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## **SECTION 1 DESCRIPTION**

The Model 821 Rig Laboratory is a drilling fluid analysis kit designed to serve as a work station where wellsite personnel can carry out the usual standard drilling fluid checks.

There are three styles of the Model 821 Rig Laboratory available. The standard 821 Rig Laboratory includes testing equipment to test drilling fluids for weight, marsh funnel viscosity, filtrate volume, pH value, sand content, and chloride ion concentration. The equipment for the 821 Rig Laboratory is contained in a durable, compact 26 ½ x 25 x 11 inches (67.3 x 63.5 x 28 cm) stainless steel cabinet that weighs 75 pounds (34 kg). The 821H Rig Lab contains the same equipment as the standard 821 Laboratory, except that the filter press used to determine filtration properties of the drilling fluid is pressurized with a dead weight hydraulic assembly instead of a CO<sub>2</sub> pressuring source. Replacing the CO<sub>2</sub> assembly with the dead weight assembly increases the weight of the 821H from 75 pounds (34 kg) to 95 pounds (43 kg). The third, and largest, model is the 821S Rig Laboratory. The 821S Laboratory contains the same equipment as the 821 Laboratory but has a sink with water connections built into the cabinet. The 821S weighs 190 pounds (86 kg) and has a cabinet size of 42 X 35 X 16 inches (107 x 89 x 40.6 cm).

The Series 821 Rig Laboratory is designed to give the drilling fluid engineer convenient access to all testing equipment, and the cabinet and equipment are built for long life and easy maintenance under field conditions.

The standard drilling fluid tests included in the Rig Laboratory are described individually. The discussion of each test includes a description of the equipment, a detailed testing procedure, and information concerning the care and maintenance of the equipment.

The rig laboratory should be mounted on a wall, or placed on some surface, so that the cabinet is approximately level and the work table at a convenient height when standing in front of the cabinet.

## **SECTION 2 SAFETY**

Samples of drilling fluid must be obtained from the Rig Drilling Fluid system. This normally is done by dipping a cup into the pit. Often this area is wet or has had drilling fluid spilled. Care should be exercised not to fall or get splashed by drilling fluid. Some drilling fluids can cause severe skin burns or irritation.

Running a filtration test may require the use of the CO<sub>2</sub> Pressuring System. Make sure to follow the procedure in Section 5 for safe operation of the filter press.

Several reagents are required for the chemical tests on the drilling fluid filtrate. Make sure to read and observe the cautions on these reagent labels.

### SECTION 3 MUD WEIGHT MEASUREMENT

The Model 821 Rig Laboratory contains the Four-Scale Mud Balance to measure the density (weight) of the drilling fluid. This Mud Balance consists of a constant-volume sample cup, with lid, connected to a balance arm. The balance arm is inscribed with four graduated scales. On the front of the arm are scales for measuring density in pounds per gallon and specific gravity. On the back of the arm are scales for measuring pounds per cubic feet and pounds per square inch per 1000 feet of depth. A rider is moved along the balance arm to indicate the scale readings. There is a knife edge attached to the arm near the balance cup, and a bubble level built into this knife edge for leveling the arm. The knife edge fits into the fulcrum that is mounted in the base stand.

To ensure that measurements are accurate, the inside of the balance arm cup should be clean and dry before it is filled with the drilling fluid sample.

#### A. Drilling Fluid Weight Testing Procedure

Follow this procedure to measure the density (weight) of drilling fluid:

1. Collect a test sample with the 1 quart (1,000 ml) measuring cup and fill the balance arm cup with drilling fluid.

Tap the side of the balance cup several times to break up any entrained air or gases; then put the lid onto the balance cup by pushing it downward with a slow, rotating motion until it is firmly seated. Make sure some of the drilling fluid sample is forced out through the vent hole in the balance cup lid (this also helps rid the sample of entrained air or other gases).

2. Clean the drilling fluid from the outside of the balance cup and lid, and then wipe off any excess water.
3. Fit the knife edge on the balance arm into the slot in the base fulcrum, and balance the arm by moving the rider along the scale.

The Mud Balance is horizontal when the bubble fluctuates an equal distance to either side of the center line.

4. Take the reading from the side of the rider nearest the balance cup. (The arrow on the rider points to the correct side for readings.)

The weight reading should be reported to the nearest 0.1 lb/gal, 0.5 lb/cu ft, or 0.01 g/cm<sup>3</sup> (this last value is equivalent to specific gravity).

#### B. Calibration of the Mud Balance

The calibration of the Mud Balance is not likely to change; however, calibration can be checked using fresh water. At 70°F (21°C) fresh water

should give a reading of 1.00 on the specific gravity scale, 8.34 on the lb/gal scale, and 62.3 on the lb/cu ft scale. This spot on the balance arm is marked with a longer scale division line called the water line. Even small amounts of dirt or drilling fluid on the balance will cause it not give the correct reading for fresh water. The instrument should be thoroughly cleaned.

If the Mud Balance continues to give improper readings for fresh water after cleaning, recalibrate it. Replacing the lid on the balance cup with a new lid can cause the Mud Balance to be out of calibration. Check the calibration whenever a different lid is used and, if necessary, recalibrate, using the new lid.

1. Remove the screw cover from the weight adjustment compartment.
2. Add or remove lead shot until the Mud Balance is correctly calibrated.

**NOTE:** Changes in temperature can affect the measurement readings and balancing to within  $\frac{1}{2}$  the width of the water line should be considered satisfactory.

## SECTION 4

### MARSH FUNNEL VISCOSITY MEASUREMENT

The Model 821 Rig Laboratory contains the Marsh Funnel Viscometer for measuring drilling fluid viscosity. The funnel is made of plastic, and is 12 inches (30.5 cm) long. The wide end is six inches (15.2 cm) in diameter. A 10-mesh screen covers one-half of the opening. The Marsh Funnel viscosity is the ratio of the speed of the drilling fluid as it passes through the outlet tube (the shear rate) to the amount of force - the weight of the drilling fluid itself that is causing the drilling fluid to flow (the shear stress). Marsh Funnel viscosity is reported as the number of seconds required for one quart (946 cm<sup>3</sup>) of drilling fluid to flow out of a Full Marsh Funnel. (The fluid to be level with the screen).

Marsh Funnel readings are only general measurements, but the frequent reporting of the Marsh Funnel viscosity will alert the drilling fluid engineer to sudden changes in the drilling fluid viscosity that could require corrective action.

In addition to the Marsh Funnel, this test requires a container to collect a drilling fluid sample, a 1000 cc measuring cup to receive the drilling fluid as it flows out of the funnel, a stop watch, and thermometer. These parts are listed in Section 9.

#### A. Drilling Fluid Viscosity Testing Procedure

The Marsh Funnel can be fitted over two nails or screws on a wall or other vertical surface for use and for storage if desired.

The Marsh Funnel should be clean and dry before beginning this procedure. Follow these steps to measure the viscosity of drilling fluid:

1. Collect a fresh drilling fluid sample.
2. Holding the funnel erect with a finger over the outlet tube, pour the drilling fluid into the funnel through the screen until the fluid level reaches the bottom of the screen. The Marsh Funnel filled to the proper level holds more than one quart of drilling fluid. (The screen will filter out the larger particles that could clog the outlet tube.)
3. Hold the funnel over a clean 1000 cm<sup>3</sup> measuring cup.
4. Quickly remove the finger from the outlet tube and, at the same time, begin timing the fluid outflow.
5. Allow one quart (946 cm<sup>3</sup>) of drilling fluid to drain from the Marsh Funnel into the measuring cup. Stop timing the outflow.
6. Record the number of seconds required for the quart of drilling fluid to flow out of the funnel. Report this value as the Marsh Funnel viscosity. Also record the temperature of the sample.



**B. Care of the Marsh Funnel**

1. Clean and dry the funnel and measuring cup thoroughly after each use.
2. Clean the orifice with a small test tube brush.

Take special care not to bend, flatten or damage the brass outlet tube at the bottom of the funnel. The Marsh Funnel Viscosity reading is computed using the exact diameter of this outlet and, if the outlet is distorted, the readings will be inaccurate.

**C. Calibration of the Marsh Funnel**

Periodically check the calibration of the Marsh Funnel by measuring the viscosity of fresh water. The funnel is dimensioned so that the outflow of one quart (946 cm<sup>3</sup>) of fresh water at a temperature of 70° ±5°F (21° ±3°C) is 26 ±0.5 seconds. If the calibration of the Marsh Funnel fails to check out, it should be cleaned again, using a pipe cleaner, to ensure that there is nothing obstructing the outlet. If the Marsh Funnel continues to give an incorrect reading for fresh water after cleaning, the outlet tube has probably become distorted, and the funnel should be replaced.

## SECTION 5 FILTRATE (FLUID LOSS) MEASUREMENT

The Model 821 Rig Laboratory has a Model 300 Standard API Filter Press mounted on the cabinet for measuring the filtration and wall-building properties of the drilling fluid. This filter press consists of a filter cell, a pressure source, a filtering medium, and a graduated cylinder for receiving and measuring the filtrate.

The filter cell is constructed of rustproof anodized aluminum and chrome-plated brass, or stainless steel. The pressure source used in the standard 821 Rig Laboratory and the larger 821S Rig Laboratory is a CO<sub>2</sub> Pressurizing Assembly. These Rig Laboratories are also equipped with an adapter which can be used to connect the filter press to the Rig compressed air supply. The filter press used in the 821H Rig Laboratory is pressured with a dead weight hydraulic assembly.

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

Two packages containing 100 filters each, two glass or plastic graduated cylinders (10 and 25 ml) and an extra mounting screen are included with the Rig Laboratory.

### A. Pressuring with a CO<sub>2</sub> Pressure Source

Follow this procedure to pressurize with a CO<sub>2</sub> cartridge pressure source:

1. Remove the barrel from the CO<sub>2</sub> pressuring assembly and insert a fresh CO<sub>2</sub> cartridge.
2. After making sure the safety bleeder valve is closed, and that the regulator adjusting screw is backed out to the closed position (maximum outward), turn the barrel loosely with the fingers until first contact with the puncturing pin is felt.
3. Advance the holder an additional 1/4 turn. The puncture pin seals when the cartridge seats.
4. Screw the adjusting screw into the regulator to apply 100 ±5 psig (approximately 690 kPa) pressure to the filter cell as indicated by the test-pressure gauge, and start timing the test. Refer to D-6 below:

### B. Pressuring with a Dead Weight Hydraulic Pressure Source

Follow this procedure to pressure the filter press with a 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, into the cylinder. Allow the piston to travel full stroke.
3. Refill the reservoir with clean, fresh water and close the bleed-off valve.
4. Attach the dead weight assembly to the filter press frame, if not already in place.
5. Connect the air hose from the dead weight assembly to the top cap pressure inlet, if not already attached.
6. 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 psig.
7. Lift the dead weight back to the top of the stroke, and start timing the test when the weight is released. Refer to D-6 below. One stroke of the piston will allow a maximum filtration loss of approximately 30 ml.

C. External Pressure Source

The 821 and 821S Laboratories are equipped with a connection so that the filter press can be pressured using the drilling rig compressed air system. The rig air is connected through a 1/4" NPT threaded connector located on the back of the cabinet. This connector passes through the cabinet wall, near the filter press frame, and is attached to a flexible air hose that can be connected to the CO<sub>2</sub> pressuring assembly through the CO<sub>2</sub> cartridge connection.

**CAUTION**

**THE PRESSURE REGULATOR ON THE CO<sub>2</sub> PRESSURING ASSEMBLY IS DESIGNED FOR AIR PRESSURES BELOW 1000 PSIG. (6900 kPa). DO NOT EXCEED THIS PRESSURE.**

D. Filter Press Testing Procedure

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

1. Assemble the dry parts of the filter cell in the following order:  
base cap, rubber gasket, screen, a sheet of filter paper, rubber gasket, and filter cell. Refer to Fig. 1. Secure the cell to the base cap by rotating it clockwise.
2. Fill the cell with a fresh test sample to within approximately 1/4" (6 mm) of the top. (Filling the cell to this level lessens the volume required from the pressure source).

3. Set the filter press in place on the frame.



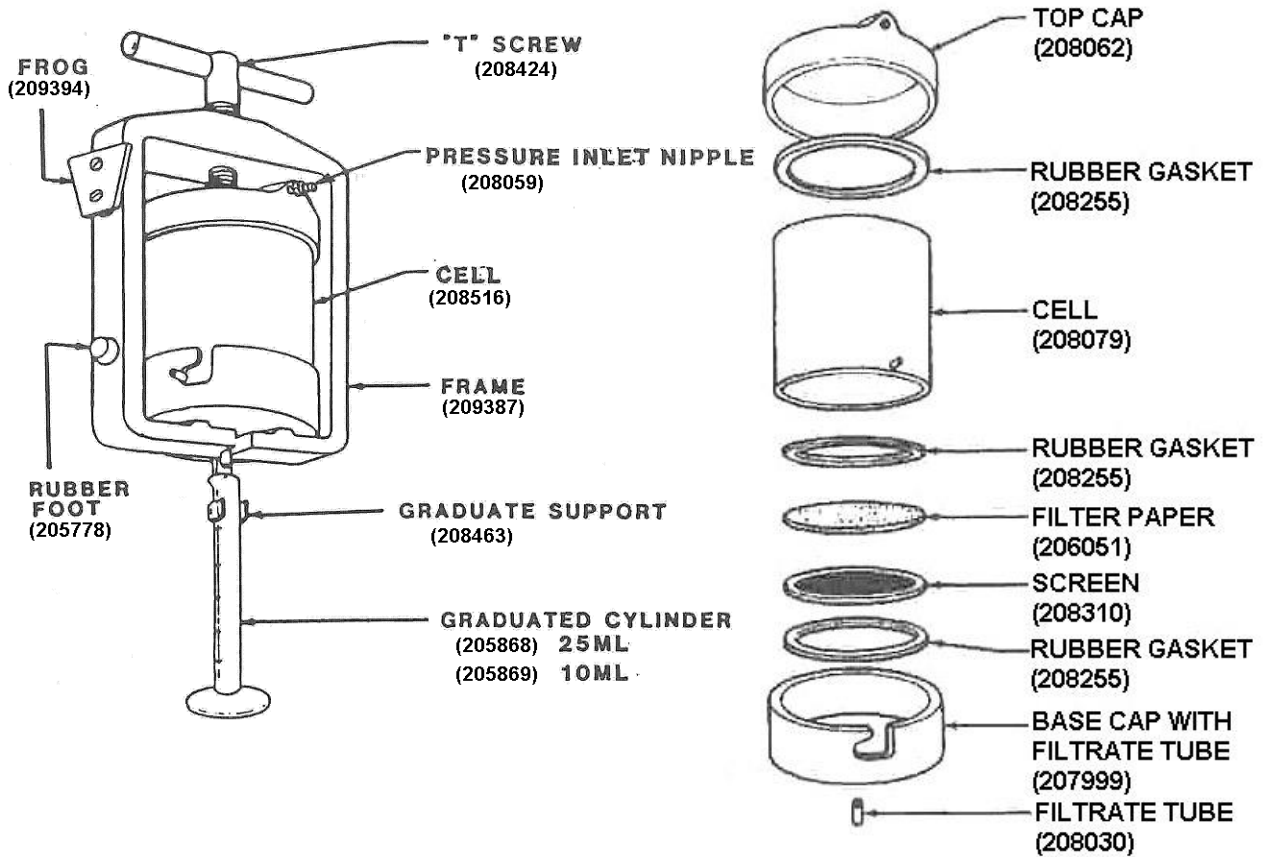
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Use **anti-seize compound** on the T-screw threads to prevent galling with the threaded insert. Both of these components are stainless steel, which is prone to galling. Without anti-seize, the T-screw can lock in place and not turn. This will make the filter press inoperable.

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4. 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.
5. Place a dry graduated cylinder under the filtrate tube.
6. Depending upon the pressure source being used, apply pressure to the cell, following the appropriate pressure source procedure as outlined above; at the same time, start timing the test.
7. At the end of 30 minutes or 7 ½ minutes (Refer to NOTE below), close the pressure source valve or back off the regulator, and open the safety-bleeder valve. If the dead weight pressure is being used, open the bleed off valve. This releases the pressure on the entire system.

**NOTE:** The amount of filtrate collected at the end of 7 ½ minutes can be noted and, when multiplied by two, will yield a rough estimate of the amount that would be collected in 30 minutes. The estimated value is usually one or more milliliters short of the actual value, and this estimation procedure should not be attempted on drilling fluids having a filtrate loss of less than 5 ml in the 7 ½ minute period.



**Fig. 1 - Filter Press Cell (Drilling Fluid Reservoir) Assembly**

8. Measure the volume of filtrate collected in the graduated cylinder and record the filtrate loss in milliliters as the API (30-minute) filtrate loss of the drilling fluid, or milliliters X 2 for the 7 ½ minute test.
9. Loosen the T-screw, remove the cell top, and remove the cell from the frame.
10. Discard the drilling fluid.
11. Disassemble the filter cell and carefully remove the filter cake and filter paper from the base cap.
12. With a gentle stream of water (or, in the case of oil drilling fluids, with diesel oil), carefully wash excess drilling fluid from the cake.

13. Measure and record the thickness of the filter cake to the nearest 1/32" (0.8 mm).
  14. If desired, record properties of the filter cake such as texture, hardness, flexibility, etc.
- E. Care of the Filter Press Assemblies
1. Filter Press

After each use, wash and dry the filter press Base Cap, Cell, Screen, and Rubber Gaskets. Wipe clean the rest of the filter press, then loosely reassemble the cell using a new piece of filter paper and place it onto the frame for storage. Wash and dry the graduated cylinder.
  2. CO<sub>2</sub> Pressure Source

At the completion of a test the regulator tee screw must be backed off (counterclockwise) until it turns freely before the bleed valve is opened, otherwise the remaining pressure in the CO<sub>2</sub> cartridge will be bled off. The pressuring assembly can be stored with a partially used cartridge in it until the next test.
  3. Dead Weight Pressure Source

Always protect the mirror finish of 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.
- F. Filter Press Regulator Maintenance and Repair
- Most regulator troubles are caused by leaking fittings or faulty pin and seat. Rarely does a diaphragm rupture. If a regulator will not hold pressure, check the fittings screwed into it. This is done by applying pressure to the system and looking for escaping gas in the form of bubbles. There are two methods of doing this. One method is to apply soap suds to the fitting area, the other is to carefully immerse all but the pressure gauge in a container of water. If leaks are apparent, disassemble and apply tape thread sealant to the threads.

If the regulator connections do not leak, the seat and pin probably need replacement. Follow this procedure to Replace the Seat and Pin in the Regulator Refer to Fig. 2:

1. Using a wrench on the hex of the spring case, unscrew the spring case. All parts down to and including the diaphragm (208617) will remain in the spring case.
2. Remove the thrust plate (208619).
3. Unscrew the retainer and remove the seat with the pin.
4. While the regulator is dis-assembled, it should be checked for evidence of drilling fluid or other contaminant that may have been sucked into the regulator. Clean any debris from inside the regulator. An outlet filter (208626) is available to prevent this contamination.
5. To replace the pin and seat, install retrofit kit (208643).
6. Re-assemble the regulator.

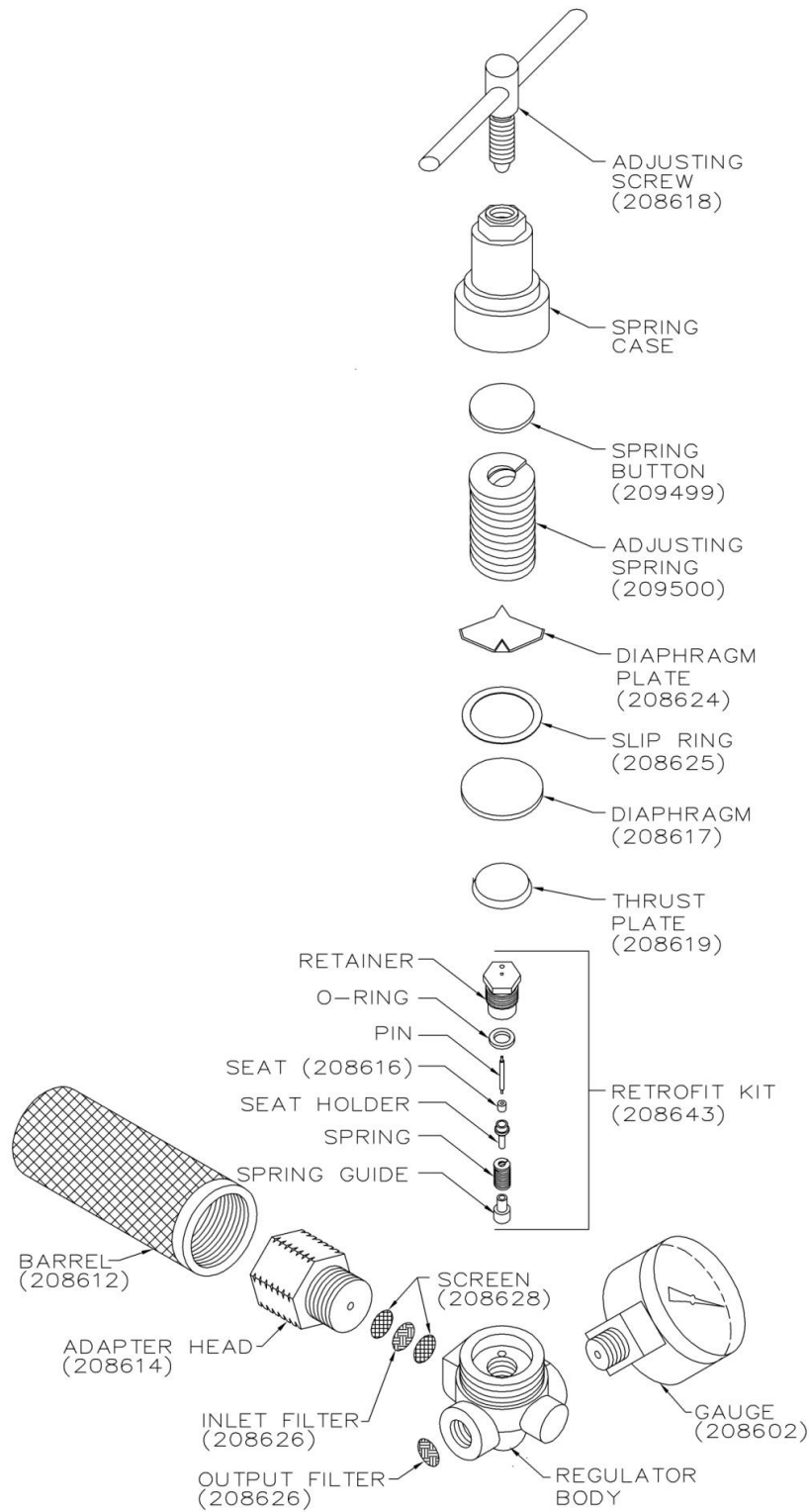


Fig. 2 Exploded View CO<sub>2</sub> Regulator



## SECTION 6

### pH MEASUREMENT

The Model 821 Rig Lab includes pHDrion pH indicator papers to measure the pH of the drilling fluids. These indicator papers are saturated with a dye that will produce a color which indicates the pH of the fluid in which it is placed. Each rig lab contains one dispenser of wide-range paper (pH 1-11) and one dispenser of short range paper (pH 10-14). A standard color chart is printed on each dispenser for comparison with the test papers.

#### A. The pH Measurement Procedure

Follow this procedure to measure the pH of drilling fluid:

1. Choose the indicator paper with a pH range that includes the expected pH values of the drilling fluid.
2. Place a one-inch (25 mm) strip of the indicator paper on the surface of the drilling fluid, and allow enough time for the indicator paper to soak up the moisture and the color to stabilize. (This could be anywhere from a few seconds to a several minutes).
3. Compare the color of the upper side of the paper (the side that has not been in contact with the drilling fluid solids) with the color chart on the dispenser and estimate the pH value of the drilling fluid.

If the color of the indicator paper cannot be matched with a color on the dispenser color chart, repeat the test with an indicator paper that covers another range of pH values.

4. Report the estimated pH value of the drilling fluid to the nearest 0.5 pH unit.

**NOTE:** The pHDrion indicator paper does not produce accurate pH measurements with drilling fluids having a high salt concentration. A pH meter (Part Number 209994 or 209997) is recommended for measuring the pH of drilling fluids with salt concentrations in excess of 10,000 ppm chloride.

#### B. Care of the pH Papers

The pHDrion dispensers should be stored in a clean, dry place that is out of direct sunlight. It is recommended that they be returned to their storage compartment in the Rig Lab cabinet.

## SECTION 7 SAND CONTENT MEASUREMENT

The Model 821 Rig Lab employs the sieve analysis method to measure the sand content of drilling fluid, using a sand screen to trap and measure the coarse particles in the drilling fluid. Each Rig Laboratory includes a sand screen, a funnel, and a measuring tube to measure sand content. The sand screen is a 200-mesh sieve mounted inside a hollow cylinder 2 1/16 inches (52.5 mm) in diameter. The funnel fits over the end of the screen cylinder, and the screen and funnel assembly in turn fit into the mouth of the glass measuring tube. The measuring tube is lined with a scale that is graduated from 0 to 20% so that the percentage of sand by volume of drilling fluid can be read directly.

### A. Sand Content Testing Procedure

Follow this procedure to measure the sand content of drilling fluid:

1. Add drilling fluid to the measuring tube up to the line labeled "Mud To Here," and then add clear water (diesel oil for oil based drilling fluids) to the line labeled "Water To Here." Close the mouth of the tube with the thumb and shake it vigorously.
2. Pour the mixture in the tube through the screen.
3. Continue adding new water to the tube, shaking it and pouring the contents through the screen, until all of the drilling fluid has been washed out of the tube.

NOTE: The mixture should not be stirred or manually forced through the screen with a finger a pencil, or the like, because this will cause erroneous readings and may pull the screen loose from the holder. Tapping the side of the screen holder as the drilling fluid and water are added will help the mixture pass through the screen.

4. Flush the screen with water to wash away the remaining drilling fluid and shale particles until all that remains on the screen is sand.
5. Fit the large end of the funnel down over the top of the screen holder and slowly invert the screen and funnel assembly, fitting the tip of the funnel into the mouth of the glass measuring tube.
6. Using a fine spray of water, wash the sand from the screen back through the funnel into the glass measuring tube and allow the sand to settle.
7. Note the quantity of sand that has settled and, using the scale on the outside of the tube, determine the percentage of the total drilling fluid volume that is sand. Report this value as "% by Volume."

NOTE: In addition to sand, there may be other coarse solids or lost circulation material retained on the screen. The presence of these solids should be noted.

B. Care of the Sand Content Test Equipment

After each use of the sand content test equipment, wash dirt from the screen, the funnel, and the measuring tube. Use special care to clean and dry the screen thoroughly.

## SECTION 8 CHLORIDE CONTENT MEASUREMENT

To determine the chloride content of drilling fluid, a sample of the drilling fluid filtrate is titrated with a standard silver nitrate solution, using potassium chromate as an indicator. The silver nitrate precipitates the chloride ion as silver chloride. When the chloride is completely precipitated, the addition of more silver nitrate produces a red color, silver chromate, which is taken as the end point. Results are reported in parts per million chloride ions. As is always the case when a "measured volume" of sample is tested instead of a "measured weight", this ppm measurement is a nominal value. The true ppm could be obtained by dividing the titration value by the density of the sample. The difference is usually negligible, except for samples with a high chloride concentration. In any event, reporting the nominal titration measurement (with no correction for density) conforms to the Standard Field Procedure for Testing Drilling Fluids, API RP 13B. All chlorides present in the filtrate, such as chlorides of magnesium and calcium, as well as sodium, are determined and reported as chlorides.

The following reagents and apparatus are included in the Model 821 Lab for determining the chloride content of drilling fluid:

- Potassium Chromate Solution, 2 oz.
- 0.01 Silver Nitrate Solution, 8 Oz.
- 0.001 Silver Nitrate Solution, 8 oz.
- Distilled Water, 8 Oz.
- Titration Dish
- Pipette, 1 ml
- Pipette, 10 ml
- Stirring Rod

The Model 821 Rig Laboratory is designed as a rig work station for monitoring the condition of drilling fluids. However, not all the chemicals and equipment necessary for every available drilling fluid test are included. Only the chemicals and equipment for the basic chloride content measurement are included. Additional equipment and chemicals necessary to deal with special circumstances, and to carry out the more involved Oil Drilling Fluid Salinity Analysis procedures are not included.

### A. Chloride Content Testing Procedure (Water Base Drilling Fluids)

Follow this procedure to measure the chloride ion ( $\text{Cl}^-$ ) content of water base drilling fluid:

1. Pipette 1.00 ml of drilling fluid filtrate into the titration dish and add 40 to 50 ml of distilled water.
2. Add four or five drops of potassium chromate indicator solution.

3. Add silver nitrate solution (either 0.01 or 0.001 depending on the expected range of salinity) drop by drop from a pipette, stirring the solution with the stirring rod, until the color of the sample solution changes from yellow to orange or brick red.
4. Multiply by 10,000 the number of milliliters of silver nitrate solution that were required to cause the color change for the 0.01 silver nitrate solution; or multiply by 1000 for the 0.001 silver nitrate solution.
5. Report the results as parts per million chloride (ppm Cl), or multiply ppm Cl by 1.65 to obtain ppm NaCl (Sodium Chloride).

B. Additional Consideration for Chloride Testing

1. When the salt content of the drilling fluid sample is very high or very low, the volume of the test sample can be increased or decreased so that more practical amounts of Silver Nitrate solution (not to exceed 10 ml) may be used. To obtain correct concentrations, when the amount of the test sample used in step 1 of the chloride content testing procedure is other than 1.0 ml, divide the results obtained in step 4 by milliliter amount of the test sample used.
2. If the sample is determined to be alkaline (using the phenolphthalein indicator solution) after it has been diluted with distilled water in step 1 of the chloride content testing procedure, it should be made colorless to phenolphthalein using N/10 sulfuric acid.
3. If the filtrate is so deeply colored by drilling fluid thinner that the color change cannot be seen in the diluted sample, the following procedure can be used:
  - a. Add 1N nitric acid to a measured volume of the original filtrate until the color changes to tan.
  - b. Add a small quantity of chloride-free powdered activated charcoal, stir thoroughly, and filter. (The most practical filtration method is gravity filtration using a funnel and fast flow filter paper.)
  - c. Wash with distilled water, collecting the washings with the first filtrate, until the volume reaches 50 ml.
  - d. Add an excess of powdered c.p. (chemically pure) calcium carbonate so that some remains undissolved and proceed with step 2 of the chloride content testing procedure.
4. If sulfides are present, as indicated by a brownish black precipitate, take a new sample, add 1 ml of 1N nitric acid, and 2 ml of potassium chromate indicator. If it is also necessary to remove

drilling fluid thinner, the removal can be done at this point beginning with step 2. above. If removal of thinner is not necessary, add 1 gram of powdered c.p. calcium carbonate, dilute to 50 ml, and proceed with step c of the chloride content testing procedure.

## SECTION 9 PARTS LIST

### A. Test Equipment in Model 821 Rig Laboratories

Part No.	Description
206769	Four-Scale Mud Balance w/o case
206884	Marsh Funnel Viscometer
206889	Measuring Cup, Plastic, 1000 cc
206898	Stop Watch, Digital
207391	Filter Press, wall mounting
208310	Screen (Spare)
208594	Dead-Weight Hydraulic Assembly (821H)
208604	Air Hose, 12 inch (821) (821S)
208613	Air Hose Adapter (821) (821S)
208647	CO <sub>2</sub> Pressuring Assembly (821) (821S)
209661	Screen (200 Mesh)
209662	Funnel
209663	Measuring Tube
209850	Potassium Chromate Indicator, 2 oz.
209910	0.001 Silver Nitrate, 8 oz.
209916	0.01 Silver Nitrate, 8 oz.
209944	Distilled Water, 8 oz.
210053	Wide range pHydriion pH Dispense, pH 1-11
210060	Short range pHydriion pH Dispense, pH 10-14
210387	Instruction Manual
205852	Brush, Large w/Wooden Handle
205854	Brush, Test Tube, Small
205868	Cylinder, graduated 25 ml
205869	Cylinder, graduated 10 ml

Part No.	Description
205902	Titration Dish, 140 ml.
206026	Pipette, 1 ml.
206029	Pipette, 10 ml.
206031	Stirring Rod
206036	Interval Timer
206038	All-Metal Thermometer, 0°-350°F
206051	Filter Paper, (package of 100)

**B. Parts for Drilling Fluid Weight Test Equipment**

Part No.	Description
206776	Weight Adjusting Screw Cover
206777	Knife Edge w/Level
206779	Rider
206781	Base w/Fulcrum
206740	Lid
206742	Lead Shot (vial)
206744	Fulcrum

**C. Parts for Drilling Fluid Filtrate (Fluid Loss) Test Equipment**

Part No.	Description
207999	Base Cap w/Filtrate Tube
208059	1/4 NPT X Eastman Adapter
208062	Top Cap
208079	Cell
208255	Gasket
208424	T-Screw
209389	T-Screw Insert
208608	Midget CO <sub>2</sub> Cartridges (10/box)



Part No.	Description
208614	Adapting Head
208653	Safety-Bleeder Valve (170 psig pop-off)

D. Parts for CO<sub>2</sub> Regulator (210378) (210382)

Part No.	Description
208615	CO <sub>2</sub> Regulator Complete
208618	Adjusting Screw
208622	Spring Button
208623	Adjusting Spring
208624	Diaphragm Plate
208625	Slip Ring
208617	Diaphragm
208619	Thrust Plate
208643	Regulator Repair Kit

E. Parts for Dead Weight Hydraulic Assembly (210379)

Part No.	Description
208594	Dead-Weight Hydraulic Assembly (210379)
205653	O-Ring for Dead-Weight Piston
208595	Reservoir
208596	1/8" Elbow
208597	Base w/Cylinder
208598	Weight
208599	Check Valve (2)
208600	1/8" Tee
208601	1/8" X 1/8" Hex Nipple
208602	Pressure Gauge, 0 to 200 psig, 1.5" diameter
208603	1/8" Eastman Adapter

208605	Piston
208605	Hoke Valve 1/8 NPT
207889	1/8" Allen Wrench

### **Warranty**

Fann Instrument Company warrants its products to be free from defects in material and workmanship for a period of 12 months from the time of shipment. If repair or adjustment is necessary, and has not been the result of abuse or misuse within the 12-month period, please return, freight prepaid, and correction of the defect will be made without charge.

Out of warranty products will be repaired for a nominal charge.

Please refer to the accompanying warranty statement enclosed with the product

### **Return of Items**

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.

Our correspondence address is:

**Fann Instrument Company**

P.O. Box 4350

Houston, Texas USA 77210

Telephone: 281-871-4482

Toll Free: 800-347-0450

FAX: 281-871-4446

Email: [fannmail@fann.com](mailto:fannmail@fann.com)

Our shipping address is:

**Fann Instrument Company**

15112 Morales Road, Gate 7

Houston, Texas 77032 USA