

TDX5

(BALANCED DIAPHRAGM)

TITANIUM

SERVICE PROCEDURE

This Product Service Procedure conveys a list of components and service procedures that reflect the TDX5 as it was configured at the time of this writing (1/28/03).

MARNING: A TDX5 Titanium First Stage must never be connected to a breathing gas supply that contains more than 40% Oxygen by volume.



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GENERAL PROCEDURES

REFER TODOC. 12-2202

SPECIFICATIONS

Torques			Intermediate Pr	essure
P/N 6865	Yoke Retainer	23 to 25 ft-lbs	Preferred	138 to 142 psi
P/N 6871	DIN Filter Retainer	16 to 18 ft-lbs	Acceptable	137 to 143 psi
P/N 6870	DIN Filter Housing	16 to 18 ft-lbs		
P/N 6864	HP Port Plug	35 to 40 in-lbs		
P/N 6863	LP Port Plug	35 to 40 in-lbs		
P/N 6869	Receiver	80 to 100 in-lbs		
P/N 6866	Environmental End Cap	220 in-lbs		
HP Hose into First Stage Body		35 to 40 in-lbs		
LP Hose into First Stage Body		35 to 40 in-lbs		
Inflator Hose into First Stage Body		35 to 40 in-lbs		

TOOLS REQUIRED

Standard Tools

Inch Pounds Torque Wrench Foot Pounds Torque Wrench 5/32" Hex Key Socket 1/4" Hex Key Socket 1/2" Open End Wrench 9/16" Open End Wrench 5/8" Open End Wrench 13/16" Open End Wrench 1" Open End Wrench 1/4" Hex Key (for DIN model) 5/16" Hex Key 3/8" Drive Socket

Specialty Tools

P/N 40.2302 Christo-Lube MCG111 (2 oz)

P/N 40.6536.1 HP Cone Tool P/N 40.6671.99 End Cap Tool Kit P/N 40.9311 Filter Circlip Pliers

P/N 40.9315 Intermediate Press. Gauge

P/N 40.9520 O-ring Tool Kit

Doc. 12-2217-r01 (1/28/03)

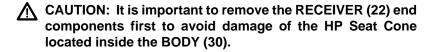
Soft Jawed Vise

TROUBLE SHOOTING					
SYMPTOM	POSSIBLE CAUSE	TREATMENT			
* Restricted airflow and inhalation resistance through complete system.	Cylinder valve not completely opened. Cylinder valve requires service. CONE FILTER (4,12) is contaminated.	Open valve completely. Connect Regulator to a different Cylinder. Replace with new and perform a complete service.			
* Air leakage detected from beneath the ADJUSTMENT CUP (38), inside the END CAP (35).	1. END CAP (35) is loose. 2. DIAPHRAGM (32) is worn or damaged. 3. Seating surface inside BODY (30) is damaged.	1. Tighten END CAP (35) onto BODY (30), using prescribed torque value in Reassembly Procedure. 2. Replace with new. 3. Replace BODY with new.			
* Air leakage detected from RECEIVER (22).	1. RECEIVER O-RING (23) is damaged or worn. 2. Seating surface inside the BODY (30) is damaged. 3. Seating surface on the RECEIVER (22) is damaged.	1. Replace with new. 2. Replace with new. 3. Replace with new.			
* Insufficient intermediate pressure.	1. END CAP (35) is loose. 2. First stage improperly adjusted. 3. DIAPHRAGM SPRING (36) is weakened or damaged. 4. Seating surface of BODY (30) beneath DIAPHRAGM (32) is damaged.	1. Tighten END CAP (35) onto BODY (30), using prescribed torque value in Reassembly Procedure. 2. Readjust according to the procedure specified in Final Adjustment Procedure. 3. Replace with new. 4. Replace BODY with new.			
* Excessive intermediate pressure/Intermediate pressure creeps.	1. First Stage improperly adjusted. 2. HP SEAT (26) is damaged or worn. 3. HP SEAT O-RING (25) is damaged or worn. 4. Seating surface of HP SEAT (26), or RECEIVER (22), or HP CONE (29), or BODY (30) or its Orifice Cone is damaged. 5. RETAINING SPRING (24) is weakened or damaged.	1. Readjust according to Final Adjustment Procedure. 2. Replace with new. 3. Replace with new. 4. Replace with new. 5. Replace with new.			

DISASSEMBLY PROCEDURE

NOTE: Be sure to check and record the intermediate pressure and perform the Leak Detection Test outlined in the Initial Inspection Procedures (Doc. 12-2202) prior to disassembling the Regulator. Review the Troubleshooting Section on page 3 to gain a better idea of which internal parts may be worn, and to better advise your customer of the service that is needed.

- 1. Before disassembling the First Stage, remove the low pressure Hoses with a 9/16" open end wrench, the high pressure Hose(s) with a 5/8" open end wrench, and the low pressure inflator hose with either a 9/16" or 1/2" open end wrench. Remove all remaining PORT PLUGS (18, 20) with a 5/32" hex key.
- 2. Remove and inspect the O-RING(S) now visible on all these items for any signs of decay. If found, discard the O-RING(S).



- 3. Using 1/4" hex key, turn the RECEIVER (22) in a counter clockwise direction to remove it from the BODY (30) (Fig. 1).
- 4. Remove the HP SEAT (26) and TRANSFER PIN (27) from the RECEIVER (22). Discard the HP SEAT, regardless of it's condition, and DO NOT attempt to reuse it.
- 5. Remove the RETAINING SPRING (24). Using a magnifier, closely examine the SPRING for any signs of corrosion, cracks, or other damage. Discard if found.
- Using care not to scratch or damage the RECEIVER (22), remove the HP SEAT O-RING (25) from inside the RECEIVER (Fig. 2). Discard, regardless of condition, and DO NOT attempt to reuse.
- Remove and inspect the RECEIVER O-RING (23) for any signs of decay. Discard if found.
- 8. Carefully insert the longer/tapered end of a Cone Tool directly into the HP CONE (29) which is held inside the BODY (30). Pull the HP CONE straight out of the BODY (Fig. 3).
- Remove and discard the HP CONE O-RING (28), regardless of condition, and DO NOT attempt to reuse it.



Fig. 1

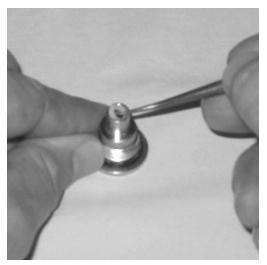


Fig. 2



Fig. 3

10. ENVIRONMENTAL KIT DISASSEMBLY:

- A. Turn the ENVIRONMENTAL CAP (41) counter clockwise by hand to loosen and remove it.
- B. Gently peel the Lip of the ENVIRONMENTAL DIAPHRAGM (40) away from the Rim of the ENVIRONMENTAL END CAP (35) and lift it out to remove it. Examine the condition of the ENVIRONMENTAL DIAPHRAGM, checking for any signs of wear, distortion, corrosion, or perforation. Discard if found.
- C. Turn the First Stage Diaphragm side down and remove the TRANSFER PISTON (39). Check for any signs of wear, distortion, or corrosion. Discard if found.
- 11. Using a 5/16" hex key, turn the ADJUSTMENT CUP (38), counter clockwise to remove it (Fig. 4).
- Remove the SPRING WASHER (37) and DIAPHRAGM SPRING (36). Inspect the SPRING WASHER for any signs of wear or distortion. Discard if found.
- 13. Secure the First Stage in a soft-jawed or well padded vise and apply a 3/8" socket wrench with a Hook/Wrench Link (from End Cap Tool) to the ENVIRONMENTAL END CAP (35). Turn the END CAP counter clockwise to remove it from the BODY (30) (Fig. 5). Lift out the DIAPHRAGM WASHER (33) and DIAPHRAGM PLATE (34), and inspect for signs of wear or distortion. Discard if found.
- ↑ CAUTION: Tighten the vise only as needed to hold the First Stage secure, and DO NOT overtighten. Doing so will result in permanent damage, rendering it inoperable.
- 14. Using a 5/32" hex key, install HP PORT PLUGS (18) into the open HP Ports, and LP PORT PLUGS (20) into all but one of the LP Ports. Check to ensure that 1 of the 4 LP Ports is open, and all other Ports are sealed. Tighten the YOKE SCREW (1) to ensure that the PROTECTOR CAP (16) is securely sealed over the YOKE RETAINER (6). For DIN models, place the PROTECTOR CAP securely over the DIN FILTER RETAINER (9) and DIN COUPLER WHEEL (11).
- 15. Remove the DIAPHRAGM (32) from the BODY (30) by covering the Receiver opening in the BODY with the palm of your hand and directing short blasts of low pressure air through the open LP Port (Fig. 6). Lift the DIAPHRAGM out carefully.
- CAUTION: DO NOT attempt to remove the DIAPHRAGM (32) with the use of a metallic instrument. Doing so will seriously damage the brass Seating Surface of the BODY (30).
- Remove the BUTTON (31) and inspect it for any signs of wear or distortion. Discard if found.



Fig. 4

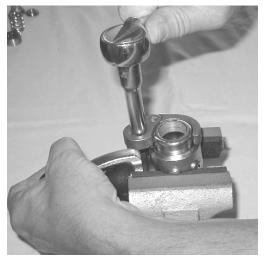


Fig. 5



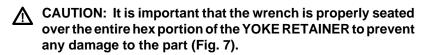
Fig. 6

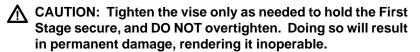


- 17. Discard the DIAPHRAGM (32), regardless of its condition, and DO NOT attempt to reuse it.
- 18. Remove all PORT PLUGS (18, 20) with a 5/32" hex key. Remove and inspect the PORT PLUG O-RINGS (19, 21) for any signs of decay. Discard if found.
- NOTE: For units received with Yoke Connectors perform step 19Y. for units received with DIN Connectors perform step 19D.



- A. Remove the YOKE SCREW (1) from the YOKE (2)
- B. Secure the BODY (30) in a soft jawed or well padded vise and apply a thin wall, or modified, 1" open end wrench to the YOKE RETAINER (6). Using firm steady force, turn the YOKE RETAINER counter clockwise to remove it. DO NOT use impact to loosen it.





- C. After removing the YOKE RETAINER (6), remove the YOKE (2), PROTECTOR CAP (16), and SADDLE (17) and set these aside. Remove and discard the YOKE RETAINER O-RING (7), regardless of condition, and DO NOT attempt to reuse.
- D. Using Internal Circlip Pliers, remove the RETAINING CLIP (3) that retains the CONE FILTER (4). The CONE FILTER should drop out freely into your hand. Discard, and DO NOT attempt to reuse. Remove and discard the FILTER O-RING (5), regardless of condition and DO NOT attempt to reuse it.

19D. DIN CONNECTOR DISASSEMBLY:

A. Secure the First Stage in a soft-jawed or well padded vise, with the DIN Connector facing up. Apply a 1/4" hex key to the FILTER RETAINER (9) and loosen* in a counter clockwise direction to remove it (Fig. 8).

*See Supplemental Information on page 13.

CAUTION: Tighten the vise only as needed to hold the First Stage secure, and DO NOT overtighten. Doing so will result in permanent damage, rendering it inoperable.

B. Remove the DIN FACE O-RING (8) and RETAINER O-RING (10). Discard and DO NOT attempt to reuse them.



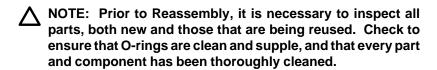
Fig. 7

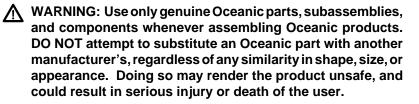


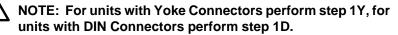
Fig. 8

- C. Lift the COUPLER WHEEL (11) straight off the DIN FILTER HOUSING (14) and set aside. Remove the PROTECTOR CAP (16) and set aside.
- D. Apply a 13/16" open end wrench to the flange at the Base of the DIN FILTER HOUSING (14) (Fig. 9). Using firm, steady force, loosen in a counter clockwise direction to remove. DO NOT use impact to loosen.
- CAUTION: It is important that the wrench is deep enough to seat entirely over the Flange to avoid any damage to the Seating Surface.
 - E. After removing the DIN FILTER HOUSING (14) from the BODY (30) and removing the SADDLE (17), turn the BODY over and tap it lightly to drop out the DIN CONE FILTER (12). Discard the FILTER and DO NOT attempt to reuse it.
 - F. Remove and inspect the FILTER O-RING (13) for any signs of decay. Discard if found. Remove the FILTER HOUSING O-RING (15). Discard and DO NOT attempt to reuse it.
 - G. Inspect the SADDLE (17), checking for any signs of damage or distortion. Discard if found.









1Y. YOKE CONNECTOR REASSEMBLY:

- A. Install a new FILTER O-RING (5) into the YOKE RETAINER (6), at the base of the Filter Cavity in the BODY (30) (Fig. 10).
- B. Install the CONE FILTER (4) into the YOKE RETAINER (6) and install the RETAINING CLIP (3) into the Groove above it, using Internal Circlip Pliers (Fig. 11).

NOTE: Close examination of the RETAINING CLIP will show that one side is slightly rounded and the other is flat. Install with the flat side facing out of the YOKE RETAINER to ensure greater holding strength.



Fig. 9

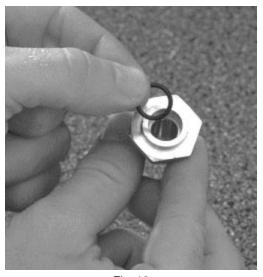


Fig. 10



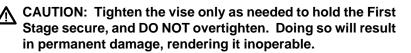
Fig. 11



- C. Lubricate and install the RETAINER O-RING (7) into the Groove on the End of the YOKE RETAINER (6).
- D. Insert the threaded End of the YOKE RETAINER (6) through the YOKE (2), facing opposite the End that holds the YOKE SCREW (1).
- E. Place the PROTECTOR CAP (16) and the SADDLE (17) onto the YOKE RETAINER (6), with the flat side mating to the Base of the YOKE (Fig. 12).
- F. Holding the YOKE RETAINER (6), YOKE (2), PROTECTOR CAP (16), and SADDLE (17) together between your thumb and forefinger (Fig. 13), insert the YOKE RETAINER into the BODY (30), so that the Threads seat properly. Hand tighten in a clockwise direction until secure. Using a thin-wall, or modified, 1" open end wrench that is properly seated over the entire Hex Portion of the YOKE RETAINER, tighten it to a torque of 23 to 25 ft-lbs.
- H. Install the YOKE SCREW (1) into the YOKE (2).

1D. DIN CONNECTOR REASSEMBLY:

- A. Lubricate and install the DIN FILTER HOUSING O-RING (15) into the Groove on the End of the DIN FILTER HOUSING (14).
- B. Insert the threaded End of the DIN FILTER HOUSING (14) through the flat Side of the SADDLE (17).
- C. Secure the BODY (30) in a soft jawed or well padded vise, with the threaded HP Inlet Bore facing straight up.



- D. Install the DIN FILTER HOUSING (14) into the BODY (30) so that the Threads seat properly, and hand tighten in a clockwise direction until secure. Using a thin-wall, or modified, 13/16" open end wrench that is properly seated over the entire Seating Surface of the Filter Housing Flange, tighten to a torque of 16 to 18 ft-lbs.
- E. Lubricate and install the FILTER O-RING (13) into the DIN FILTER HOUSING (14), at the Base of the Filter Cavity. Install the DIN CONE FILTER (12) into the FILTER HOUSING.
- F. Install the PROTECTOR CAP (16) and the DIN COUPLER WHEEL (11) down over the Stem of the DIN FILTER HOUSING (14), with the Threaded End facing up.
- G. Lubricate and install the DIN FACE O-RING (8) and RETAINER O-RING (10) onto the DIN FILTER RETAINER (9).



Fig. 12



Fig. 13

H. Insert the Threaded End of the DIN FILTER RETAINER (9) through the DIN COUPLER WHEEL (11) into the DIN FILTER HOUSING (14), and tighten until secure. Apply a 1/4" hex socket and tighten to a torque of 16 to 18 ft-lbs.

2. Using the Button Alignment Tool*, affix the BUTTON (31) directly onto the center of the DIAPHRAGM (32) (Fig. 14). Ensure that it adheres properly and remove the Tool.

*Refer to Supplemental Information on page 13.

- 3. Position the DIAPHRAGM (32) with BUTTON (31) directly over the opening of the BODY (30) (Fig. 15). Gently push the Edges of the DIAPHRAGM down inside the Internal Threads of the BODY, one Thread at a time (Fig. 16). Rotate the BODY while doing this, to facilitate an even seating of the DIAPHRAGM. Closely inspect to ensure it is well seated at the Base of the Threads.
- CAUTION: DO NOT force the DIAPHRAGM into the BODY in a manner that will damage either the Lip or Surface of the DIAPHRAGM, or the Threads of the BODY. The use of a sharp instrument, such as a screwdriver, is to be strictly avoided.
- 4. Place the DIAPHRAGM WASHER (33) into the BODY (30) on top of the DIAPHRAGM (32) with the collar facing up.
- Lay the DIAPHRAGM PLATE (34) into the Center of the DIA-PHRAGM WASHER (33) with its flat surface against the DIA-PHRAGM (32)
- 6. Thread the ENVIRONMENTAL END CAP (35) into the BODY (30), turning clockwise by hand until secure.
- 7. Secure the BODY (30) in a soft jawed or well padded vise, and using a 3/8" socket wrench with an appropriate Hook/Wrench Link (from End Cap Tool) and a foot-pounds torque wrench, tighten the ENVIRONMENTAL END CAP (35) into the BODY to a torque of 220 in-lbs (Fig. 17).
- CAUTION: Tighten the vise only as needed to hold the First Stage secure, and DO NOT overtighten. Doing so will result in permanent damage, rendering it inoperable.
- 8. Apply a very light film of lubricant (Christo Lube MCG #111) to both Ends of the DIAPHRAGM SPRING (36), and place it on the DIAPHRAGM PLATE (34).
- Place the SPRING WASHER (37) directly onto the Upper End of the DIAPHRAGM SPRING (36) and install the ADJUSTMENT CUP (38) into the END CAP (35). Using a 5/16" hex key, turn the ADJUSTMENT CUP clockwise until only 2 Threads show.

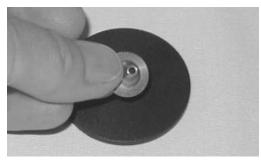


Fig. 14



Fig. 15



Fig. 16



-ig. 17

- 10. Lubricate and install the HP CONE O-RING (28) onto the HP CONE (29), and place the Sealing Edge of the HP CONE down onto the smaller end of a clean two-part Cone Tool. Use care not to damage the seating surface of the HP CONE as this is done. Lower the large opening of the installation tool sleeve over the HP CONE until the Edge of the Narrow Opening is even with the Base of the HP CONE.
- 11. Guide the HP CONE/Tool Assembly into the High Pressure Chamber of the BODY (30), taking care to properly align the HP CONE (29) with the Recess in the High Pressure Chamber (Fig. 18). Carefully press the HP CONE completely into place and withdraw the Tool, pulling it straight out.
- Lightly lubricate and install the RECEIVER O-RING (23) onto the RECEIVER (22) and the HP SEAT O-RING (25) into the Inner Bore of the RECEIVER. Lightly lubricate the threads of the RECEIVER.
- 13. Apply a very light film of lubricant to both ends of the RETAINING SPRING (24) and the lower 1/4" of the HP SEAT (26) Shaft. Install the RETAINING SPRING onto the end of the RECEIVER (22).
- 14. Carefully guide the shaft of the HP SEAT (26) so that it passes through the RETAINING SPRING (24) and into the HP SEAT O-RING (25) in the Inner Bore of the RECEIVER (22) (Fig. 19).
- 14. Carefully insert the TRANSFER PIN (27) into the Opening of the HP SEAT (26).
- 15. While looking into the BODY (30) so that you can see the HP CONE (29), insert the HP SEAT/RECEIVER Assembly directly into the Center of the Receiver Opening in the BODY and carefully guide the TRANSFER PIN (27) through the Center of the HP CONE and into the BUTTON (31) (Fig. 20). Use caution to avoid touching the HP CONE as the TRANSFER PIN passes through the Center of it.
- 16. While holding the BODY (30) secure, turn the RECEIVER (22) clockwise to engage the Threads and using a 1/4" hex key, tighten the RECEIVER into the BODY to a torque of 80 to 100 in-lbs.
- 17. Lubricate and install PORT PLUG O-RINGS (19, 21) onto the PORT PLUGS (18, 20). While holding the BODY (30) secure, install the PORT PLUGS into the BODY, tightening clockwise with a 5/32" hex key to a torque of 35 to 40 in-lbs.
- 18. Lubricate and install all Hose O-rings onto Hoses and install the Hoses into the BODY (30). While holding the BODY secure, tighten the LP Second Stage Hose(s) clockwise with a 9/16" open end wrench, the HP Hose(s) with a 5/8" open end wrench, and the LP Inflator Hose(s) with either a 9/16" or 1/2" open end wrench, to a torque of 35 to 40 in-lbs.

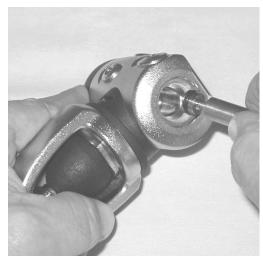


Fig. 18



Fig. 19



Fia. 20

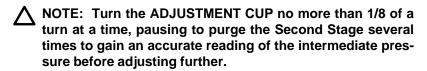
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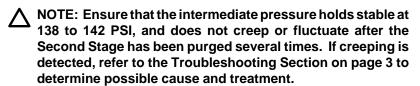
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 \sum CAUTION: Be certain NOT to install any Low Pressure Hose into a High Pressure Port using an adaptor.

FINAL ADJUSTMENT

WARNING: A TDX5 Titanium First Stage must never be connected to a breathing gas supply that contains more than 40% Oxygen by volume.

- Connect a recently calibrated Intermediate Pressure Test Gauge to a Low Pressure Hose, and connect the First Stage with Second Stage and Low Pressure Test Gauge to a pure breathing gas source of 3000 PSI. Slowly open the supply valve to pressurize the Regulator, and purge the Second Stage several times.
- 2. Adjust the intermediate pressure, if necessary, to read 138 to 142 PSI by turning the ADJUSTMENT CUP (38) clockwise to increase the pressure or counter clockwise to decrease it (Fig. 21).





- 3. Insert the TRANSFER PISTON (39) into the ENVIRONMENTAL END CAP (35) (Fig. 22).
- 4. Turn the air supply off and bleed off intermediate pressure. Insert the ENVIRONMENTAL DIAPHRAGM (40) over the Top of the ENVIRONMENTAL END CAP (35) with the thin Perimeter Seal facing down. Ensure that the Perimeter Seal is seated completely into the circular Groove in the ENVIRONMENTAL END CAP (Fig. 23).
- Thread the ENVIRONMENTAL CAP (41) onto the ENVIRON-MENTAL END CAP (35), being very careful to avoid cross threading, and tighten clockwise by hand until secure. DO NOT use tools to tighten.
- 6. Turn on the air supply and purge the Second Stage several times, and check once more to ensure proper intermediate pressure of 138 to 142 psi.



Fig. 21



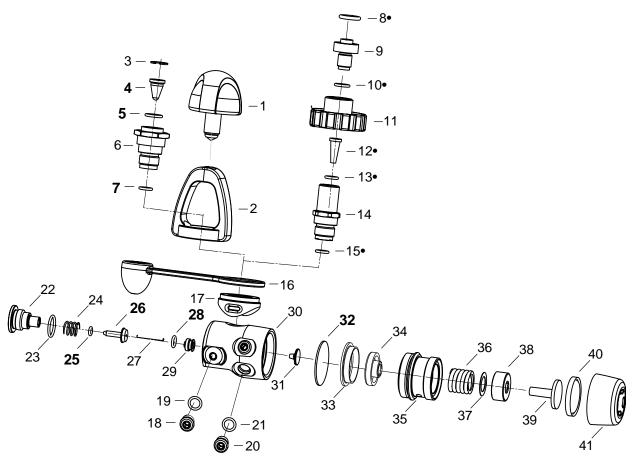
Fig. 22



Fia. 23



Dia. No. Part#	Description	Dia. No. Part #	Description	
	'		<u>'</u>	
YOKE VERSIO			I VERSIONS (continued)	
1c 6875	SCREW, YOKE	22c 6869	RECEIVER	
2c 6622	YOKE	23c 6508	O-RING, RECEIVER	
3c 3530	CLIP, RETAINING	24c 6512	SPRING, RETAINING	
4a 3545	FILTER, CONE	25a• 6498	O-RING, HP SEAT	
5a 2.013	O-RING, FILTER	26a• 6490	SEAT, HP	
6c 6865	RETAINER, YOKE	27c 6698	PIN, TRANSFER	
7a 2.011	O-RING, RETAINER	28a• 2.010	O-RING, HP CONE	
		29c 6697	CONE, HP	
DIN VERSION		30c 6873	BODY	
8a• 6374	O-RING, DIN FACE	31c 6868	BUTTON	
9c 6871	RETAINER, DIN FILTER	32a• 6778	DIAPHRAGM	
10a• 2.012	O-RING, RETAINER	33b 4917	WASHER, DIAPHRAGM	
11c 6872	WHEEL, DIN COUPLER	34c 6540	PLATE, DIAPHRAGM	
12a• 4546	FILTER, DIN CONE	35c 6866	CAP, ENVIRONMENTAL END	
13a• 2.011	O-RING, FILTER	36c 6717	SPRING, DIAPHRAGM	
14c 6870	HOUSING, DIN FILTER	37b 6524	WASHER, SPRING	
15a• 2.011	O-RING, FILTER HOUSING	38c 6862	CUP, ADJUSTMENT	
		39c 6516	PISTON, TRANSFER	
YOKE and DIN	VERSIONS	40c 6511	DIAPHRAGM, ENVIRONMENTAL	
16c 6560	CAP, PROTECTOR (BK)	41c 6711	CAP, ENVIRONMENTAL	
17c 6585	SADDLE			
18c 6864	PLUG, HP PORT	ANNUAL SER	ANNUAL SERVICE PARTS KITS	
19c 3.904	O-RING, HP PORT PLUG	40.6126	KIT, YOKE CONNECTION SERVICE PARTS	
20c 6863	PLUG, LP PORT		(Includes all Bold items.)	
21c 3.903	O-RING, LP PORT PLUG	40.6127	KIT, DIN CONNECTION SERVICE PARTS	
			(Includes all • items)	



SUPPLEMENTAL INFORMATION

DIN FITTING

In the event that the complete DIN Fitting comes off the First Stage when the DIN FILTER RETAINER is being removed during Disassembly (step 19D, page 6), it will be necessary to disassemble the Fitting to replace the FILTER.

The DIN FILTER HOUSING has a hex machined into the end opening of the Inner Barrel. Hold the HOUSING with a 7/32" hex key and remove the DIN FILTER RETAINER using a 1/4" hex key.

Dia. Part No. 31 (BUTTON) and 32 (DIAPHRAGM)

As described in Reassembly Procedure, step 2 on page 9, the Button Alignment Tool is to be used to affix the BUTTON to the DIAPHRAGM prior to installing them in the Regulator BODY. Refer to the Instructions, Doc. No. 12-2376, provided with the Button Alignment Tool that is enclosed in the Service Parts Kit.