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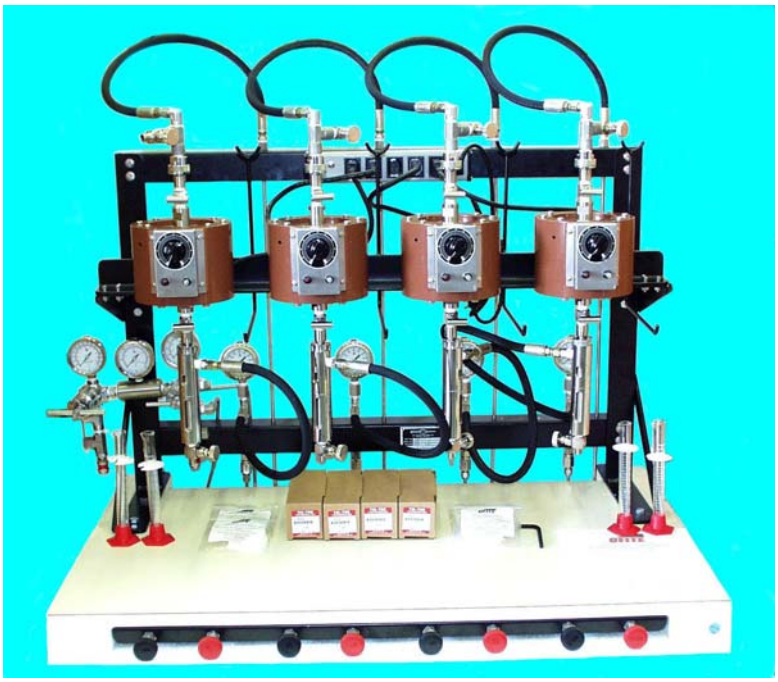

4-Unit Model MB HTHP Filter Press

#171-50-4: 115-Volt
#171-51-4: 230-Volt

Instruction Manual

Updated 7/26/2011
Ver. 2.2

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Intro

The 4-unit Model MB HTHP Filter Press assembly is designed for testing drilling fluids and cement under elevated temperatures and pressures. This simulates various downhole conditions and provides a reliable method for determining the effectiveness of the material being tested. The complete assembly consists of four standard 250-mL filter presses mounted in a convenient frame for regular laboratory or drilling rig usage. All filter press units are complete and ready for use after the assembly has been connected to a source of compressed nitrogen. It includes a dual nitrogen manifold for supplying up to 1,350 PSI (9,309 kPa) pressure to the cell and up to 750 PSI (5,171 kPa) to the back pressure assemblies.

Although all four units are supplied nitrogen at the same pressure, both the primary pressure to the cell (left regulator) and the back pressure (right regulator) can be turned on and off individually by valves mounted at the front of the work table base. The red knobs control the primary pressure flow of nitrogen to the cells and the black knobs control the flow to the back-pressure receivers. The pressure for each line is indicated by the gauge above each regulator and both pressure lines contain a check valve to prevent any accidental reverse flow of fluid.

The connection at the back of the dual manifold assembly has a standard ¼" pipe thread (NPT) with a ¼" tubing fitting so that the connection to the nitrogen bottle can be made with ¼", .035", or .049" wall stainless steel tubing or with a high pressure hose. Any system that is used must be rated at 1,500 PSI (10,343 kPa) or more working pressure.

Specifications

Size:	39.25" × 25.75" × 37.5" (99.7 × 65.4 × 95.3 cm)
Weight:	175 lb (79.5 kg)
Shipping Size:	46" × 31" × 44" (117 × 79 × 112 cm)
Shipping Weight:	250 lb (113.4 kg)
Maximum Temperature:	350°F (176°C)
Maximum Pressure:	1,500 PSI (10,342.5 kPa)
Pressure Source:	Nitrogen (at least 1500 PSI / 10,343 kPa)
Test Cell Capacity:	250 mL
Voltage:	115V or 230V (built to specification)
Heater:	200 Watt

Components

#142-58 O-ring for HTHP Coupling
#153-16 Glass Graduated Cylinder; 25 mL × 2/10 mL
#154-10 Dual-Scale Thermometer with Metal Dial; 5" Stem; 50° - 500°F; 0° - 250°C
#170-07 O-ring
#170-11 Heating Element; 115V; 200W
#170-19 2½" (6.35 cm) Filter Paper; Specially Hardened for Filter Presses
#171-24 1350 & 750 PSI Nitrogen Manifold
- #170-20 Manifold Block
- #171-23-1 Retainer Pin
- #171-24-001 Modified Regulator
- #171-25-1 Relief Valve; Set at 750 PSI
- #171-25-2 Relief Valve; Set at 1,350 PSI
- #171-26 5000# Hose; 3/16" × 3'; Qty: 2
- #171-28 Dual Manifold Body
- #171-38 1,000-PSI Gauge; 2½"; ¼" NPT Bottom
- #171-40 1,500-PSI Gauge; 2½"; ¼" NPT Bottom
- #171-42 3,000-PSI Gauge; 2½"; ¼" NPT Bottom

#171-38 1000-PSI Gauge; 2¼"; ¼" NPT Bottom
#171-52 O-ring
#171-54 Fuse
#171-60 HTHP Test Cell
#171-62 Test Cell Lid
#171-66 Stainless Steel Receiver Tube
#171-75 Receiver Body
#171-82 Power Cord with Male Plug Only

Optional:

#170-37 Nitrogen Cylinder; 21" × 7"; Right-hand Thread
#171-26 5,000# Hose; 3/16" × 3'

#171-50-4-SP Spare Parts for #171-50-4:
- #140-60-01 O-ring for Bleeder Valve; Qty: 16
- #142-58 O-ring for HTHP Coupling; Qty: 48
- #143-19 Repair Kit for Victor Regulator; Qty: 2
- #153-16 Glass Graduated Cylinder; 25 mL × 2/10 mL; Qty: 4
- #153-55 Silicone Stopcock Grease; 150 g Tube; Dow Corning; Qty: 4
- #154-10 Dual-Scale Thermometer with Metal Dial; 5" Stem; 50° - 500°F; 0° - 250°C; Qty: 2
- #170-07 O-ring; Qty: 8
- #170-19 2½" (6.35 cm) Filter Paper; Specially Hardened for Filter Presses; Qty: 20
- #171-38 1000-PSI Gauge; 2¼"; ¼" NPT Bottom; Qty: 2
- #171-52 O-ring; 2 5/16" × 2½" × 3/32"; Qty: 48
- #171-54 Fuse; Qty: 4
- #171-78 Screw for Test Cell; Qty: 24
- #171-79 Hex Wrench; ¼"; Qty: 2

Safety

Important

Nitrogen must be supplied in an approved Nitrogen Gas Cylinder and secured to meet safety standards.

Do not use nitrous oxide, oxygen, or compressed air as a pressure source for high-temperature, high-pressure (HTHP) filtration. Under high temperature and pressure, these gasses can detonate, causing serious injury or damage to equipment.

Due to the high temperatures and pressures involved in this test, extreme care must be exercised at all times. All safety precautions must be met, especially in the cell breakdown procedure after the filtration procedure has been completed.

Procedure

1. Before beginning a test, carefully examine all o-rings for nicks and cuts. Replace any o-rings that show signs or damage or wear.

2. Unscrew the T-screws (counter-clockwise) on the Nitrogen manifold to make sure both regulators are completely closed. Connect a Nitrogen bottle (at least 1,500 PSI / 10,343 kPa) to the center inlet on the pressure manifold. Open the pressure release valve on the nitrogen bottle and note the bottle pressure as registered on the middle pressure gauge.

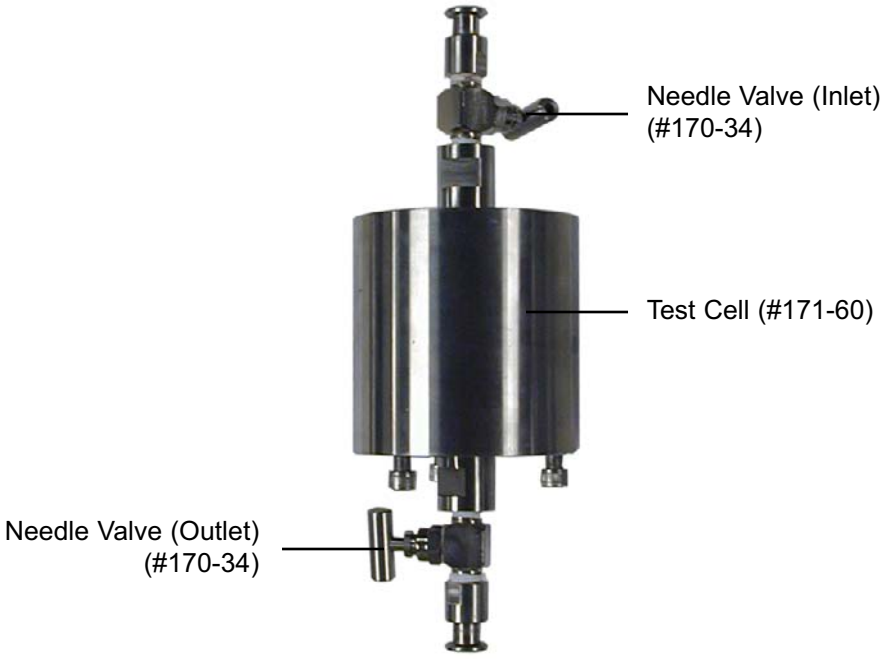
   Note

   The regulator on the left with the 1,500 PSI gauge provides primary pressure. The regulator on the right with the 1,000 PSI gauge provides back pressure. Refer to the diagram on page 10 for more details.

3. Connect the power strip to an appropriate power source. Connect each of the four heating jackets to the power strip and turn the power strip on.

4. For each filter press that will be running a test, place a dial-type thermometer into the well in the heating jacket. Preheat the jacket to 10°F (6°C) above the desired test temperature. A pilot light will come on when the heating jacket is at the desired temperature as selected by the thermostat control knob.

5. Prepare each sample according to API specifications. Close both needle valves on the test cell by turning them counter-clockwise. Invert the cell and carefully pour the test fluid into the cell body. Leave at least 0.5" (13 mm) of empty space below the o-ring groove to allow for heat expansion of the fluid. Do not spill fluid on the o-ring inside the cell.



6. Place a circle of filter paper in the groove and place an o-ring on top of the paper. Place the cell cap into the cell, and twist it into position so the cap locking screws will fasten to the wings of the cell cap. Evenly tighten the set screws with the allen wrench.

O-ring Groove

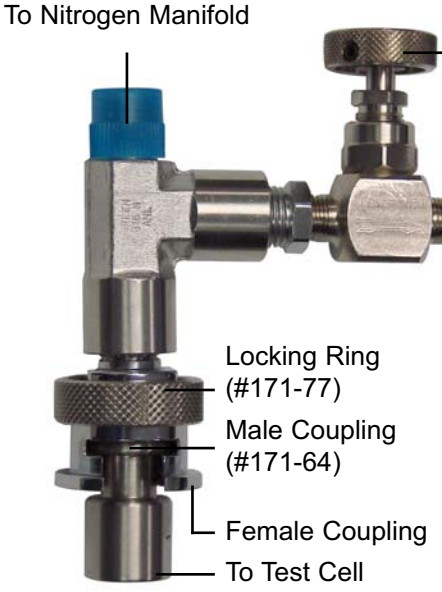
Cell Cap (#171-62)

Locking Screws (#171-78)

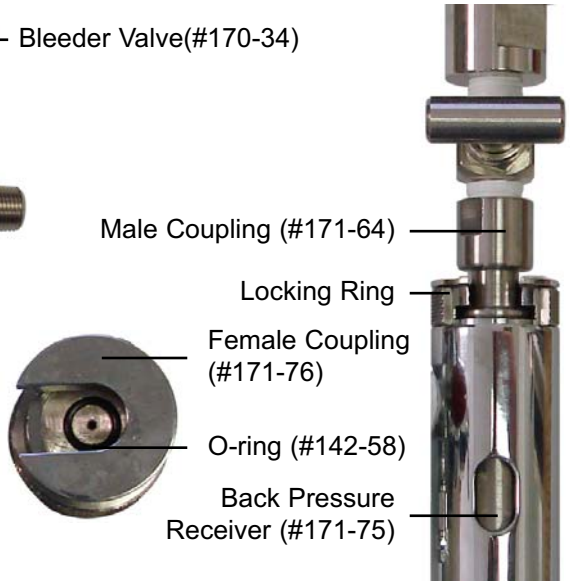
7. Place the cell in the heating jacket with the outlet or filter side of the cell cap properly oriented down. Make sure both valves on the cell are closed. Transfer the thermometer into the thermometer well within the cell.

8. Check the o-rings on the inside of the female couplings on the top pressure manifold and back pressure receiver. Apply a thin coat of silicone grease to the o-rings but do not seal up the holes with grease. Connect the top pressure assembly to the top male coupling by lifting the lock ring and sliding the female coupling onto the male coupling. Release the lock ring and the top manifold has been installed.

9. If you will be testing above 200°F (93.3°C), place the back pressure receiver on the bottom valve assembly in the same manner.



Top Pressure Assembly



Back Pressure Receiver

10. Make sure all of the red and black knobs at the bottom of the platform are completely closed (clockwise).

11. Keeping all valves closed, adjust both regulators on the nitrogen manifold to the recommended back pressure for your test (refer to the chart below). This will make the pressure available to the system.


Note

The upper and lower limits of the test pressure differential are determined by the test temperature. As this temperature exceeds 212°F (100°C), the back pressure must be increased in order to prevent vaporization of the filtrate. The 500 PSI differential pressure must be maintained, so the top pressure will have to be increased accordingly. The table below shows the pressures recommended for various test temperatures.

Recommended Minimum Back Pressure

Test Temperature		Vapor Pressure		Minimum Back Pressure	
°F	°C	PSI	kPa	PSI	kPa
212	100	14.7	101	100	690
250	121	30	207	100	690
300	149	67	462	100	690
350	177	135	932	160	1,104
400*	204	247	1,704	275	1,898
450*	232	422	2,912	450	3,105
500*	260	680	4,692	700	4,830

**For tests above 400°F, use Teflon o-rings.*

12. Open both the red and black knobs that correspond to the filter presses being tested. The red knob allows the primary pressure from the Nitrogen manifold to reach the pressure inlet on the test cell. The black knob does the same for the back pressure receiver.

13. Open the top valve on the test cell one full turn and apply the pressure to the fluid sample inside the cell. This pressure will minimize boiling while the sample is heating. Maintain this pressure on the fluid until the desired temperature is stabilized, as indicated by the thermometer. The heating time of the sample should never exceed one hour.

14. When the fluid sample reaches the desired test temperature, increase the primary pressure (the left-hand regulator on the Nitrogen manifold) to 500 PSI (3,448 kPa) more than the back pressure. Open the bottom valve on the test cell to initiate filtration and begin timing.

15. Collect the filtrate for 30 minutes while maintaining the selected test temperature within ± 5°F (± 3°C). Carefully monitor the back pressure gauge. If the back pressure rises above the desired setting during the test, cautiously reduce the pressure by opening the bleeder valve on the receiver and drawing off some of the filtrate into the graduated cylinder.

16. At the end of the test, close the top and bottom valves on the cell. Close the red and black knobs that correspond to the cell you are testing. This will stop the flow of pressure to the cell. Set the thermostat to 0 to turn off the heating jacket.

17. Slowly open the needle valve on the back pressure receiver and collect the remaining filtrate in the graduated cylinder. Leave the valve open to allow all remaining pressure in the line to bleed off.

18. Slowly open the needle valve on the top pressure manifold to bleed off the pressure in the line. Remove the top pressure manifold from the test cell.

19. Remove the back pressure receiver and drain any remaining filtrate into the graduated cylinder. Correct the total filtrate volume collected to a standard filtration test area of 7.1 in^2 (45.8 cm^2) by doubling the filtrate volume collected in 30 minutes. Record this total filtrate volume (doubled), and the temperature, pressure, and time.

20. Remove the cell from the heating jacket and allow it to cool to room temperature or quick cool the cell by immersing it in cool water. Keep the cell in an upright position during this procedure. When the cell has cooled, slowly open the two needle valves to bleed off the cell pressure.

Important

Pressure inside the sample cell will still be approximately 500 PSI (3,450 kPa). Keep the cell upright and cool it to room temperature before disassembling. The cell must be cool for at least one hour at room temperature or at least 10 minutes in cool water before loosening the cap locking screws and removing the cell cap.

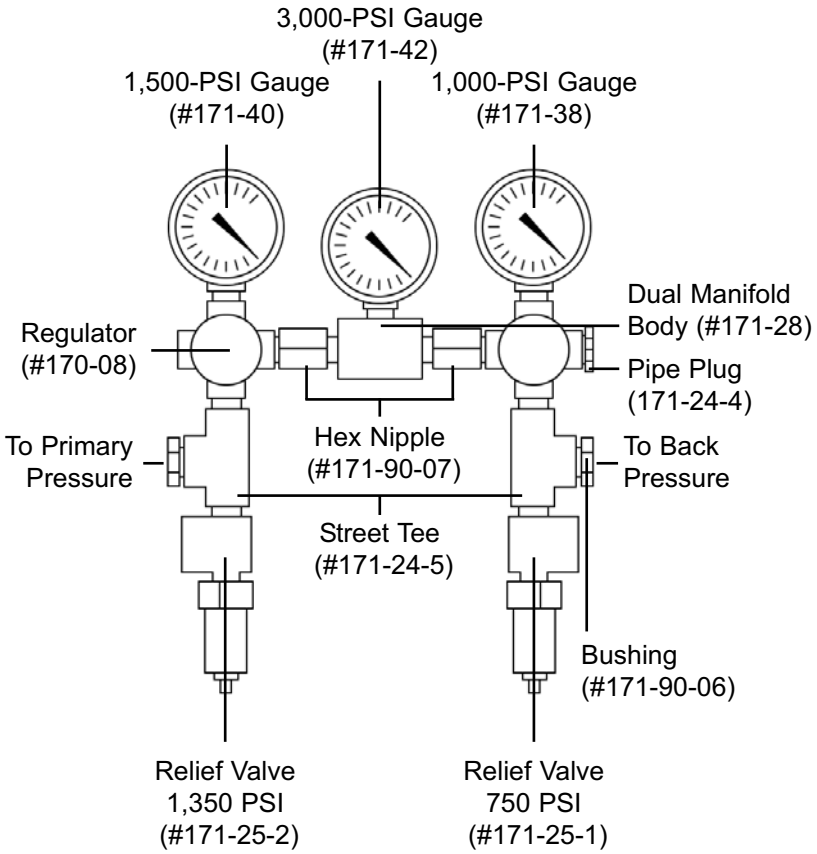
21. Invert the cell and loosen the cell cap screws with the Allen wrench. Use extreme care to save the filter paper and deposited filter cake. Discard the fluid inside the cell, and retrieve the filter cake.

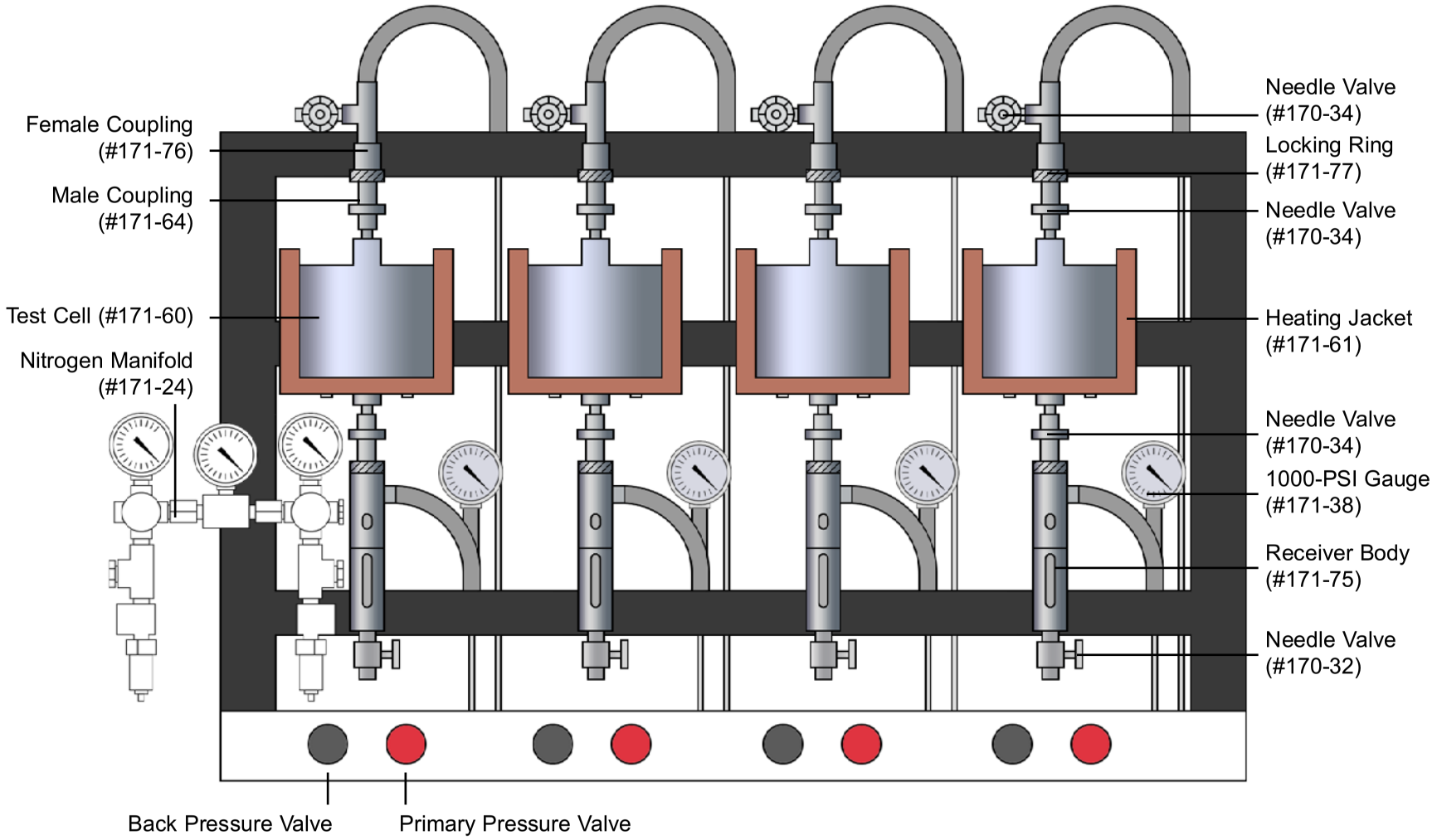
22. Wash the filter cake on the paper with a gentle stream of water. Measure and report the thickness of the filter cake to the nearest 1/32" (0.8 mm).

23. Clean and dry the apparatus thoroughly after each use. Inspect all o-rings and replace if necessary.

24. After all testing is complete, close both regulators on the Nitrogen manifold by turning them counter clockwise. Open all of the bleeder valves on the pressuring manifolds and back pressure receivers to release any remaining pressure in the lines. Close the pressure release valve on the Nitrogen bottle. Set all four thermostats to 0 and turn off or unplug the power strip.

Diagrams


3,000-PSI Gauge
(#171-42)
1,500-PSI Gauge
(#171-40)
1,000-PSI Gauge
(#171-38)
Dual Manifold
Body (#171-28)
Regulator
(#170-08)
Pipe Plug
(171-24-4)
To Primary
Pressure
Hex Nipple
(#171-90-07)
To Back
Pressure
Street Tee
(#171-24-5)
Bushing
(#171-90-06)
Relief Valve
1,350 PSI
(#171-25-2)
Relief Valve
750 PSI
(#171-25-1)


Female Coupling
(#171-76)
Male Coupling
(#171-64)
Test Cell (#171-60)
Nitrogen Manifold
(#171-24)
Needle Valve
(#170-34)
Locking Ring
(#171-77)
Needle Valve
(#170-34)
Heating Jacket
(#171-61)
Needle Valve
(#170-34)
1000-PSI Gauge
(#171-38)
Receiver Body
(#171-75)
Needle Valve
(#170-32)
Back Pressure Valve
Primary Pressure Valve