FLUKE®
Calibration

P5521 & P5522

Liquid Separator

Users Manual

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Chapter 1
Preparation

Introduction

This manual applies to the P5521 and P5522 Liquid Separators.

The Liquid Separator is used to separate the working fluid of the deadweight tester to which it is fitted, from the working fluid in the device under test. This prevents contamination of either hydraulic system, and allows calibration of the device in its specific working fluid. See Schematic, 1-1, at the end of this Chapter.

Note

The term "Device Under Test (DUT)" in this document refers to any pressure-measuring instrument such as Gauges, Transfer Standards, Digital Calibrators and Transducers.

The two liquids are separated by flexible diaphragm held across the internal chamber.

How to Contact Fluke

To order accessories, receive operating assistance, or get the location of the nearest Fluke distributor or Service Center, call:

- Technical Support USA: 1-800-99-FLUKE (1-800-993-5853)
- Calibration/Repair USA: 1-888-99-FLUKE (1-888-993-5853)
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31-402-675-200
- China: +86-400-810-3435
- Japan: +81-3-3434-0181
- Singapore: +65-738-5655
- Anywhere in the world: +1-425-446-5500

Or, visit Fluke's website at www.fluke.com.

To register your product, visit http://register.fluke.com.

To view, print, or download the latest manual supplement, visit http://us.fluke.com/usen/support/manuals.

Operating Fluid Compatibility

The table below details the sealing materials used in the two versions of this instrument. The P5521 is designed to work with a wide range of fluids compatible with Viton, but the P5522 is specifically designed for use with Skydrol, brake fluids and other, similar aggressive fluids compatible with PTFE and EPDM. The maximum working pressure of the P5522 is limited to 7,000 psi / 500 bar, due to the PTFE diaphragm.

Table 1-1. Operating Fluid Compatibility

Model	Diaphragm	O Rings
P5521 (MWP 10,000 psi / 700 bar)	Viton	Viton
P5522 (MWP 7,000 psi / 500 bar)	PTFE	Ethylene Propylene

Safety Information

Safety Summary

The following are general safety precautions that are not related to any specific procedures and do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during equipment operation and maintenance to ensure safety and health and protection of property.

Compressed Liquid

Use of compressed liquids can create an environment of propelled foreign matter. Pressure system safety precautions apply to all ranges of pressure. Care must be taken during testing to ensure that all hydraulic connections are properly and tightly made prior to applying pressure. Personnel must wear eye protection to prevent injury.

Personal Protective Equipment

Wear eye protection approved for the materials and tools being used.

Symbols Used in this Manual

In this manual, a **Warning** identifies conditions and actions that pose a hazard to the user. A **Caution** identifies conditions and actions that may damage the Liquid Separator.

Symbols used on the Liquid Separator and in this manual are explained in Table 1-2.

Table 1-2. Symbols

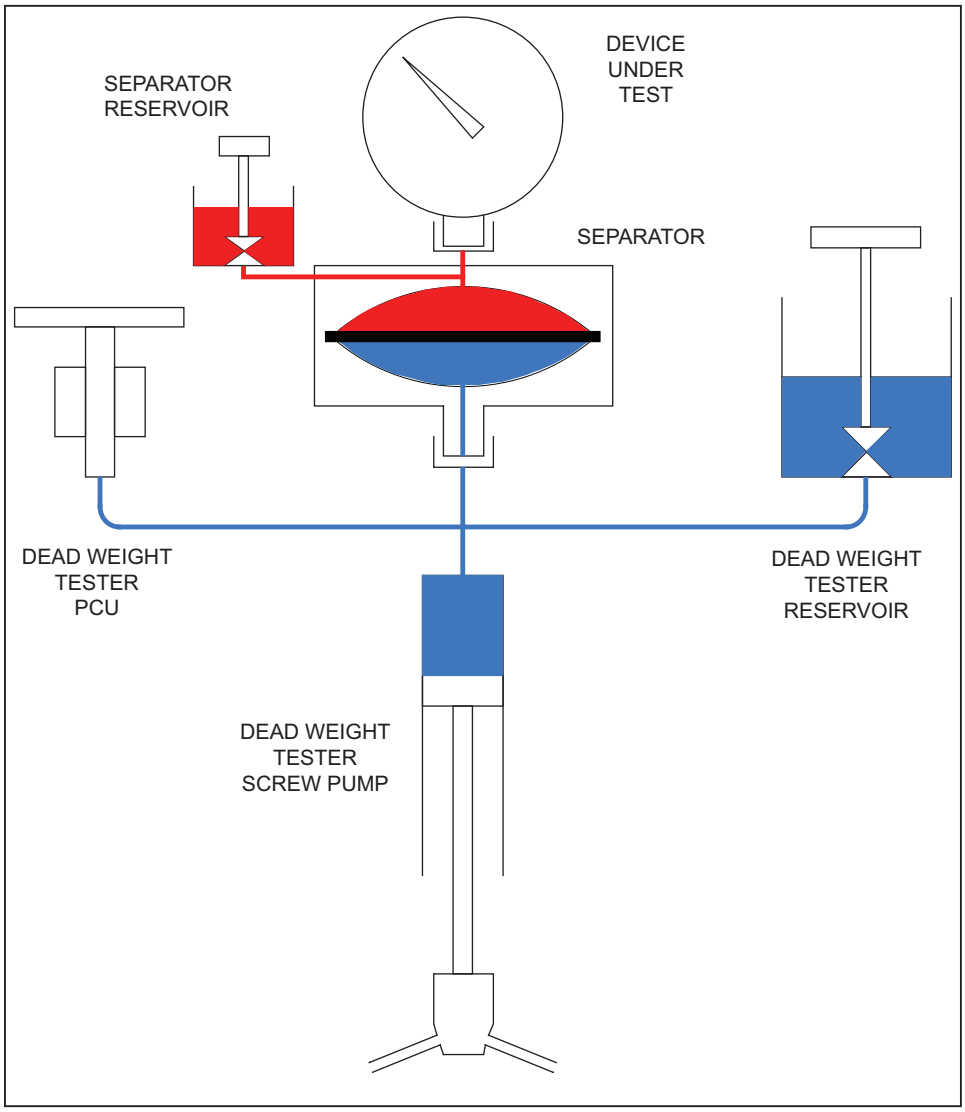
Symbol	Description
~	AC (Alternating Current)
⏚	Earth Ground
⚠	Important Information: refer to manual
	Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.

Applying Pressure Corrections

For ease of operation, the liquid separator is designed to be mounted directly to the test port on a deadweight tester. This creates an additional head of fluid above the pressure reference level on the deadweight tester, which means that 0.15 psi / 0.1 bar (or equivalent) should be deducted from the reading of the deadweight tester to maintain accuracy.

The flexible diaphragm will be displaced from the center of the chamber during normal operation, but its elastic properties will always tend to try to return it to central, neutral position. This "spring" effect exerts a small force on the fluid. As there is no way to determine the diaphragm's position relative to the center of the chamber at any given time, a "diaphragm rating" uncertainty of ± 0.15 psi / 0.1 bar (or equivalent) should be applied to the pressure reading to maintain accuracy.

Both of the above effects are relatively small "constant" errors, which can be important when calibrating at low pressures, but become less significant as the pressure increases.



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Figure 1-1. Schematic of Separator/Deadweight Tester Arrangement

Chapter 2
Connections

Introduction

Fit the device under test (DUT) to the test port using the method described below:

⚠ Caution

Ensure that all devices are internally clean and free from contamination before connecting to the separator.

Particle contamination can damage or puncture the diaphragm causing cross-contamination of both systems.

⚠ Warning

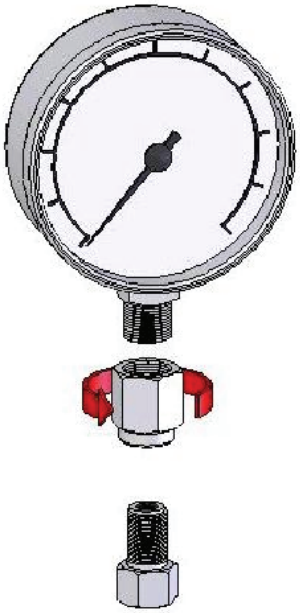
DO NOT use Teflon/PTFE tape on these connections as this will prevent correct sealing. The Gauge Adapter sealing system is designed for hand-tight sealing up to 20,000 psi / 1,400 bar-wrenches or similar tools are not required—over tightening can cause damage to threads or sealing faces.

Before connection, ensure that there is an O-ring fitted to the test port.

Check that the sealing face of the device to be fitted is clean and undamaged, as scratches or dents can form leak-paths.

Note

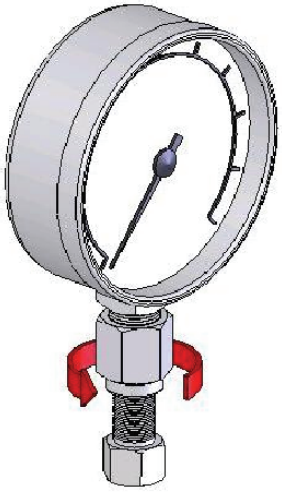
The thread on the test port, and the lower part of the gauge adapters is LEFT-HANDED. The following procedure details the correct method for mounting devices using these adapters:



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Figure 2-1. Connecting the Gauge

1. Screw the appropriate gauge adapter fully on to the instrument to be tested.
2. Screw assembly down COUNTER-CLOCKWISE on to test port.

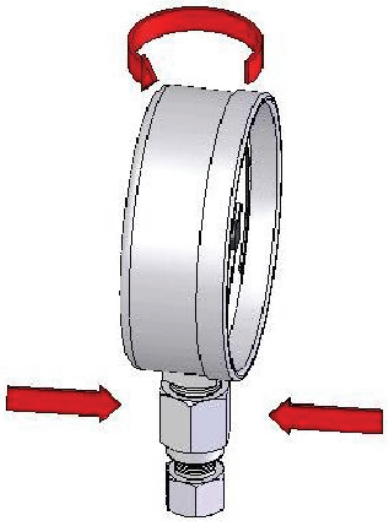


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Figure 2-2. Screw Assembly Down

Note

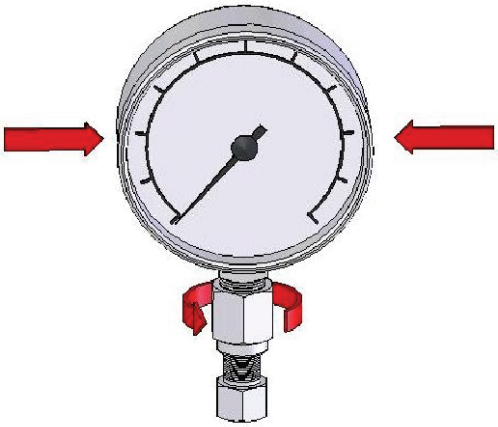
Hand-tight is sufficient; ensure that the bottom face contacts the O-ring on the test port.



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Figure 2-3. Adjust the Gauge

3. To adjust the position to face forward, hold the gauge adapter and turn the instrument COUNTER-CLOCKWISE, so that it faces forward.
4. Hold the instrument steady, while turning the gauge adapter COUNTER-CLOCKWISE until it pulls down onto the O-ring.



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Figure 2-4. Tighten the Gauge



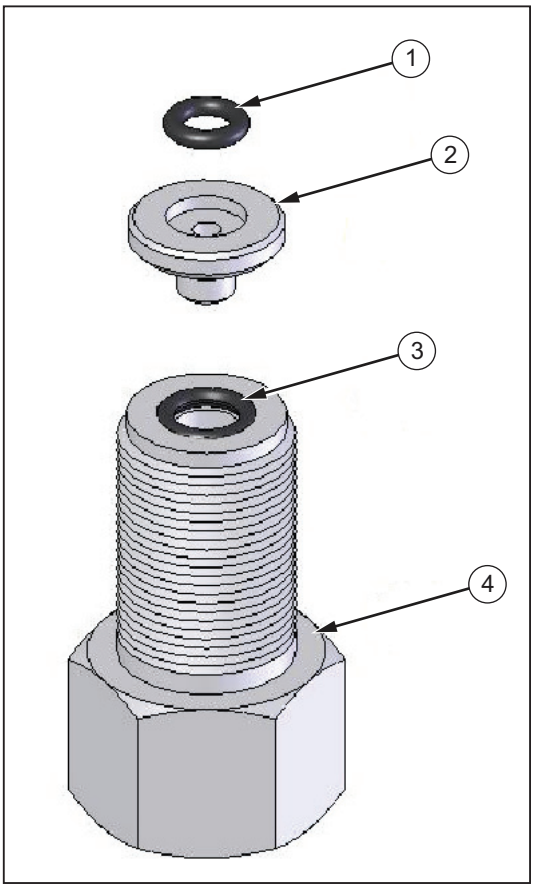
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Figure 2-5. Hand Tighten Only

Test Port Insert

For devices with 1/8 BSP or NPT mounting threads, the diameter of the thread is very close to the effective sealing diameter of the O-ring fitted to the test port.

This can make it difficult to achieve a good seal. When mounting these devices, use the test port insert as shown in Figure 2-6.



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Figure 2-6. Test Port Insert

Table 2-1. Test Port Insert Parts

Item	Description	PART	
		P5521	P5522
1	O Ring	3865163	3867888
2	Test Port Insert	3919892	3919892
3	O Ring	3883521	3867895
4	Test Port	3921119	3921119

To calibrate panel-mounted gauges with pressure connections in the rear, use an Angle Adapter, (See Chapter 5, Ancillary Equipment).

Chapter 3
Operation

Priming

⚠ Warning

To avoid damage to the instrument, the operator should check the quality of the operating fluid during use. If the fluid becomes discolored, cloudy or particles appear in the reservoir, the system should be drained and flushed with clean fluid.

1. Fit the separator to the deadweight tester using the adapter supplied, as described in Chapter 2, above.
2. Fit the DUT to the test port of the separator.
3. Rotate reservoir dust cover through ½ turn and fill reservoir (6) approximately ¾ full with the appropriate fluid. Rotate dust cover back to cover reservoir.
4. Open separator reservoir valve (1) one turn counter-clockwise.
5. Open deadweight tester reservoir valve one turn counter-clockwise, and turn screw press fully in.
6. Close reservoir valves on both separator and deadweight tester, and turn screw press fully out.
7. Open separator reservoir valve.
8. Repeat steps 4 through 7 at least three times to fully prime the deadweight tester side of the separator chamber.

Note

For devices with large or complex internal volumes, it may be necessary to additionally repeat steps 4 through 7.

9. Close deadweight tester reservoir valve, turn screw press in to drive trapped air into the separator reservoir.

⚠ Warning

Ensure that the system pressure does not exceed 15 psi / 1 bar.

10. Open deadweight tester reservoir valve, and turn screw press fully in.
11. Close deadweight tester reservoir valve, turn screw press fully out, then close separator reservoir valve (1).

12. Open deadweight tester reservoir valve; wait for a few seconds to allow the system pressure to equalize, then close the deadweight tester reservoir valve.

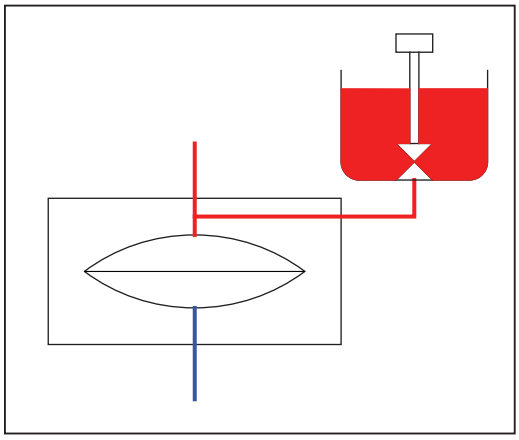
Operation

⚠ Warning

Do not exceed the maximum working pressure of the instrument.

Both sides of the hydraulic system are now primed, perform calibration of the DUT in accordance with the normal operation of the deadweight tester.

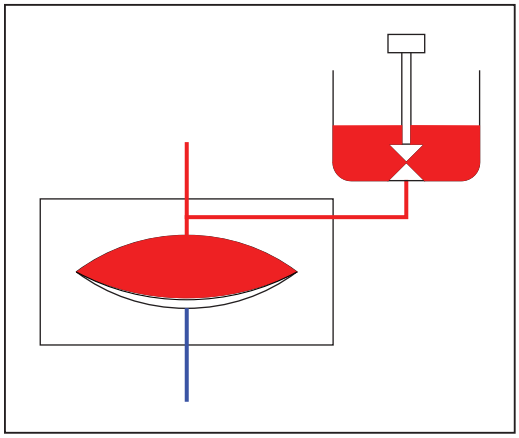
Separator as first mounted to deadweight tester.



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Figure 3-1. Diagram of Stage 1

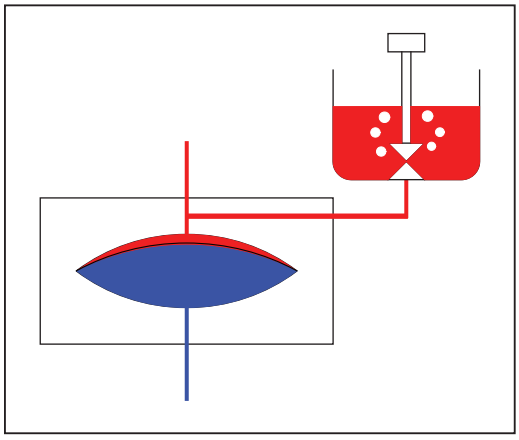
The liquid is drawn into upper section of separator chamber (above diaphragm), from the reservoir.



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Figure 3-2. Diagram of Stage 2

The liquid from the deadweight tester is forced into lower section of separator chamber (below diaphragm), displacing liquid and trapped air above diaphragm back into reservoir.



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Figure 3-3. Diagram of Stage 3

Chapter 4
Maintenance & Servicing

Introduction

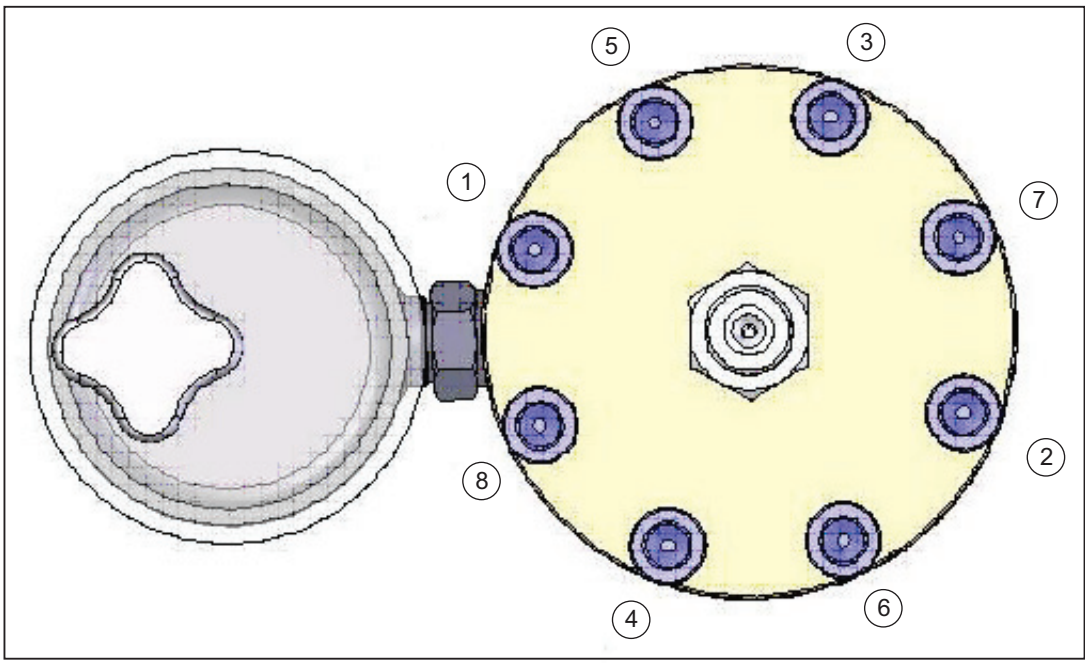
The Figures on the following pages detail the components of each assembly, together with the relevant part numbers.

Before beginning any maintenance, remove the separator from the deadweight tester, any instruments that may be mounted to the separator, and drain the fluid from the system.

Diaphragm Replacement

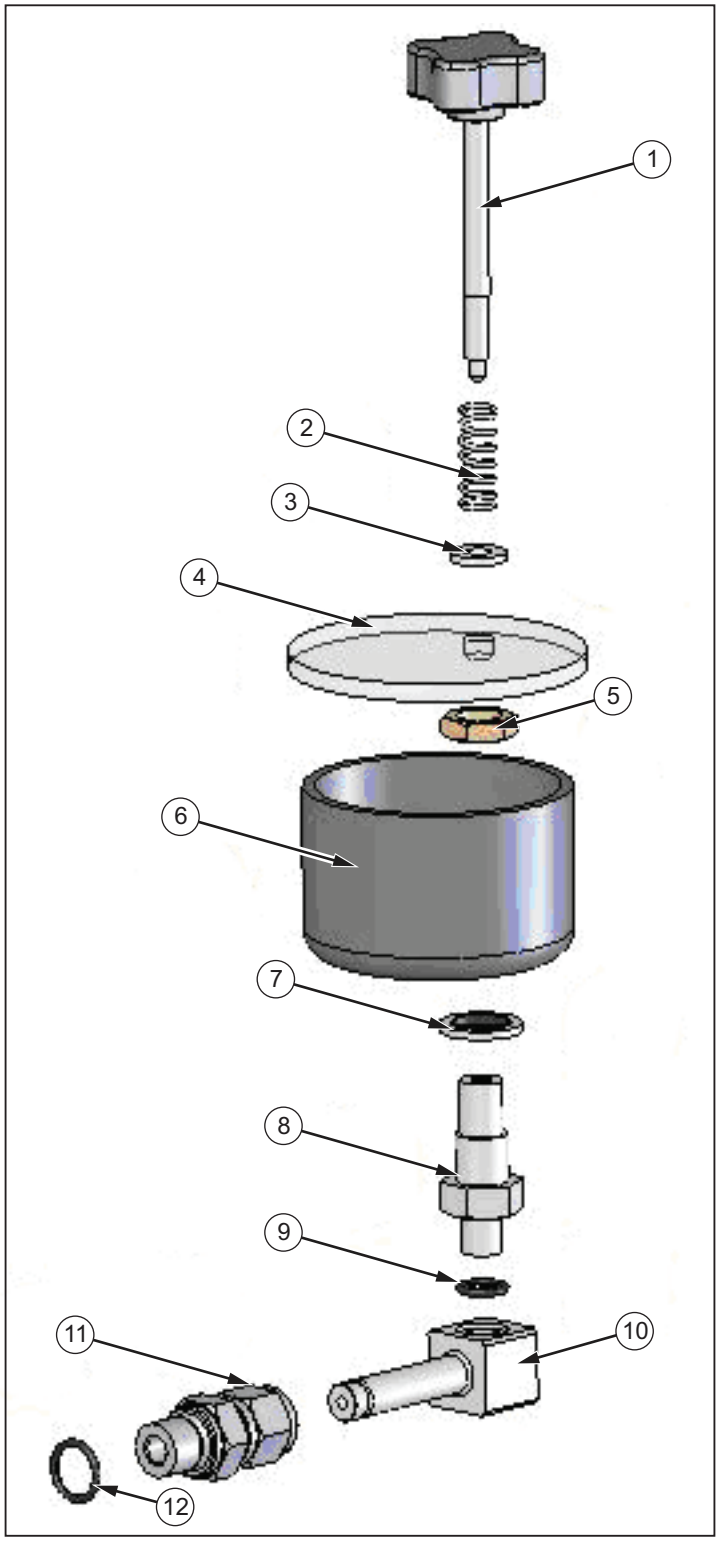
If deadweight tester fluid appears in the separator reservoir, or separator fluid appears in the deadweight tester reservoir, then the diaphragm has been damaged. To avoid further cross-contamination, the diaphragm must be replaced.

1. Remove the 8 screws (13) in the order shown in Figure 4-1.
2. Lift off the top plate (18) assembly.
3. Remove diaphragm (20) and o-ring (21).
4. Clean and inspect the inside surfaces of top plate (18) and bottom plate (22) for signs of damage.
5. Check the operation of the mushroom valve (19) in the top plate assembly—it should move easily, and be held off of the inside surface of the chamber by a light spring-force, in its rest position.
6. Replace both the diaphragm (20) and o-ring (21) with new items, ensuring that the o-ring groove is clean.
7. Place the top plate assembly over the bottom plate assembly, and replace the screws (13) finger-tight only.
8. Re-tighten the screws to 50 ft-lb in the order shown in Figure 4-1.



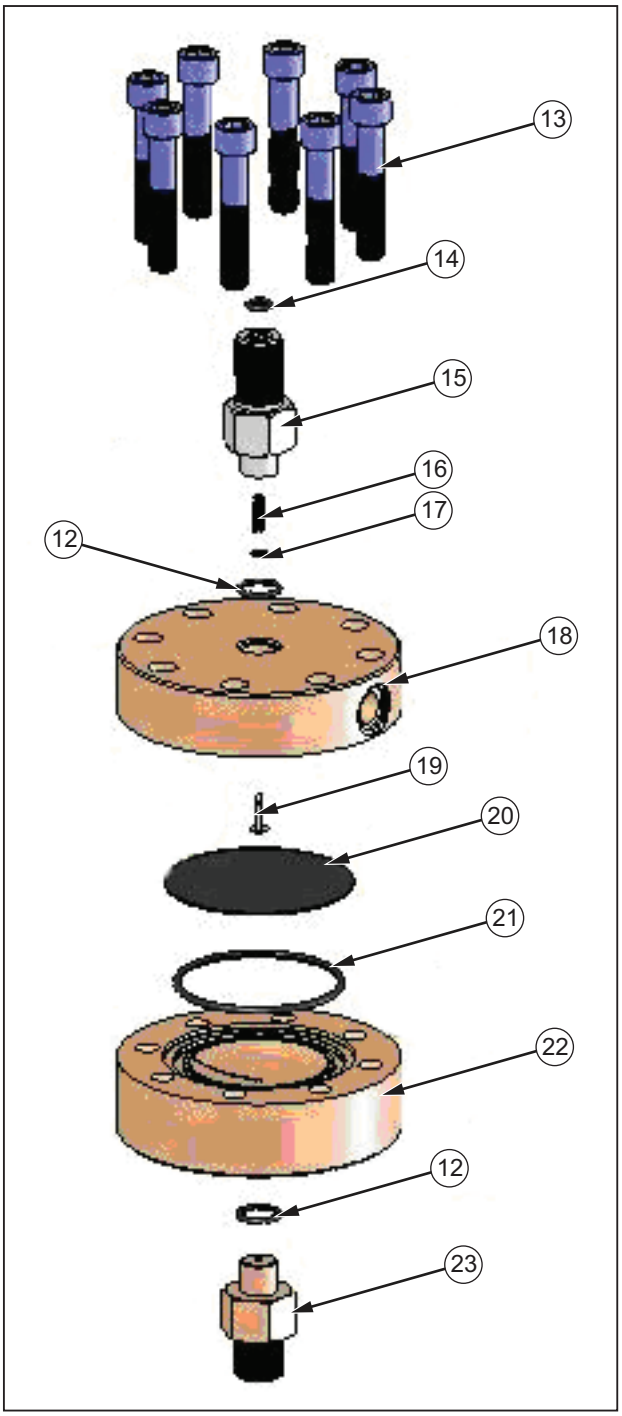
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Figure 4-1. Screw Torque Sequence



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Figure 4-2. Reservoir Assembly



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Figure 4-3. Pressure Chamber Assembly

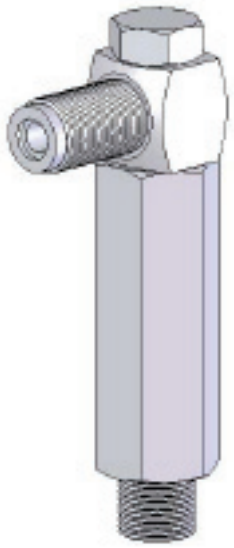
Table 4-1. P5521/P5522 - Parts List

Item	Description	Part	
		P5521	P5522
1	VALVE STEM ASSEMBLY	3885982	
2	SPRING	3922786	
3	NYLON WASHER	3916458	
4	RESERVOIR COVER	3918350	
5	LOCKNUT	3918244	
6	RESERVOIR	3919463	
7	BONDED SEAL	3922096	3922043
8	VALVE BODY	3923785	
9	O RING	3865277	3921986
10	ELBOW	3919417	
11	COUPLING	3868096	
12	O RING	3919393	3921999
13	SCREW	3910324	
14	O RING	3883521	3867895
15	TEST PORT	3921119	
16	SPRING	3919387	
17	SPRING CLIP	3919379	
18	SEPARATOR TOP PLATE	3919421	
19	MUSHROOM VALVE	3919442	
20	DIAPHRAGM	3919456	3919400
21	O RING	3864891	
22	SEPARATOR BOTTOM PLATE	3919439	
23	BOTTOM CONNECTOR	3923760	

Chapter 5
Ancillary Equipment

Angle Adapter, P5543

To calibrate gauges with the pressure connection on the rear (e.g. panel-mount gauges) in their correct position, an angle adapter should be used. The angle adapter fits directly onto the test station, converting it through 90 degrees, allowing the standard adapters to be used.



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Figure 5-1. Angle Adapter

Pointer Remover/Punch, P5551

To remove and refit the pointer of a pressure gauge, use the pointer remover/punch instrument. This tool has a spring-loaded plunger to quickly and consistently refit the pointer.



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Figure 5-2. Pointer Remover/Punch