



FDX-10

(BALANCED DIAPHRAGM)

SERVICE PROCEDURE

This FDX-10 Service Procedure conveys a list of components and service procedures that reflect the FDX-10 as it was configured at the time of this writing (3/8/05).

FDX-10 BALANCED DIAPHRAGM FIRST STAGE

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GENERAL PROCEDURES

REFER TO	DOC. 12-2202
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SPECIFICATIONS

Torques

P/N 6564	Yoke Retainer	23 to 25 ft-lbs
P/N 4544-200	DIN Filter Retainer	16 to 18 ft-lbs
P/N 6740	DIN Filter Housing	16 to 18 ft-lbs
P/N 3462	HP Port Plug	35 to 40 in-lbs
P/N 3463	LP Port Plug	35 to 40 in-lbs
P/N 6678	Receiver	80 to 100 in-lbs
P/N 6887	Environ. End Cap	20 to 22 ft-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

Intermediate Pressure

Preferred	138 to 142 psi
Acceptable	137 to 143 psi

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
 5/32" Allen Key
 5/16" Allen Key
 1/4" Allen Key
 Soft Jawed Vise
 Magnifying Lens
 Soft Probe (Wooden Dowel)

Specialty Tools

P/N 40.2302	Christo-Lube MCG111 - 2 oz
P/N 40.6536.1	HP Cone Tool
P/N 40.6671	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

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TROUBLE SHOOTING		
SYMPTOM	POSSIBLE CAUSE	TREATMENT
* Restricted airflow and inhalation resistance through complete system.	<ol style="list-style-type: none"> 1. Cylinder valve not completely opened. 2. Cylinder valve requires service. 3. DRT FILTER (6,14) is contaminated. 	<ol style="list-style-type: none"> 1. Open valve completely. 2. Connect Regulator to a different cylinder. 3. Replace with new and perform a complete service.
* Air leakage detected from beneath the ADJUSTMENT CUP (38) inside the ENVIRONMENTAL END CAP (35).	<ol style="list-style-type: none"> 1. ENVIRONMENTAL END CAP (35) is loose. 2. DIAPHRAGM (33) is worn or damaged. 3. SPRING SHOE (34) is damaged or incorrectly seated. 4. Seating surface inside BODY (31) is damaged. 	<ol style="list-style-type: none"> 1. Tighten END CAP onto BODY, using prescribed torque value in Reassembly Procedure. 2. Replace with new. 3. Reseat or replace with new. 4. Replace BODY with new.
* Air leakage detected from RECEIVER (22).	<ol style="list-style-type: none"> 1. RECEIVER O-RING (23) is damaged or worn. 2. Seating surface inside the BODY (31) is damaged. 3. Seating surface on the RECEIVER (22) is damaged. 	<ol style="list-style-type: none"> 1. Replace with new. 2. Replace with new. 3. Replace with new.
* Insufficient intermediate pressure.	<ol style="list-style-type: none"> 1. ENVIRONMENTAL END CAP (35) is loose. 2. First Stage improperly adjusted. 3. DIAPHRAGM SPRING (36) is weakened or damaged. 4. Seating surface of BODY (31) beneath DIAPHRAGM (33) is damaged. 	<ol style="list-style-type: none"> 1. Tighten END CAP onto BODY, using prescribed torque value in Reassembly Procedure. 2. Readjust according to procedure specified in Reassembly Procedure. 3. Replace with new. 4. Replace BODY with new.
* Excessive intermediate pressure/intermediate pressure creeps.	<ol style="list-style-type: none"> 1. First Stage improperly adjusted. 2. HP SEAT (26) damaged or worn. 3. HP SEAT O-RING (25) damaged or worn. 4. Seating surface of HP SEAT (26), or RECEIVER (22), or HP CONE (27), or BODY (31) is damaged. 5. RETAINING SPRING (24) is weakened or damaged. 	<ol style="list-style-type: none"> 1. Readjust according to Reassembly 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 prior to disassembling the Regulator. Review the Troubleshooting Section 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 second stage 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.

2. Remove and inspect the O-RINGS now visible on all these items for any signs of decay. Discard if found.

CAUTION: It is important to remove the RECEIVER (22) End Components first to avoid damage to the Cone of the HP ORIFICE (25) located inside the BODY (31).

3. Using 1/4" hex key, turn the RECEIVER (22) in a counter clockwise direction to remove it from the BODY (31) (Fig. 1).

4. Remove the HP SEAT (24) from the RECEIVER (22). Discard, regardless of condition, and DO NOT attempt to reuse it.

5. Remove the RETAINING SPRING (24). Using the magnifier, closely examine the SPRING for any signs of corrosion. Discard if found and DO NOT attempt to reuse.

6. 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 it.

7. Remove and inspect the RECEIVER O-RING (23) for any signs of decay. Discard if found.

8. Turn the ENVIRONMENTAL CAP (42) counter clockwise by hand to loosen and remove it.

9. Remove the ENVIRONMENTAL DIAPHRAGM (41) from the ENVIRONMENTAL CAP (42). Examine the condition of the DIAPHRAGM, checking for any signs of wear, distortion, corrosion, or perforation. Discard if found.

10. Lift the STYLING RING (40) off the Collar of the ENVIRONMENTAL END CAP (35). Inspect the RING for any signs of wear or deterioration. Discard if found.

11. Remove the BODY UPPER BOOT (30) from the BODY (31) using care not to lose any of the 4 BODY BOOT RETAINING SCREWS (43) (Fig. 3).



Fig. 1

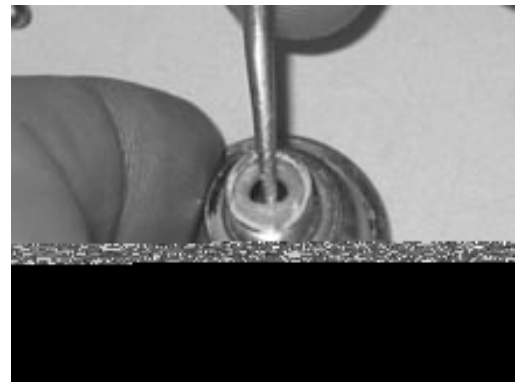


Fig. 2



Fig. 3

FDX-10 BALANCED DIAPHRAGM FIRST STAGE

12. Secure the First Stage in a soft-jawed or well padded vise and apply a 3/8" socket drive wrench with a Hook/Wrench Link (from End Cap Tool) to the ENVIRONMENTAL END CAP (35) (Fig. 4). Turn the CAP counter clockwise to remove it from the BODY (31). Lift out the SPRING SHOE (34) and inspect it 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.

13. Remove the ENVIRONMENTAL END CAP (35) from the vise and remove the TRANSFER PISTON (39) by pressing in on the Shaft with your finger. Check for any signs of wear, distortion, or corrosion. Discard if found.

14. Place the First Stage on the repair bench, situated with the YOKE SCREW, or DIN Connector, facing farthest away, vertically. Holding the YOKE, or DIN Connector, firmly in place, apply a 5/16" hex key to the ADJUSTMENT CUP (38), and turn counter clockwise to remove it (Fig. 5).

15. Remove the SPRING WASHER (37) and DIAPHRAGM SPRING (36). Inspect the WASHER for any signs of wear or distortion. Discard if found.

16. Using a magnifier, closely inspect the DIAPHRAGM SPRING (36) for any signs of corrosion. Discard if found and DO NOT attempt to reuse.

17. 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. Ensure that the PROTECTOR CAP (17) is securely sealed over the DRT YOKE RETAINER (3) or DRT DIN RETAINER (9).

18. Remove the DIAPHRAGM (33) from the BODY (31) 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 and discard, regardless of its condition, and DO NOT attempt to reuse it.

⚠ NOTE: The DIAPHRAGM can also be removed by pressing the PIN portion of the BUTTON/PIN (32) through the other side with a wooden dowel.

⚠ CAUTION: DO NOT attempt to remove the DIAPHRAGM with the use of a metallic instrument. Doing so will seriously damage the brass seating surface of the BODY (31).

19. Remove the BUTTON/PIN (33) and inspect it for signs of wear or distortion. Discard if found.



Fig. 4



Fig. 5



Fig. 6

FDX-10 BALANCED DIAPHRAGM FIRST STAGE

20. Gently insert the longer, tapered end of an HP Cone Tool directly into the HP CONE (27), which is held inside the BODY (31). Pull the Tool straight out to remove the HP CONE from the BODY (Fig. 7).
21. Remove the HP CONE O-RING (28), being very careful to avoid damaging the HP CONE (27). Discard the O-RING, and DO NOT attempt to reuse it. Inspect the HP CONE for any signs of damage or corrosion. Discard if found.
22. 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.
23. Secure the First Stage BODY (31) in a soft jawed or well padded vise with the YOKE Assembly, or the DIN Connector, facing up.

⚠ 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.

△ NOTE: The FDX-10 utilizes Dry Regulator Technology (DRT) that is configured with a FILTER and other components that are different than standard First Stage components. For units received with YOKE Connectors perform step 24Y, for units received with DIN Connectors perform step 24D.

24Y. DRT Yoke Connector Disassembly:

- A. Remove the YOKE SCREW (1) from the YOKE (2).
- B. Apply a thin wall, or modified, 1" open end wrench to the DRT YOKE RETAINER (3). Using firm steady force, turn it counter clockwise to remove it. DO NOT use impact to loosen.

△ NOTE: It is important that the wrench is properly seated over the entire Hex portion of the DRT YOKE RETAINER (3) to prevent any damage to the part (Fig. 8).

C. Remove the DRT YOKE RETAINER (3), YOKE (2), and PROTECTOR CAP (17).

D. Remove and discard the DRT RETAINER O-RING (7) and DO NOT attempt to reuse them.

E. Remove the DRT FILTER (6), DRT PLUNGER SPRING (5), and DRT PLUNGER (4) from the DRT YOKE RETAINER (3) (Fig. 9). Discard the FILTER and PLUNGER and DO NOT attempt to reuse them.



Fig. 7



Fig. 8



Fig. 9

FDX-10 BALANCED DIAPHRAGM FIRST STAGE

24D. DRT DIN Connector Disassembly:

- A. Apply a 1/4" hex key to the DRT DIN RETAINER (9) and loosen it in a counter clockwise direction to remove it (Fig. 10).
- B. Remove and discard the DRT RETAINER OUTER and INNER O-RINGS (8/10). DO NOT attempt to reuse them.
- C. Lift the DIN COUPLER WHEEL (10) straight off the DRT DIN FILTER HOUSING (15), remove the PROTECTOR CAP (17).
- D. Apply a 13/16" open end wrench to the Flange at the base of the DRT DIN FILTER HOUSING (15) (Fig. 11).
- E. Using firm, steady force, loosen in a counter clockwise direction to remove IT. DO NOT use impact to loosen.

△ NOTE: It is important that the wrench is deep enough to seat entirely over the Flange to avoid any damage to the seating surface.

F. After removing the DRT DIN FILTER HOUSING (15) from the BODY (31), turn it over and remove the DRT PLUNGER (12), DRT PLUNGER SPRING (13), and DRT DIN FILTER (14). Discard the FILTER and and PLUNGER and DO NOT attempt to reuse them.

G. Inspect the DRT PLUNGER SPRING (13) for any signs of distortion or corrosion. Discard if found.

25. Using your thumbs, push and peel the BODY LOWER BOOT (29) off of the BODY (31). Check for any signs of damage or distortion. Discard if found.



Fig. 10



Fig. 11

REASSEMBLY PROCEDURE

△ NOTE: Prior to reassembly, it is necessary to inspect all parts, both new and those that are being reused. Check to ensure that O-RINGS are clean and supple, and that every part and component has been thoroughly cleaned.

⚠ WARNING: Use only genuine Oceanic parts, subassemblies, and components whenever assembling Oceanic products. DO NOT attempt to substitute an Oceanic part with another manufacturer's, regardless of any similarity in shape, size, or appearance. Doing so may render the product unsafe, and could result in serious injury or death of the user.

1. Install the BODY LOWER BOOT (29) onto the BODY (31) ensuring that it is oriented properly
2. Secure the First Stage BODY in a soft jawed or well padded vise, with the Threaded HP Inlet Bore facing straight up.

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⚠ 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.

△ NOTE: For units received with YOKE Connectors perform step 3Y, for units received with DIN Connectors perform step 3D.

3Y. DRT Yoke Connector Reassembly:

A. Install the DRT PLUNGER (4), DRT PLUNGER SPRING (5), and DRT FILTER (6) into the DRTYOKE RETAINER (3) (Fig. 12).

B. Lubricate and install the DRT RETAINER O-RING (7) into the Groove on the end.

C. Insert the Threaded End of the DRT YOKE RETAINER (3) through the YOKE (2), facing opposite the end that holds the YOKE SCREW (1).

D. Place the Loop End of the PROTECTOR CAP (17) over the raised Lip of the BODY BOOT (29/30), and hold it in place. Holding the DRT YOKE RETAINER (3), and YOKE (2) together between your thumb and forefinger, mate the DRT YOKE RETAINER into the BODY (31), 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 (Fig. 13), tighten it **to a torque of 16-18 ft-lbs.**

E. Install the YOKE SCREW (1) into the YOKE (2).

3D. DRT DIN Connector Reassembly:

A. Lubricate and install the DRT DIN FILTER HOUSING O-RING (16) onto the DRT DIN RETAINER (9) at the Base of the Filter Cavity.

B. Install the DRT DIN FILTER HOUSING (15) into the BODY (31) so that the Threads seat properly, and hand tighten in a clockwise direction until secure.

C. Using a thin-wall, or modified, 13/16" open end wrench that is properly seated over the entire seating surface of the DRT DIN FILTER HOUSING (15) Flange, tighten **to a torque of 16-18 ft-lbs.**

D. Install the DRT DIN FILTER (14), DRT PLUNGER SPRING (13), and DRT PLUNGER (12) into the DRT DIN FILTER HOUSING (15).

E. Place the Loop End of the PROTECTOR CAP (18) over the raised Lip of the BODY BOOT (29/30), and hold it in place.



Fig. 12



Fig. 13

FDX-10 BALANCED DIAPHRAGM FIRST STAGE

F. Install the DIN COUPLER WHEEL (11) down over the Stem of the DRT DIN FILTER HOUSING (15), with the Threaded End facing up.

G. Lubricate and install the DRT DIN RETAINER OUTER and INNER O-RINGS (8/10) onto the DRT DIN RETAINER (9).

H. Insert the Threaded End of the DRT DIN RETAINER (9) through the DIN COUPLER WHEEL (11), into the DRT DIN FILTER HOUSING (15), and tighten it until secure. Apply a 1/4" hex socket and tighten it **to a torque of 16-18 ft-lbs.**

4. Lubricate and install the HP CONE O-RING (28) onto the HP CONE (27), and place the Sealing Edge of the HP CONE down onto the smaller end of a clean HP Cone Tool. Use care not to damage the Seating Surface of the HP CONE as this is done.
5. Guide the HP CONE/Tool Assembly into the HP Chamber of the BODY (31), taking care to properly align the HP CONE (27) with the Recess in the HP Chamber (Fig. 14). Carefully press the HP CONE completely into place and withdraw the Tool, pulling it straight out.
6. Place the Stem of the BUTTON/PIN (32) directly into the Center Hole in the BODY (31), ensuring that it enters without any restriction (Fig. 15).
7. Position the DIAPHRAGM (33) flat, directly over the Opening of the BODY (31). Gently push the edges of the DIAPHRAGM down inside the internal Threads of the BODY, one Thread at a time. Rotate the BODY while doing this, to facilitate an even seating of the DIAPHRAGM, and closely inspect it to ensure it is well seated at the Base of the Threads (Fig. 16).

⚠ 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.

8. Place the SPRING SHOE (34) into the BODY (31) on top of the DIAPHRAGM (33) with the Collar facing up.
9. Thread the ENVIRONMENTAL END CAP (35) into the BODY (31) turning it clockwise by hand until secure.
10. Secure the First Stage BODY in a soft jawed or well padded vise, and using a 3/8" socket drive wrench with a Hook/Wrench Link (from End Cap Tool), tighten the ENVIRONMENTAL END CAP (35) into the BODY (31) **to a torque of 20-22 ft-lbs** (Fig. 17).
11. Apply a very light film of lubricant (Christo Lube MCG111) to both ends of the DIAPHRAGM SPRING (36), and insert it down through the ENVIRONMENTAL END CAP (35) on to the SPRING SHOE (34).



Fig. 14



Fig. 15



Fig. 16



Fig. 17

FDX-10 BALANCED DIAPHRAGM FIRST STAGE

12. Place the SPRING WASHER (37) directly onto the upper end of the DIAPHRAGM SPRING (36) and install the ADJUSTMENT CUP (38) into the ENVIRONMENTAL END CAP (35) (Fig. 18). Using a 5/16" hex key, turn the ADJUSTMENT CUP clockwise until only 2 threads are showing (Fig. 19).
13. Lightly lubricate and install the RECEIVER O-RING (23) onto the RECEIVER (22) and the HP SEAT O-RING (24) into the Inner Bore of the RECEIVER. Lightly lubricate the Threads of the RECEIVER.
14. Apply a very light film of lubricant to Both Ends of the RETAINING SPRING (24) and the Lower 1/4" of the Shaft of the HP SEAT (26). Install the RETAINING SPRING onto the End of the RECEIVER (22).
15. 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. 20).
16. While looking into the BODY (31) so that you can see the PIN portion of the BUTTON/PIN (32), insert the SEAT/RECEIVER Assembly directly into the Center of the RECEIVER Opening in the BODY (Fig. 21). Use care to ensure that the Hole in the Center of the HP SEAT (26) goes straight down over the PIN.
17. While holding the BODY (31) secure, turn the RECEIVER (22) clockwise to engage the Threads. Then, using a 1/4" hex key, tighten the RECEIVER into the BODY **to a torque of 80-100 in-lbs** (Fig. 22).
18. Lubricate and install PORT PLUG O-RINGS (19/21) onto the PORT PLUGS (18/20). While holding the BODY (31) secure, install the PORT PLUGS into the BODY, tightening clockwise with a 5/32" hex key socket **to a torque of 35-40 in-lbs**.
19. Ensuring proper alignment with the BODY LOWER BOOT (29), install the BODY UPPER BOOT (30) with 4 BODY BOOT RETAINING SCREWS (43) onto BODY (31).
20. Lubricate and install all Hose O-rings onto Hoses and install the Hoses into the BODY (31). While holding the BODY secure, tighten the low pressure Second Stage Hose(s) clockwise 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(s) with either a 9/16" or 1/2" open end wrench, to **a torque of 35-40 in-lbs**.

NOTE: It is important to connect the primary Second Stage to the LP port identified by the letter R molded onto the BODY BOOT (29/30) above it for optimum performance.

CAUTION: Be certain not to install any low pressure Hose into a high pressure PORT via an adaptor.



Fig. 18



Fig. 19



Fig. 20



Fig. 21



Fig. 22

FDX-10 BALANCED DIAPHRAGM FIRST STAGE

FINAL ADJUSTMENT

1. Connect a recently calibrated Low 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. 23).

△ NOTE: Turn the ADJUSTMENT CUP (38) no more than 1/8 of a turn at a time, pausing to purge the Second Stage several times to gain an accurate reading of the intermediate pressure before adjusting further.

△ NOTE: Ensure that the intermediate pressure holds stable at 138 TO 142 PSI, and does not creep or fluctuate after the Second Stage has been purged several times. If creeping is detected, refer to the Troubleshooting Section to determine possible cause and treatment.



Fig. 23

ENVIRONMENTAL COMPONENT REASSEMBLY

1. Turn the air supply off and bleed off intermediate pressure.
2. Insert the TRANSFER PISTON (39) into the ENVIRONMENTAL END CAP (35) (Fig. 24).
3. Place the STYLING RING (41), larger diameter end first, down over the Threads and on to of the Collar of the ENVIRONMENTAL END CAP (35)
4. Place the ENVIRONMENTAL DIAPHRAGM (41) over the Top of the ENVIRONMENTAL END CAP (35), ensuring that it is positioned evenly (Fig. 25).
5. Thread the ENVIRONMENTAL CAP (42) onto the ENVIRONMENTAL 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.

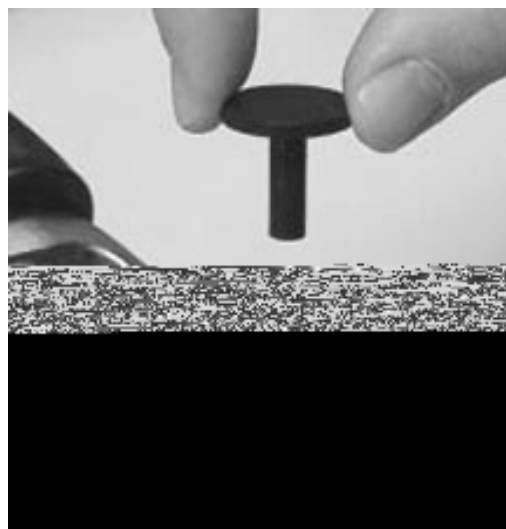


Fig. 24



Fig. 25

FDX-10 BALANCED DIAPHRAGM FIRST STAGE

