

# Series 300 LPLT Filter Press

## Instruction Manual



Manual No. 207128, Revision H

## **LPLT Filter Press Instruction Manual**

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Houston, Texas, USA

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## 1 Introduction

Fann's Series 300 LPLT Filter Press is used for measuring filtration and wall-building properties of drilling fluids and cement slurries. The filtration rate is the fluid loss measured in milliliters at ambient temperature and 100 psi (690 kPa) through a special filter paper for 30 minutes. Wall-building characteristics are demonstrated by the thickness and consistency of the filter cake (the residue) deposited on the filter paper after 30 minutes. The filter cake is measured to the closest 1/32 in. or the nearest millimeter.

The low pressure filter press assemblies described in this manual consist of the following items:

- filter cell mounted in a frame
- pressure assembly and regulator
- filter paper, the filtering medium
- 25 ml graduated cylinder, the filtrate receiver

The filter press cell body, top cap, and base cap are constructed of 303 stainless steel.

The filtering medium is filter paper that has been especially hardened for filtrate testing.

Pressure sources deliver the required pressure,  $100 \pm 5$  psi ( $690 \pm 35$  kPa) and can be any of the following:

- compressed nitrogen or air in cylinders,
- carbon dioxide gas cartridges,
- high pressure air or water systems,
- dead-weight hydraulic pressure assembly



Compressed oxygen should not be used as a pressure source. Fire and explosion hazards exist when using oxygen.

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### 1.1 Document Conventions

The following icons are used in this manual.



**NOTE.** Notes emphasize additional information that may be useful to the reader.



**CAUTION.** Describes a situation or practice that requires operator awareness or action in order to avoid undesirable consequences.



**MANDATORY ACTION.** Gives directions that, if not observed, could result in loss of data or in damage to equipment.



**WARNING!** Describes an unsafe condition or practice that if not corrected, could result in personal injury or threat to health.



**ELECTRICITY WARNING!** Alerts the operator that there is risk of electric shock.



**HOT SURFACE!** Alerts the operator that there is a hot surface and that there is risk of getting burned if the surface is touched.

## 2 Safety

Safe operation of filter presses requires that the laboratory technician or drilling fluids engineer be familiar with the proper operation and potential hazards associated with this equipment. For instance, if the filter cell or pressurization equipment has a leak, then sample or pressurizing fluid could be released and cause serious injury.

Several precautions that should be observed are described in this section.

### 2.1 Safe Pressurization

#### 2.1.1 Gases

- Always use nitrogen, carbon dioxide (CO<sub>2</sub>), or compressed air. Never connect the LPLT Filter Press to oxygen, natural gas, or any other non-recommended gas.



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Compressed oxygen should not be used as a pressure source. Fire and explosion hazards exist when using oxygen.

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- Nitrogen must be supplied from an approved nitrogen gas cylinder. Nitrogen cylinders must be secured and meet all safety standards.
- Carbon dioxide is normally supplied in small cartridges, which contain about 900 psi (6205 kPa) pressure. They are primarily used for field operations.



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Do **NOT** allow carbon dioxide cartridges to be heated or exposed to fire. They can explode if overheated.

---

- If compressed air is used, its maximum pressure should not exceed 150 psi (1035 kPa) at the regulator inlet.



### 2.1.2 Pressure Regulators

- Maintain pressure regulators in good condition. Never use oil on pressure regulators.
- Pressurization systems that leak should be repaired or replaced.
- Gauges, fittings and hoses should be kept in good condition and leaks should be corrected.
- Periodically test the safety relief valves on the pressurization manifolds to verify they will relieve if excessive pressure should occur. Never plug or bypass these safety valves.
- When pressurizing the cell, always make sure that the regulator is closed (i.e., Tee screw backed all the way out, counterclockwise). Then open the supply pressure, and adjust the regulator.



Do **NOT** attempt to pressurize higher than 100 psi (694 kPa).  
Follow the pressurizing procedures in Section 4.

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- When depressurizing, first shut off the supply pressure. Then bleed the system of pressure, and back out the regulator Tee screw (turn counterclockwise), following the procedures in Section 4.

### 3 Features and Specifications

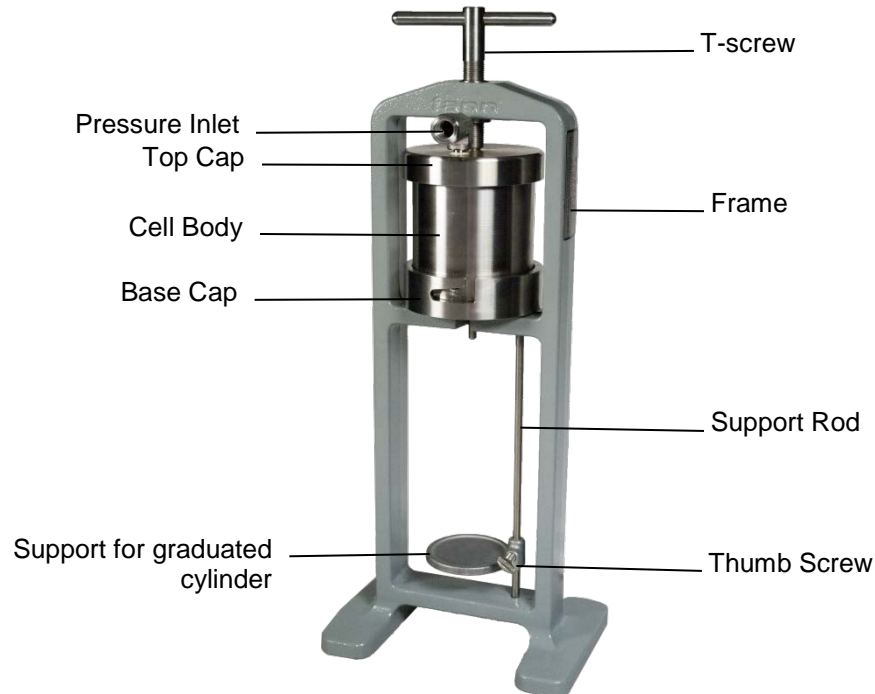
This filter press is used in a static filtration test to measure fluid loss and filter cake characteristics of drilling fluids.

The basic filter press assembly consists of the filter press unit and accessories, listed in Section 10. See Figure 3-1.

The specifications for the LPLT Filter Press are listed in Table 3-1.

**Table 3-1 Basic Filter Press Assembly Specifications**

Category	Specification
Working Pressure	100 psi (690 kPa)
Filtering Area	7.1 in <sup>2</sup> (45.8 cm <sup>2</sup> )
Dimensions (Width x Depth x Height)	9 x 9 x 20 inches 22.86 x 22.86 x 50.8 centimeters
Weight	15 lb (6.8 kg)



**Figure 3-1 Basic Filter Press Assembly**

## 4 Pressure Sources

The pressure sources for this filter press are carbon dioxide (cartridges or cylinder), nitrogen, compressed air, and dead-weight hydraulics (water source).

### 4.1 Carbon Dioxide Pressure Source

Follow this procedure to pressurize the filter press with a CO<sub>2</sub> cartridge. See Figure 4-1 and 10-5. Carbon dioxide cartridges are not included.

1. Remove the barrel from the CO<sub>2</sub> pressure assembly and insert a fresh CO<sub>2</sub> cartridge.
2. Make sure the safety bleeder valve is closed, and the regulator adjusting screw is backed out to the closed position (maximum outward). Then turn the barrel loosely until first contact with the puncturing pin is felt.
3. Turn the holder again, approximately a 1/4 turn. The puncture pin, shown in Figure 4-1, seals when the cartridge sits securely in the holder.
4. Turn the adjusting screw into the regulator to apply 100 psi ± 5 psi (690 kPa ± 35 kPa) pressure to the filter cell, as indicated by the pressure gauge. Start timing for 30 minutes.

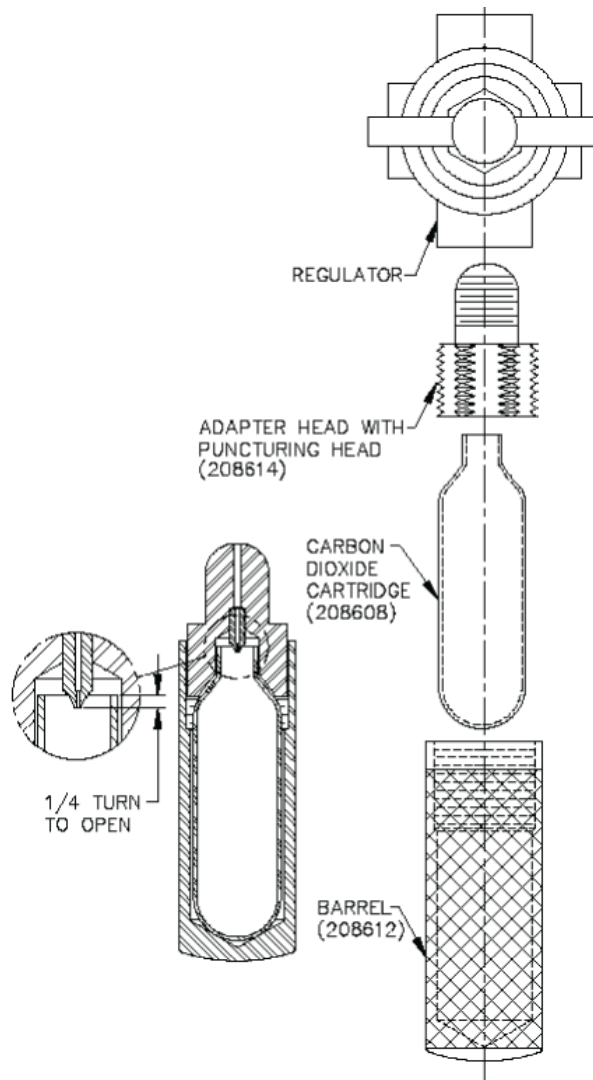


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An inlet pressure gauge or valve is not used with CO<sub>2</sub> cartridges . Use care when replacing spent CO<sub>2</sub> cartridges. There could be some pressure left in the cartridge. Keep the CO<sub>2</sub> cartridges away from extreme heat.

---

Fann Instrument Company offers an extended CO<sub>2</sub> cartridge barrel kit (P/N 101758212). This kit consists of an extended barrel and a polyurethane ball. This extended barrel can accept CO<sub>2</sub> cartridges that are longer than the standard cartridge, as well as standard cartridges. The ball can be placed into the barrel so that standard cartridges can fit.



**Figure 4-1 CO<sub>2</sub> Cartridge Holder Assembly**

## 4.2 Nitrogen Cylinder Pressure Source

Follow this procedure to pressurize the filter press with a nitrogen cylinder. Refer to the assembly in Figure 10-4 which shows a filter press with a nitrogen regulator.

1. With the regulator adjusting screw backed out to the closed position (maximum outward), slowly open the pressure valve on the cylinder. The inlet pressure gauge shows the cylinder pressure. Be sure the inlet pressure is greater than 100 psi, (690 kPa).
2. Be sure the hose between the cylinder regulator and the cell is secure and all fittings are tight, and the safety-bleeder valve is closed.
3. Turn the regulator adjusting screw into the regulator to apply 100 psi  $\pm$  5 psi (690 kPa  $\pm$  35 kPa) pressure to the filter cell, as indicated by the pressure gauge. Start timing for 30 minutes.



---

Always turn the regulator adjusting screw to its maximum outward position before opening the release valve on the pressure source. If full pressure is released to an open regulator, the regulator is put under a severe strain. If this causes the regulator to fail, the full tank pressure is released to the filter press and it may be damaged. As an added precaution, a safety bleeder valve that releases at approximately 170 psi is placed between the regulator and the filter press.

---

### 4.3 Dead-Weight Hydraulic Pressure Source

The Dead-Weight Hydraulic Filter Press is a Series 300 Filter Press equipped with a dead-weight hydraulic assembly. See Figure 10-6.

Follow this procedure to pressurize the filter press with the dead-weight hydraulic pressure source.

1. Fill the water reservoir and cylinder of the dead-weight assembly to the top with clean fresh water.
2. Open the bleed-off valve and place the piston, with the weight attached, in the cylinder. Allow the piston to travel full stroke. Refill the reservoir with clean, fresh water and close the bleed-off valve.
3. Set the unit in place on the filter press frame, and tighten the attaching set screws.
4. Connect the hose from the dead-weight assembly to the top cap pressure inlet.
5. Raise the weight to the top of its stroke and allow it to settle. In about two-thirds of the stroke, the delivery pressure gauge will indicate 100 psi.
6. Lift the dead weight back to the top of the stroke. Start timing the test when the weight is released. One stroke of the piston will allow a maximum filtration loss of approximately 30 ml.

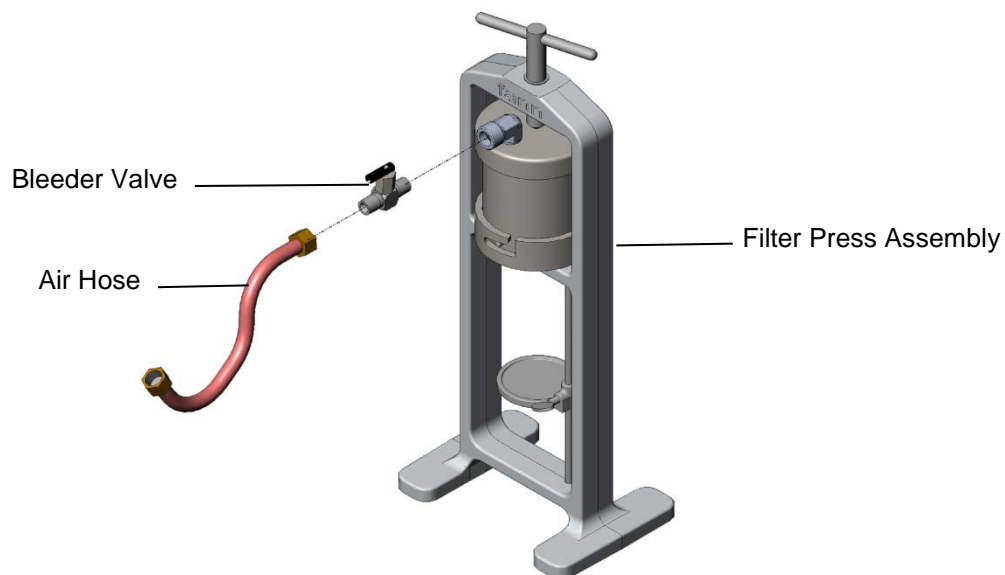
#### **4.4 External Pressure Source**

A compressed air source that supplies more than 100 psi (690 kPa) is suitable to pressurize this filter press.

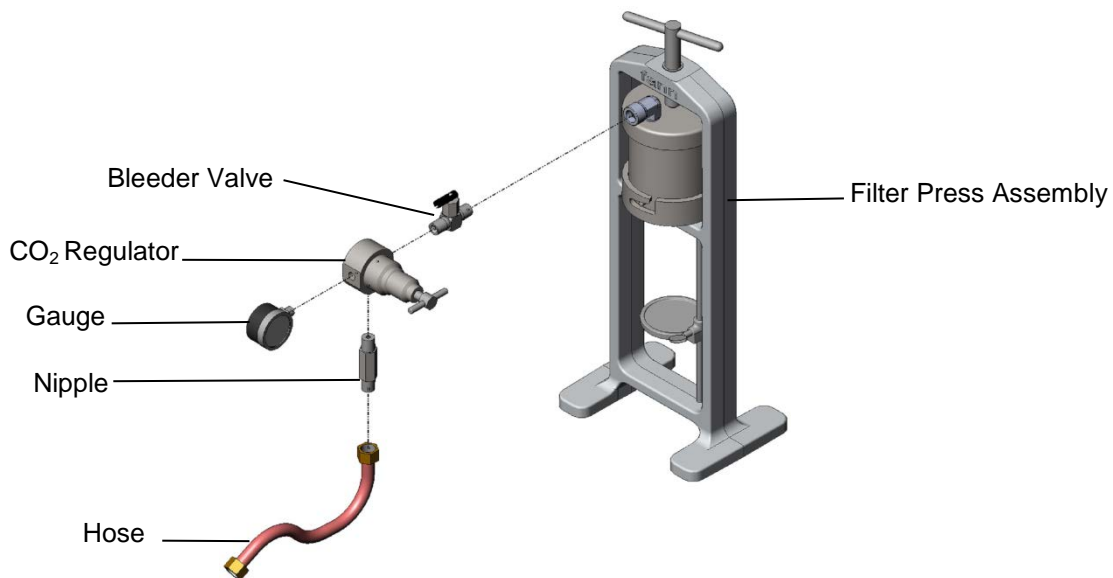
A regulator is required. You can attach any regulator that meets the specific requirements for compressed air, nitrogen or carbon dioxide.

## 5 Filter Press and Pressure Source Set-up

The illustrations below show how to set-up each filter press unit and its pressure source.

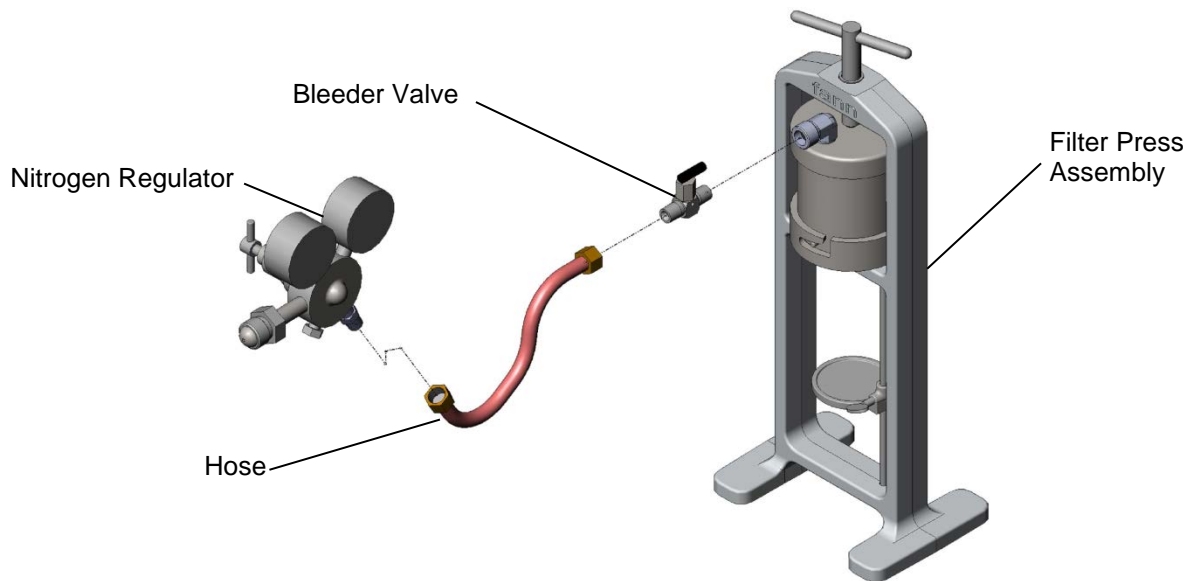


**Figure 5-1 Basic Filter Press Set-up, P/N 207173**

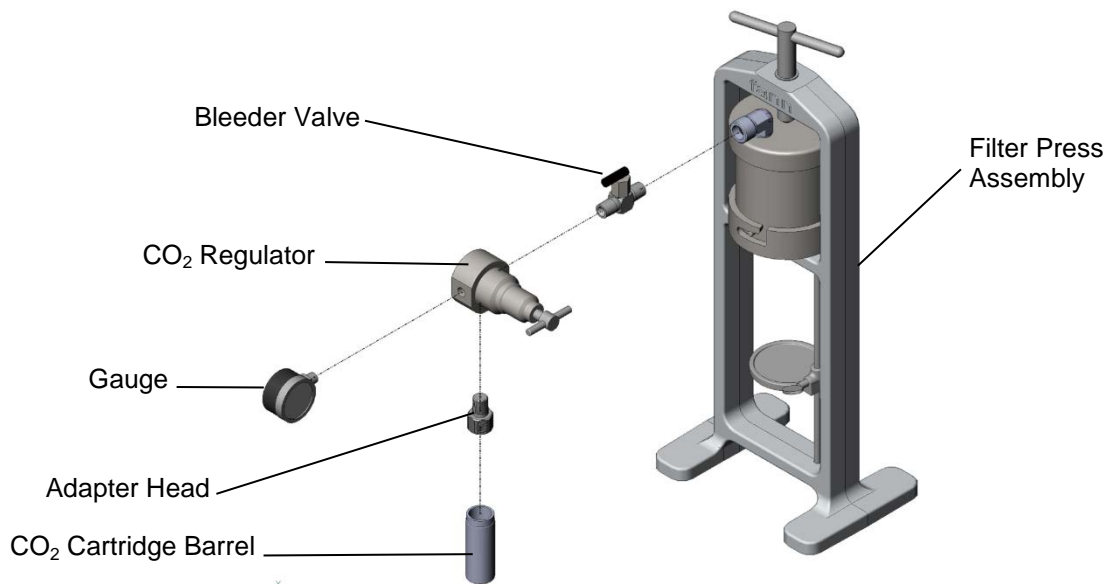


**Figure 5-2 Filter Press with Regulator Set-up, P/N 207174**





**Figure 5-3 Filter Press with Nitrogen Regulator Set-up, P/N 207223**



**Figure 5-4 Filter Press with CO<sub>2</sub> Pressure Set-up, P/N 207224**

## 6 Standard Filter Press Test Procedures

Follow this procedure to operate the filter press with a compressed gas or dead-weight hydraulic pressure source.

1. Assemble the clean, dry parts of the filter cell (Figure 6-1) in the following order:
  - a) base cap
  - b) rubber gasket
  - c) screen
  - d) a sheet of filter paper
  - e) rubber gasket
  - f) cell body
2. Secure the cell to the base cap by rotating it clockwise.
3. Fill the cell with the test sample to within approximately 1/4 in. (6 mm) of the top.



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Filling the cell to 1/4 inch (6 mm) of the top lessens the volume of pressurizing gas required from the pressure source.

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4. Set the filter press cell assembly in place within the frame.
5. Check the top cap to make sure the rubber gasket is in place. Place the top cap, already connected to the pressure source, onto the filter cell and secure the cell in place with the T-screw.
6. Place a dry graduated cylinder under the filtrate tube, either on the support or in the clip.
7. Apply pressure to the cell following the appropriate pressure source procedure as outlined in Section 4.
8. After 30 minutes close the pressure source valve and back off the regulator. Then, open the safety-bleeder valve to release the pressure on the entire system.
9. Measure the volume of filtrate collected in the graduated cylinder. Record the volume in milliliters as the API 30 minute filtrate loss of the drilling fluid.

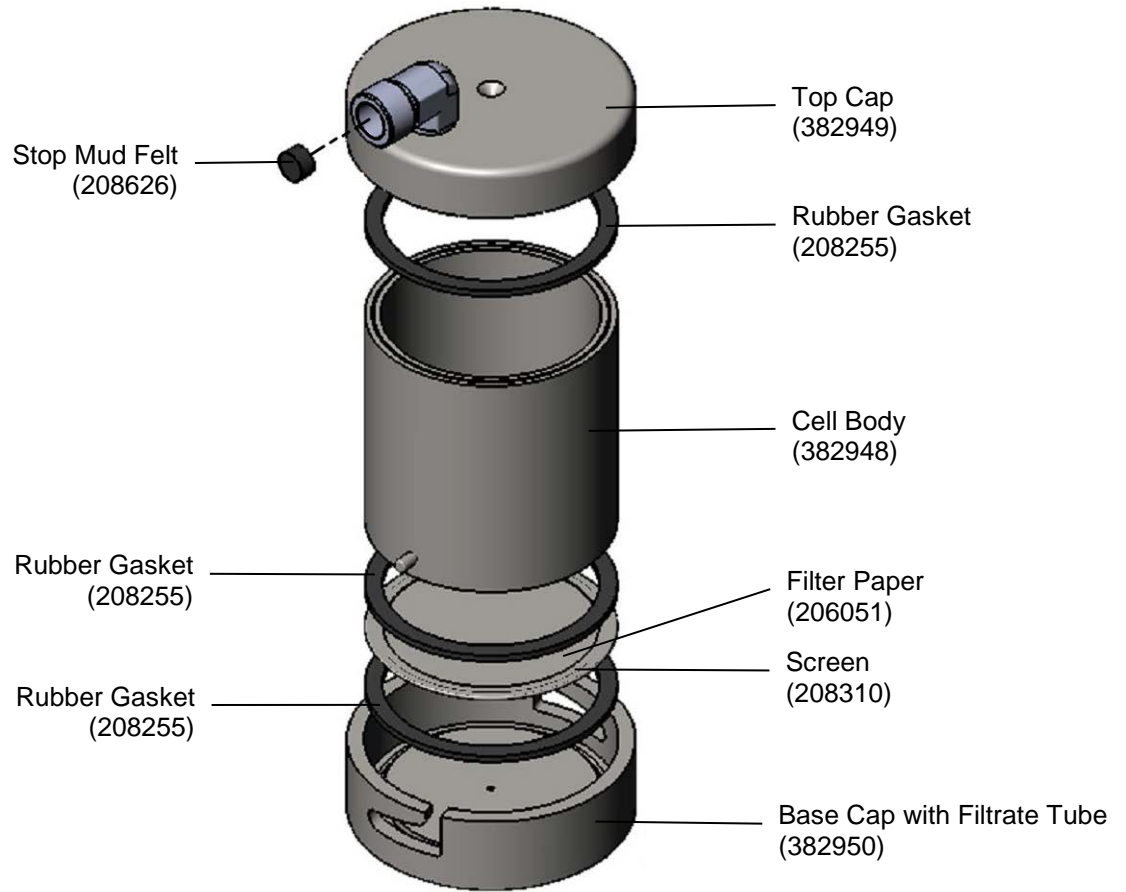
10. Loosen the T-screw, remove the cell top, and then remove the cell from the frame.
11. Discard the drilling fluid.
12. Disassemble the filter cell and carefully remove the filter cake and filter paper from the base cap.
13. With a gentle stream of water, carefully wash excess drilling fluid from the cake. For oil-based drilling fluids, use a clean base oil to wash the filter cake.
14. Measure and record the thickness of the filter cake to the nearest 1/32 in. to the nearest millimeter.
15. Record properties of the filter cake such as texture, hardness, flexibility, etc.



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You can record the filtrate volume collected after 7 ½ minutes. Multiply this value by two to obtain a rough estimate of filtrate volume that will be collected in 30 minutes. This estimated value is usually one or more milliliters less than the actual volume. This estimation procedure should not be used for drilling fluids that have a filtrate loss of less than 5 ml in 7 ½ minutes.

---



**Figure 6-1 Cell Assembly**

## **7 Test Analysis**

### **7.1 References**

- API Recommended Practice for Field Testing Water Based Drilling Fluids, API RP 13B-1
- API Recommended Practice for Field Testing Oil Based Drilling Fluids, API RP 13B-2

### **7.2 Results**

The fundamental filtration measurements include the filtrate volume and filter cake thickness.

The volume of liquid filtrate collected after 30 minutes is reported in milliliters (ml), to the nearest 0.1 ml.

For a 7 ½ minute test, multiply the filtrate volume by 2.

The thickness of the resulting filter cake is measured at its center, and reported to the nearest 1/32 inch or to the nearest millimeter.

## 8 Troubleshooting and Maintenance

Troubleshooting and regular maintenance procedures are described in this section. If more extensive maintenance or service of the instrument is required, please contact Fann Instrument Company.

### 8.1 Cleaning

- After each use, disassemble and clean the filter press cell. Wash and thoroughly rinse all drilling fluid from the cell.
- Wipe the filter press, and dry all parts completely.
- Replace the filter paper on the screen, and assemble the end cap onto the cell.
- Reassemble the cell onto the frame for storage.

### 8.2 Pressure Regulator Maintenance and Repair

Most regulator malfunctions are caused by leaking fittings or faulty pins and seats. A diaphragm rarely ruptures.

#### 8.2.1 Checking for leaks

If the regulator will not hold pressure, check the fittings connected to it.

- Apply pressure to the system and look for escaping gas in the form of bubbles.
- There are two methods of doing this. One method is to apply soapy water to the fitting areas, and the other method is to carefully immerse the entire regulator, except the pressure gauge in a container of water.
- If leaks are apparent, disassemble and apply thread sealant to the threads.



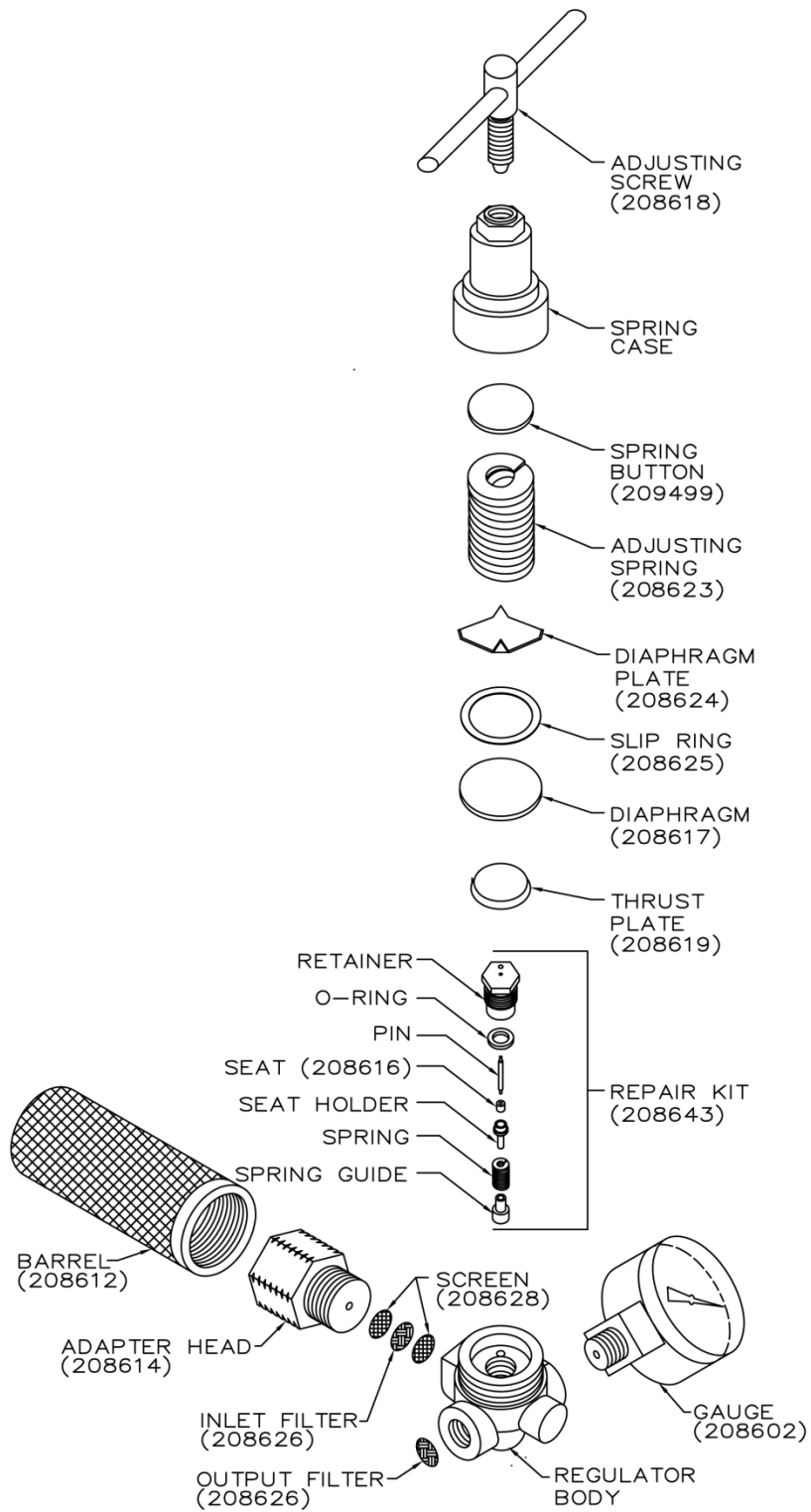
Do NOT use oil-based thread sealant or oil when assembling any regulator.

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### **8.2.2 Replacing the seat and pin**

If regulator connections do not leak, the seat and pin probably need replacement. Use the following procedure. Refer to the items shown on Figure 8-1 and 8-2.

1. Using a wrench on the hex of the spring case, unscrew the spring case. All parts, including the diaphragm will remain in the spring case.
2. Remove the thrust plate.
3. Unscrew the retainer and remove the seat with the pin.
4. Inspect the regulator for dirt or drilling fluid in the regulator body. Clean the regulator body, if necessary. An outlet filter (P/N 208626) is available to prevent dirt or drilling fluid from entering the regulator body.
5. Replace the pin and seat.
6. Reassemble the regulator.



**Figure 8-1 CO<sub>2</sub> Pressure Assembly Drawing, P/N 208647**



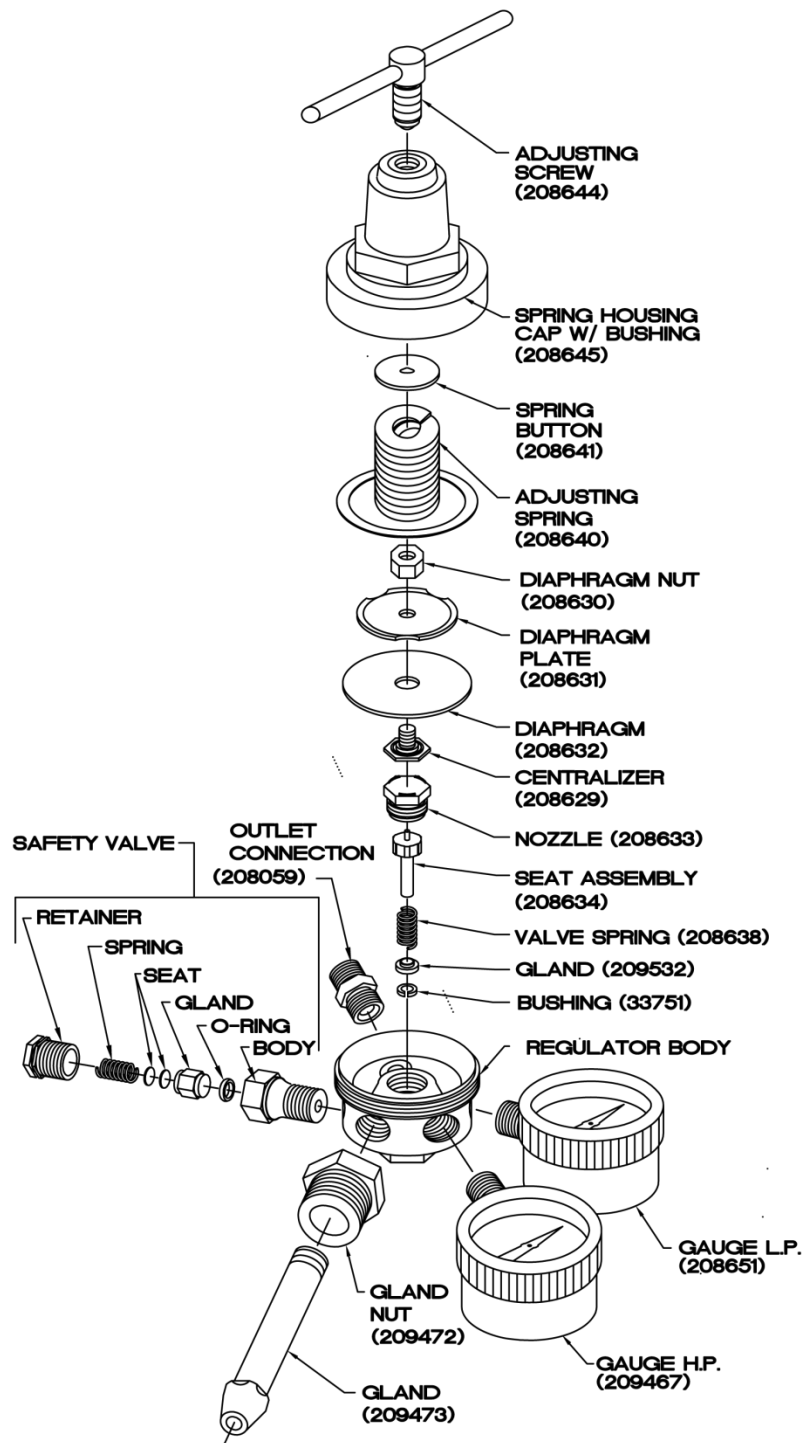


Figure 8-2 Nitrogen Regulator Assembly Drawing, P/N 208652

### **8.3 Dead Weight Hydraulic Unit Maintenance**

Always protect the stainless steel piston, especially when removing it.

Clean the fine mesh screen on the bottom of the water reservoir.

If the piston moves sluggishly during a test, remove the piston and O-ring from the cylinder. Clean the O-ring groove in the cylinder. Examine the O-ring carefully for torn or rough places, and, if the surface is damaged, replace it with a new O-ring. Before replacing the O-ring and the piston, apply a light film of high-grade, water-repellent grease.

In subfreezing weather, the water in the dead-weight assembly can be replaced by an anti-freeze solution, such as propylene glycol and water; this does not adversely affect the operation of the unit.

## 9 Accessories

This filter press does not have accessories. However, additional equipment is available that may be useful.

**Table 9-1 Optional Equipment**

<b>Part Number</b>	<b>Description</b>
205868	Graduated Cylinder, 25 ml
206035	Timer, Interval, 30 minute
208312	Screen, Stainless Steel, cement tests, 60 x 325 mesh
208463	Clip with Bracket
208604	Air Hose, 12 in
209387	Wall Mount Frame
209394	Frame Bracket
209395	Wall Bracket
101758214	Extended Carbon Dioxide Cartridge Barrel Kit*
101758212	Extended Carbon Dioxide Cartridge Barrel
101758213	Polyurethane Ball

\* This kit consists of the extended barrel and polyurethane ball.

## 10 Parts List

### Standard Filter Press Assemblies

Table 10-1 Filter Press, Basic Assembly, P/N 207127

Item No.	Part No.	Description
0007	382950	BASE CAP WITH FILTRATE TUBE
0009	382949	TOP CAP
0010	382948	CELL BODY
0012	208255	RUBBER GASKET
0014	208310	SCREEN, 60 MESH
0018	208626	STOP MUD FELT
0020	208129	FRAME ASSEMBLY
0022	101983293	FANN RULER
0023	205868	GRADUATED CYLINDER, GLASS 25ml
0024	206051	FILTER PAPER

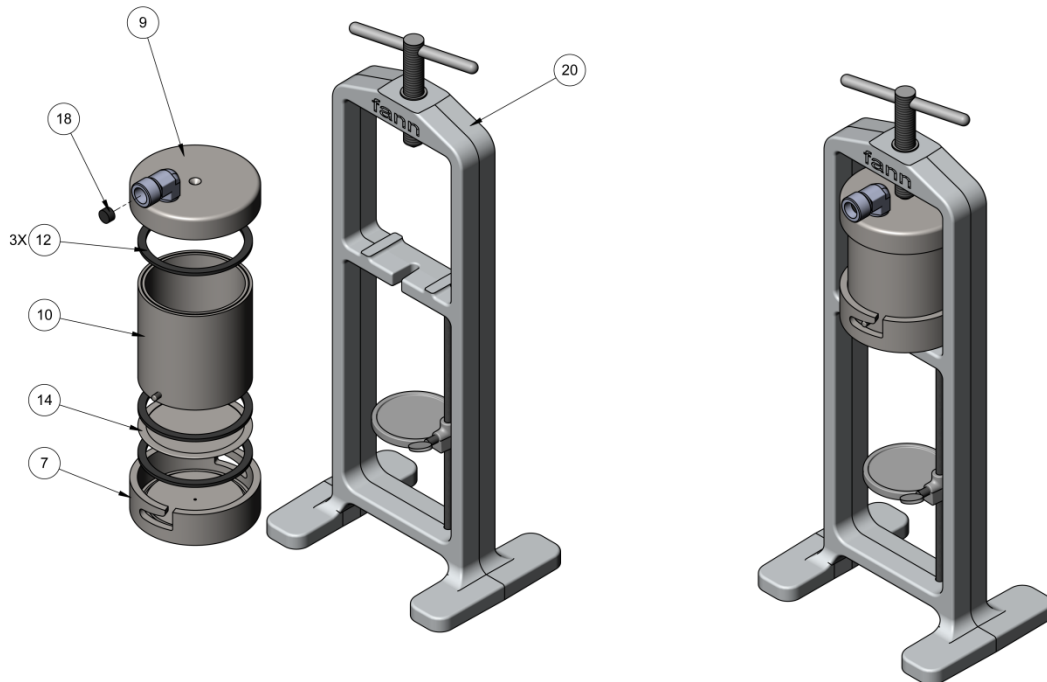
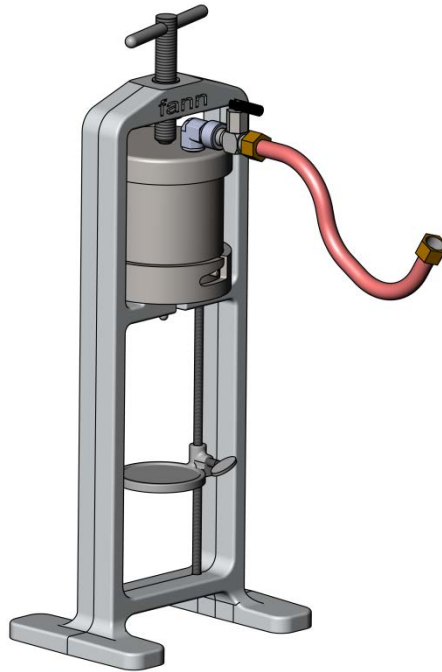


Figure 10-1 Series 300 LPLT Filter Press, Basic Assembly

**Table 10-2 Filter Press Assembly w/Air Hose, P/N 207173**

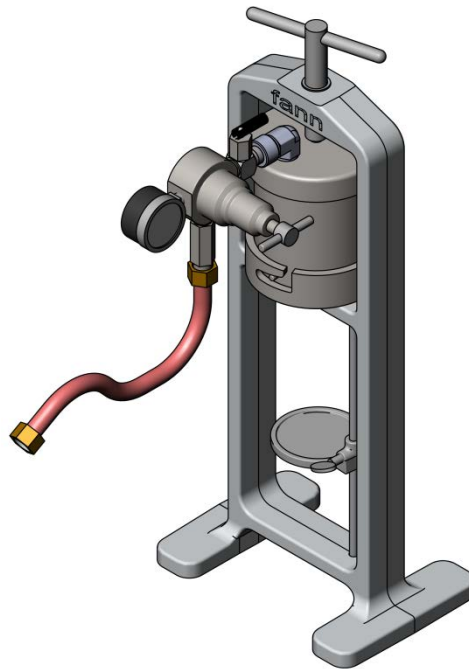
<b>Part No.</b>	<b>Description</b>
207127	FILTER PRESS, BASIC ASSEMBLY
207929	AIR HOSE, 3 FT
208653	BLEEDER VALVE



**Figure 10-2 Filter Press with Air Hose**

**Table 10-3 Filter Press Assembly w/Regulator, P/N 207174**

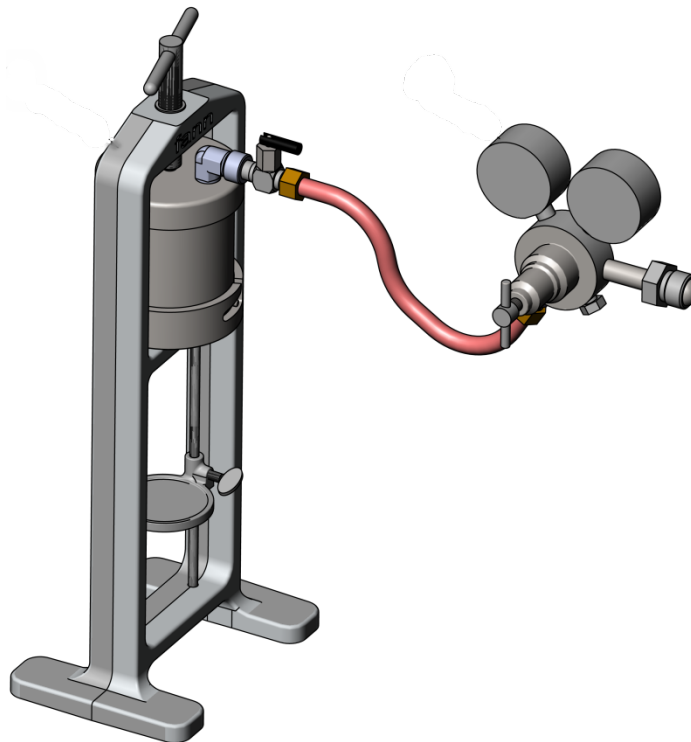
<b>Part No.</b>	<b>Description</b>
207127	FILTER PRESS, BASIC ASSEMBLY
207929	AIR HOSE, 3 FT
102177087	REGULATOR ASSEMBLY



**Figure 10-3 Filter Press w/Regulator**

**Table 10-4 Filter Press Assembly w/ Nitrogen Regulator, P/N 207223**

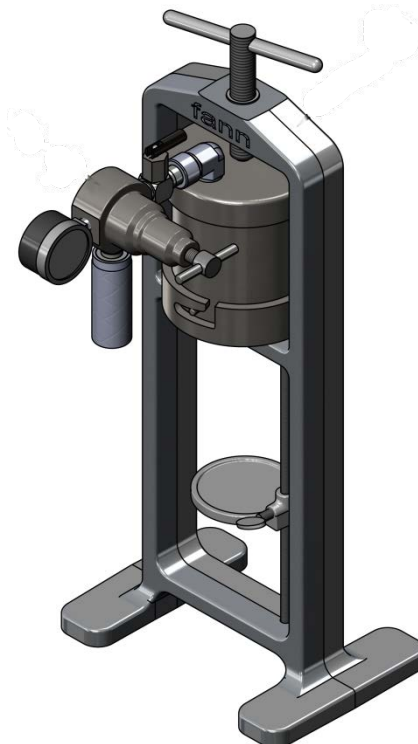
Part No.	Description
207127	FILTER PRESS, BASIC ASSEMBLY
207929	AIR HOSE, 3 FT
208652	NITROGEN REGULATOR
208653	BLEEDER VALVE



**Figure 10-4 Filter Press w/ Nitrogen Regulator**

**Table 10-5 Filter Press w/ Carbon Dioxide Pressure Assembly, P/N 207224**

<b>Part No.</b>	<b>Description</b>
207127	FILTER PRESS, BASIC ASSEMBLY
208647	CARBON DIOXIDE PRESSURE ASSEMBLY



**Figure 10-5 Filter Press w/ Carbon Dioxide Pressure Assembly**



**Table 10-6 Dead-Weight Hydraulic Filter Press, P/N 207290**

<b>Part No.</b>	<b>Description</b>
207127	FILTER PRESS, BASIC ASSEMBLY
208594	DEAD-WEIGHT HYDRAULIC ASSEMBLY



**Figure 10-6 Dead-Weight Hydraulic Assembly**

**Wall Mount Filter Press Assemblies**

**Table 10-7 Wall Mount Filter Press w/CO<sub>2</sub> Pressure Assembly, P/N 207503**

<b>Part No.</b>	<b>Description</b>
205868	GRADUATED CYLINDER, 25 ml
206051	FILTER PAPER (100/BOX)
207391	FILTER PRESS, WALL MOUNT
208647	CO <sub>2</sub> PRESSURE ASSEMBLY



**Figure 10-7 Wall Mount Filter Press w/CO<sub>2</sub> Pressure Assembly**

## Multiple Cell Filter Press Assemblies

**Table 10-8 Four Unit Filter Press with Manifold, P/N 207785**

Part No.	Description
205587	COUPLING, 1/4-IN. NPT
205868	GRADUATED CYLINDER, 25 ML
205889	PIPE PLUG, 1/4-IN. NPT
206051	FILTER PAPER (100/BOX)
207444	PIN FOR INSERT
207786	FRAME
207787	MANIFOLD
207790	PREPARATION TRAY
208059	AIR HOSE ADAPTER, 1/4 IN. NPT X 1/4 IN.
208255	NEOPRENE GASKET (6 ea. per cell)
208283	SUPPORT ROD
208310	60-MESH SCREEN
208349	THUMB SCREW
208424	T-SCREW, STAINLESS STEEL
208459	GRADUATED CYLINDER SUPPPORT
208604	AIR HOSE CONNECTORS. 12 IN.
208626	FELT FILTERS
208653	SAFETY BLEEDER VALVE, 170 PSI (1100 kPa)
208655	NEEDLE VALVE, 1/4-IN. NPT
209389	THREADED INSERT
382948	CELL CYLINDER
382949	TOP CAP
382950	BASE CAP w/ FILTRATE TUBE



**Figure 10-8 Four Unit Filter Press w/Manifold**

**Table 10-9 Six Unit Filter Press with Manifold, P/N 207673**

Part No.	Description
205587	COUPLING, 1/4-IN. NPT
205868	GRADUATED CYLINDER, 25 ML
205889	PIPE PLUG, 1/4-IN. NPT
206051	FILTER PAPER (100/BOX)
207444	PIN FOR INSERT
207674	FRAME
207675	MANIFOLD
207678	PREPARATION TRAY
208059	AIR HOSE ADAPTER, 1/4 IN. NPT X 1/4 IN.
208255	NEOPRENE GASKET (6 ea. per cell)
208283	SUPPORT ROD
208310	60-MESH SCREEN
208349	THUMB SCREW
208424	T-SCREW, STAINLESS STEEL
208459	GRADUATED CYLINDER SUPPPORT
208604	AIR HOSE CONNECTORS. 12 IN.
208626	FELT FILTERS
208653	SAFETY BLEEDER VALVE, 170 PSI (1100 kPa)
208655	NEEDLE VALVE, 1/4-IN. NPT
209389	THREADED INSERT
382948	CELL CYLINDER
382949	TOP CAP
382950	BASE CAP w/ FILTRATE TUBE



**Figure 10-9 Six Unit Filter Press w/Manifold**

## Carbon Dioxide Pressuring Equipment

**Table 10-10 CO<sub>2</sub> Pressure Assembly, P/N 208647**

Part No.	Description
208602	GAUGE, 200 PSI, 1-1/2-IN. DIA, 1/8 NPT
208612	BARREL FOR CO <sub>2</sub> CARTRIDGE
208614	ADAPTER HEAD W/ PUNCTURE PIN
208615	REGULATOR
208653	SAFETY BLEEDER VALVE, 170 PSI

**Table 10-11 CO<sub>2</sub> Pressure Assembly w/ Top Cap, P/N 208648**

Part No.	Description
208062	TOP CAP
208647	CO <sub>2</sub> PRESSURE ASSEMBLY

**Table 10-12 Accessories for CO<sub>2</sub> Pressure Assembly**

Part No.	Description
205608	GAUGE, 200 PSI
208613	ADAPTER for external pressure supply

**Table 10-13 Pressure Regulator, P/N 208615**

Part No.	Description
208615	SEAT
208617	DIAPHRAGM
208618	ADJUSTING SCREW, SPRING CASE
208619	THRUST PLATE
208622	SPRING BUTTON
208623	ADJUSTING SPRING
208624	DIAPHRAGM PLATE
208625	SLIP RING
208626	OUTPUT FILTER
208628	SCREENS (2)
208643	REGULATOR REPAIR KIT: RETAINER PIN; O-RING; SEAT; SEAT HOLDER; SPRING; SPRING GUIDE

## Nitrogen Pressuring Equipment

**Table 10-14 Nitrogen Pressure Regulator, P/N 208652**

Part No.	Description
203950	GLAND NUT RIGHT HAND
208059	OUTLET CONNECTION
208629	CENTRALIZER
208630	DIAPHRAGM NUT
208631	DIAPHRAGM PLATE
208633	NOZZLE
208634	SEAT ASSEMBLY
208635	GASKET
208636	BUSHING REGULATOR – FRICTION WASHER
208637	GLAND
208638	VALVE SPRING
208639	SLIP RING
208640	ADJUSTING SPRING
208641	SPRING BUTTON
208644	ADJUSTING SCREW
208645	SPRING HOUSING CAP W/BUSHING
208651	GAUGE, 200 PSI
209467	GAUGE, 3000 PSI
209472	GLAND NUT, LEFT HAND
209473	GLAND, LONG (INLET CONNECTION)

**Table 10-15 Accessories for Nitrogen Pressure Assembly, P/N 102177554**

Part No.	Description
203950	RIGHT HAND MALE NUT
207929	AIR HOSE, 3 FT
208059	HEX NIPPLE, 1/4 NPT
208652	NITROGEN REGULATOR W/ GLAND
208653	BLEEDER VALVE

## **11 Warranty and Returns**

### **11.1 Warranty**

Fann Instrument Company warrants only title to the equipment, products and materials supplied and that the same are free from defects in workmanship and materials for one year from date of delivery. **THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED OF MERCHANTABILITY, FITNESS OR OTHERWISE BEYOND THOSE STATED IN THE IMMEDIATELY PRECEDING SENTENCE.** Fann's sole liability and Customer's exclusive remedy in any cause of action (whether in contract, tort, breach of warranty or otherwise) arising out of the sale, lease or use of any equipment, products or materials is expressly limited to the replacement of such on their return to Fann or, at Fann's option, to the allowance to Customer of credit for the cost of such items. In no event shall Fann be liable for special, incidental, indirect, consequential or punitive damages. Notwithstanding any specification or description in its catalogs, literature or brochures of materials used in the manufacture of its products, Fann reserves the right to substitute other materials without notice. Fann does not warrant in any way equipment, products, and material not manufactured by Fann, and such will be sold only with the warranties, if any, that are given by the manufacturer thereof. Fann will only pass through to Customer the warranty granted to it by the manufacturer of such items.

### **11.2 Returns**

For your protection, items being returned must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Fann will not be responsible for damage resulting from careless or insufficient packing.

Before returning items for any reason, authorization must be obtained from Fann Instrument Company. When applying for authorization, please include information regarding the reason the items are to be returned.

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