator free flows, you will need to remove the cover to make adjustments.

Usually at this point the regulator adjustment knob will be between 5 and 7 turns out. ***Note: If when backing the adjustment knob out from the full "in" position, the regulator starts free flowing at less than five turns, then this usually indicates insufficient free play at the lever.***

There are several issues that could cause the regulator to free flow, even when the adjustment knob is turned all the way in. These are as follows:

A) The regulator was rebuilt and the adjustment nut is too tight. If this is the case, the nut must be loosened.

B) The washer was never removed from the regulator and a second one has accidentally been installed. If this is the case, the second washer must be removed.

C) The regulator body has never been properly serviced and there is corrosion inside the body, making proper inlet valve travel impossible.

5) Check the free play at the lever. The lever should have between 1/16-1/8 inch (1.5-3.0 mm) play. If adjustment is necessary, adjust using the KMDSI tools.

6) KMDSI tools: Using the inlet valve holding rod, (L shaped rod), insert the end of the rod into the balance hole. Lightly apply force by pushing on the rod making it act as a lever to put friction against the inlet valve shaft. At this point, the KMDSI wrench can be used to rotate the lever nut . Rotate the nut "In" (clockwise) to reduce lever play or "Out" (counter clockwise) to increase lever play.

Only rotate the nut 1/8 turn at a time. Remove the tools and depress the lever several times after adjusting to ensure the correct play is achieved. It may be necessary to repeat this procedure several times, as the method requires estimating the correct position of the nut.

Note: if there is little (less than 1/16 inch /1.5 mm) or no lever play, the regulator will free flow. If there is too much free play, (more than 1/8 inch / 3.0 mm) the regulator will not be capable of full demand flow potential.

7) If the free flow did not stop after this procedure, refer to regulator disassembly and cleaning procedures.

Alternate method: If a KMDSI tool kit is not available, a small jeweler's screwdriver or metal scribe can be inserted in the slot on the end of the inlet valve to keep it from rotating, and needle nose pliers may be used to rotate the lever nut. Holding the slot of the inlet valve from rotating, carefully rotate the nut "In" (clockwise to remove lever play and "Out" (counterclockwise) to increase lever play.

Only turn the adjustment nut 1/8 turn at a time. Depress the lever momentarily after each adjustment and observe the lever play. It may be necessary to complete this procedure several times, as the procedure requires estimating the proper position of the nut. If the regulator free flow did not stop after this procedure, refer to regulator disassembly and cleaning sections of this manual.

8) When adjustment is complete, place the diaphragm and cover in place, and press tightly down on the cover to simulate the action of the clamp.

9) With the cover pressed tight against the diaphragm, if the regulator starts to free flow, the lever may need to be bent down slightly. If the regulator does not free flow, slowly depress the purge button until a slight free flow develops. The purge button should depress no further than 1/8 inch (3.0 mm) before the regulator develops a flow.

If the regulator does not develop a slight free flow when the purge button is depressed in 1/8 inch (3.0 mm), then the lever will require slight upward bending.

Before bending the lever, double check the adjustments. It is rare that the lever requires bending in a regulator that has been in service. Usually levers only require bending in new installations or because of damage during disassembly.

10) Install the clamp and clamp screw. Tighten the screw to the correct torque (see appendix for torque specifications).

11) Again, press on the purge button in the cover. It must have 1/16 inch (1.5 mm) minimum and 1/8 inch (3.0 mm) maximum free travel before it contacts the diaphragm. If there is more than 1/8 inch (3.0 mm) travel, the lever must be bent upward, per this chapter. If the button has only slight or no free travel, the lever must be bent down.

12) If the purge button travel is correct, the adjustment is complete.

7.8.12 Regulator Steady Flows When Pressured Up

1) Ensure supply pressure is adjusted between 135-150 p.s.i.g. (9.3-10.3bar).

2) Adjust demand regulator bias adjustment knob clockwise (in) until the free flow stops.

NOTE: If demand regulator bias adjustment knob is turned fully "in" and gas continues to flow, the demand regulator requires adjustment.

3) Recheck lever play at the purge button ensuring 1/16 inch (1.5 mm) to l/8 inch (3.0 mm) of free travel before the purge button comes in contact with the diaphragm actuating a slight flow of gas. If a slight flow of gas develops with the purge button depressed less than 1/16 inch (1.5 mm) or greater than 1/8 inch (3.0 mm) the lever will require adjusting.

7.8.13 Regulator has Low or No Flow When Pressurized

Tools Required:
Regulator Adjustment Tools, (Part #525-620)
1/4 inch Flat Blade Attachment on Torque Screwdriver

NOTE: If there is low or no flow when the regulator is pressurized, and the lever is very loose (travels more than 1/8 inch at the roller end), the nut must be tightened.

1) Adjust demand regulator bias adjustment knob "in", i.e., clockwise.

2) Ensure supply pressure is adjusted between 135-150 p.s.i.g. (9.3-10.3bar).

3) Back the demand regulator bias adjustment knob out counterclockwise until a slight steady flow develops. Then adjust the knob in clockwise until the free-flow just stops. Depress the lever several times to ensure the regulator is stabilized.

4) Recheck the lever play at the purge button ensuring 1/16 inch (1.5 mm) to l/8 inch (3.0 mm) of free travel before the purge button (123d) comes in contact with the diaphragm actuating a slight flow of gas. If a slight flow of gas develops with the purge button depressed less than 1/16 inch (1.5 mm), the lever will require slightly more play.

If the purge button travels greater than 1/8 inch (3.0 mm), the lever will require a reduction of play by adjusting.

5) Recheck that gas source pressure is set between 135-150 p.s.i.g. Gas source must be capable of supplying 4.5 a.c.f.m. (127.4 BL/min per diver) at the required over bottom pressures for the depth of the dive.

6) If the preceding steps were satisfactory, check the following helmet/mask parts for foreign debris in the air/gas passages:

a. One-way valve
b. Side block assembly
    1. Defogger valve
    2. Emergency Valve Assembly
    3. Bent Tube Assembly

7.8.14 Unexplained Demand Regulator Free Flow

Any leak in the neck dam when the diver is face down will cause gas to vent out into the water from the inside of the helmet. This causes the demand regulator to steady flow, making up for the vented gas. Even if the adjustment knob is turned in, the leak may continue.

1) One method to check for this is for the diver to place the demand regulator above the neck dam by looking up. Free flow from a leaky neck dam should cease as long as the helmet is in the upright position.

2) Ensure the demand regulator bias adjustment knob (120) is properly adjusted for the supply pressure.

3) During ascent the regulator will free flow if the supply pressure to the helmet is not backed off (topside) or, the diver does not adjust "in" (clockwise), the demand regulator adjustment knob as the diver's depth and the ambient pressure decreases.

4) If the preceding steps were checked and the demand regulator still steady flows the regulator requires adjustment.

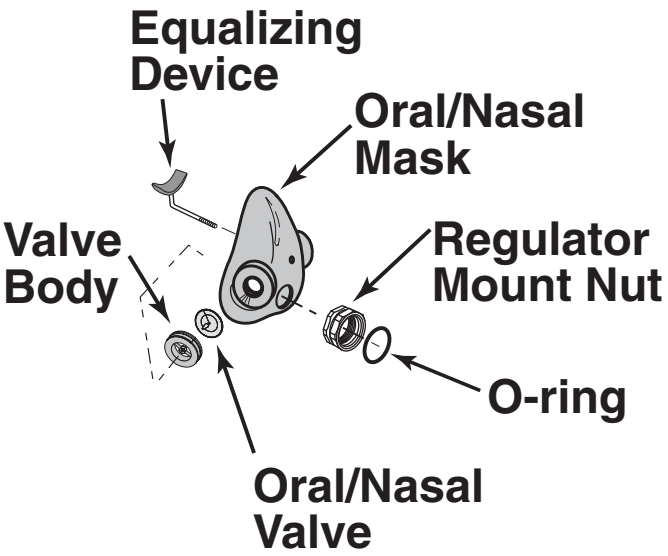
7.9 Oral Nasal

7.9.1 Oral Nasal General Information

The oral nasal mask is used to control and maintain low carbon dioxide (CO2) levels in the helmet and to isolate the microphone for more intelligible speech.

⚠ WARNING

Never dive with a Kirby Morgan helmet without a properly functioning oral nasal mask. Without an oral nasal, dangerous levels of carbon dioxide may accumulate in the helmet. This can lead to unconsciousness and death.



The oral nasal mask and the parts associated with it are easy to access.

7.9.2 Oral Nasal Removal

Tools Required:
7/16 inch Open-end Wrench

The oral nasal mask is easily replaced.

1) Remove the nose block device first. See chapter 8.

2) Remove the microphone.

3) The oral nasal mask can then be pulled off the regulator mount nut. It is held on by a snap fit.

⚠ WARNING

The nose block device MUST be removed and reinstalled when installing a new oral nasal mask. Simply stretching the oral nasal mask over the nose block device can cause the oral nasal mask to tear. Do not use a torn oral nasal mask. This can lead to dangerous levels of carbon dioxide in the helmet.

7.9.3 Inspection of Oral Nasal

1) Inspect the oral nasal mask. If it is torn, damaged or aged it must be replaced.

2) Inspect the oral nasal valve. If it is torn or damaged it must be replaced.

3) Remove the valve body by pushing it out of the oral nasal.

4) Remove the old valve by pulling it out.

5) Install the new valve by feeding the thin tail through the valve body and pulling on it until the valve is seated. Cut off the excess “tail.”

6) Install the valve body in the oral nasal. The valve MUST be on the inside of the oral nasal.

The exhaust valve must be in good condition if you plan to reuse it.

7.9.4 Oral Nasal Replacement

1) Snap the oral nasal over the regulator mount nut.

2) Reinstall the microphone.

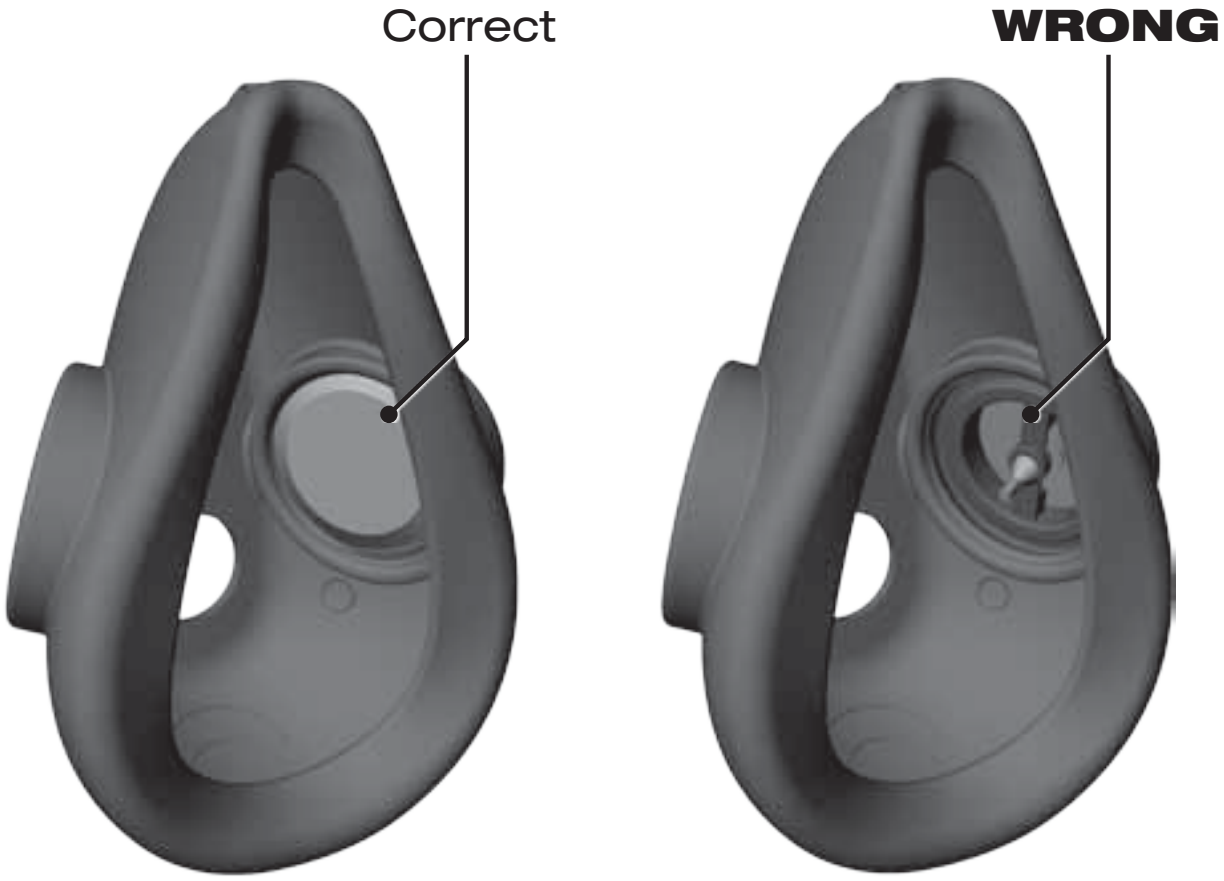
3) Reinstall the nose block device.

4) Ensure that the oral nasal valve has been installed correctly.

⚠ WARNING

The oral nasal valve must be replaced correctly to provide gas flow in the proper direction. The flow through the valve must be from the interior of the helmet into the oral nasal mask. This will allow the diver to breathe the gas from the defogger valve freely, yet help to reduce carbon dioxide inside the helmet.

If the valve is not replaced properly this could make it difficult to breathe the gas supplied by the defogger and expose the diver to an excess of carbon dioxide. This could lead to exhaustion and blackout resulting in serious injury or death.



Correct installation of the oral nasal valve is extremely important to your safety.

7.10 Quad-Valve™ Exhaust Assembly

The Quad-Valve™ exhaust became standard on the SuperLite®-17 helmet as of March 2005. This is a superior exhaust system that ties together the regulator exhaust and the helmet exhaust into one unit with exceptionally low exhalation resistance.

The Quad-Valve™ is nearly identical in design to the previously standard Tri-Valve™. The difference between the two units is that the Quad-Valve™ uses the quad exhaust cover to connect the exhaust body to the exhaust main body. All other parts are identical. If you have an older SL-17 helmet you are strongly encouraged to upgrade your helmet to the Quad-Valve™ design with the Quad-Valve™ cover.

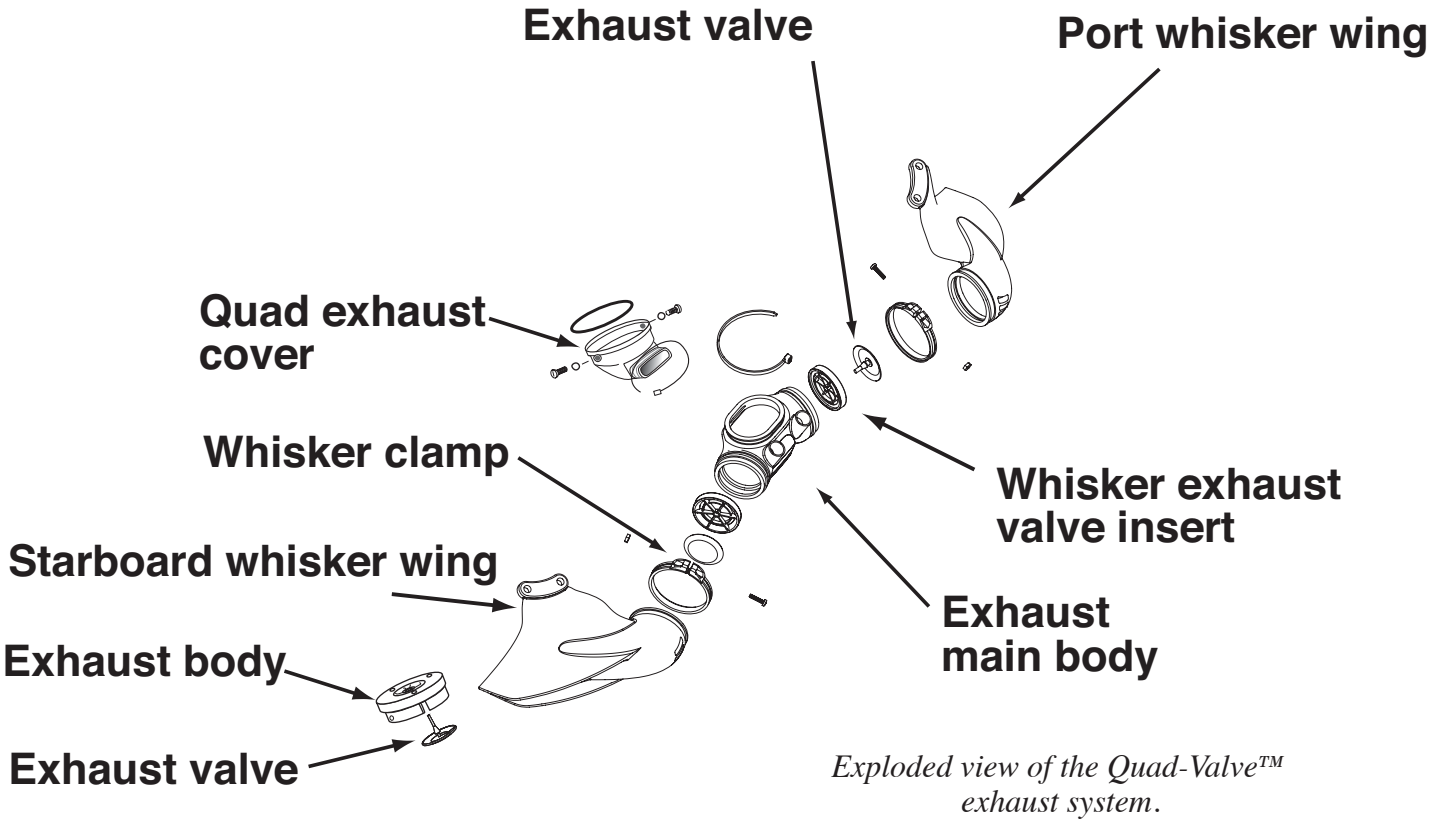
7.10.1 Quad-Valve™ Assembly Removal

Tools Required: Screwdriver
Small cutting pliers

NOTE: *It is necessary to first remove the regulator and Quad-Valve™ exhaust assembly from the helmet to separate the Quad-Valve™ Assembly from the regulator.*

1) Removal of the Quad-Valve™ Assembly is started by removing the clamps that secure the whiskers. After removing the clamps, stretch the exhaust main body over and off of the regulator exhaust flange.

To remove the Quad-Valve™ exhaust from the helmet you must first cut the tie-wrap that secures the exhaust main body to the regulator.



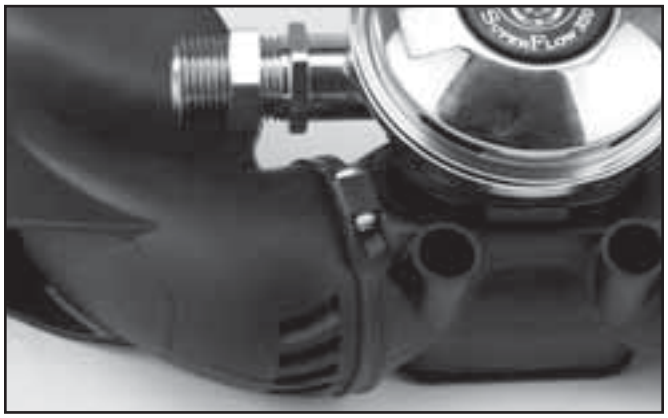
Exploded view of the Quad-Valve™ exhaust system.

7.10.2 Quad-Valve™ Exhaust Valve Replacement

1) Remove the Quad-Valve™ Assembly from the regulator.

2) Carefully remove the two whisker clamps that hold the whisker wings to the main exhaust body.

3) Remove the two exhaust valve inserts and valves. Carefully note which side the valves are installed into and which way they face when mounted in the body. They MUST be reinstalled facing the same way. See the illustrations below.



To allow access to the two exhaust valves in the whisker wings, you must first remove the two whisker clamps that hold the whiskers on the exhaust main body. This is the starboard clamp.

4) Install a new exhaust valve into each whisker wing exhaust valve insert on the correct side by feeding valve tail through hole in center of valve insert and pulling on it until valve is seated.

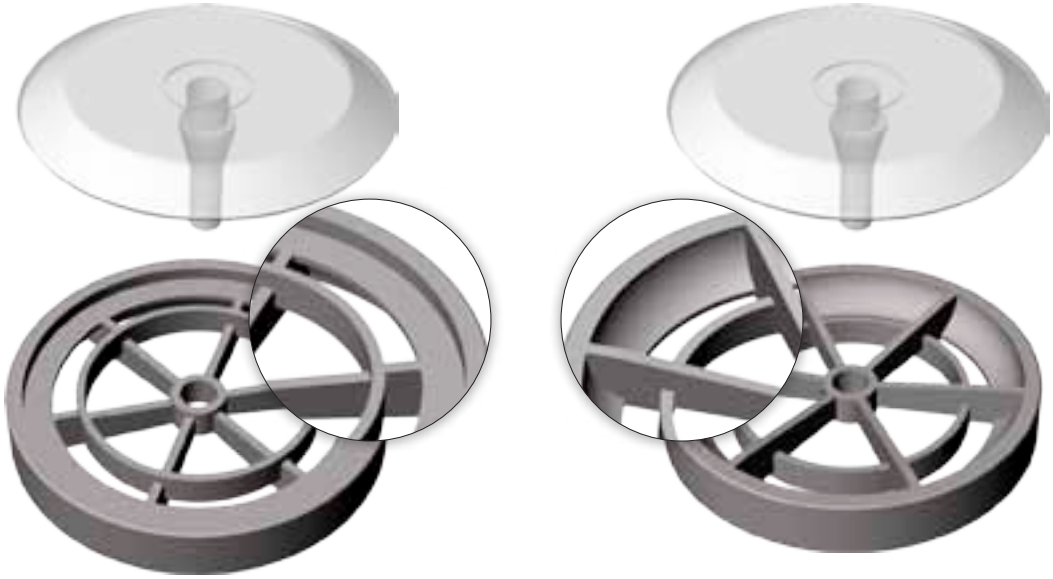
NOTE: The exhaust valve and whisker wing exhaust valve inserts must be placed into the Quad-Valve™ exhaust main body correctly to provide gas flow in the proper direction. The flow must be from the inside of the Quad-Valve™ exhaust main body out to starboard whisker wing and port whisker wing.

5) Install an exhaust valve whisker wing exhaust valve insert assembly into both seating areas on each side of the exhaust main body.

6) Slide the starboard whisker wing onto the starboard side of the main body, making sure that you do not dislodge the exhaust valve whisker wing exhaust valve insert assembly from its seating area. The parting line

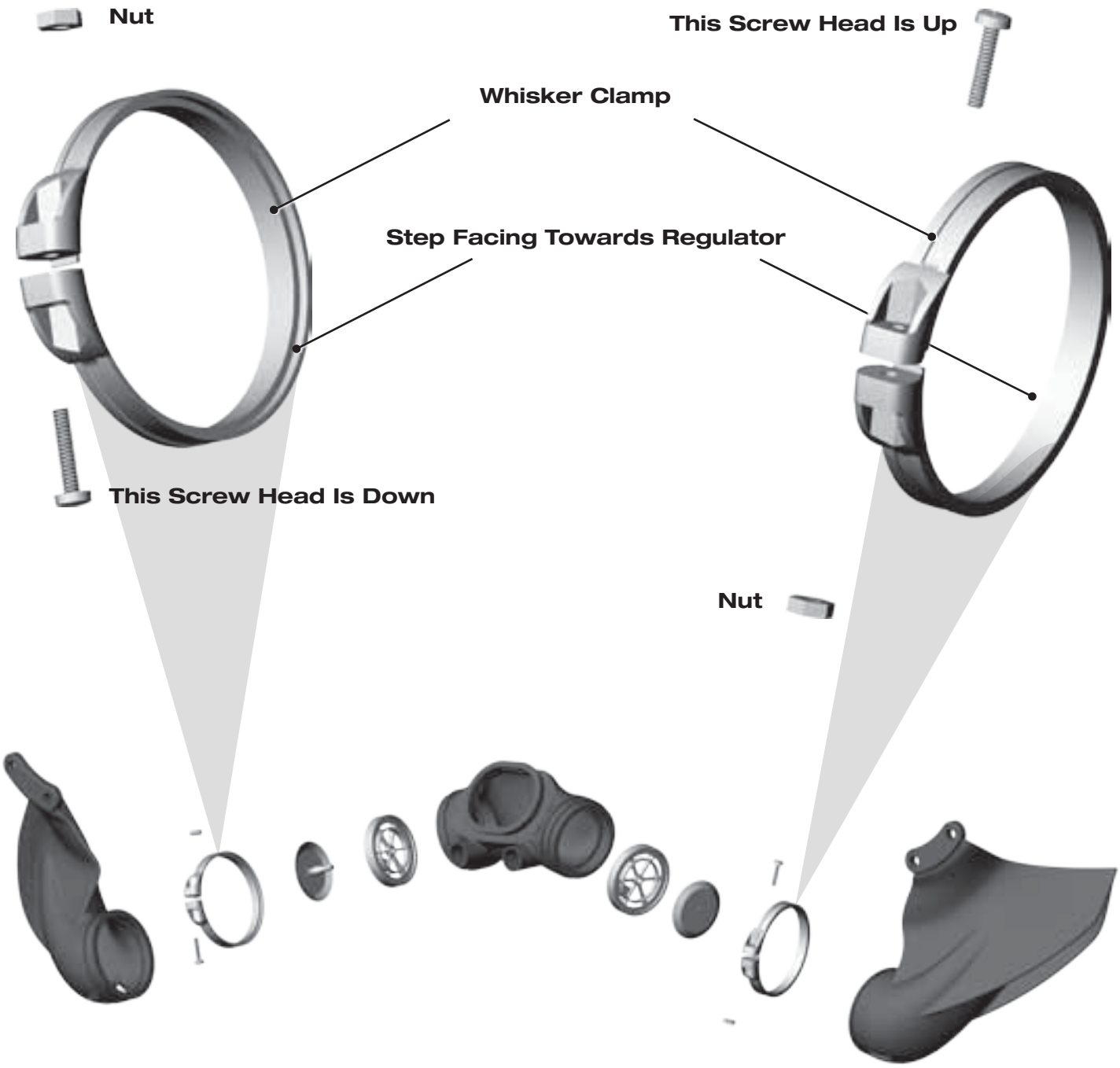
⚠ WARNING

The exhaust valve inserts must be installed in the correct orientation in exhaust main body. If the inserts are installed backwards, the diver will be unable to exhale. This could lead to suffocation and death.



Correct **WRONG**

The exhaust valve inserts are recessed on one side to accept the exhaust valves so they sit flush in the inserts. The exhaust valves must be installed properly in the inserts or they will not seal or perform properly.



Whisker Assembly Details

Special note on whisker clamps: There is no left or right whisker clamp. Both clamps are identical.

If the clamps are not oriented correctly, it will be very difficult to tighten the screws that secure them. There is also a good possibility that the clamp will come off of the whisker wing, reducing the effectiveness of the exhaust system in keeping the breathing system dry.

⚠ WARNING

If the whisker clamps are not installed properly, the exhaust valves will leak. This leads to a chance of backflow into the regulator through the exhaust valve. In contaminated water diving, this is a serious situation.

⚠ WARNING

The exhaust valves must be correctly installed in the exhaust valve inserts or they will not seal correctly. This could lead to a backflow of water into the helmet, which could expose the diver to any contaminants that are in the surrounding water. Depending on the contaminants, this could lead to serious personal injury or death.

The whiskers must be aligned properly on the exhaust main body.

on the bottom of the exhaust whiskers should be 5/16" behind the parting line on the main body.

7) Repeat this procedure for the port side.

8) Place whisker clamps around the grooves on each of the two whiskers. Before doing the final tightening

Note the step on the inside of the whisker clamps. These must be oriented in the correct position to retain the whisker wings properly.

Note the correct alignment of the mold line that spans the whiskers and the exhaust main body.

of the clamps, make sure that parting line on bottom of the whisker wings is 5/16" behind the parting line on the main body, and the clamps are positioned properly on the body.

The correct orientation of the whiskers relative to the exhaust main body are as shown in the photo here. Tighten the screws that hold the clamps until the screws are snug. The threaded ends of the screws should be at least flush with the outer edge of the nut that holds them. Do not overtighten.

7.10.3 SuperFlow® Regulator Exhaust Valve Replacement

Before removing the regulator exhaust valve, carefully inspect the area around the edges to assure the rubber exhaust valve is in contact with the regulator body. The metal cross area of the body under the valve could be slightly bent out resulting in the valve not sealing.

If the exhaust valve is high and not sealing, lightly press in on the metal cross, bending the metal in slightly until the rubber valve seats. Remove the existing regulator exhaust valve by pulling it out of its mount hole. If the valve tears, make sure that it is removed without any valve material left inside the regulator.

NOTE: Before installing the new valve, ensure that the spokes that hold the exhaust valve are smooth, even and not bent. The exhaust valve seating area should be free of dirt and corrosion to insure the valve can lay flat and seal properly. NEVER lubricate the valve.

1) Remove the regulator clamp screw and clamp.

2) Remove the regulator cover and the diaphragm.

3) Install the new regulator exhaust valve by placing the stem of the valve in through the hole in the hub of the spokes from the outside of the regulator. Gently, (using needle nose pliers) from the inside of the regulator, pull the stem of the valve through the hole in the hub of the spokes until it pops into its seating area.

4) Reinstall the diaphragm, regulator cover, clamp and clamp screw.

The exhaust valve must make proper contact with the spokes on the exhaust flange. If the spokes are not in proper alignment with each other, the regulator will leak.

7.10.4 Quad-Valve™ Assembly Installation

1) The Quad-Valve™ Main Body opening mates to the regulator exhaust flange. This opening needs to be worked onto the flange. Make sure that the Quad-Valve™ exhaust system is facing the correct direction and is not upside down.

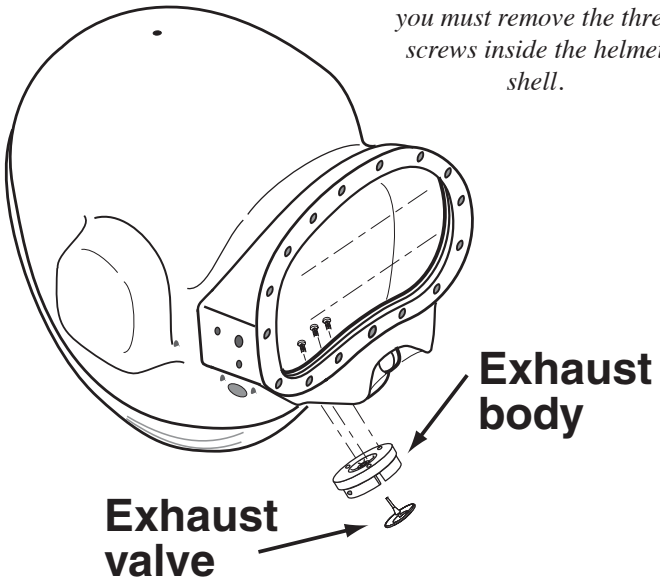
2) Place the tie wrap around the tie wrap groove and tighten, making sure that the tie wrap end is positioned properly. Cut off the excess tie wrap tail.

3) Reinstall the regulator exhaust assembly on the helmet.

7.11 Water Dump Exhaust Body

The water dump exhaust assembly is mounted onto the bottom of the helmet by three screws that are installed on the inside of the helmet shell. RTV silicone sealant is used to seal the water dump body to the helmet shell.

To remove the exhaust body you must remove the three screws inside the helmet shell.



7.11.1 Water Dump Valve Removal

Tools Required:
Flat Blade Screwdriver

1) The Quad-Valve™ cover can be removed by unscrewing the two screws.

2) The rubber exhaust valve should be replaced at the slightest sign of deterioration or aging of the rubber. Simply grasp the valve and pull to remove.

The Quad-Valve™ cover must be removed to inspect the water dump valve.

7.11.2 Water Dump Valve Replacement

1) The rubber exhaust valve is installed by inserting the center stem through the exhaust body then pulling from the inside of the helmet shell until it snaps into place.

2) When installing the quad exhaust cover be sure to never use longer screws that would protrude into the interior of the exhaust body as this would interfere with the operation of the rubber exhaust valve .

7.11.3 Water Dump Valve Body Removal

1) The water dump body should never need servicing. If it is to be removed, you must first remove the three screws inside the helmet shell.

After this is done, gently twist the valve body off of the helmet shell. A putty knife may be used to slide between the valve body and the shell to break the RTV sealant.

7.11.4 Water Dump Valve Body Remounting

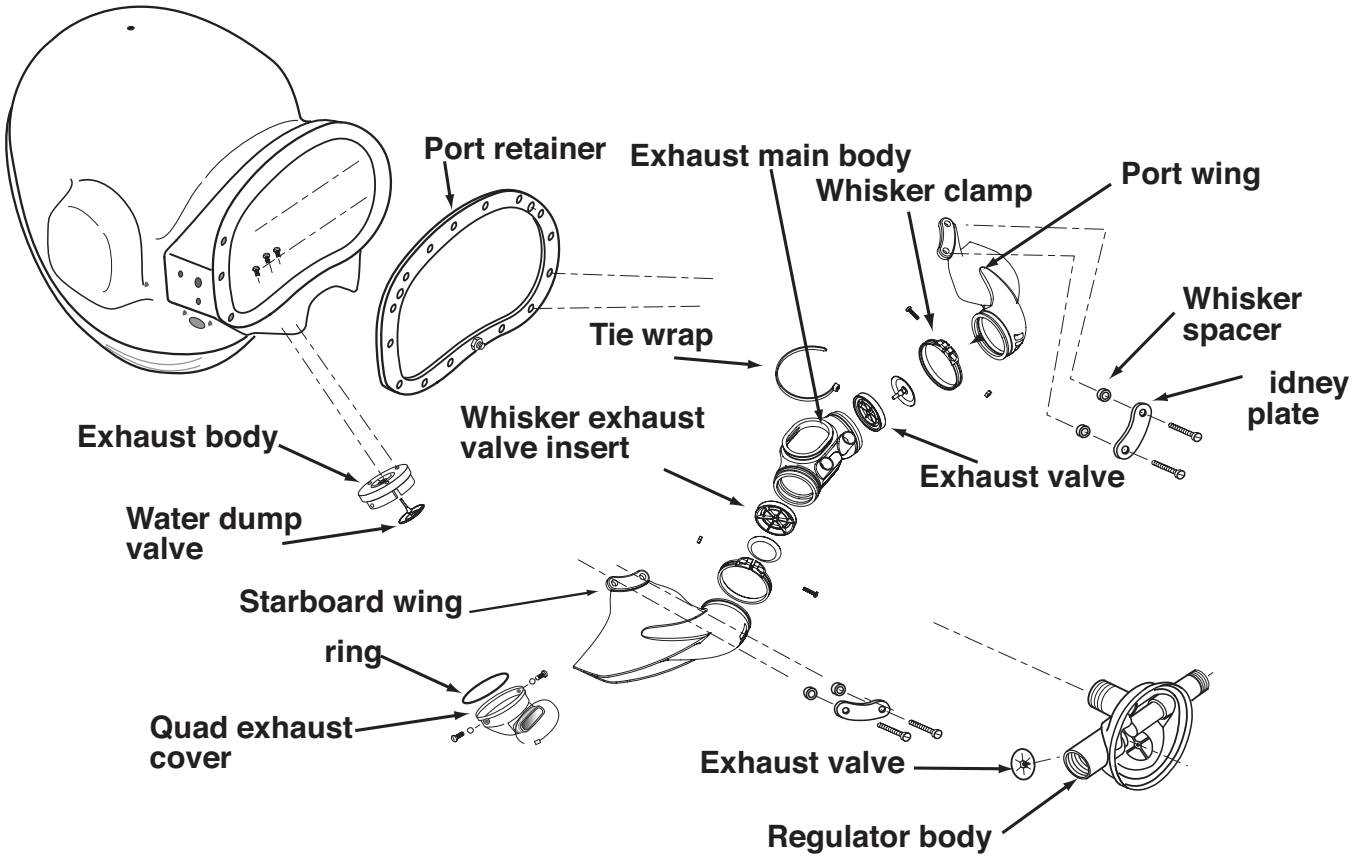
1) To replace the main exhaust body, first be sure to clean the helmet and the main exhaust body of the old silicone sealant prior to remounting.

Place a coating of RTV silicone sealant on the mounting surfaces and around the mounting holes, and mate the body to the helmet and start to tighten the mount screws on the interior of the helmet. Wipe off the excess RTV silicone sealant that is squeezed out. Make sure any excess silicone that may have extruded inward is removed to prevent flow restriction past the valve. Tighten the screws to 12 inch pounds.

Silicone sealant is used to seal the exhaust body to the helmet shell.

⚠ WARNING

Use silicone sealant in a well ventilated area. Do not breathe the fumes from uncured silicone sealant. These fumes are dangerous and can cause unconsciousness. They can also cause long term damage to body tissue. Read and follow all precautions listed on the silicone sealant tube and Material Safety Data Sheet.



Components of the SuperLite®-17 exhaust system.

7.12 Reinstalling the Quad-Valve™ Exhaust Assembly

Once the Quad-Valve™ exhaust has been reassembled, it may be mounted back on the helmet.

1) Begin to re-install the demand regulator into the mounting hole in the helmet shell, but insert it only about halfway in. This will allow the stainless steel adapter cover to align easier with the main exhaust body.

Start the cover straight onto the main exhaust body, then alternate back to inserting the regulator. Do this until both are in their proper positions. Lubricate the regulator seal o-ring and hand start the regulator mount nut.

2) Lubricate and install the 2 o-rings and install onto the washer head screws. Using either a flat blade screwdriver or a ¼ nut driver, fully engage the screws. Tighten until snug. TIP: the ¼" hex tool found in the Kirby Morgan regulator tool kit works very well for this purpose. (Part #525-620)

Note: Refer to "7.8.9 Reassembly of the SuperFlow® 350 Demand Regulator" on page 87

3) Reinstall the bent tube assembly and tighten the jam nut to 40 inch pounds.

4) Retighten the regulator mount nut to 100 inch pounds.

5) Reinstall the 4 spacers, kidney plates and screws and torque to 12 inch pounds.

6) Attach any other components that may have been displaced to aid in this installation.

The Quad-Valve™ cover must be properly connected to the main exhaust and water dump valve body.

⚠ WARNING

Use only KMDSI original replacement spares when repairing your helmet. The use of other manufacturer's parts will interfere with the performance characteristics of your life support equipment and may jeopardize your safety. Additionally, any substitutions will void all warranties offered by KMDSI.

7.13 Standard Old Style Single Exhaust Whisker PN# 510-554

Drawing location numbers regarding the 510-554 whisker only refer to the drawing shown on this page.

Note: The Standard old style exhaust whisker (139) PN# 510-554 has been used since 1976. This whisker as well as the double exhaust whisker PN# 525-102 has now been replaced by the new Tri-Valve Exhaust whisker PN# 525-752. The following procedure covers the servicing of the old style whisker PN# 510-554.

7.13.1 Whisker Removal

Tools Required:
Torque Screwdriver
1/4 inch Screw Flat Blade Attachment.
7/8" Torque Wrench 0-200 inch lb
7/8" Crow Foot Adapter
5/8" Crow Foot Adapter
7/8" Open End Wrench

1 I/4" Socket (regulator nut)
1/16" Crow Foot Adapter

1. Loosen the two bent tube retaining nuts, and remove the bent tube.

2. Remove the nose block knob, packing nut, and nose block shaft.

3. Remove the regulator mount nut and O- ring.

4. Remove the oral nasal mask.

5. Loosen and remove the whisker retaining screws, remove the retaining plates then pull the regulator and whisker free. Use caution not to lose the whisker spacers. The rubber whisker is removed by stretching and pulling the rubber away from the back of the regulator "whisker flange". The "whisker flange" forms the exhaust valve seat and surrounds the regulator silicone exhaust valve. The whisker is held in place at the regulator body by being stretched over the whisker flange., To remove it, pull the whisker free.

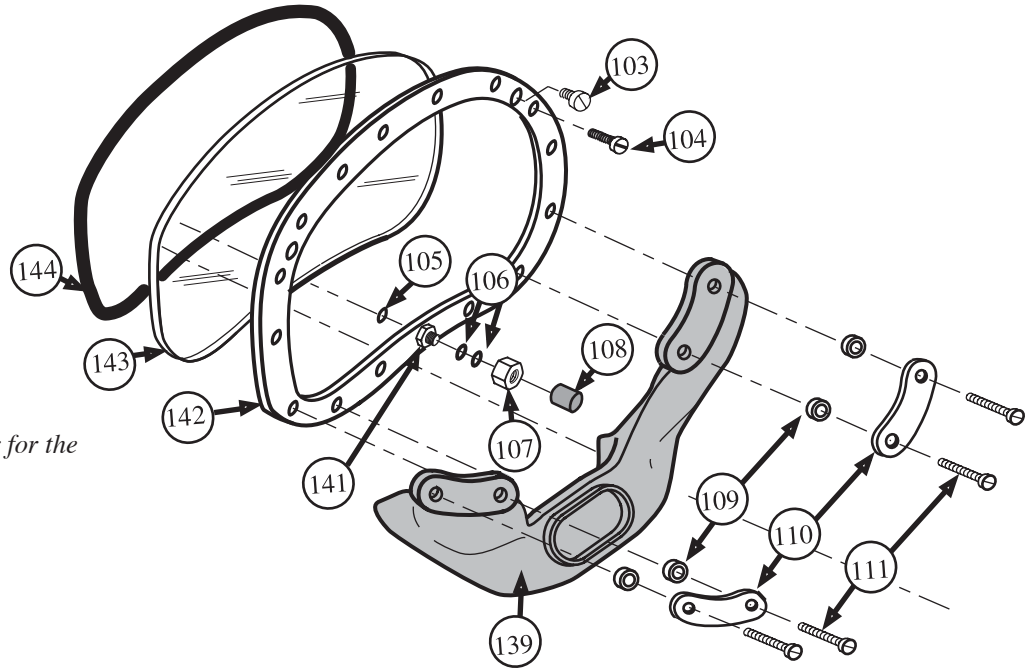
6. Clean the valve and valve land area of the regulator body.

Note: Whenever the whisker is removed or replaced, the exhaust valve should be carefully cleaned and inspected. Replace the valve if any damage or deterioration is found. All exhaust valves should be replaced during scheduled overhauls or at least once a year.

Note: Before removing the regulator exhaust valve, carefully inspect the area around the edges to assure the silicone exhaust valve is in contact with the regulator body. Ensure the spokes that hold the exhaust valve are smooth, even and not bent.

The exhaust valve seating area should be free of dirt and corrosion to ensure the valve can lay flat and seal properly. The metal cross-area of the body under the valve could be slightly bent out resulting in the rubber valve not sealing.

If the exhaust valve is high and not sealing, with



The original single whisker for the SuperLite®-17.

the exhaust valve in place, lightly press in on the metal cross, bending the metal in slightly until the spokes are flat and the valve seats.

7.13.2 Reinstalling the Whisker

1) If a scheduled overhaul is being performed, or the exhaust valve is questionable, replace the regulator exhaust valve.

Note: NEVER lubricate the exhaust valve. Lubricating the valve will attract dirt and may allow leakage.

2) Stretch the whisker onto the exhaust flange of the regulator.

3) Place the regulator into the helmet opening, then attach the screws, spacers and plate, on each side of the port retainer and using a torque screwdriver torque to 12 inch pounds. See Appendix 1.

4) Lightly lubricate a new O-ring and place on the regulator inlet tube then thread the retaining nut on hand tight only.

5) Clean and inspect the bent tube O-ring and side block seal. These components can be reused during normal field service but should be replaced during normal overhauls or if damage is detected.

6) Lightly lubricate the bent tube O-ring and install the bent tube into the inlet nipple and thread the nut on several revolutions.

7) Swing the bent tube into place on the side block, engage the bent tube side block nut and hand tighten.

8) Install the regulator retaining nut and O-ring. Torque the regulator retaining nut to 100 inch pounds.

9) Lightly tighten both the side block nut and nipple tube nut until resistance is felt then torque the side block nut to 100 inch lbs, and the inlet nipple jam nut against the inlet nipple nut to 40 inch pounds.

10) Clean and inspect the oral nasal mask and install on the regulator mount nut.

11) Clean and inspect the nose block O-rings, shaft, and nut replace damaged components. Lightly lubricate the shaft and O-rings, reinstall and torque the packing nut to 20 inch pounds.

⚠ WARNING

Always be sure to use a torque screwdriver whenever checking the port retainer screws. Overtightening can cause damage to the threaded inserts in the fiberglass shell and cause them to loosen. Without the correct tension the port retainer may come loose and the helmet could leak resulting in flooding of the helmet. This could lead to serious injury or death.

7.14 Double Exhaust Whisker

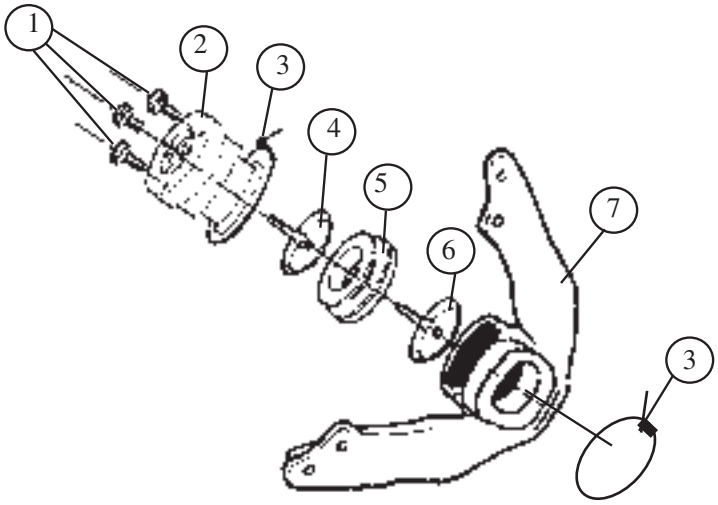
All drawing location numbers on this page refer to the drawing of the double exhaust system shown here.

The double exhaust system was originally designed to help minimize or reduce the possibility of back flow of biological and chemical contaminants. This system has been used successfully for diving in biologically contaminated environments. However, there are certain chemicals (i.e.. Toluene, Acetic acid etc.) that will attack the rubber in the valves in the exhaust assembly. The double exhaust system has been replaced by the Quad-Valve™ Exhaust System, however the Double Exhaust system is still available.

⚠ WARNING

The double exhaust system PN#525-102 increases exhalation resistance and should not be used for dives deeper than 150 FSW. Use of this system at deeper depths could lead to exhaustion and unconsciousness.

Location	Part Number	Description
1	530-032	Screws (3)
2	550-087	Double Exhaust Main Body
3	520-042	Tie Wrap (2)
4	510-561	Exhaust Valve
5	520-020	Valve Body
6	510-550	Exhaust Valve
7	525-103	Double Exhaust Whisker



7.14.1 Double Exhaust Whisker Cleaning and Overhaul, Whisker PN# 525-102

Tools Required:
Torque Screwdriver
1/4 inch Screw Flat Blade Attachment.
7/8" Torque Wrench 0-200 ft lb
7/8" Crow Foot Adapter
5/8" Crow Foot Adapter
7/8" Open End Wrench
1 I/4" Socket (regulator nut)
1/16" Crow Foot Adapter

1) Loosen the two bent tube retaining nuts, and remove the bent tube.

2) Remove the nose block knob, packing nut, and nose block shaft.

3) Remove the regulator mount nut and O- ring.

4) Remove the oral nasal mask.

5) Loosen and remove the whisker retaining screws. Remove the retaining plates then pull the regulator and whisker free. Use caution not to lose the whisker spacers. The rubber whisker is removed by stretching and pulling the rubber away from the back of the regulator "whisker flange". The "whisker flange" forms the exhaust valve seat and surrounds the regulator silicone exhaust valve. The whisker is held in place at the regulator body by being stretched over the whisker flange and secured with a tie wrap. To remove, cut the tie wrap and pull the whisker free.

6) Remove the inner valve cage assembly. Clean and inspect the valve and cage. Replace the valve if any damage or deterioration is present or if a routine overhaul is being performed.

Note: This is the same valve, and cage as used in the oral nasal. Clean and inspect the valve. Replace the valve if any damage or deterioration is present or if a routine overhaul is being performed.

Note: Before removing the regulator exhaust valve, carefully inspect the area around the edges to assure the silicone exhaust valve is in contact with the regulator body. Ensure the spokes that hold the exhaust valve are smooth, even and not bent. The exhaust valve seating area should be free of dirt and corrosion to ensure the valve can lay flat and seal properly.

The metal cross-area of the body under the valve could be slightly bent out resulting in the rubber valve not sealing. If the exhaust valve is high and not sealing, with the exhaust valve in place, lightly press in on the metal cross, bending the metal in slightly until the spikes are flat and the valve seats.

7) Clean the valve and valve seat area of the regulator body. Replace the exhaust valve in accordance with the regulator overhaul procedure. The silicone exhaust valve is removed by pulling it out.

Note: Whenever the whisker is removed or replaced the exhaust valve should be carefully cleaned and inspected. Replace the rubber whisker and or valve if any damage or deterioration is found. All exhaust valves should be replaced during scheduled overhauls or at least once a year and anytime damage or deterioration is present.

8) Stretch the double exhaust whisker (7) onto the regulator flange and install tie-wrap (3) loosely around whisker on the regulator flange. Install tie-wrap (3) snugly around whisker on the exhaust body flange making sure that the tie wrap is in the slot on the exhaust body! This is very important to the sealing of the exhaust! Tighten the regulator flange tie-wrap snugly around the whisker, insuring that it does not become pinched between the helmet/mask frame & regulator. Cut off excess tie wrap ends.

NOTE: In newer exhaust whisker kits, the second exhaust valve (6) and body (5) are already installed in the whisker. If whisker replacement is being done the valve and cage needs to be installed.

9) Place the regulator back into the mount hole of the helmet/mask frame. Stretch the double exhaust kit whisker over the special main exhaust body ensuring the whisker is seated properly on the main exhaust body flange.

10) Place the regulator into the helmet opening, then attach the screws, spacers and plate, on each side of the port retainer and using a torque screwdriver torque to 12 inch pounds. **SPECIAL CARE must always be taken to not over torque any port retainer screws!**

11) Lightly lubricate a new O-ring and place on the regulator inlet tube then thread the retaining nut on hand tight only.

12) Clean and inspect the bent tube O-ring and side block seal. Components can be reused during normal field service but should be replaced during normal overhauls or if damage is detected.

13) Lightly lubricate the bent tube O-ring and install bent tube into the inlet nipple and thread the nut on several revolutions.

14) Swing the bent tube into place on the side block, engage bent tube side block nut and hand tighten.

15) Torque regulator retaining nut to 100 inch pounds.

16) Lightly tighten both the bent tube retaining nuts, then torque the side block nut to 100 inch lbs, and the inlet nipple jam nut against the inlet nipple nut to 40 inch pounds.

17) Clean and inspect the oral nasal mask and install on the regulator mount nut.

18) Clean and inspect the nose block O-rings, shaft, and nut. Replace damaged components, lightly lubricate the shaft and O-rings, reinstall and torque the packing nut to 20 inch pounds.

7.15 Tri-Valve Exhaust Whisker

The Tri-Valve® Exhaust System is another "legacy" product. In addition, it does not provide the same level of backflow protection as the Quad-Valve™. All divers are encouraged to use the Quad-Valve™ system when using the SuperLite®-17.

If you are already using the Tri-Valve®, conversion to the Quad-Valve™ requires only a few additional parts.

Tools needed:
Medium size flat blade screwdriver
Torque screwdriver with medium size flat blade
Small cutting pliers
Needle nose pliers
1 ¼" Socket on Torque Wrench
Flat Blade Attachment on Torque Screwdriver
11⁄16" Open End Attachment on Torque Wrench
13⁄16" Open End Attachment on Torque Wrench
7/8" Open End Attachment on Torque Wrench
7/8" Open End Wrench

7.15.1 Demand Regulator Assembly Removal

1) To remove the regulator from the helmet, the Bent Tube or regulator hose assembly w/O-Rings ("A" style side block) must be removed first. The bent tube assembly must be removed before regulator removal.

2) Loosen and remove the regulator mount nut and O-ring.

3) Remove the whisker wing for the Tri-Valve Exhaust System from the port retainer, held on each side of the helmet by two screws, stand off spacers and one plate on each side. Take care not to lose the four spacers.

4) Removal of a Tri-Valve Exhaust system will require the tie wrap that holds the Tri-Valve Exhaust main body to the regulator exhaust flange to be cut off. After removing the tie wrap, remove the Tri-Valve Exhaust main body by stretching it over and off of the regulator exhaust flange.

7.15.2 Replacing the Regulator Exhaust Valve

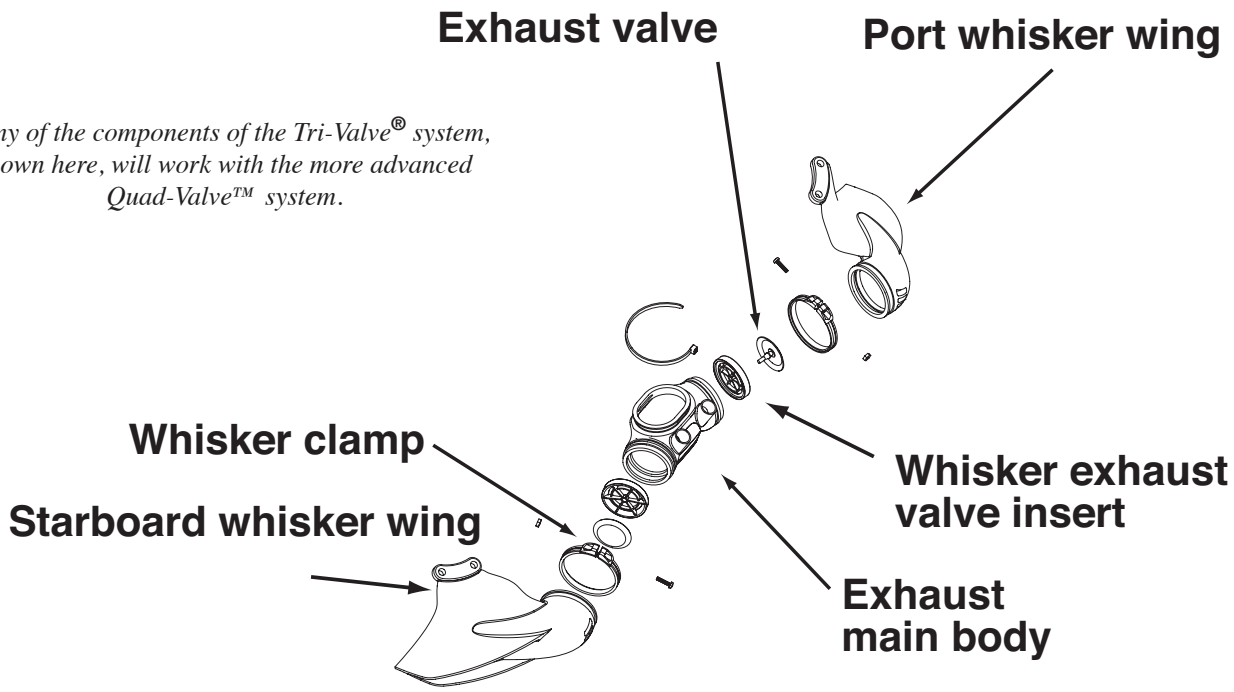
1) Remove the existing regulator exhaust valve by pulling it out of its mount hole. If the valve tears, make sure that is removed without any valve material is left in the inside of the regulator.

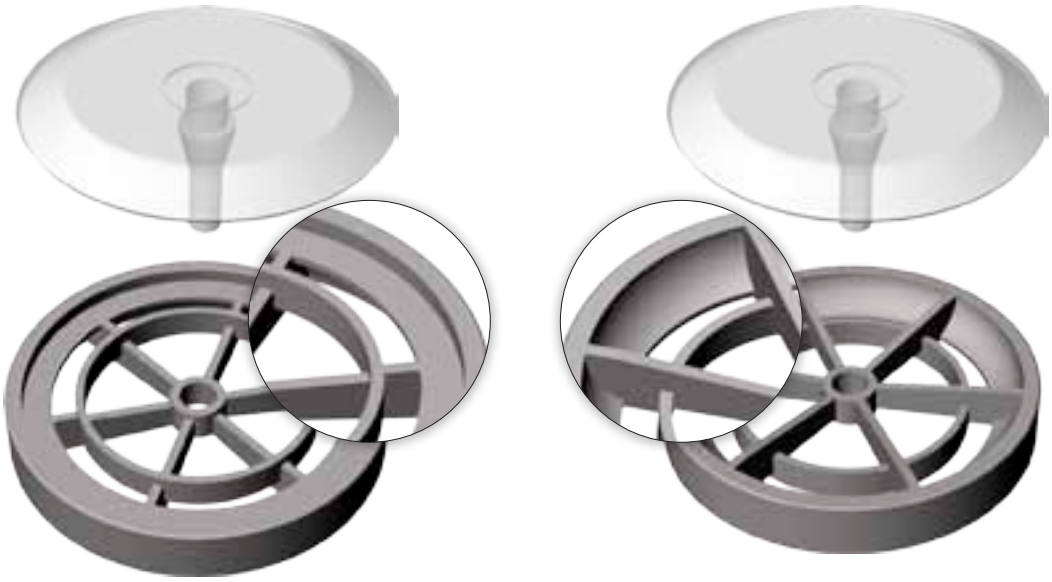
NOTE: Before installing the new valve, ensure that the spokes that hold the exhaust valve are smooth, even and not bent. Slight bends in the spokes may be removed utilizing slight pressure with a thumb. (Do not bend the spokes in.) The exhaust valve seating area should be free of dirt and corrosion to insure the valve can lay flat and seal properly. NEVER lubricate the valve.

2) Remove the regulator clamp screw and clamp.

3) Remove the cover and the diaphragm.

Many of the components of the Tri-Valve® system, shown here, will work with the more advanced Quad-Valve™ system.





The exhaust valve inserts are recessed on one side to accept the exhaust valves so they sit flush in the inserts. The exhaust valves must be installed properly in the inserts or they will not seal or perform properly.

4) Install the new regulator exhaust valve by placing the stem of the valve in through the hole in the hub of the spokes from the outside of the regulator. Gently, (using needle nose pliers) from the inside of the regulator, pull the stem of the valve through the hole in the hub of the spokes until it pops into its seating area.

5) Reinstall the diaphragm, cover, clamp and clamp screw.

To allow access to the two exhaust valves in the whisker wings, you must first remove the two whisker clamps that hold the whiskers on the exhaust main body. This is the starboard clamp.

7.15.3 Tri-Valve Exhaust Valve Replacement

1) Remove the Tri-Valve Exhaust Assembly

2) Remove the two clamps that hold the whisker wing to the main exhaust body.

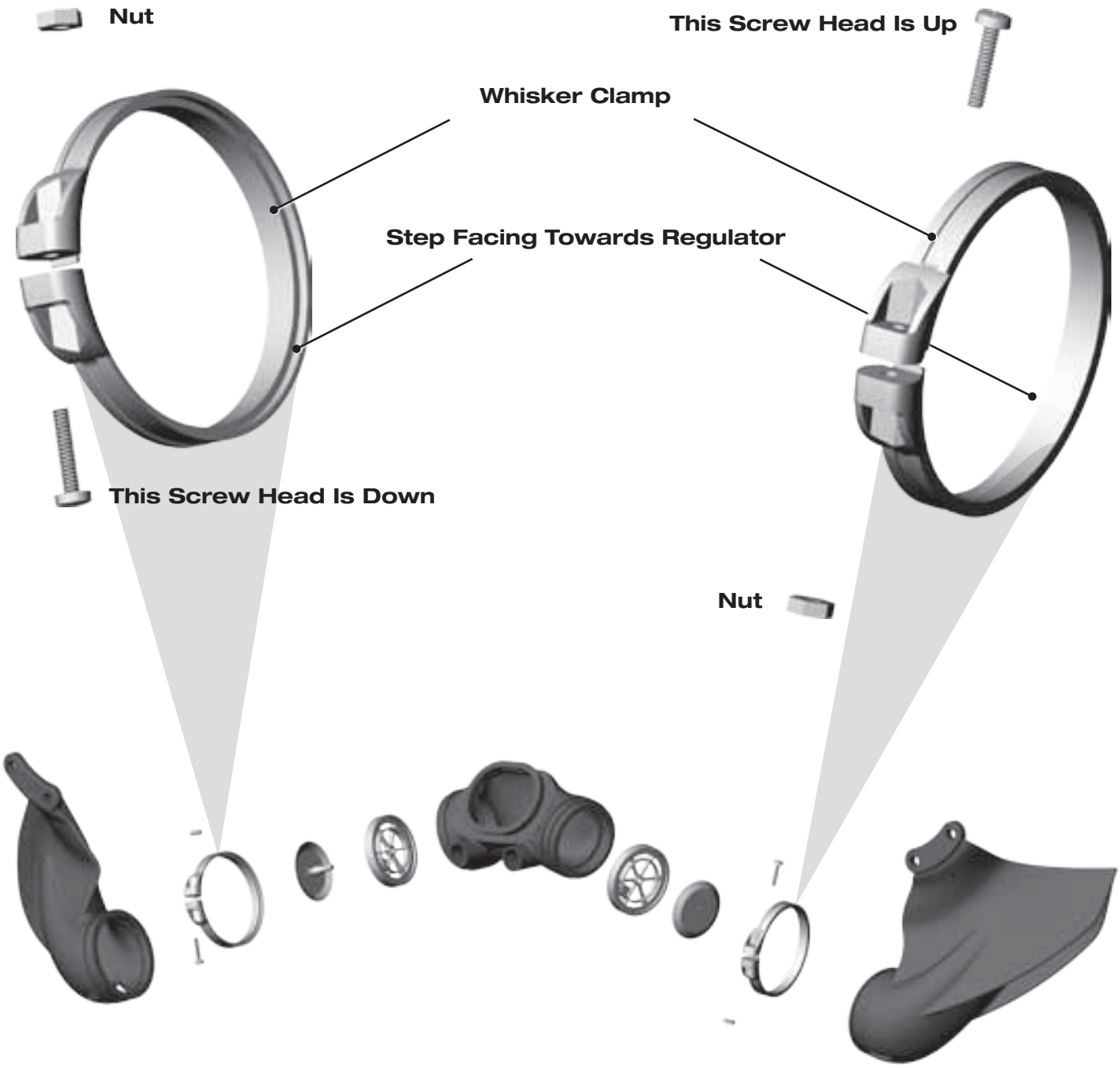
3) Remove the two exhaust valve Inserts, and valves. ***Carefully note*** which side the valves are installed into and which way they face when mounted in the body. They **MUST** be reinstalled facing the same way.

4) Install a new exhaust valve into each whisker wing exhaust valve insert on the correct side by feeding valve tail through hole in center of valve insert and pulling on it until valve is seated

NOTE: The exhaust valve whisker wing exhaust valve inserts assembly must be placed into Tri-Valve Exhaust main body correctly to provide gas flow in the proper direction. The flow must be from the inside of Tri-Valve Exhaust main body out to the whiskers.

5) Install an exhaust valve whisker wing exhaust valve insert assembly into both seating areas on each side of Tri-Valve Exhaust main body.

6) Slide the starboard whisker wing onto the starboard side of the main body, making sure that you do not dislodge exhaust valve whisker wing exhaust valve insert assembly from its seating area. The part-



Whisker Assembly Details

Special note on whisker clamps: There is no left or right whisker clamp. Both clamps are identical.

If the clamps are not oriented correctly, it will be very difficult to tighten the screws that secure them. There is also a good possibility that the clamp will come off of the whisker wing, reducing the effectiveness of the exhaust system in keeping the breathing system dry.

⚠ WARNING

If the whisker clamps are not installed properly, the exhaust valves will leak. This leads to a chance of backflow into the regulator through the exhaust valve. In contaminated water diving, this is a serious emergency.

Note the step on the inside of the whisker clamps. These must be oriented in the correct position to retain the whisker wings properly.

⚠ WARNING

The exhaust valves must be correctly installed in the exhaust valve inserts or they will not seal correctly. This could lead to a backflow of water into the helmet, which could expose the diver to any contaminants that are in the surrounding water. Depending on the contaminants, this could lead to serious personal injury or death.

Note the correct alignment of the mold line that spans the whiskers and the exhaust main body.

ing line on bottom of the exhaust whiskers should be 5/16 inch behind the parting line on the main body.

7) Repeat this procedure for the port side.

8) Place the clamps around the grooves in each of the two whiskers. Before doing the final tightening of the clamps, make sure that they are positioned on the body as shown.

7.15.4 Installing the Tri-Valve Exhaust System onto the Regulator

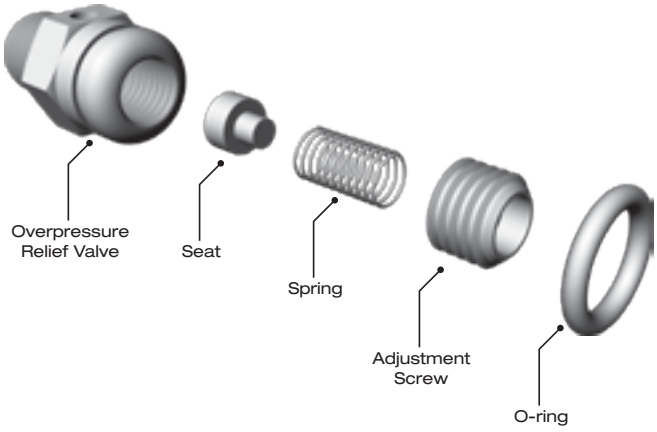
1) The Tri-Valve Exhaust Main Body opening mates to the regulator exhaust flange. This opening needs to be worked onto the flange.

IMPORTANT NOTE: DO NOT attempt to stretch the whisker wing onto the regulator flange by pulling on the long part of the whisker wing. Doing this could possibly loosen or separate the parts. Grasp the main body area of the whisker wing as shown, while stretching the rubber onto the flange. Make sure that the Tri-Valve Exhaust System is facing the correct direction and is not upside down.

2) Place the clamps around the clamp seating surface and tighten, making sure that the clamp screws are properly positioned as shown in the drawing on the next page.

The correct orientation of the whiskers relative to the exhaust main body are as shown in the photo here. Tighten the screws that hold the clamps until the screws are snug. The threaded ends of the screws should be at least flush with the outer edge of the nut that holds them. Do not overtighten.

7.16 Overpressure Relief / Bleed Valve Overhaul Procedures



Over Pressure Relief Valve Component breakdown

7.12.1 Overpressure Relief Valve

The relief/bleed valve should ***always*** be used on all Emergency Gas Supply (EGS/bail-out) first stage regulators to prevent the hose from rupturing in the event the first stage pressure creeps. The Kirby Morgan relief body is made of stainless steel.

The basic components last a long time but the valve should be disassembled, cleaned, and inspected at least once a year or whenever it fails testing. The valve should be tested monthly. Cleaning and overhaul is easily performed using a nylon toothbrush and a 50/50 solution of vinegar and fresh water. Cleaning for 15 minutes in an ultrasonic sink, if available, with the 50/50 vinegar solution is highly recommended.

Repair parts are available. Normal replacement parts include the O-ring, soft seat, spring, and hex nut. The O-ring should be replaced at least annually. The other parts require replacement only if worn or damaged. An exploded view of the valve is located in all KMDSI Helmet and Band Mask Operations and Maintenance Manuals. The location numbers listed on the next two pages refer to the drawing on this page.

Tools Required.
Torque wrench
1/2" open-end wrench attachment for torque wrench
1/8" Allen wrench
Nylon toothbrush
Vinegar, Fresh water
Mild dish soap
Ultrasonic sink, if available
Magnifying glass
New valve body o-ring

⚠ WARNING

Do not use cleaning solvents (i.e. mineral spirits, bleach, etc.) when cleaning the relief/bleed valve. The use of cleaning solvents may lead to failure of the relief/bleed valve.

7.16.2 Overpressure Relief Valve Disassembly and Cleaning

1) Turn off the gas supply to the first stage regulator, then bleed off any remaining pressure. Remove the first stage regulator from the air/breathing gas source so it cannot be accidentally turned on, i.e., pressurized. Make sure the intermediate pressure in the regulator hose is also fully drained of pressure.

2) Remove the relief/bleed valve from the regulator body using the 1/2" open-end wrench.

3) Remove, cut, and discard the relief/bleed valve body O-ring.

4) Using the 1/2" open-end wrench to hold the bleed/relief body, use the 1/8" Allen wrench to remove the Allen head adjustment screw. Then, shake out the spring and soft seat.

5) Place all parts in the 50/50 solution of vinegar and water and allow to soak for 15 to 30 minutes. If using an ultrasonic sink, reduce time to 15 minutes.

6) Using the nylon toothbrush, brush all components to remove corrosion and mineral deposits. Then, rinse with fresh water and blow or air dry.

7) Using the magnifying glass, carefully inspect all components for excessive corrosion and/or damage. Replace the spring and/or adjustment nut, if either part is excessively corroded or shows signs of wear and/or damage.

Inspect the soft seat for nicks, cuts, and wear and

replace if any damage is found. Replace the entire assembly if any damage to the valve body is present.

NOTE: A deep groove in the soft seat is normal. Replacement is only necessary if the rubber seat is deteriorated, cut, and/or chipped.

7.16.3 Overpressure Relief Valve Reassembly

1) After cleaning, inspection and/or parts replacement, reassemble the valve by installing the soft seat, spring, and adjustment nut. Screw the adjustment nut down until it is approximately 1/2 thread from being flush with the top of the valve body.

2) Lightly lubricate a new body O-ring, then install on the valve body.

3) Test the relief/bleed valve according to the test procedure below.

7.16.4 Overpressure Relief Valve Lift Check/Setting

Tools required:
Adjustable first stage scuba regulator or controlled adjustable pressure source
Intermediate pressure test gauge
Torque wrench
1/2" open-end wrench adapter for torque wrench
1/8" Allen wrench
HP air source {SCUBA tank) with at least 500 p.s.i.g. (34.4 bar).
Mild dish soap

The purpose of lift checking the relief/bleed valve is to ensure it operates properly, allowing excess pressure to escape in the event the first stage develops a slight leak. Without the relief/bleed valve, high-pressure gas will continue to increase until the emergency supply hose ruptures, possibly causing injury and a complete loss of the Emergency Gas System (EGS).

⚠ WARNING

Ensure the relief/bleed valve is only installed in a low-pressure port of the first stage regulator. Installation in a high-pressure port will lead to loss of EGS supply and possible serious personal injury if the valve fails.

This procedure explains the steps necessary for readjusting the relief/bleed valve after it is cleaned, overhauled or any time the valve is tested.

NOTE: The relief/bleed valve is lift checked and/or adjusted using an adjustable first stage regulator, equipped with a low-pressure test gauge, which is used for adjusting the intermediate pressure of scuba regulators. The check/adjustment can be performed using a standard scuba test stand, or a gas control console, using air or mixed gas with an oxygen content below 23% by volume.

⚠ WARNING

Do not use oxygen, or mixed gas containing more than 23% oxygen by volume, for lift checking the relief/bleed valve. The use of oxygen, or mixed gas, in a high-pressure supply system not designed and cleaned for oxygen service, can result in a fire or explosion causing serious injury or death.

If a first stage scuba regulator is used, it must be able to be adjusted to the desired lifting pressure. The pressure gauge should be compared to a gauge of known accuracy.

NOTE: If the Allen screw on the relief/bleed valve hex nut is rotated too far, too fast, the relief/bleed valve will pop open. This could possibly require the air to be secured at the cylinder or supply source to reset the seat before the adjustment can be accomplished.

NOTE: The relief/bleed valve can be installed in any first stage regulator, providing the first stage has an intermediate setting of 135 - 165 p.s.i.g. (9.3 – 11.4 bar).

1) Install the relief valve in a low-pressure port on an adjustable 1st stage regulator. Or install on the scuba test stand.

2) Install the intermediate pressure gauge in one of the low-pressure ports of the first stage regulator.

3) Install the 1st stage regulator on the cylinder. Ensure the relief valve and intermediate pressure gauge are attached to low-pressure ports.

4) Wet the relief valve with soapy water to help indicate gas flow

5) Slowly bring up air pressure while watching the intermediate pressure gauge until the pressure gauge indicates 180- 200 p.s.i.g. (12.40-13.78 bar). If the relief valve starts venting at a pressure below 180- 200 p.s.i.g. (12.40-13.78 bar), secure the air supply and adjust the adjustment screw (1) in (clockwise) 1/8th turn. Slowly bring up pressure and recheck.

Continue this procedure as necessary until the relief valve consistently vents at a pressure between 180-200 p.s.i.g. (12.40-13.78 bar). If the valve does not start venting when the gauge reads 200 p.s.i.g. (13.78 bar), slowly back out on the adjustment screw (counter clockwise) until the valve starts venting, forming bubbles in the soap solution.

6) After the valve has been adjusted, adjust the 1st stage regulator intermediate setting to 135 p.s.i.g. (9.3 bar), re-wet the valve, then slowly increase the intermediate pressure on the 1st stage regulator one last time to recheck the lift pressure. The valve should start forming bubbles or venting at between 180- 200 p.s.i.g. (12.40-13.78 bar).

7) After final lift check reset the regulator to the appropriate over bottom setting. Remove the intermediate pressure gauge.

TROUBLESHOOTING
Problem: Valve pops open and will not stop flowing:

Check: If while setting the relief/bleed valve the valve pops open and will not stop flowing, secure the air supply valve and allow the valve to reseat. Try the procedure again, ensuring that the supply valve is only slightly cracked open, allowing full test pressure but minimizing high flow potential.

Problem: After resetting the first stage to 135 p.s.i.g. (9.3 bar), the valve continues to leak:

Check: This indicates the valve body, seating surface or the soft seat is either dirty or damaged. Usually, cleaning both the metal body, seating surface in the valve body and the soft seat will fix the problem.

If, after cleaning, the problem persists, replace the soft seat and spring and retest the unit. If the seat continues to leak, then replacement of the complete valve will be necessary.

The purpose of lift checking the valve is to ensure the relief operates properly allowing excess pressure to escape in the event the first stage develops a slight leak. This procedure also explains the steps necessary for readjusting after cleaning or overhaul.

Chapter 8
Corrective Maintenance

8.1 General

This section covers the maintenance and repair of all non-breathing system components of the SuperLite®-17 diver's helmet. Correct repairs will result in better communications and improved overall diver comfort and performance in getting the job done.

NOTE: For O-ring Removal/Inspection/Cleaning & Installation see Chapter 6. For General Cleaning Guidelines, including KMDSI recommended cleaning, sanitizing solutions, and procedures, see Chapter 6.

NOTE: All Kirby Morgan Parts are specifically manufactured for Kirby Morgan designed helmets and Band Masks™.

⚠ WARNING

Use only Kirby Morgan original replacement parts when repairing your helmet. The use of other manufacturer's parts will interfere with the performance characteristics of the helmet and may compromise diver safety.

⚠ WARNING

All parts on the SuperLite®-17 must be adjusted to their proper torque specifications. See Appendix 1 for a complete listing of torque specifications for each part. Failure to adjust parts to the recommended specifications could lead to helmet failure and accidents. This could result in serious injury or death.

8.2 Yoke/Neck Clamp Assembly and Helmet Shell Inspection

In 1999 all Kirby Morgan fiberglass yokes of the yoke/neck clamp assembly were replaced with a urethane and stainless steel composite. Original yokes were constructed of hand laid fiberglass. Both function the same and are assembled and mounted to the clamp assembly the same way.

1) Remove the yoke/neck clamp assembly from the helmet. Perform a visual inspection of all components. Ensure the neck dam has no holes, tears, or damage. The neoprene must be firm, and the neck dam should fit snug, but should not be uncomfortable or tight.

2) Visually inspect all metal parts of the clamp assembly for damage. Check the hinge pins for a loose fit, signs of cracking, distortion or any damage.

3) Visually inspect the adjustment stud for signs of cracking, distortion, bending, stripped or damage threads or corrosion.

4) Check the rear hinge tab and hinge for signs of cracking bending, distortion, and loose fasteners.

5) Check the latch catch assembly for proper operation. Check for corroded, worn or damaged parts, loose or missing screws. Ensure the proper safety pin is present.

6) Test mate the yoke / neck dam / clamp to the helmet. Check for proper clamp adjustment and smooth operation. Repair, replace, and adjust parts as necessary.

The helmet shell is constructed using hand laid fiberglass cloth, carbon fiber, mat, and strands, impregnated with polyester resin. It is extremely durable but can be damaged.

Helmets that have suffered damage can often be repaired, but repairs to the helmet shell must only be accomplished by KMDSI technicians that have been

trained and certified in fiberglass repair by KMDSI. Many Kirby Morgan fiberglass helmets and masks still in use today are more than 30 years old.

7) Visually inspect the helmet shell exterior for obvious signs of fiberglass damage including cracks, gouges or depressions.

Polyester gel coat covers the exterior of the shell. Although this material is far more durable than paint, it can be scratched and chipped. Light scratches can be removed by using an automotive rubbing compound and waxing. Authorized KMDSI factory trained technicians can repair chips and scratches.

⚠ WARNING

Do not attempt to install new thread inserts in the helmet shell for the port retainer screws by yourself. If the installation is done improperly, the port retainer can come loose and the helmet could flood resulting in drowning. Fiberglass and insert repairs should be only be completed by technicians specifically trained and certified in these procedures.

8.3 Nose Block Assembly

8.3.1 Nose Block Assembly Removal

Tools Required:
Slip Joint Pliers and a Rag or cloth
7/16 ” Open-End Wrench

1) Hold the nose block knob with a pair of pliers padded by a cloth, while unscrewing the nose block device with your hand.

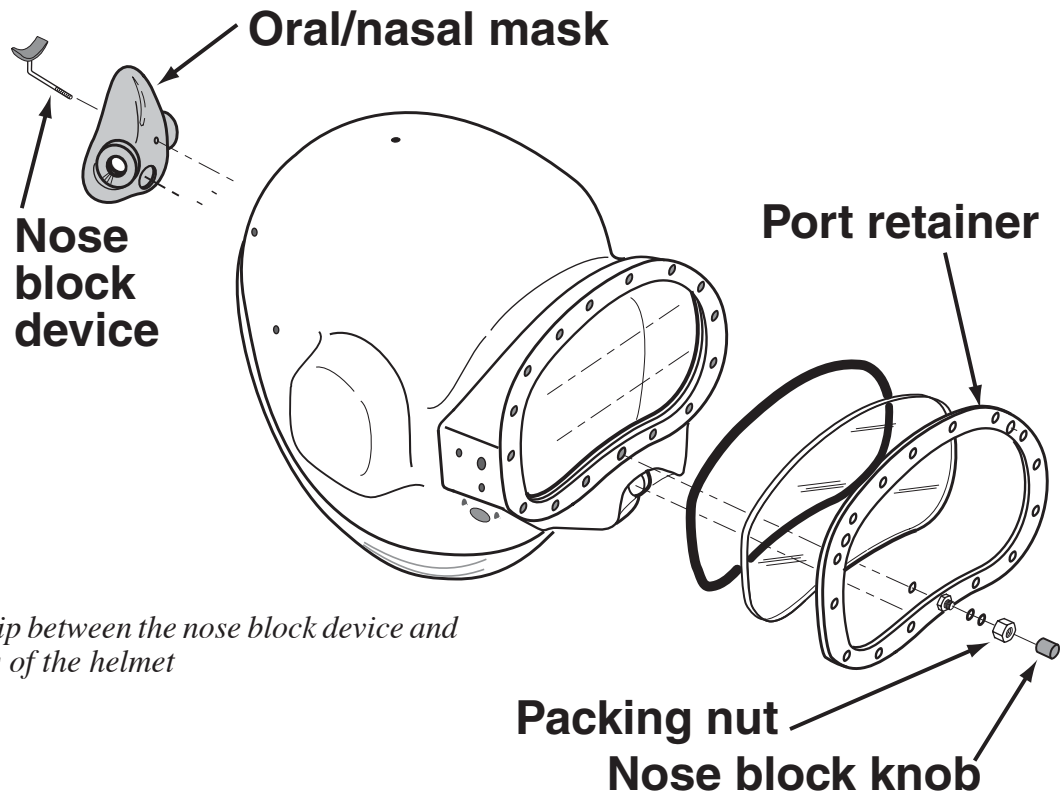
2) After the knob is removed, loosen and remove the packing nut.

Loosen the nose block knob with a pair of pliers.

The nose block knob must be removed prior to removing the packing nut.

3) Slip the two O-rings off the end of the shaft of the nose block device and slide the nose block device out through the oral nasal mask.

4) The padded end of the shaft may be bent with pliers to better fit an individual. A larger pad of rubber can also be glued onto this pad.



Relationship between the nose block device and other parts of the helmet

8.3.2 Nose Block Device Replacement

1) Prior to reassembly, lubricate the two O-rings.

2) Slide the shaft through the oral nasal mask in the helmet shell.

3) Place both O-rings on the shaft, followed by the packing nut and the knob.

4) Tighten the packing nut until snug. Do not over tighten, as this will make it difficult to slide the nose block device in and out.

5) Tighten the knob with the pliers, padded by a cloth, while holding the pad end with your hand.

The shaft for the nose block device slides through the hole in the oral nasal mask.

The nose block packing nut must be tightened enough to seal the nose block device shaft but loose enough for the device to slide in and out.

8.4 Handle and Weights

8.4.1 Handle Removal

Tools Required:
Flat blade screwdriver
Torque screw driver and flat blade attachment Dow Corning® RTV 732 Multi Purpose sealant or equivalent

The handle is a convenient location to mount television cameras, lights, and other instruments. If the handle is to be drilled to accept any of these items, it must be removed to prevent accidental damage to the helmet shell.

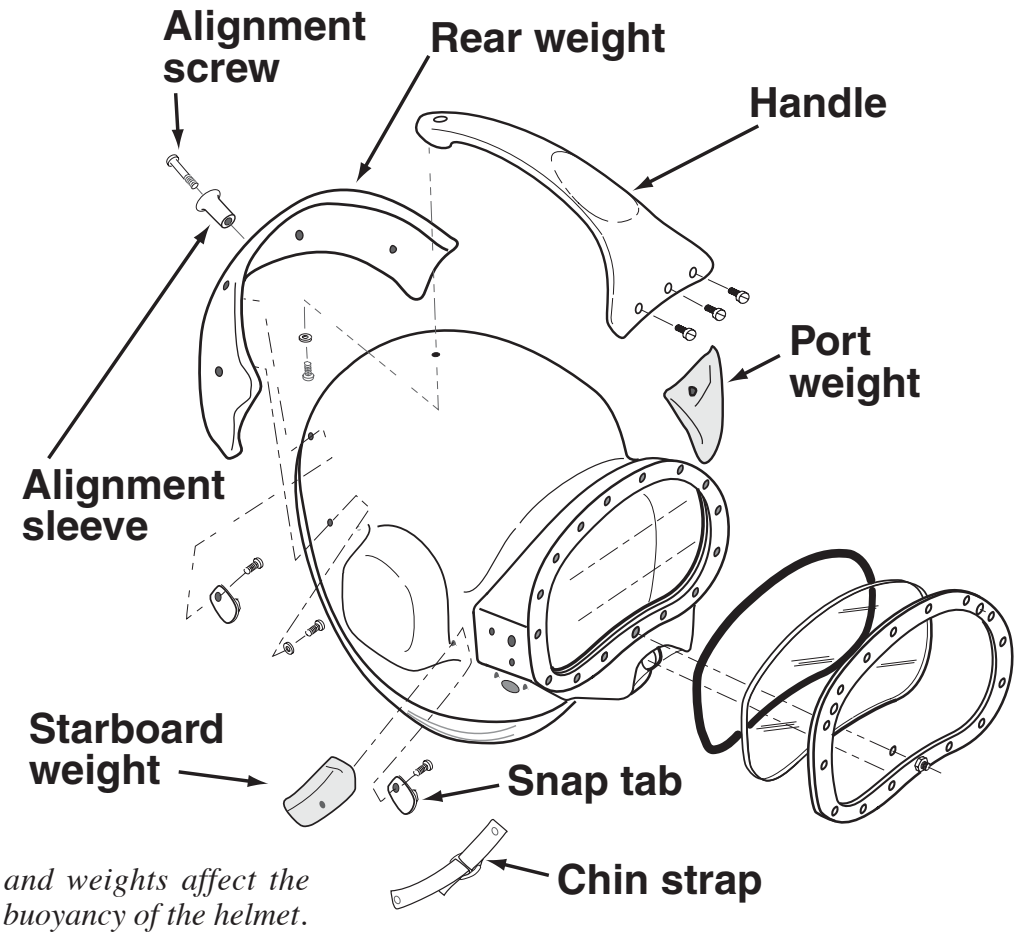
NOTE: Weights only need to be removed if fiberglass damage of the helmet shell is suspected or mounting holes are to be drilled and tapped into the weights for camera or light mounting.

1) The handle is removed by first unscrewing the top three port retainer screws.

2) Remove the rear handle mount screw and washer.

3) Pry up at the front of the handle to break loose the RTV.

To remove the handle, you must also remove the internal screw.



The handle and weights affect the balance and buoyancy of the helmet.

8.4.2 Handle Replacement

1) Clean off all the old RTV (silicone sealant) remaining on the handle and the helmet shell and screw hole.

2) Place a liberal amount of RTV Dow Corning® RTV 732 or equivalent Multi Purpose sealant on the rear mount surface of the handle and in the mount screw hole in the helmet shell.

3) Position the handle and run in the front screws only until snug.

4) Hold the handle in place and thread the rear mount screw (90) with its washer. Torque to 20 inch pounds.

5) Tighten the front mount screws to 12 inch pounds.

6) Wipe off any excess RTV from the helmet shell.

⚠ WARNING

Use silicone sealant in a well ventilated area. Do not breathe the fumes from uncured silicone sealant. These fumes are dangerous and can cause unconsciousness. They can also cause long term damage to body tissue. Read and follow all precautions listed on the silicone sealant tube and Material Safety Data Sheet.

Use a torque screwdriver to tighten the front handle screws to 12 inch pounds.

8.4.3 Weight Removal

Tools Required:
Torque screwdriver and flat blade attachment
Flat blade screwdriver
Wooden wedges,
Dow Corning® RTV 732 Multi Purpose sealant or equivalent

The weights are held on by fasteners as well as the RTV sealant. Do not use sealants other than RTV. Before removing the weights take NOTE of the position of the snap tabs and earphone retainer clips. If the snap tabs are not installed correctly, it will be difficult to reinstall your head cushion.

1) Unscrew the snap tab screws and earphone retainer screws. The chin strap will also be removed at this time.

2) Use the wooden wedges inserted under the edges of the weights to gently pry the weight off of the helmet shell.

Use a wooden wedge to help pry the weight off the helmet.

⚠ CAUTION

Do not use a screwdriver or similar sharp instrument, as it will damage the fiberglass finish. Use only wooden wedges under corners edges of the weights.

The rear weight provides the anchor point for the earphone retainers.

3) On the side weights, this is best done starting along the bottom edge.

4) On the rear weight, start removal at the corners.

5) Be patient and take your time because the RTV is an excellent adhesive and makes removal of the weights difficult. If you are hasty you may damage the helmet shell.

8.4.4 Weight Replacement

1) Clean off old RTV as necessary using a block of wood or the wooden wedges.

2) If the original weights are reinstalled they will fit the shape of the helmet and hole position. Replacement weights may need to be adjusted and aligned. Extra RTV can be used to help bed the weights evenly to the shell.

3) Check the fit of the replacement weights. If the holes in the shell do not line up with the holes in the weights the holes may be enlarged with a round file. Do not make the holes too big. Extend them only as necessary to fit the screws. If the holes are too big there will be insufficient material to keep the snap tabs in place.

4) Surround the holes with RTV (silicone sealant) to seal all penetrating screws. Be liberal with the RTV as it must seal the weights to prevent water entry.

RTV (silicone sealant) is used to seal the weights to the helmet shell.

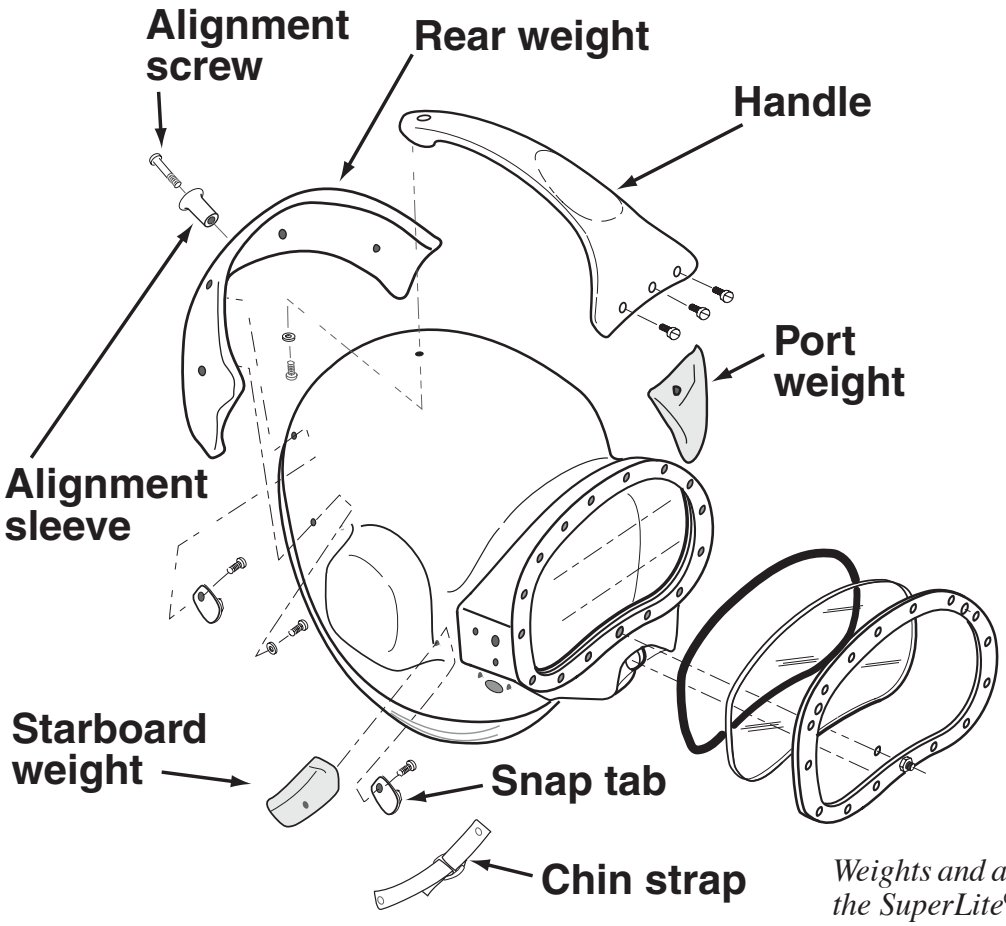
5) Install the screws and washers and tighten using a torque wrench with screwdriver adapter to the required torque values (35 inch pounds). Make sure all snap tabs, the chin strap, and the earphone retainer clips are in their original positions.

6) Wipe off all excess RTV that has oozed out from under the weights.

7) Allow 24 hours for the sealant to cure before using the helmet.

⚠ WARNING

Use silicone sealant in a well ventilated area. Do not breathe the fumes from uncured silicone sealant. These fumes are dangerous and can cause unconsciousness. They can also cause long term damage to body tissue. Read and follow all precautions listed on the silicone sealant tube and Material Safety Data Sheet.



Weights and associated hardware on the SuperLite®-17B

8.5 Chin Strap and Yoke Strap

The chin strap should be regularly inspected to ensure it is in good condition. If it is worn or frayed it must be replaced.

The importance of a properly functioning chin strap cannot be overstressed. If the chin strap is missing or not engaged, the diver's face will not be properly positioned in the oral nasal mask. This can lead to a build-up of carbon dioxide inside the helmet.

The chin strap will also help to maintain the helmet on the diver's head in the rare event that the neck dam/yoke become disengaged from the bottom of the helmet shell. If this happens, however, the helmet can still flood if the diver does not maintain an upright position in the water.

⚠ WARNING

The chin strap must be properly installed in the helmet and used on every dive. Without a properly functioning chin strap installed and correctly used, the diver may suffer from exposure to carbon dioxide. This can lead to unconsciousness, serious personal injury, and death.

⚠ WARNING

The chin strap will help to maintain the helmet on the diver's head in the rare event the yoke/neck clamp separates from the bottom of the helmet. However, even if the helmet stays on the diver's head, it may flood, which can lead to drowning, unconsciousness, serious personal injury, or death.

8.5.1 Chin Strap Removal

Tools Required:
Flat blade screwdriver

1) The chin strap is removed by removing the screws that secure the two snap tabs that penetrate the helmet shell and attach to the two front weights.

2) Remove the snap tabs and the chin strap. There is no need to remove the weights if you are only replacing the chin strap.

3) Clean off all traces of the old RTV inside the helmet where the snap tabs lay against the helmet shell and in the holes that the screws thread into to secure the snap tabs.

8.5.2 Chin Strap Replacement

Tools Required:
Torque screwdriver and flat blade attachment
RTV silicone sealant

1) Thread the screw on the port weight through the snap tab and the mount hole on the left side of the chin strap.

2) Fill the hole where the screw threads into the weight with silicone sealant.

3) Thread the screw in the hole and tighten the screw to 20 inch pounds.

4) Wipe off any excess silicone sealant.

5) Follow the same procedure for the snap tab on the right side of the helmet.

⚠ WARNING

Use silicone sealant in a well ventilated area. Do not breathe the fumes from uncured silicone sealant. These fumes are dangerous and can cause unconsciousness. They can also cause long term damage to body tissue. Read and follow all precautions listed on the silicone sealant tube and Material Safety Data Sheet.

8.5.3 Removal of the Yoke Strap

If the yoke strap is old and worn out you can simply cut it to remove it, if you are unable to replace it immediately. Otherwise, removal of an old strap can be done as part of the installation of the replacement strap.

8.5.4 Replacement of the Yoke Strap

Tools required:
Flat Blade Screwdriver

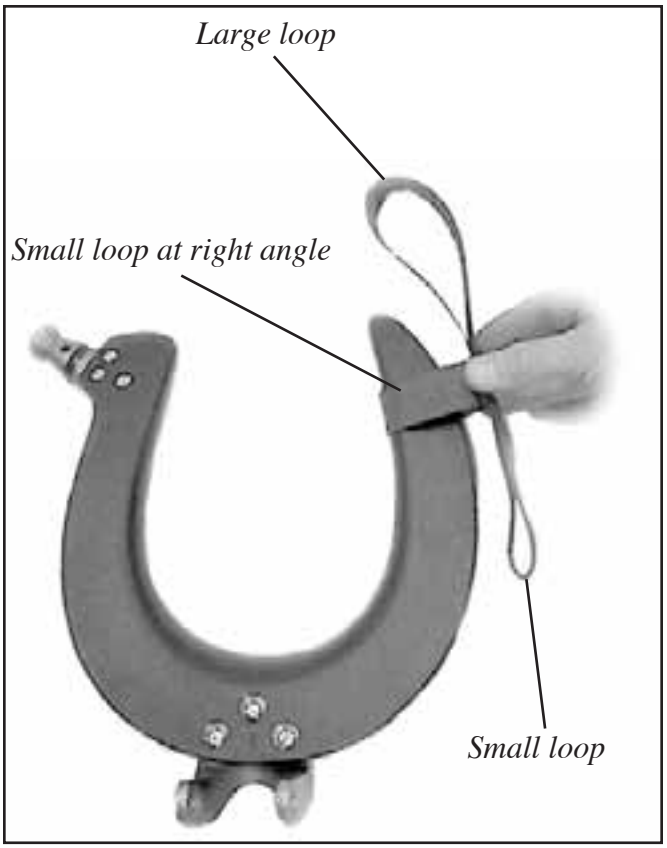
A replacement yoke strap (top) and guide strap (bottom).

1) Remove the yoke from the neck clamp by removing the rear hinge bolt.

The yoke and neck clamp (with neck dam) must be separated from each other.

2) Look at the guide strap. You will note that there is a short loop that is fastened at a right angle to the longer part of the strap. The longer part of the strap has a large loop in the front and a smaller loop at the rear.

With the yoke sitting right side up, slide the short loop that sits at the 90 degree angle over the right side of the yoke.



Slide the guide strap onto the right side of the yoke

3) Slide the guide strap back along the yoke until you can hoke the small rear loop over the right arm of the rear hinge.

The small loop at the rear of the guide strap encircles the right arm of the rear hinge.

4) Reinstall the neck clamp on the yoke. Tighten the bolt until the end of the bolt protrudes from the lock nut.

This is how the guide strap should look when it is properly installed (note that yoke/neck clamp is upside down to allow you to see where the strap installs).

5) Install the non-adjustable loop on the yoke strap on the side of the yoke where the latch catch assembly is mounted.

In some cases, it may be necessary to remove the latch catch to install the loop. Follow the procedures for removal and reinstallation per this chapter.

6) For proper use of the yoke strap, see Chapter 3 of this manual.

Installation of the non-adjustable loop on the yoke strap.

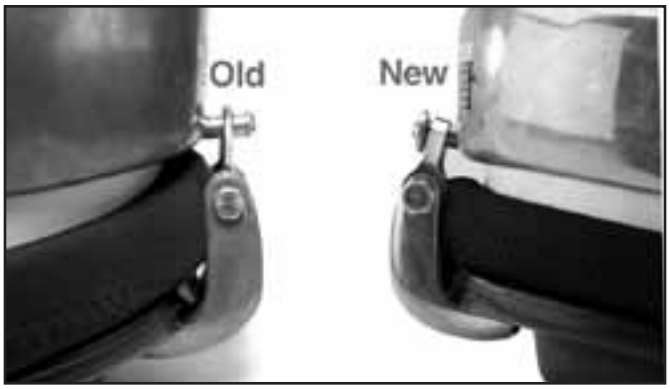
Completed installation of the Yoke Strap

8.6 Alignment Sleeve

Beginning in November, 2003, all SuperLite® 17A/B and MK-21 Helmets come equipped with a new style Alignment sleeve. The new part, Part #550-339, has a flange on its outer end which helps to ensure that the rear hinge tab Loop cannot become dislodged from its correct position over the Alignment sleeve. The old style straight sleeve, Part # 550-039 is discontinued and no longer available.

The alignment sleeve provides the attachment point for the rear hinge tab. It should never need replacing, unless it is bent or otherwise seriously damaged. KMDSI recommends at a minimum, yearly removal and inspection of the alignment screw from the rear weight. Conduct a visual inspection of the tapped threads in the rear weight and the male threads of the alignment screw. Replace the weight and or screw if threads are damaged.

The new sleeve part number, may not work with some dry suits without modification to the dry suit.



You can clearly see the difference between the old and new alignment sleeves, in the photos above and below.

8.6.1 Sleeve Removal and Inspection

Tools required:
Torque Screwdriver
Flat blade screwdriver adapter for torque wrench
Wire Brush, stainless steel or brass bristles only
Loctite® 222, or equivalent

1) To remove the sleeve, simply unscrew it from its attachment to the rear weight. The sleeve slips over the screw that holds it in place.

2) Visually inspect the sleeve ensure it is not damaged or deformed. Replace as necessary. Clean all residual Loctite® from the alignment screw using a stainless or brass wire brush and thoroughly inspect all threaded surfaces for corrosion or degradation; replace if questionable / required.

NOTE: The use of a mild steel wire brush to clean fasteners will possibly leave steel residue on the stainless components that will later corrode making the stainless fasteners appear corroded.

8.6.2 Sleeve Replacement

1) Apply Loctite® 222 or equivalent to the alignment screw and screw it into the rear weight until the alignment screw just bottoms out, then torque to 35-50 inch pounds.

8.7 Port Retainer

The port retainer is made of chrome-plated brass. We exercise extreme care in installing the nose block guide located in the lower center front. It is fastened in place using Loctite® 222 or equivalent. Under normal use, the port retainer should never need replacement.

8.8 Face Port

8.8.1 General

The face port, or viewing lens, is made of a polycarbonate plastic. Small scratches on the exterior are not important, as they tend to disappear underwater. However, the face port is easily replaced by removing the port retainer and reinstalling a new O-ring and face port.

The face port should be replaced anytime cracks are present or anytime nicks and scratches deeper than 1/16" are present or anytime the condition is questionable.

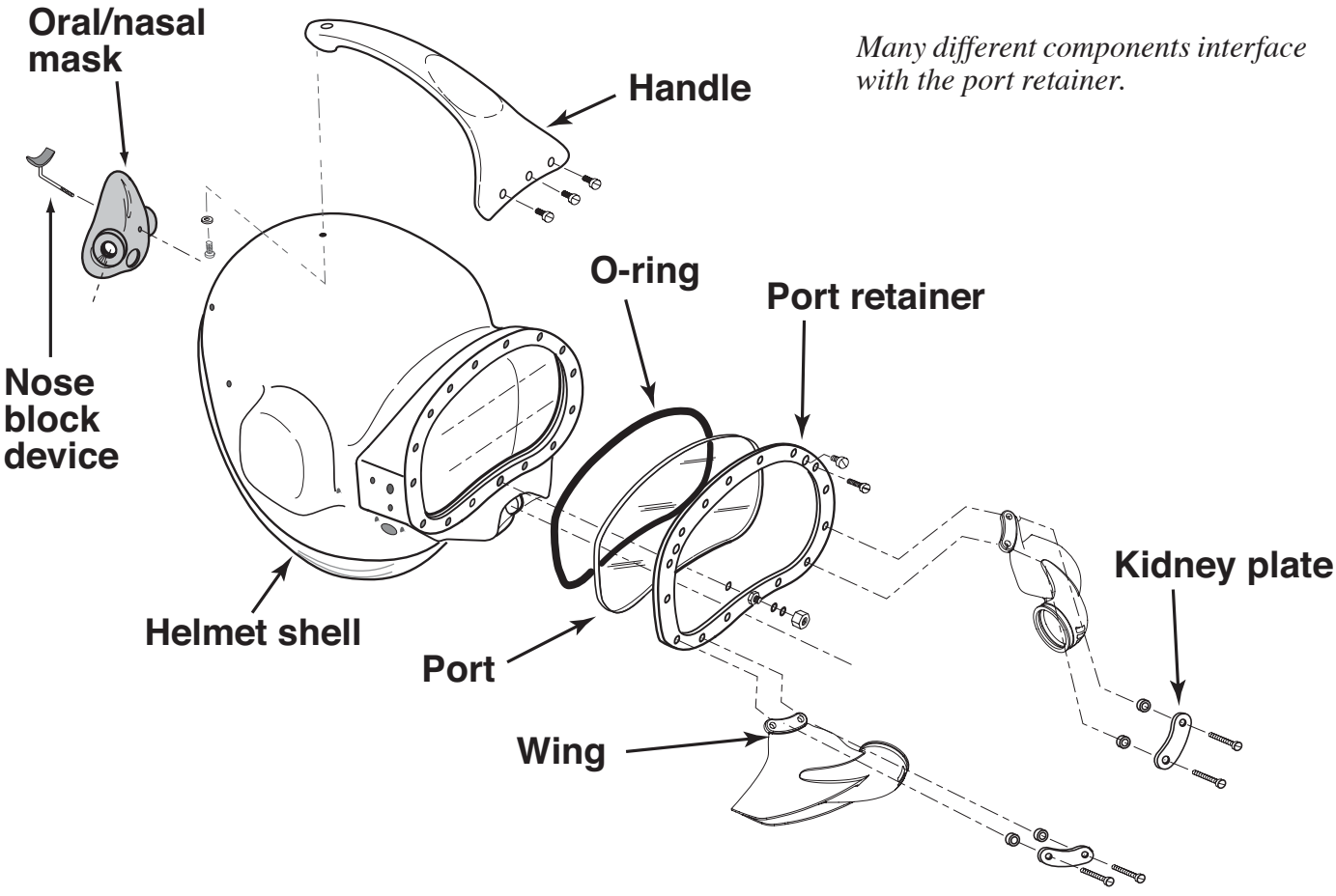
⚠ WARNING

Never use aerosol-propelled sprays near the face port of the SuperLite®-17. The propellant used in these aerosols can invisibly damage the face port and cause it to shatter upon impact from any strong blow. If the face port fails underwater, the helmet will flood and drowning may result.

8.8.2 Face Port and Nose Block Device Removal

Tools Required:
7/16 " Open-end Wrench
1/4 " Flat Blade Attachment on Torque Screwdriver
Slip Joint Pliers and a Rag or cloth

NOTE: Wrap a rag around the nose block knob while removing to prevent chrome damage when turning with pliers.



Many different components interface with the port retainer.

1) First remove the nose block device knob then the packing nut and slip the O-rings off the nose block shaft.

2) Pull the nose block device out through the interior of the oral nasal mask.

3) Remove the handle as per this chapter.

4) Next, unscrew the remaining twelve port retainer screws. Pull the retainer clear of the helmet shell.

5) Be sure not to lose the O-ring that is located on the back side of the port retainer at the nose block device packing.

6) The four whisker spacers must not be misplaced. They will usually be found lodged in the whisker wings.

7) Remove the old port and sealing O-ring.

8.8.3 Face Port and Nose Block Replacement

1) Clean the face port O-ring groove, carefully inspecting it for any damage.

2) Lightly lubricate the O-ring with Dow Corning® 111

The whiskers must be removed prior to removing the port retainer and port.

Be sure not to lose the whisker spacers.

Replace the face port if it becomes badly scratched or shows any signs of damage due to contact with chemicals.

lubricant or equivalent and replace in the helmet shell.

3) Place the face port into the helmet shell making sure the O-ring has been lightly lubricated and is in its groove.

4) Clean and lubricate the small O-ring on the back of the small tube on the face port where the nose block device penetrates the helmet.

⚠ WARNING

The O-ring used with the face port of the SuperLite®-17A/B is made from a special compound and has unique dimensions. It is a softer durometer O-ring than is commonly available. There are no equivalent O-rings manufactured by other vendors. This O-ring must be replaced with a new KMDSI O-ring. Failure to do so could lead to seal failure resulting in leaks or flooding.

If you are replacing the face port, it's a good idea to replace the o-ring that seals it.

5) Slip the O-ring on the small tube that protrudes from the rear of the port retainer nose block guide. Place the port retainer onto the helmet shell, holding it in place against the face port and face port O-ring (while the twelve screws are all run in loose. Replace the handle as per this chapter.

6) Using a torque screwdriver slightly tighten each opposing screw evenly, i.e. 12 o'clock position, 6 o'clock position, 9 o'clock position, 3 o'clock etc.. Repeat this process, one after another, until all screws are evenly torqued to 12 inch pounds of and the O-ring has completely sealed the face port.

NOTE: Testing of the inserts should be accomplished once a year, or whenever damage is suspected. Use Part #525-115 Thread Insert Testing Block Kit.

When testing the Thread Inserts, or when removing

⚠ WARNING

Always be sure to use a torque screwdriver to check the tension of the port retainer screws. Over tightening can cause damage to the threaded inserts in the fiberglass shell and cause them to loosen. Without the correct tension the port retainer may come loose and the helmet could flood. This could lead to drowning.

and replacing the port retainer, it is crucial that the KMDSI recommended torque specs be followed when tightening the port retainer screws. Any over torque of a screw greater than 14 inch pounds can result in serious damage to the surrounding fiberglass in the port area. This can lead to loosening of the port retainer and in extreme instances to flooding of the helmet.

The test procedure is designed to identify any inserts that have been damaged, or become loose, requiring replacing. Replacement of inserts should only be completed by an authorized / trained KMDSI technician that has received certification in insert replacement. Minor fiberglass and gel coat repairs must only be completed by technicians that have received fiberglass and gel coat training and certification by KMDSI.

7) Install the nose block device from the interior of the oral nasal mask and out through the nose block guide on the port retainer.

8) Slide the two lubricated O-rings onto the shaft of the nose block device.

9) The packing nut is threaded into place followed by the nose block device knob.

10) Tighten the packing nut until some resistance is felt when the nose block device knob is pushed in and out. Tighten the nut until it cannot be loosened by hand, then another half turn. If the packing nut is too tight the nose block device cannot slide in and out.

11) The nose block device knob should be tightened to the shaft using a padded pair of pliers, while holding the nose block pad on the inside of the helmet.

8.8.4 Special Note Regarding Ports

NOTE: There are two different face ports available for KMDSI helmets and masks. One port specifically fits the SuperLite® Helmets and the KMB 18. One port only fits the KMB 28 Band Mask. These two ports are not interchangeable. The face port for the SuperLite®-17A/B the SuperLite®-17K, SuperLite®-27, SL-17C and the KMB 18 Band mask is Part #520-004. The face port for the KMB 28 Band Mask is Part #520-128.

⚠ WARNING

The face port is very strong. However, certain chemicals will attack the port and weaken it. Some solvents used for lubricant removal will also attack the port. Use only mild detergents or organic soaps to clean the face port.

⚠ WARNING

The face port for the SuperLite®-17 and KMB 28 are not interchangeable. Do not attempt to use a face port from a KMB 28 in a SuperLite®-17. Although the port will fit into the helmet shell, it will not seal properly. This could lead to flooding of the helmet, resulting in serious personal injury or death.

⚠ WARNING

Use only genuine KMDSI face ports. An aftermarket face port's thickness or outer periphery may be incorrect and cause the helmet to flood. It could also be made of inferior materials causing it to fail. This could result in serious injury or death.

8.9 Communications System

8.9.1 General

The communications system in the SuperLite®-17 A/B requires regular attention and maintenance for proper function. Clear two-way speech communications between the diver and surface crew is one of the most important capabilities of surface-supplied diving operations.

8.9.2 Earphone Inspection

To service the earphones, first remove the head cushion from the helmet. The earphones can be carefully pulled out of the retainers in the helmet shell for inspection and disassembly.

1) Remove the (clear) cover first and slide it along the wire to get it out of the way. Remove the earphone protector and then peel back the (black) rear cover.

2) Check the wire connections. They should be solid.

3) Check the mylar diaphragm. If the mylar is torn or loose, replace the entire unit, see "8.9.4 Earphone Removal and Replacement" on page 135.

4) If the rubber covers are worn or damaged, replace them also.

To gain access to the earphones, you must first remove the head cushion.

Remove the earphones from the retainers to inspect the speaker cones.

Check the earphones regularly, especially if water has entered your helmet.

8.9.3 Microphone Removal and Replacement

Tools Required:
1/8 ” Flat Blade Screwdriver
3/8” Open End Wrench

The entire microphone is replaced the same as the earphones by removing the wire lugs from the communications posts and replacing the entire unit. If a wire is broken it can usually be cleaned and soldered.

1) Remove the nuts and washers from the communications posts. If you are using the optional terminal block this may be where the wires from the earphone and microphone are connected.

2) Lift the terminal lugs off of the communications posts. **NOTE the position of the terminal wires.** They need to be installed in the same order.

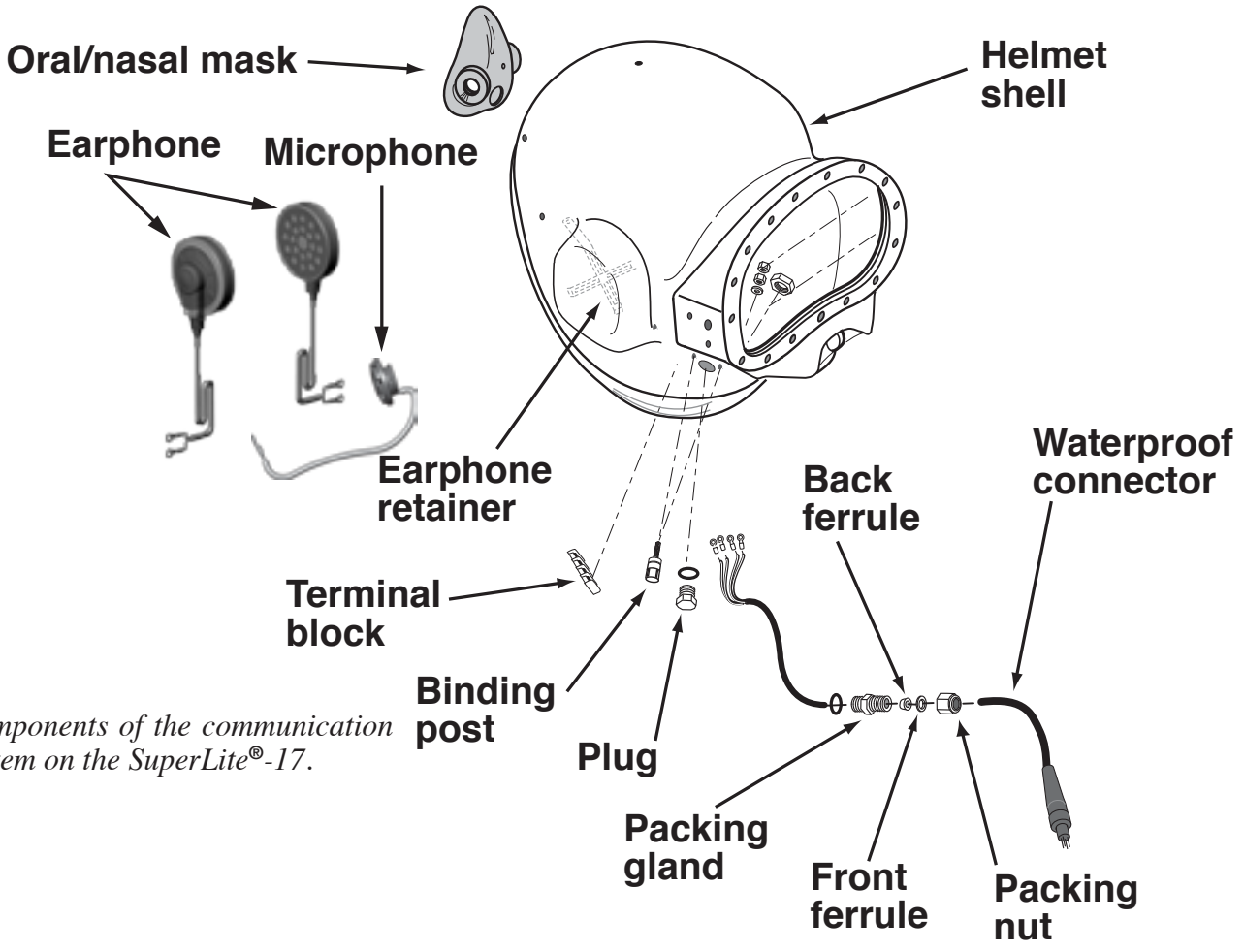
3) Slowly pull the microphone out of the oral nasal mask. The wires that connect it to the communications posts will follow.

4) Install the terminals for the new microphone. **NOTE** that the wires must go on separate terminals as before.

5) On helmets with terminal nuts, tighten the terminal nuts carefully, using a small drill bit, pin punch or opened large paper clip in the post hole to keep the post from turning. If the posts turn, it means that the seal made by the silicone sealant on the helmet shell has been broken. If this happens the posts will allow water to leak into the helmet.

⚠ WARNING

Take care not to break the seal made by the silicone sealant where the communications posts penetrate the helmet shell. If these posts turn, the helmet will leak and resealing using silicone sealant will be necessary.



Components of the communication system on the SuperLite®-17.

8.9.4 Earphone Removal and Replacement

NOTE: If only the earphone speaker is damaged, it can be replaced by removing the tie-wrap inside of the covers, unscrewing the wire connection and replacing the necessary components. There is no need to completely remove the assembly from the communications module.

Tools Required:
1/8 ” flat Blade Screwdriver
NOTE: The earphones may be replaced individually if needed.

1) Remove the nuts and washers from the communications posts. If you are using the optional terminal block this may be where the wires from the earphone and microphone are connected.

2) Lift the terminal lugs off of the communications posts. NOTE the position of the terminal wires.

3) Install the terminals for the new earphones. Note that the wires must go on separate terminals as before.

4) Tighten the terminal nuts carefully, using a small drill bit, pin punch or opened large paper clip in the post hole to keep the post from turning. If the posts turn, it means that the seal made by the silicone sealant on the helmet shell has been broken. If this happens the posts will allow water to leak into the helmet requiring resealing.

5) Test the communications to see if they are working.

8.9.5 Waterproof Connector

SuperLite®-17 helmets are supplied either with a set of terminal posts or an optional waterproof connector. The waterproof connector is durable but can fail if the wire and fitting receives rough handling. To replace the connector use the following procedure.

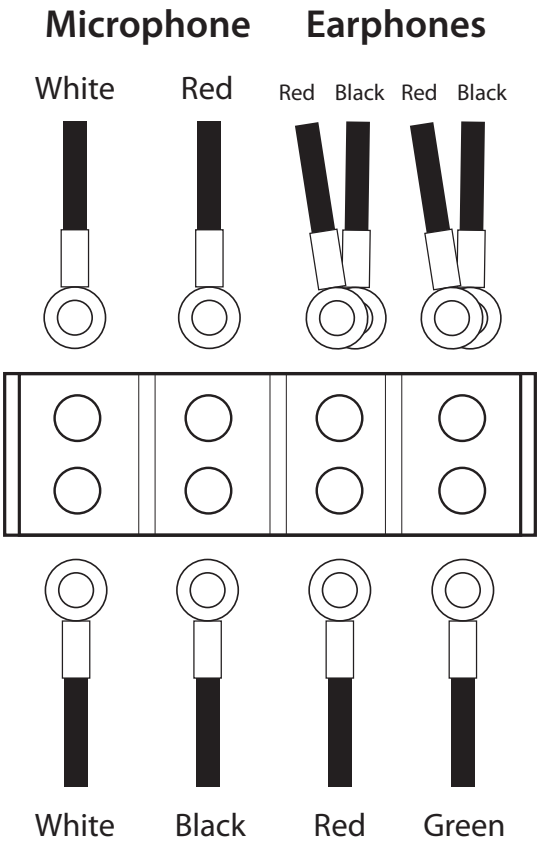
8.9.5.1 Connector Removal

Tools Required:
3/8” Open-end Wrench
5/8” Open-end Wrench

11/16 ” Open-end Wrench
Torque Wrench with 11/16 Open End Attachment

1) Remove the earphone wire lugs from the interior of the communications posts or terminal block.

2) Remove the nut from the packing gland on the interior of the helmet shell.



Wiring diagram for a SuperLite® 17B

If you are using the terminal block, this is where you will disconnect the earphones from the helmet.

⚠ CAUTION

Take care not to break the seal made by the silicone sealant where the communications posts penetrate the helmet shell. If these posts turn, the helmet will leak.

3) Separate the connector/packing gland assembly from the helmet shell.

4) Place the packing gland in a vice and unscrew the packing nut.

5) Pull the connector through the gland.

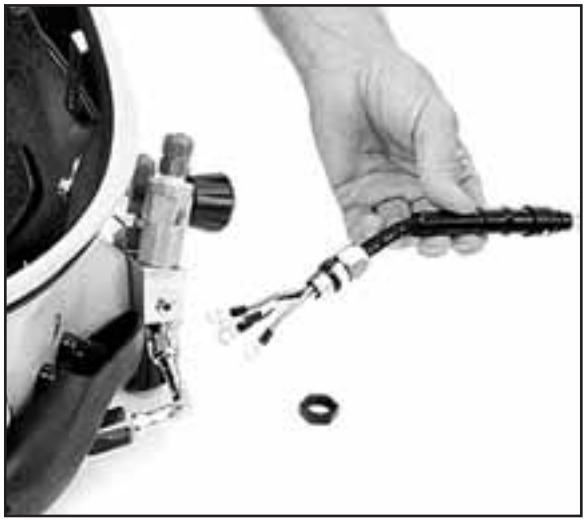
NOTE: It will be much easier to do this if the lugs are cut off the end of the connector first. Save the front and back ferrules and the packing nut.

8.9.5.2 Connector Replacement

1) Lubricate the new connector with silicone lubricant (or recommended equivalent).

2) Slide the packing nut and ferrules onto the new connector.

3) Feed the connector through the packing gland.



Removal of the waterproof connector.

⚠ WARNING

Use silicone sealant in a well ventilated area. Do not breathe the fumes from uncured silicone sealant. These fumes are dangerous and can cause unconsciousness. They can also cause long term damage to body tissue. Read and follow all precautions listed on the silicone sealant tube and Material Safety Data Sheet.

4) Check the O-ring on the packing gland. Replace or lubricate as necessary.

5) Install the W.P Connector assembly in the helmet shell.

6) Tighten the nut on the packing gland until snug.

7) Connect the wire lugs on the connector to the communications posts or terminal block as preferred.

8) Test the communications to ensure they are working.

The binding posts are sealed in place with silicone sealant.

Make sure the holes in the binding posts are properly aligned so that you will be able to thread the communications wire through them easily when you are ready to dive.

8.9.6 Communications Posts
8.9.6.1 Communications Post Removal
Tools Required;
3/8” Open-end Wrench

1) Disconnect the communications set as per this chapter.

2) Remove the nuts and washer.

3) Pull the communications post away from the helmet shell.

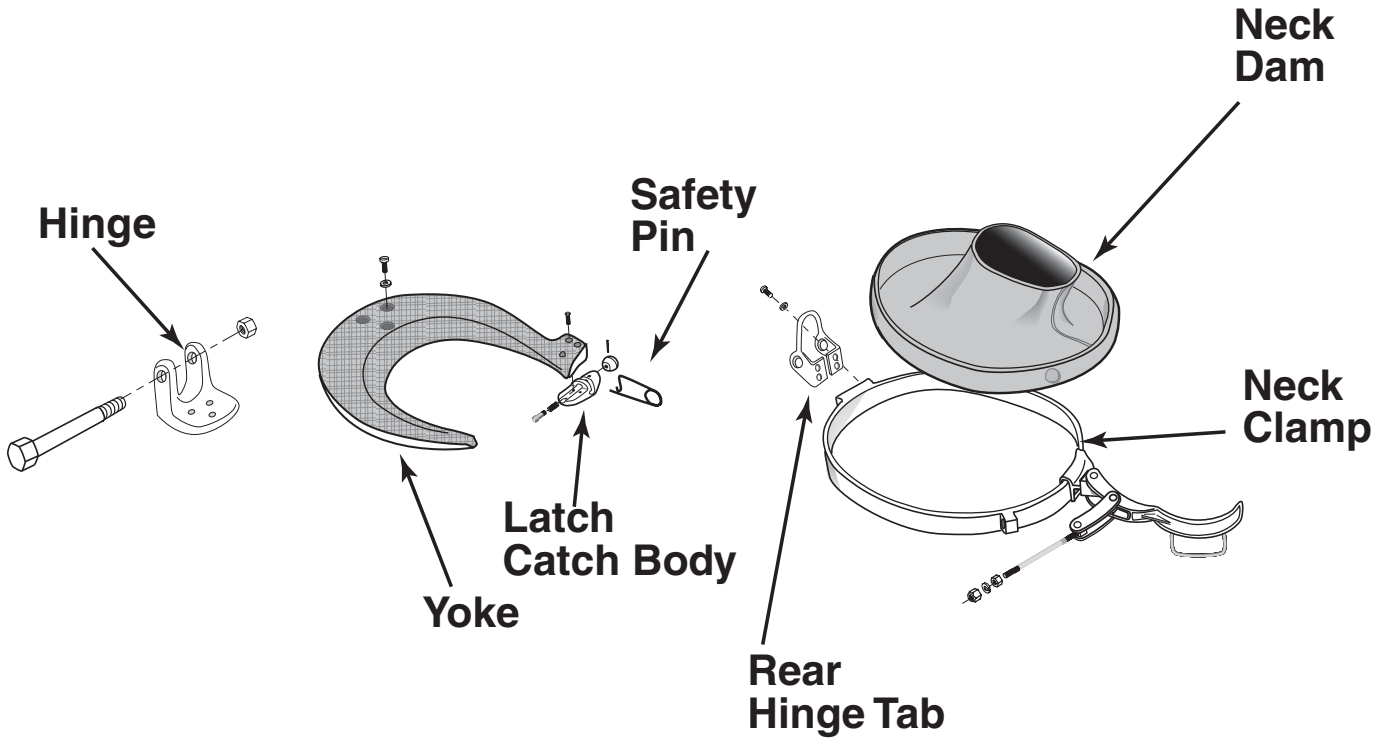
8.9.6.2 Communications Post Replacement

1) Clean off all the old RTV silicone sealant from the helmet shell and communications posts.

2) Apply fresh RTV to the communications post(s). Check posts for cracks and smooth turning for proper wire capture. Replace post if necessary.

3) Insert the communications posts into the helmet shell. Before bottoming it against the shell, rotate it slightly to

Begin the disassembly of the yoke by removing the latch catch assembly.



Components of the yoke/neck clamp assembly.

To disconnect the yoke from the neck clamp, you must remove the three screws at the rear of the yoke.

ensure an even spread of the RTV to completely seal the hole.

4) The hole in the post should end up angled towards the earphone area of the helmet.

5) Install the washer followed by the nuts. Tighten the nuts to 20 inch pounds of torque, using a small drill bit, pin punch or opened large paper clip in the post hole to keep the post from turning.

6) Wipe off all the excess silicone sealant from the helmet

8.10 Neck Clamp/Yoke Assembly

8.10.1 Yoke

8.10.1.1 Yoke Removal and Disassembly

Tools Required:
Flat blade screwdriver
Loctite® 222 Thread locker
Torque wrench
Flashlight or penlight to aid visual inspection
Wire Brush – either stainless steel or brass bristles, only

NOTE: The use of a mild steel wire brush to clean fasteners will possibly leave steel residue on the stainless components that will later corrode making the stainless fasteners appear corroded.

NOTE: Yokes manufactured after 1999 are now made of a composite of stainless steel and urethane.

1) Unscrew the three screws that fasten the latch catch assembly to the yoke. Using the stainless or brass wire brush clean all residual Loctite® from all screws. Thoroughly inspect all threaded surfaces for corrosion or degradation; replace if questionable / required.

2) Remove the three screws and washers that secure the hinge to the yoke. Using the stainless or brass wire brush clean all residual Loctite® from all screws. Thoroughly inspect all threaded surfaces for corrosion or degradation; replace if questionable/required.

3) Perform all functional test/ inspection on the latch catch assembly. After removal using the flashlight/ penlight, shine the beam into the drain hole(s) top and bottom of the latch catch assembly body that houses the stainless steel spring. Visually inspect the spring and the plunger for corrosion or degradation.

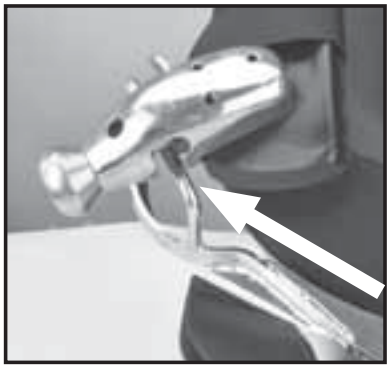
Pull, rotate and release the knob repeatedly ensuring the spring actuates and the plunger does not bind and is not bent. Determine that the plunger fully engages the latch catch body towards the yoke. If overhaul or corrective maintenance is required; see the section in this chapter

4) Remove the bolt from the hinge. Clean and inspect the bolt for damage. Remove the four screws and the star washers that fasten the rear hinge tab to the neck clamp.

Thoroughly clean and inspect the screw(s) and the star washers, inspect the hinge tab for signs of damage. Replace any parts that show signs of wear or damage.

The latch catch assembly must be fastened to the yoke using Loctite® to secure the screws.

Note the proper engagement of the latch catch mechanism in the top photo on this side of the page. Also note that the centerline of the yoke bisects the entire helmet.



Note that the latch catch mechanism on this side of the page does not properly engage the bail on the neck clamp. Also note the yoke is "skewed" and is not centered across the rest of the helmet.

5) Reinstall the rear hinge tab using the star washers and the screws and using a torque screwdriver torque the screws to 25 inch pound.

NOTE: KMDSI recommends Loctite® 222 or ND Industries Vibra-Tite or equivalent be used on the screws. The star washers also provide locking capability.

6) Reinstall the neck clamp back on the yoke using the bolt and nut with the nylon insert. Insert the bolt through the hinge and rear hinge tab. You can reuse the nut provided that it **CANNOT** be turned with your fingers once it reaches the point where the nylon insert engages the bolt.

8.10.1.2 Yoke Replacement and Reassembly

1) Use Loctite® per the manufacturer's instructions and insert the three screws through the yoke and thread them into the latch catch assembly. Tighten with the torque screwdriver to 20 inch pounds.

2) Use Loctite® thread locker or equivalent and install the three screws and washers at the rear of the yoke and into the hinge. Tighten so they are just snug but you can still shift the yoke on the hinge. You are now going to fine tune

Once the pin is driven out, you can remove the knob from the shaft.

Remove the shaft and spring for service.

Inspect the spring and shaft and clean in a mild solution of white vinegar.

the yoke alignment to the helmet.

3) With the helmet resting face down on the face port, mount the yoke/clamp assembly on the helmet completely and close the clamp without catching the bail in the catch.

Looking directly at the front of the helmet (see above), the yoke should be centered on the hat and the catch slot should be over the bail. If the yoke is not centered, shift it on the hinge until it is centered, then gently lift the yoke up without shifting it out of position and using a torque screwdriver tighten the screws to 20 inch pounds of torque.

8.10.2 Latch Catch Assembly

8.10.2.1 Latch Catch Mechanism Disassembly

Tools Required:
Block of wood

The pin secures the knob on the end of the shaft.

Pin punch
Ball peen hammer
Vice grip™ pliers
Torque Screw Driver Flat Blade Attachment

1) Remove the three screws that secure the latch catch assembly to the yoke..

2) With the latch catch assembly positioned on the edge of a block of wood, drive the pin through the knob.

3) Unscrew the knob. Use the safety pin to keep the plunger shaft from turning while you unscrew the knob.

4) Remove the safety pin and remove the shaft and spring.

5) Clean all parts in a mild solution of white vinegar and water, removing all traces of corrosion from the shaft. Clean all of the threads.

6) Carefully inspect for signs of wear or damage. Replace any parts that show signs of damage.

8.10.2.2 Latch Catch Mechanism Reassembly

1) Slide the spring onto the shaft.

2) Insert the shaft into the latch catch body.

3) Screw the knob onto the shaft.

4) Align the hole in the knob with the hole in the end of the shaft.

5) Drive the pin through the hole in the knob and the shaft until the end of the pin is flush with the side of the knob.

8.10.3 Neck Clamp Assembly
8.10.3.1 Neck Clamp Assembly Adjustment /Inspection

Tools Required
7/16” Open-end wrench
Wire Brush – either stainless steel or brass bristle

NOTE: The neck clamp assembly will periodically need adjustment as the neck dam ages and grows thinner. Replacement of the neck dam will also require neck clamp adjustment.

NOTE: Dry suits used with neck clamps must not cause

The neck clamp must be periodically inspected for signs of wear and tested for proper closure.

the clamp to close with excessive force. The clamp must work properly with the dry suit. If the adjustment stud adjustment nut is backed out all the way and the clamp closes with excessive force, do not use.

Adjustments must be made with the yoke/neck clamp assembly open.

1) Visual inspection of the adjustment stud portion of the neck clamp is accomplished by loosening the lock nut with the washer all the way to the shoulder (towards the clamp), until the entire threaded portion is exposed. Then squeeze the clamp and expose the previously hidden portion to the adjustment stud.

Inspect the entire threaded surface for corrosion or degradation and ensure the entire surface is thoroughly inspected and /or cleaned with the stainless or brass wire brush, or replace the neck clamp if required.

IMPORTANT SAFETY NOTE: The neck clamp assembly, like all other mechanical parts, will wear over time, thus requiring routine maintenance and eventual replacement. KMDSI strongly recommends that all Kirby Morgan SuperLite®-17 A/B Neck Clamp Assemblies should be carefully and thoroughly inspected for signs of damage and wear at least monthly and visually inspected daily for obvious signs of damage.

The clamp should also be checked daily for proper adjustment prior to commencement of dive operations. Worn or damaged neck clamps and especially those damaged from improper adjustment pose a potentially serious safety hazard to the user. All neck clamp assemblies will eventually become worn to a point where they must be replaced. Proper routine inspection should reveal wear and any damage before it becomes a danger to the user.

In April of 1999 KMDSI started embossing all new neck clamp assemblies with the date of manufacture and identification number. All newly manufactured neck clamps undergo inspection and testing in accordance with AWS Standard D1.1.

KMDSI recommends a maximum service life of five years for neck clamps that are used in harsh environments (i.e. welding, cutting, and contaminated waters) or other practices that can degrade the metal components of the neck clamp. All neck clamps should be visually inspected at least monthly in detail with the neck dam fabric removed or pulled free so all welds can be visually inspected for signs of cracking or damage as well as bends in the clamp.

Neck clamps kept in service after 5 years should be inspected more frequently. Additionally, the three pins and clevis welds should be carefully inspected, as well as the adjustment stud. All metal parts should be carefully inspected for signs of wear or damage. The stainless nylon lock nut will wear out over time and will require replacement.

If any metal components appear worn or damaged, the neck clamp must be replaced. This inspection is considered the minimum. The use of other nondestructive test methods such as dye penetrate testing can be used to validate suspected damage.

Neck clamp assemblies which are bent or deformed due to improper adjustment or accidental damage, may be returned to KMDSI, via your local dealer, for possible repair. Users must keep in mind that there are limits to restoring used or abused parts. KMDSI uses a fixture that resembles the bottom of a SL 17A/B to adjust all new neck clamps and this same fixture can often be used to reshape bent or deformed neck clamps.

Proper adjustment of the neck clamp should place the bail squarely in the groove of the latch catch body when the clamp is closed.

If there is any question regarding the condition of the neck clamp, don't use it. Suspected worn or damaged neck clamp assemblies should be taken to a KMDSI dealer to be sent on to KMDSI for a factory inspection.

Check fit and adjustment of the neck clamp by installing the clamp on the helmet, ensuring that the neck clamp is seated properly over the O-ring area of the helmet. When closing the lever, the lever should get tight at the mid-point of travel, and once the lever is past the mid-point of travel, the clamp should close easily.

Do not force the clamp shut. If it does not close as described, you **MUST** adjust the clamp by loosening the adjustment-lock nut. From the closed position, if you pull out on the lever approximately 1-2 inches, the lever should snap closed when released. As the neck dam ages it compresses. The clamp must be adjusted by tightening the adjustment-locking nut so that the clamp operates as described above.

The stainless steel nylon lock nut will require periodic replacement due to the periodic adjustments to the

⚠ WARNING

The neck clamp must be closed properly to help keep the helmet on the diver correctly. If the neck clamp does not function properly the helmet could come off the diver's head. Drowning could result.

clamp that MUST be made as the neck dam ages or you change to a dry suit mount or a new neck dam. **You should not have to force the clamp shut.**

Helmets being used with dry suits made to be sealed and held in place by the clamp should not hamper proper adjustment of the clamp. Always check the clamp adjustment after the first dive. After the first dive with a new neck dam the neoprene will compress from the water pressure and will usually require the clamp to be adjusted in slightly. The tension should be checked prior to each dive.

1) To adjust the neck clamp, start by loosening the lock nut and adjusting the position of the nut as necessary.

2) The outer lock nut has a nylon insert. This lock nut should be replaced when it no longer offers resistance on the neck clamp stud. The nut should have a running torque of at least 6 inch pounds.

3) When the neck clamp assembly is correctly adjusted, the clamp should fit tight at the middle of its travel when mated to the helmet shell. Once the lever is past midline, movement of the lever should be easy.

From the closed position, the diver should be able to pull the lever open about one to two inches and when released, the lever should snap closed. Proper adjustment of the neck clamp places the bail of the neck clamp squarely in the groove of the latch catch body when the clamp is closed.

4) If the neck clamp binds and does not close correctly after adjustment, the neck clamp must be straightened, or an authorized KMDSI Service Center must accomplish this procedure.

8.10.4 Neck Dam

8.10.4.1 Neck Dam Replacement

Available Neck Dams Pre-84

Part Number	Description
510-649	Neck Dam Pre-84 Small
510-528	Neck Dam Pre-84 Medium
510-650	Neck Dam Pre-84 Large
510-651	Neck Dam Pre-84 X-Large

Draw String Type

Part Number	Description
510-533	Neck Dam, Drawstring
510-643	Neck Dam, Drawstring X-Large

Cold Water

Part Number	Description
510-652	Neck Dam, Cold Water, Small
510-531	Neck Dam, Cold Water, Medium
510-530	Neck Dam, Cold Water, Large
510-653	Neck Dam, Cold Water, X-Large

General:

The neck dam clamp and yoke assembly are bolted together and are used as a single unit. KMDSI offers three distinctly different style neck dams (previously listed) which are mission specific, but the style is often dictated by personal preference due to size constraints. It should be noted that use of the Pre-1984 and Cold Water Neck Dams, which are preferred by some divers, have some maintenance issues.

Due to the required monthly visual inspection of the weld points and the clamp assembly, these neck dams will require

You must separate the yoke from the neck clamp to replace the neck dam.

This hole is where the neck clamp is fed through the neck dam.

additional maintenance and will require replacement more often than the drawstring type due to additional wear and tear of the inspection. For this reason the pre-84 neck dams are not as popular as the drawstring type.

Pre-84 and Cold Water Type Neck Dam Installation

Tools Required:
Two 7/16" wrenches
Pliers
Flat Tip Screwdriver, Medium
One pair of sharp scissors
Thread Locker, Loctite® 222 or equivalent
New neck dam (part# 510-649 or 510-528 or 510-650 or 510-651)

1) Remove the neck dam yoke assembly completely from the helmet. Remove old neck dam and properly dispose of it.

2) Remove the bolt and nut that connects the yoke to the neck clamp at the hinge sleeve and separate the yoke and the clamp assembly.

3) Unscrew the four yoke hinge mount screws with the star washers from the yoke hinge and retain for future use. Remove the yoke hinge from the neck clamp and the neck dam.

4) Remove the neck clamp lock nut and slip the threaded portion of the adjustment arm out of the retaining block. Remove the lock washer and the nut and retain for future use.

5) With the clamp lock nut removed from the threaded neck clamp adjustment bolt pull the front of the neck clamp open by pressing down on the block end of the neck clamp and up on the lever end.

6) The neck dam has two holes in the upper sleeve. The starting hole is the larger of the two next to the sewn (and glued) seam. The second (smaller) hole is used for the block that receives the threaded portion of the adjustment arm on the clamp.

NOTE: Installation of Pre-84 or the Cold Water Neck Dam can be difficult and time-consuming process and requires patience so the neck dam is not damaged. KMDSI recommends that a solution of warm soapy water be poured into the starting hole of the neck dam to aid in clamp insertion.

Feeding the neck clamp through the neck dam.

The block on the neck clamp must protrude through the hole in the neck dam.

Insert the stud through the block and screw the nut onto the adjustment stud.

7) Set the neck clamp down with the open ends facing you with the lever end on your right with the locking loop down. Place the neck dam inside the Clamp in the position it should be when assembled. (Rubber side in-cloth out, with the outer edge rolled up towards the clamp).

8) Start feeding the end of the neck clamp that does not have the lever into the (large hole) of the new neck dam. Work the rubber around the neck clamp assisting it over the block and the guide tracks on the clamp. Carefully work the rubber around the clamp continually lifting it over the block ensuring the internal rubber is not compromised.

When the rear-sewn seam is just past the hinge tab mount plate on the rear of the neck clamp stop feeding the rubber. This is the correct position. Even out the rubber on the neck dam so it is uniform in stretch all about the neck clamp.

9) The two ends of the neck clamp are now overlapping. The lever end of the neck clamp must now be inserted into the guide tracks of the lever end of the neck clamp. The block that receives the threaded adjustment arm should be in the correct position to be accepted by the second (smaller) hole that was present in the new neck dam. Ensure the sleeve is not stretched unevenly (the hole at the base of the handle should not be pulling or stretched into elongation).

10) Run the nut onto the threaded adjustment bolt arm about $^{1}/_{2}$ inch, slip on the lock washer and insert the adjustment arm through the block and run on the lock nut. Work the lever of the neck clamp back and forth, checking that the ends of the clamp are engaged, tracking correctly and not binding.

11) Make sure the rear sewn seam of the neck dam is next to, but not on, the hinge tab of the neck clamp where the rear hinge tab is mounted. Install the clamp on the helmet shell and close. The purpose for this is to ensure the neck dam material is properly aligned.

Note: The clamp will require adjusting so that the neoprene gets compressed tightly against the helmet. At this point feel for the hinge tab mounting surface under the neoprene, and once located use a marker to trace the outline staying just slightly inside the so that after the neoprene patch is cut, the cut out opening will be slightly smaller than the hinge tab mounting plate.

NOTE: There are two ways to mount the neck dam over the hinge tab screws. The first is to cut individual holes for each of the hinge tab screws, and then sandwich the neoprene between the hinge tab and clamp.

The other way is to cut a small rectangular piece of material from the area where the hinge tab mounting surface is for the screws. Sandwiching is preferred by many, saying the neck dam lasts longer and remains drier. Both ways will work. However if the neoprene is to be sandwiched using four hole method the screws must have thread locker applied and re-torque after 24 hours of the initial torque. Torque the screws to 25 inch pounds.

8.10.4.2 Four Hole Method of Attaching Neck Dam to Hinge Tab

a.) Feel for the hinge tab mounting surface under the neoprene, and once located use a heated nail or metal scribe to burn a hole for each of the screws that secure the dam to the hinge tab. Use care not to damage the surrounding area and ensure the hole diameters are as large as the screws.

b.) Visually inspect each screw prior to reuse, if any abnormalities are present replacement is recommended.

NOTE: KMDSI recommends use of a non-locking thread locker such as Loctite® 222, ND Industries Vibra-Tite or equivalent in this application along with the use of the star washers.

c.) Install the hinge tab and secure using the four screws and washers. Torque to 25 inch pounds. Allow to set for at least 24 hours, then remove one screw apply thread locker, and torque to 25 inch pounds. Repeat this procedure with the other three screws.

8.10.4.3 Patch Method of Attaching Neck Dam to Hinge Tab

a.) Using a sharp pair of scissors carefully cut out a square from the neck dam over the hinge plate, slightly smaller than the hinge plate itself.

b.) Visually inspect each screw prior to reuse, if any abnormalities are present replacement is recommended.

NOTE: KMDSI recommends use of a non-locking thread locker such as Loctite® 222, ND Industries Vibra-Tite or equivalent in this application along with the use of the star washers.

c.) Using the screws and the washers mount the rear hinge tab on the neck clamp hinge tab mounting plate. Ensure that none of the neoprene from the neck dam is in between the tab and the tab mounting plate. Using a torque screwdriver torque screws to 25 inch pounds.

NOTE: KMDSI recommends the employment of Black Magic on the edges of the square cut out of the neck-dam in step 12, to avoid any inadvertent tearing or shredding of neck dam material.

12) Visually inspect the previously removed hinge bolt and nut prior to reuse. If any abnormalities are present or the nylon insert is worn, replacement is recommended. Tighten the nut onto the bolt until the end of the bolt protrudes past the nylon insert.

13) Adjust the neck clamp per the instructions in this chapter..

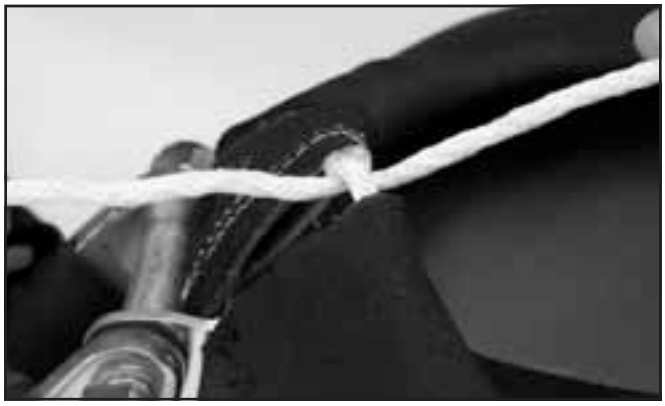
8.10.4.4 Drawstring Type Neck Dam Installation

Tools Required:
7/16” wrench
New neck dam (part# 510-533 or 510-643)
Thread Locker, Loctite® 222 or equivalent

1) Remove the old neck dam. Remove the nylon lock nut from the adjustment stud on the neck clamp assembly. Place the lock nut and washer aside so they are not lost.

2) Place the yoke/neck clamp assembly in your lap, or on a table, upside down. Swing the yoke up until it is against your chest. Hold the neck clamp handle and the adjustment stud together in your right hand.

Pull the tab on the drawstring neck dam through the opening of the hinge tab.



Tie a square knot in the drawstring to secure the dam around the clamp.

3) Do this step very carefully. Locate the large hole in the neck dam, which is found between the front seam and the large reinforcing patch.

4) Feed the stud and handle through the hole from the same side the patch is located on to the opposite side of the neck dam.

5) Position the neck dam so that it doesn't slide any further onto the neck clamp assembly. Slide the open end of the neck clamp assembly onto the opposite side of the clamp, engaging the tracks of the clamp. Hold the neck dam and the neck clamp assembly so the clamp does not come apart.

6) Feed the small hole in the neck dam over the adjustment block on the neck clamp assembly.

7) Place the lock washer on the adjustment stud on the neck clamp.

8) Insert the adjustment stud through the adjustment block on the neck clamp assembly. Thread the lock nut onto the adjustment stud. (Replace the lock nut if the nylon insert is worn.) Do not tighten at this time.

NOTE: Due to periodic readjustment and wear KMDSI recommends replacement of the neck clamp Nylock nut whenever worn or when it can be rotated by hand Nylon lock type nuts are designed to maintain initial torque however repeated use would disable the nut's designed "locking" capability.

The o-ring on the base of the helmet should be replaced whenever it shows signs of wear.

9) Feed the tab at the rear of the neck dam through the space between the sleeve and the rear hinge tab. Pull the tab up as far as it will go.

NOTE: You may find it easier to pull the tab through this space by tying a separate loop of string through the tab and feeding it through first.

⚠ WARNING

A loose fitting head cushion will cause poor oral nasal mask fit resulting in CO_2 buildup in the helmet. This condition could lead to a build up in CO_2 (hypercapnia), possibly resulting in unconsciousness, serious injury or death.

The foam in the head cushion should be inspected and replaced whenever it starts to crumble.

10) Feed one end of the string through the tab in the neck dam. Draw up on the string until the neck dam material is snug. Do not over tighten. Tie a series of square knots (at least three) with the string. Tape the knots with electrical tape. Tuck the knots into the sleeve of the neck dam. Adjust the neck dam clamp per this chapter.

8.11 O-Ring Seal Replacement

Tools Required:
Silicone lubricant Dow Corning® 111 or equivalent.
Clean rag or Q-tips
New O-ring (part# 510-446)

The O-ring on the base of the helmet shell is tough and lasts at least a year. The O-ring should be replaced at least once a year, whenever it starts showing signs of wear. It must be in good condition with no visible nicks, tears or cracking. The O-ring makes the seal between the helmet shell and the yoke/neck clamp/neck dam assembly.

To replace the O-ring, lightly lubricate with silicone lubricant. Clean the O-ring groove in the helmet with a clean rag or Q-tips™ and inspect the groove for damage, cracks etc.

Install the new clean lubricated O-ring by stretching it over the bottom of the helmet shell.

8.12 Head Cushion Foam Replacement

The head cushion foam should be replaced when the foam begins to crumble. Order replacement kit, Part #510-523. A loose head cushion will create a sloppy fit and cause discomfort for the diver and may cause poor oral nasal mask fit-up increasing the risk of CO2 buildup in the helmet.

1) The head cushion is fastened into the helmet with snap tabs and pulls out easily.

2) The separate layers of open cell foam sections that fill the head cushion bag primarily determine the fit of the helmet. The diver's head can be moved forward into the oral nasal mask by increasing the thickness of the foam at the rear of the head cushion. The diver's head can be moved up or down in the helmet by decreasing or increasing the foam pads at the top of the head cushion.

Usually, a diver with a small head will require all the foam that comes with a new hat. A diver with a larger head will need to remove some foam in the center top and back of the head cushion.

The foam may be cut with scissors to loosen the fit, or more foam can be added to give a tighter fit. Inspect the cushion bag for broken snaps, tears, or rips, repair/replace as necessary. On the SuperLite®-17 there is a chin strap to further help adjust the fit of the head cushion. Ensure the chin strap on the head cushion is in good condition and is used.

If the chin strap is not fastened properly, the helmet will float up on the diver's head. Ensure the cushion bag is properly reinstalled back into the helmet with the head cushion bag "snapped back" into the interior helmet shell using the snap tabs installed.

Note: If the head moves, the helmet should follow.

Chapter 9
Accessories

9.1 Introduction
This section provides the manufacturer's advice on how to install KMDSI accessories including the Hot Water Shroud, Low Pressure Inflator Hoses, and the Weld Lens and Weld Shield assemblies.

9.2 Hot Water Shroud General
The Hot Water Shroud (Part #525-100) in conjunction with hot water to the diver should be used whenever diving operations are conducted using HeO_2 at water temperatures less than 60°F (15.56°C). The shroud helps to heat the diver's breathing gas and helps to protect the diver from respiratory heat loss.

KMDSI further recommends that the shroud be used in conjunction with hot water to the diver whenever diving operations are conducted using air diving, in waters colder than 37°F (2.22°C) to reduce the possibility of demand regulator icing.

NOTE: Regulator icing in surface supplied diving is rare because the umbilical gas supply is at the same temperature as the water. Usually the greatest danger of demand regulator icing will be encountered on deck when the surrounding air temperature is less than 32°F (0°C).

Regulator freezing is primarily due to the refrigeration effect of breathing air pressure reduction, and the addition of moisture from the divers exhalation coming in contact with the topside air temperature. This happens as the gas expands in the regulator. When the topside environment air temperature is colder than 32°F (0°C), icing of the demand regulator while on the surface may be avoided, if the hot water shroud is not installed, by running warm water over the exterior of the demand regulator..

9.2.1 Installation of the Hot Water Shroud
Tools Required:
1/4 " Flat Blade Screwdriver
7/8 " Open end wrench
7/8 " Open End Attachment on Torque Wrench
11/16 " Open End Attachment on Torque Wrench
Small pair of snips (to trim tie wraps)

1) Disconnect the bent tube assembly at the side block end only. Loosen the jam nut at the regulator. If the bent tube will not swivel freely, you must loosen the large nut at the regulator.

2) Remove the free flow knob, locknut and spring.

3) Remove the EGS valve knob, nut, and spring.

4) Remove the one-way valve.

5) Screw the regulator adjustment knob in all the way.

Begin installation of the hot water shroud by loosening the bent tube at the sideblock.

Pull the rubber cover over the regulator body.

Install the PVC tube at the regulator.

Install the bent tube at the side block.

6) To install the rubber regulator cover, slide it over the bent tube assembly and stretch it over the regulator adjustment knob.

7) Install the rubber side block cover. Start by inserting the non-return valve through the square hole on the back side of the cover. All the other holes will then line up correctly.

8) Slide one of the PVC flanges (Part #520-046) over the bent tube and insert it into the regulator shroud.

9) Slide the corrugated tube over the bent tube.

10) Install the second PVC flange in the side block shroud (1/4 of the flange should still show).

11) Attach the side block end of the bent tube to the side block assembly and using a torque wrench torque to 100 inch pounds.

12) Re-torque jam nut using a torque wrench torque to 40 inch pounds.

13) Stretch the corrugated tube over PVC flanges on the regulator and the side block.

14) Install the tie wraps on the corrugated tube over the PVC stiffeners and tighten, then trim excess tail off.

15) Trim the excess ends from the tie wraps.

16) Reinstall the free flow knob, spring, and lock nut.

17) Reinstall the EGS (Emergency Gas Supply) knob, spring, and nut.

18) Reinstall the one-way valve and using a torque wrench tighten to 150 inch pounds.

Completed installation of the hot water shroud on the Super-Lite®-17.

9.3 Low Pressure Inflator Hose Installation on the B Sideblock

The low-pressure inflator system is intended for use with dry suits. For certain pieces of equipment it may be necessary to use a longer inflator hose than is originally supplied by the manufacturer of the low-pressure system. Regardless all inflator hoses should have a limiting orifice that does not allow a flow of more than 100 l.p.m.

Tools Required:
5/32 ” Allen Wrench Attachment on Torque Wrench

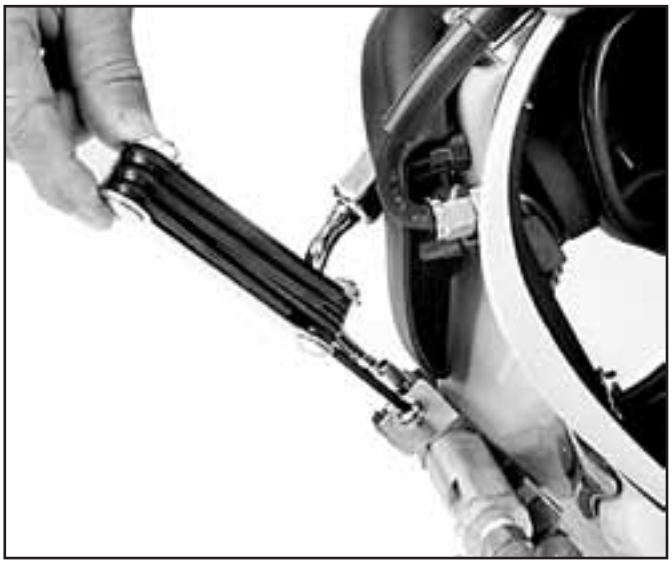
1) Remove the plug from the side block. Save this plug.

2) Check the O-ring on the low-pressure whip to be sure it is present and in good condition.

3) Carefully screw the low-pressure whip into the side block.

4) Tighten fitting to the specifications provided by the dry suit manufacturer. Do not overtighten.

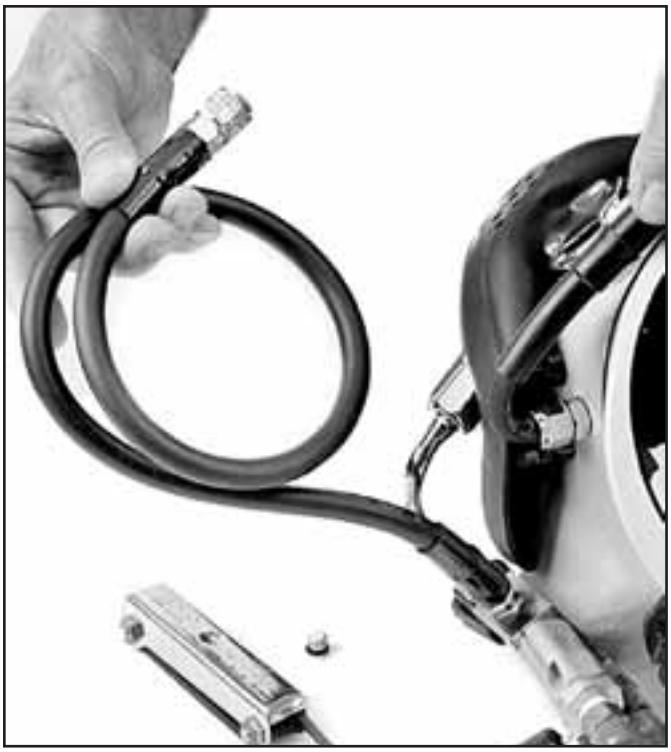
5) Pressurize helmet and test connection for leaks.



To install the inflator hose, you will need to remove the low pressure plug from the sideblock.

⚠ WARNING

When using the low-pressure port on the side block for attachment of a low-pressure hose, a hose with built in flow restriction or the KMDSI Flow Restrictor Adapter, P/N 555-210 must be used. Without a restrictor, a hose failure could deplete the Emergency Gas Supply very rapidly leading to suffocation. This could result in serious personal injury or death.

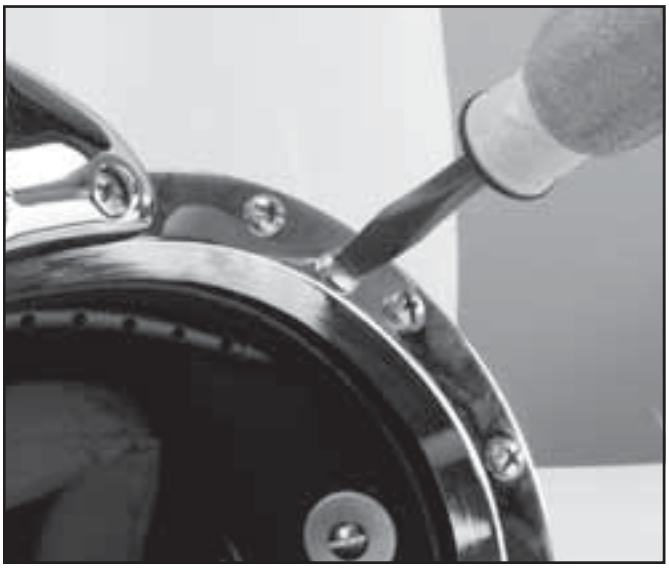


Install the low pressure hose in the block and test it for leaks following installation. Be sure to save the low pressure plug.

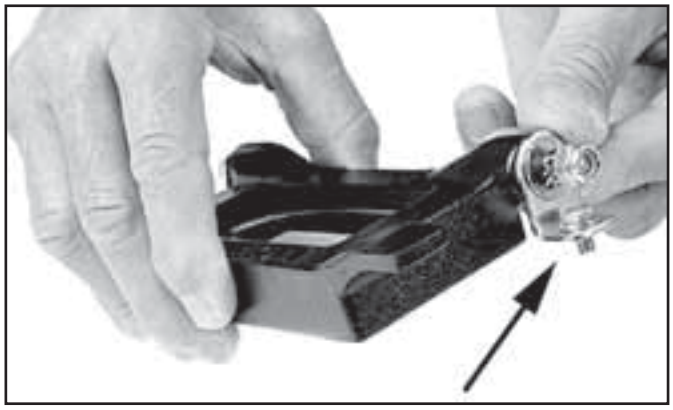
9.4 Weld Lens & Weld Shield Assemblies

Tools Required:
3/8 ” Open End Wrench
1/4 ” Flat Blade Attachment on Torque Screwdriver

1) Remove the two plug screws from the port retainer. Refer to the drawing included with the weld lens or weld shield assembly kit for the remainder of the location numbers.



Remove the two plug screws from the face port.



Insert the screws in the mount ears of the weld lens assembly.

2) Insert the screws through the spacer washers and then through the mount ears.

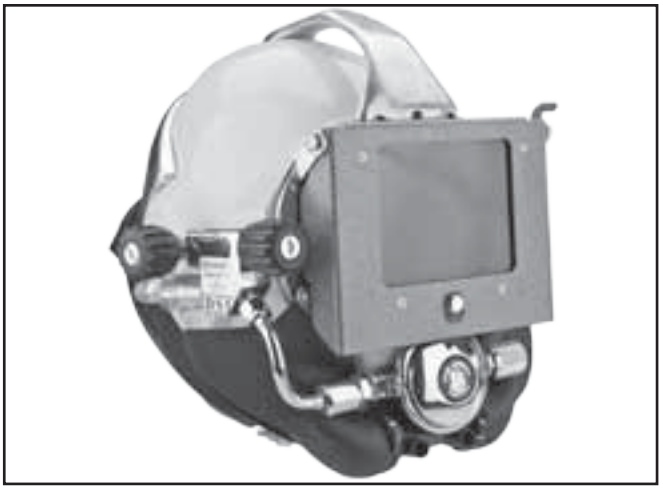
3) Mount the weld lens assembly with the rubber bumpers facing the inside of the helmet. The Weld Shield mounts with the lens and spring side facing inside the helmet.

4) Install and tighten the two mount bolts into the port retainer.

5) On the Weld Lens Assembly, tighten the two lock nuts on the ends of the hinge studs so that the assembly can be flipped up, but will not fall down from its own weight. The Weld Shield Assembly comes pre-tightened from the factory and should not need any adjustment.

The screws that secure the weld shield insert as shown here.

Tighten the screws that secure the assembly to the port retainer.



Proper installation of the weld shield.

⚠ WARNING

Use only the bolts provided with the kits for installation of these assemblies. Longer bolts will damage the helmet shell and/or the threaded inserts. This could cause flooding through the port. Drowning could result.

⚠ WARNING

The weld lens assemblies are designed to provide eye protection from the intense light of welding only. We highly recommend that extreme caution be exercised by all divers, regardless of helmet or band mask used, to avoid the possibility of underwater explosions when cutting or welding. Any underwater explosion can result in serious personal injury, or death, of the diver!

9.5 Use of Quick Disconnect

A quick disconnect can be used with all bail out systems. It provides greater convenience on deck while dressing the diver. It also makes it possible to separate the attachment of the bail-out from the helmet should the diver become entangled underwater.

The quick connect is designed to be installed in any low pressure port of the diver's bail-out regulator. The connector splits the hose into two halves, with a male connector on one end and a female connector on the other. The female connector should be equipped with a sleeve lock that must be properly aligned before the hose can be disengaged. Double shut off quick connects are recommended over open quick connects.

One end of the connector is designed to be attached to the EGS valve assembly, while the other end of the connector is designed to attach to any of the standard low pressure ports on the SuperFlow® first stage regulator (or any high performance regulator) used for the bail-out supply.

A quick disconnect makes setting up your helmet and bail-out system much easier.

9.6 Double Exhaust System

This assembly has been replaced by the Quad-Valve™ Exhaust System which is standard on all 17s, see Chapter 7. This section is included for those who are still using this system. We highly recommend that this double exhaust system be replaced by the improved Quad-Valve™ Exhaust System.

The double exhaust system helps prevent a backflow of biological and certain chemical contaminants into the helmet. This system has been used successfully for diving in biologically contaminated environments. However, there are certain chemicals (i.e. Toluene, Acetic acid etc.) that will attack the rubber in the valves in the exhaust assembly.

More information on contaminated water diving may be found in the book *"Diving in High-Risk Environments"* by Steven Barsky, published by Hammerhead Press.

⚠ WARNING

Diving in contaminated water is extremely hazardous. Do not dive unless you know exactly what contaminants are in the water and you are certain they are compatible with all parts of your diving system. Failure of any component of your life support system may lead to serious personal injury or death.

9.6.1 Double Exhaust Kit Installation

Tools Required:
1/4 " Flat Blade Attachment on Torque Screwdriver
Small pair of snips (to trim tie wraps)

1) Remove the two whisker kidney plates and spacers and screws. These will be used in the installation/ reassembly.

2) Following the general instructions for removal of the regulator and exhaust whisker (some parts will not exist if you are using the double exhaust kit or older whisker systems). This will also require removal of the nose block device, oral nasal and bent tube.

3) Remove the main exhaust body and clean off all traces of the old silicone sealant.

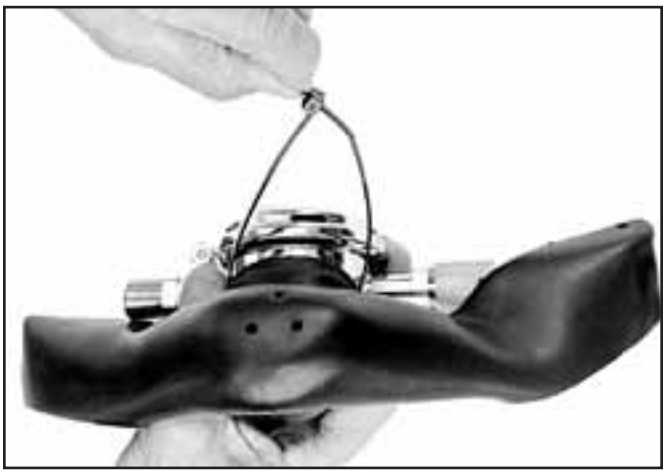
Mount the double exhaust system on the regulator.

4) Mount the double exhaust whisker to the regulator exhaust flange.

5) Secure it with a tie wrap and trim off the excess tail.

6) Apply silicone sealant to the double exhaust body to seal it to the helmet.

7) Install the double exhaust body on the helmet using the three screws that originally held the main exhaust body in position.



Secure the whisker to the regulator body.

The double exhaust body must be sealed to the helmet shell with RTV.

Be sure to install the screws which help to secure the double exhaust body to the helmet shell.

Install the regulator on the helmet.

Attach the whisker to the double exhaust main body.

8) Install the regulator in the helmet, with the regulator mount nut hand tight.

9) Attach the double exhaust whisker to the main exhaust body. Make sure the internal rubber ridge is in the groove in the main exhaust body.

10) Secure the exhaust whisker to the main exhaust with a tie wrap and trim off excess tail.

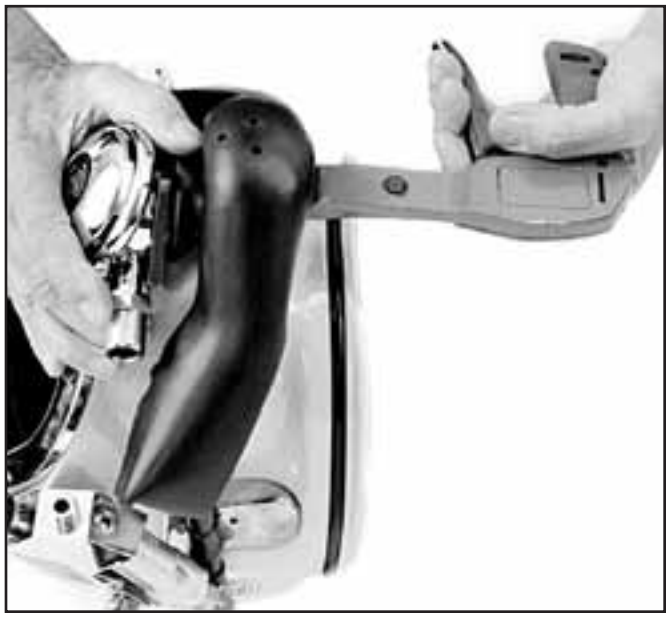
11) Attach the bent tube to the regulator and side block and torque to the proper specification.

12) Secure the whisker to the port retainer with the screws, spacers and kidney plate removed earlier.

13) Tighten the regulator mount nut and bent tube attachments.

14) Reinstall the oral nasal and nose block device.

15) Allow 24 hours for the silicone sealant to cure before diving with the helmet. Test the helmet for leakage before diving under ***any*** conditions and before every contaminated water dive.



Use a tie wrap to secure the double exhaust whisker to the double exhaust main body.

⚠ WARNING

The exhaust valves used in the double exhaust system and regulator must be regularly inspected and replaced whenever they show the slightest signs of wear. If this is not done, leakage into the helmet and breathing systems may occur. This can be fatal, depending on the type of contaminant to which the diver is exposed.

Completed installation of the double exhaust system.

⚠ WARNING

Any helmet / dry suit system must be leak tested according to the manufacturer's instructions before EVERY dive in contaminated water! The slightest leak may be produced serious long term disability or death, depending on the contaminant.

Table of Equivalents

To convert units appearing in Column 1 (left column) into equivalent values in Column 2 (center column), multiply by factor in Column 3. Example: To convert 7 gallons into cubic inches, multiply 7 × 231 = 1617. To convert units appearing in Column 2 (center) into equivalent values of units in Column 1 (left), divide by factor in Column 3. Example: To convert 25 horsepower into Btu per minute, divide 25 by 0.02356 = 1061

To Convert Into	Into To Convert	Multiply By Divide By
Atmospheres	Feet of Water	33.9
Atmospheres	Inches of Mercury (Hg)	29.92
Atmospheres	PSI (LBS per Sq. Inch	14.7
BTU	Foot Pounds	778.3
BTU per hour	Watts	0.2931
BTU per minute	HorsePower	0.02356
Celsius (Centigrade)	Fahrenheit	°C x 1.8 + 32
Centimeters	Inches	0.3937
Cubic Centimeters	Gallons (U.S. Liquid)	0.0002642
Cubic Centimeters	Liters	0.0001
Cubic Feet	Cubic Inches	1728
Cubic Feet	Gallons (U.S. Liquid)	7.48052
Cubic Inches	Cubic Feet	0.0005787
Cubic Inches	Gallons (U.S. Liquid)	0.004329
Days	Seconds	86.400
Degrees (Angle)	Radians	0.01745
Feet	Meters	0.3048
Feet	Miles	0.0001894
Feet of Water	Atmospheres	0.0295
Feet of Water	Inches of Mercury (Hg)	0.8826
Feet of Water	PSI (Lbs per Sq. Inch)	0.4335
Feet per Minute	Miles per Hour	0.01136
Feet per Second	Miles per Hour	0.6818
Foot-Pounds	BTU	0.001286
Foot-Pounds per Minute	Horsepower	0.0000303
Foot-Pounds per Second	Horsepower	0.001818
Gallons (U.S. Liquid)	Cubic Feet	0.1337
Gallons (U.S. Liquid)	Cubic Inches	231
Gallons of Water	Pounds of Water	8.3453
Horsepower	BTU per Minute	42.44
Horsepower	Foot-Pound per Minute	33,000
Horsepower	Foot Pounds per Second	550
Horsepower	Watts	745.7
Hours	Days	0.04167
Hours	Weeks	0.005952
Inches	Centimeters	2.54
Inches of Mercury (Hg)	Atmospheres	0.03342
Inches of Mercury (Hg)	Feet of Water	1.133
Inches of Mercury (Hg)	PSI (Lbs. per Sq. Inch)	0.4912
Inches of Water	PSI (Lbs. per Sq. Inch)	0.03613
Liters	Cubic Centimeters	1000
Liters	Gallons (U.S. Liquid)	0.2642
Micron	Inches	0.00004
Miles (Statute)	Feet	5280
Miles per hour (MPH)	Feet per Minute	88
Miles per hour	Feet per Second	1.467
Ounces (Weight)	Pounds	0.0625
Ounces (Liquid)	Cubic Inches	1.805
Pints (Liquid)	Quarts (Liquid)	0.5
Pounds	Grains	7000
Pounds	Grams	453.59
Pounds	Ounces	16
PSI (Pounds per Sq. Inch)	Atmospheres	0.06804
PSI (Pounds per Sq. Inch)	Feet of Water	2.307
PSI (Pounds per Sq. Inch)	Inches of Mercury (Hg)	2.036
Quarts	Gallons	0.25
Square Feet	Square Inches	144
Temperature (°F - 32)	Temperature (°C)	0.5555
Tons (U.S.)	Pounds	2000
Watts	Horsepower	0.001341

Appendix 1: Torque Specifications

TL=Thread locking Compound Medium Strength - Loctite® 222 or Equivalent

Loc. #	Part #	Description	Torque in Inch Pounds	Torque in Newton Meters
6	530-320	Nut, Lock	6	0.67
15	530-066	Screw	20	2.25
28	530-025	Screw, rear hinge tab	25	2.8
29	530-080	Screw, yoke	20	2.25
36	550-020	Bonnet, defogger valve	100	11.3
42	550-024	Stud, sideblock	35	4
45b	555-154	Bent Tube Assy, Side block end	100	11.3
48	550-095	Low pressure plug	20	2.25
50	550-140	Emergency valve body	See note 1	See note 1
54	550-091	Packing nut, emergency valve	50 after seating	5.65 after seating
60		One way valve body	150	17
66		One way valve seat	150	17
67	555-117	Adapter, brass (umbilical)	See note 1	See note 1
68	555-195	One way valve	150	17
76	530-070	Screw, for mounting weights	20	2.25
79	530-078	Screw, for mounting weights	20	2.25
82	550-038	Regulator mount nut	100	11.3
87	530-090	Screw, alignment	35-50 TL†	4-5.6
90	530-070	Screw, handle	20	2.25
94	530-040	Screw, handle	12	1.3
98	530-317	Nut, air train	35	4
101	530-317	Nut, air train	15	1.6
102	530-050	Screw, sideblock	20	2.25
103	530-052	Screw, port plug	20	2.25
104	530-035	Screw, port retainer	12	1.3
107	555-180	Packing nut, nose block	20	2.25
108	550-062	Knob, nose block	12	1.3
111	530-045	Screw, whisker kidney plate	12	1.3
119	550-055	Packing nut, regulator	40 after seating	4.52 after seating
124	530-030	Screw, regulator clamp	12	1.3
130a	550-046	Inlet nipple, regulator	40	4.5
131b	550-050	Jam nut, regulator	40	4.5
132b	550-048	Inlet nipple, regulator	40	4.5
146	530-308	Nut, communications posts	20	2.25

Loc. #	Part #	Description	Torque in Inch Pounds	Torque in Newton Meters
149	530-032	Screw, main exhaust body	12	1.3
152b	530-019	Screw, Quad Exhaust	12	1.3
163	555-178	Packing nut, waterproof connector	20	2.25
—	200-017	Overpressure Relief Valve	20	2.25
—	555-210	Restrictor Adaptor	20	2.25

Note on Torque Specifications

Note 1: Use Teflon® tape for one to one and a half wraps, starting two threads back from the pipe thread end of the fitting to avoid getting Teflon® tape in the valve. Tighten pipe thread using good engineering practices.

* For a neoprene neck dam, turn the screw three turns. Screws may need adjustment after several dives.

† Use thread locking compound Loctite® 222 or equivalent, medium strength only.

Checklist, Maintenance, and Pre-Dive Inspections

For the most current check lists, helmet maintenance procedures, and pre-dive inspections, please check on the Internet at www.divelab.com.

Appendix A2
Maintenance and Inspection Procedures

The following section describes the maintenance and inspection procedures that are used to complete the Annual, Monthly and Daily Checklists, to ensure optimum reliability and performance. These procedures are additionally utilized in conjunction with the daily pre and post dive maintenance checklists. The following service intervals are the minimum recommended for helmets being used under good conditions. Helmets used in harsh conditions, i.e., contaminated water, welding / burning operations, or jetting may require more frequent servicing.

The intention of the maintenance and overhaul program is to help maintain all helmet components in good working order in accordance with KMDSI factory specifications. It will also help to identify worn or damaged parts and components before they affect performance and reliability. Whenever the serviceability of a component or part is in question, or doubt exists, replace it. All helmet components and parts have a service life and will eventually require replacement.

NOTE: The side block does not need to be removed from the helmet annually, providing, after removal of side block components, there is no corrosion and verdigris. Kirby Morgan recommends that every three years the side block assembly be physically removed from the helmet per Section 7.3. Clean and inspect the stud and securing screw, replace if bent, stripped, or any damage is detected.

NOTE: The pipe thread fittings used on the umbilical adapter and the emergency gas valve are the only fittings that require sealing with Teflon® tape. Do not use liquid sealant. When installing Teflon® tape on pipe threads, apply the tape starting one thread back from the end of the fitting. Apply the tape in a clockwise direction under tension. 1-1½ wraps is all that is needed. The use of more than 1½ wraps could cause excess Teflon® tape to travel into the breathing system. Do not overtighten when installing.

Chapters 6, 7 and 8 of this maintenance manual gives guidance on all routine and corrective maintenance and repairs. Disassembly and reassembly of components is explained in a step-by-step manner that may not necessarily call out that all O-rings and normal consumable items will be replaced. The manual is written in this way so that if an assembly, component, or part is being inspected or disturbed between normal intervals it is acceptable to reuse O-rings and components providing they pass a visual inspection. When conducting annual or scheduled overhauls all O-rings should be replaced. The side block should be removed from the helmet at least every three years (or 400 operating hours) so that the stud and securing screw can be inspected. All O-rings should be lightly lubricated with the applicable lubricant.

Lubrication / Cleanliness:
Helmets intended for use with breathing gas mixtures in excess of 50% oxygen by volume, should be cleaned for oxygen service. They must only be lubricated with oxygen compatible lubricants such as Christo-Lube® or Krytox®. All air supply systems must be filtered and must meet the requirements of grade D quality air or better. Helmet breathing gas systems/gas train components used for air diving should only be lubricated with silicone lubricant Dow Corning® 111 or equivalent. KMDSI uses Christo-Lube® at the factory for lubrication of all gas train components requiring lubrication, and highly recommends its use.

Before 1999, Kirby Morgan Dive Systems, Inc., used Danger and Warning Notices in the helmet and mask owner's manual limiting the breathing gas percentage to less than 23.5 percent oxygen. This was due primarily to cleaning issues in regards to possible fire hazards and was in compliance with the recommendations of the Association of Standard Test Methods (ASTM), National Fire Protection Agency (NFPA), and the Compressed Gas Association (CGA) as well as other industry standards.

During the 1990's, open circuit scuba use of enriched-air (Nitrox) by technical and recreational divers became very popular, and as use increased, so did the number of combustion incidents during the mixing and handling of the breathing mixtures. These combustion incidents brought attention to the dangers and inherent risks associated with oxygen and oxygen enriched gas mixtures.

Kirby Morgan cannot dictate or override regulations or recommendations set forth by industry standards or governing bodies pertaining to enriched gas use. However, it is the opinion of Kirby Morgan that breathing gas mixtures up to 50% oxygen by volume

should not pose a significant increased risk of fire or combustion in Kirby Morgan helmets and masks low-pressure components and does not warrant the need for the stringent specialized oxygen clean post-sampling and particulate analysis normally accomplished for components used in high pressure oxygen valves, regulators, and piping systems. The decision for using 50% has been primarily based on a long history of operational field use.

As long as Kirby Morgan helmets and masks are cleaned and maintained in accordance with the maintenance manual, the equipment should not pose a significant increased risk of a fire or ignition originating in the helmet or mask low-pressure (<250 p.s.i.g. /<17.2 bar or less) components when used with enriched gases of up to 50% oxygen. However, CAUTION should be exercised any time enriched gases are handled or used.

In general, helmets and masks used primarily for mixed gas use are subject to far less oil and particulate contamination than those used for air diving. For this reason, helmets and masks commonly used with both air and enriched breathing gases should be cleaned and maintained with greater care and vigilance. It is important that all internal gas-transporting components, i.e., side block, bent tube, and demand regulator assemblies remain clean and free of hydrocarbons, dirt, and particulates. Whenever the equipment is depressurized, all exposed ports or fittings should be plugged or capped to help maintain foreign material exclusion.

Gas train components should be cleaned according to the procedures outlined in the operations manual at least annually and/or whenever contamination is suspected or found. Helmet interior and exterior surfaces should be cleaned at least daily at the completion of daily diving operations. Helmets and masks used in waters contaminated with oils and other petroleum or chemical contaminants may require cleaning after each dive.

Helmet and mask components requiring lubrication should be lubricated sparingly with lubricants approved for oxygen use such as Christo-Lube®, Krytox®, or Flourolube. KMDSI highly recommends using Christo-Lube®, and uses Christo-Lube® during the assembly of all KMDSI gas train components.

Regardless of the approved lubricant used, never mix different kinds of lubricants. Persons mixing handling and working with breathing gases should be properly trained in all aspects of safe gas handling.

⚠ WARNING

Do not use lubricants of any kind on the diaphragm or exhaust valves. Use of lubricants can attract and hold debris that could interfere with the proper operation of the regulator.

NOTE: Refer to Chapter 7 for removal and disassembly / reassembly procedures.

NOTE: The helmet weights do not need to be removed from the helmet unless fiberglass damage is present or suspected.

NOTE: During annual overhauls, all O-rings and soft goods, i.e., valve seats and washers should be replaced. KMDSI offers kits that have all the necessary parts.

NOTE: The neck dam rubber need not be replaced if the inspection reveals no damage or significant wear and the rubber components are not dried out.

NOTE: The oral nasal mask and oral nasal valve requires replacement, only if inspection reveals damage, distortion, or signs of damage.

NOTE: All threaded fasteners and parts require careful cleaning and inspection as well as the mating parts. Replace any and all threaded parts or components that show signs of wear or damage.

KMDSI highly recommends a certified KMDSI repair technician make all repairs and that only genuine KMDSI repair and replacement parts be used. Owners of KMDSI products that elect to do their own repairs and inspections should only do so if they possess the knowledge and experience. All inspections, maintenance and repairs should be completed using the appropriate KMDSI Operation and Maintenance Manual.

Persons performing repairs should retain all replacement component receipts for additional proof of maintenance history. Should any questions on procedures, components, or repairs arise, please telephone Kirby Morgan Dive Systems, Inc., at 1-805-928-7772 or E-mail them at kmdsi@kirbymorgan.com or telephone Dive Lab, Inc., at 1-850-235-2715 or E-mail them at divelab@aol.com.

Appendix 3
Supply Pressure Requirements & Tables

Table 1 should be used whenever low pressure compressors are used or when using surface control panels that are limited to outlet pressures within the range of 220 psig or less.
It is important to insure the required outlet pressure from the table can be maintained in a stable manner at the surface to insure adequate supply at depth. When used with high pressure consoles that can regulate pressures greater than 220 psig use Appendix 3 Table 2 SuperFlow® / SuperFlow® 350 Regulator High Pressure Regulated Source.

Diver Work Rates

The divers work rate, also known as respiratory minute volume (RMV), is basically how hard the diver breathes. As the diver's physical exercise increases, so does the ventilation rate. Proper training teaches the diver to never push the work rate beyond normal labored breathing. (This is in the 30-50 RMV range). To put things in perspective, heavy work for a physically fit person:

Swimming at one knot is about 38 RMV.
Running at 8 miles per hour is about 50 RMV.

Once the diver hits 55 RMV, they are entering the extreme range. Many fit divers can do 75 RMV for one to two minutes providing the inhalation resistive effort of the breathing system is not much above 1-1.3 J/L. The divers work rate should never be so heavy that the diver cannot maintain a simple conversation with topside.

When the work rate gets into the moderately heavy to heavy range 40-50 RMV the diver needs to slow down!

Working to the point of being excessively winded should be avoided at all costs!

Working at rates greater than 58 RMV underwater is extreme, and can pose hazards that are not present when doing extreme rates on the surface. When underwater, inhalation and exhalation resistive effort increases due to the density of the breathing gas and resistive effort of the equipment. The increase in resistive effort can cause an increase in blood level CO_2 because the diver cannot ventilate as freely as when breathing at the surface. When breathing air at the deeper depths, nitrogen narcosis can mask CO_2 symptoms which can then snowball into even heavier breathing, often resulting in confusion, panic, and in rare cases muscle spasm, unconsciousness, sometimes resulting in death.
In some rare cases high ventilation rates has been suspected as the cause of respiratory barotraumas, including arterial gas embolism. The possibility of suffering a respiratory over inflation event during high work rates while underwater could be even greater for divers that smoke, or have previous known or unknown lung disease or respiratory damage. The safest course for the diver is to keep the equipment properly maintained for peak performance and to know and understand the capabilities and limitations of the equipment including all breathing supply systems they use.
The output capability of the supply system including umbilicals should be known to all that use it and periodic tests should be done to insure flow capability.

Use Of Low Pressure Supply Table

The low pressure supply tables were developed to simplify calculation of supply pressure. In order to get the required volume to the diver, you need to have the proper supply pressure. The table starts at 90 psig and increases in 10 psig increments. The user simply selects the lowest pressure that best represents the low cycling pressure of the compressor being used. The table basically shows the maximum depth that can be attained while breathing at RMV's (breathing rates in liters per minute) listed. It is strongly recommended that divers plan for a minimum supply pressure that will allow the diver to work at no less that 50 - 62.5 RMV.

Appendix 3 Table 1 Work Rate Expressed as Respiratory Minute Volume (RMV)*

Work Load	RMV	Cubic Feet/Minute (CFM)	Equivalent Land Based Exercise
Rest	7-10 RMV	0.2 - 0.35 CFM	
Light Work	10-20 RMV	0.35 - 0.7 CFM	Walking 2 miles per hour
Moderate Work	20-37 RMV	0.7 - 1.3 CFM	Walking 4 miles per hour
Heavy Work	37-54 RMV	1.3 - 1.9 CFM	Running 8 miles per hour
Severe Work	55-100 RMV	1.94 - 3.5 CFM	
** source: U.S. Navy Diving Manual*			

Appendix 3 Table 2 Compressor Supply Table SuperFlow® and SuperFlow® 350

Supply Pressure Requirements for Helmets & Masks equipped with SuperFlow® and SuperFlow® 350 Non-balanced regulators when used with low pressure compressors

Supply Pressure	RMV	Depth		ATA	Required SLPM	w/20% safety margin	Required SCFM
		FSW	MSW				
90 PSIG / 6.21 BAR	**40**	76	23	3.30	132.12	158.55	5.60
	50	63	19	2.91	145.45	174.55	6.17
	62.5	44	13	2.33	145.83	175.00	6.18
	75	33	10	2.00	150.00	180.00	6.36
100 PSIG / 6.9 BAR	**40**	86	26	3.61	144.24	173.09	6.11
	50	72	22	3.18	159.09	190.91	6.74
	62.5	55	17	2.67	166.67	200.00	7.06
	75	42	13	2.27	170.45	204.55	7.23
110 PSIG / 7.59 BAR	**40**	100	31	4.03	161.21	193.45	6.83
	50	83	25	3.52	175.76	210.91	7.45
	62.5	67	20	3.03	189.39	227.27	8.03
	75	50	15	2.52	188.64	226.36	8.00
120 PSIG / 8.28 BAR	**40**	112	34	4.39	175.76	210.91	7.45
	50	91	28	3.76	187.88	225.45	7.96
	62.5	71	22	3.15	196.97	236.36	8.35
	75	57	17	2.73	204.55	245.45	8.67
130 PSIG / 8.97 BAR	**40**	122	37	4.70	187.88	225.45	7.96
	50	100	31	4.03	201.52	241.82	8.54
	62.5	82	25	3.48	217.80	261.36	9.23
	75	60	19	2.82	211.36	253.64	8.96
140 PSIG / 9.66 BAR	**40**	137	42	5.15	206.06	247.27	8.73
	50	108	33	4.27	213.64	256.36	9.06
	62.5	84	26	3.55	221.59	265.91	9.39
	75	65	20	2.97	222.73	267.27	9.44
150 PSIG / 10.35 BAR	**40**	145	44	5.39	215.76	258.91	9.15
	50	120	37	4.64	231.82	278.18	9.83
	62.5	95	29	3.88	242.42	290.91	10.28
	75	69	21	3.09	231.82	278.18	9.83

Appendix 3 Table 2 Compressor Supply Table SuperFlow® and SuperFlow® 350 Continued

Supply Pressure	RMV	Depth		ATA	Required SLPM	w/20% safety margin	Required SCFM
		FSW	MSW				
160 PSIG / 11.04 BAR	**40**	157	48	5.76	230.30	276.36	9.76
	50	124	38	4.76	237.88	285.45	10.08
	62.5	100	31	4.03	251.89	302.27	10.68
	75	76	23	3.30	247.73	297.27	10.50
170 PSIG / 11.73 BAR	**40**	167	51	6.06	242.42	290.91	10.28
	50	135	41	5.09	254.55	305.45	10.79
	62.5	107	33	4.24	265.15	318.18	11.24
	75	86	26	3.61	270.45	324.55	11.46
180 PSIG / 12.42 BAR	**40**	181	55	6.48	259.39	311.27	11.00
	50	148	45	5.48	274.24	329.09	11.62
	62.5	115	35	4.48	280.30	336.36	11.88
	75	93	28	3.82	286.36	343.64	12.14
190 PSIG / 13.11 BAR	**40**	190	58	6.76	270.30	324.36	11.46
	50	154	47	5.67	283.33	340.00	12.01
	62.5	122	37	4.70	293.56	352.27	12.44
	75	100	31	4.03	302.27	362.73	12.81
200 PSIG / 13.8 BAR	**40**	192	59	6.82	272.73	327.27	11.56
	50	166	51	6.03	301.52	361.82	12.78
	62.5	132	40	5.00	312.50	375.00	13.25
	75	102	31	4.09	306.82	368.18	13.01
210 PSIG / 14.49 BAR	**40**	212	65	7.42	296.97	356.36	12.59
	50	175	53	6.30	315.15	378.18	13.36
	62.5	137	42	5.15	321.97	386.36	13.65
	75	108	33	4.27	320.45	384.55	13.58
220 PSIG / 15.18 BAR	**40**	220	67	7.67	306.67	368.00	13.00
	50	182	56	6.52	325.76	390.91	13.81
	62.5	147	45	5.45	340.91	409.09	14.45
	75	111	34	4.36	327.27	392.73	13.87

Appendix 3 Table 3 SuperFlow® 350 Regulator High Pressure Regulated Source

Depth		Regulator Setting Surface Gauge in P.S.I.G.		Regulator Setting Surface Gauge in BAR	
FSW	MSW	Minimum P.S.I.G.	Maximum P.S.I.G.	Minimum Bar	Maximum Bar
0-60	0-18	150	225	10.3	15.5
61-100	19-30	200	250	13.8	17.2
101-132	31-40	250	275	17.2	18.9
133-165	41-50	250	300	17.2	19.6
*166-220	51-67	300	325	20.6	22.4

*May not be capable of performing at 75 RMV deeper than 165 FSW.

Performance is based on a minimum of 75 RMV to 165 FSW (50 MSW) and 62.5 RMV to 220 FSW (67 MSW) using a 3/8" (9.5 mm) umbilical 600 foot (183 meters) long, made up of two 300 foot (91 meter) sections.

Appendix 4 Standard Kirby Morgan Surface Supply Pressure Formula - Old Method

Old Pressure Table Calculation:

The old method of determining supply pressure was to multiply the dive depth by .445 PSI and then add the over-bottom pressure called out in the depth ranges for the depth from the KMDSI operations manual. The old method was based on a minimum RMV of 62.5. This method can still be used. The old method used the formula and called out over bottom pressures for depth as follows [(FSW x .445) + PSIG for depth] from the table below.

Depth in Feet and Meters		Over Bottom Pressure
0-60 FSW	(0-18 MSW)	90 PSIG (6.2 Bar)
61-100	(18-30)	115 (7.9)
101-132	(30-40)	135 (9.3)
133-165	(40-50)	165 (11.4)
166-220	(50-67)	225 (15.5)

For more information on determining supply pressure related information check the Dive Lab web site at www.divelab.com.