

®

**Model 144  
Convertible Density Balance  
Instruction Manual**

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**DESCRIPTION**

The Convertible Density Balance is an accurate, self-contained measuring device used to accurately determine the density of Drilling Fluids, Cement Slurries, and similar materials. It can be used as a Non-Pressurized or Pressurized Density Balance. Its density range is:

- ?? 7 to 24 lb/gal. (pounds per gallon)
- ?? 0.84 to 2.88 Specific Gravity (SP GR or g/cm<sup>3</sup>)
- ?? 50 to 180 lb/cu ft (Pounds per Cubic foot)
- ?? 350 to 1250 lb/sq in/ 1000 ft (Pounds per square inch per 1000 feet depth)

?  
The Fluid Density Balance in its Non-Pressurized mode consists of:

- ?  
?? A constant-volume sample cup connected to an arm (5). The arm has four graduated scales for measuring density directly in different units.
- ?  
?? A sample cup lid (1) with a vent hole in the center that fits on the sample cup to assure a constant volume.
- ?  
?? A Rider (8) that fits over the arm and is moved along the balance arm to indicate the density reading.
- ?  
?? A Knife-edge (7), with a built in bubble level, permanently attached to the arm near the Balance Cup. This assures the arm is level when the density scale is read.
- ?  
?? A fulcrum that is mounted on a base stand, or in the carrying case when a case is used.

The Fluid Density Balance in its Pressurized mode consists of:

?  
?? The same Balance Cup and Arm with Knife-edge, Rider, etc.

?  
?? A Lid Assembly. The lid assembly seals to the Balance Cup. It also contains a valve to hold pressure and a port to connect to the Pressurization Pump.

?  
?? A Cup Housing and Closure fits around the cup and lid assembly to retain them.

?  
?? A Counterweight to be mounted on the end of the arm to compensate for the additional weight of the Pressure Lid, Closure and Cup Housing on the cup.

?  
?? A hand pump used for pressurizing.

?  
**CONVERTING FROM PRESSURIZED TO NON-PRESSURIZED OPERATION**

?  
?? Unscrew the Closure (13) and then remove the Cup Housing (9) and Pressure Lid (14).

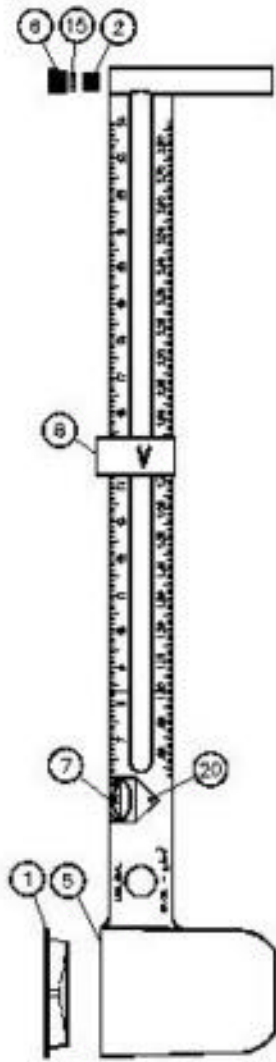
?  
?? Pull the Counterweight (11) downward and remove it from the end of the balance.

?  
?? Place the Non-Pressurized cup Lid (1) on the Balance Cup.

?  
**NON-PRESSURIZED DENSITY MEASUREMENT PROCEDURE**

?  
Fluid samples containing large amounts of gas should be tested using the pressurized density measurement procedure.

?  
The Balance Cup should be clean and dry before it is filled with the fluid sample. Drops of fluid anywhere on the balance will cause erroneous readings.



**Fig. 1**  
**Non-Pressurized Density Balance**

1. Place the base stand with the fulcrum on a surface that is approximately level. If a case with a built in fulcrum is being used, place the open case on a surface that is approximately level.
2. Fill the Balance Cup with the sample to be tested. Tap the side of the Balance Cup several times to break up any entrained air or gases. Place the Non-Pressurized Lid (1) onto the Balance Cup by pushing it downward with a rotating motion until it is firmly seated. Make sure that some of the test sample is forced out through the vent hole in the lid. This action will also help to rid the sample of any entrained air or gas.
3. Clean any sample from the outside of the Balance Cup and Lid.
4. Fit the Knife-edge (7) of the balance arm onto the fulcrum and balance the assembly by moving the Rider (8) along the arm. The Balance Arm is horizontal when the level bubble fluctuates an equal distance to either side of the center line.
5. Take the reading from the side of the Rider nearest the Balance Cup. The arrow on the Rider is pointing to this side.
6. Empty the sample from the cup. Clean and dry the entire assembly immediately.

The fluid density should be reported to the nearest 0.1 lb/gal, 0.01 g/cm<sup>3</sup> (which is equivalent to specific gravity), 0.5 lb/cu ft, or 5 psi/1000 ft. of depth.

## **CONVERTING FROM NON-PRESSURIZED TO PRESSURIZED OPERATION**

?? Remove the Lid (1).

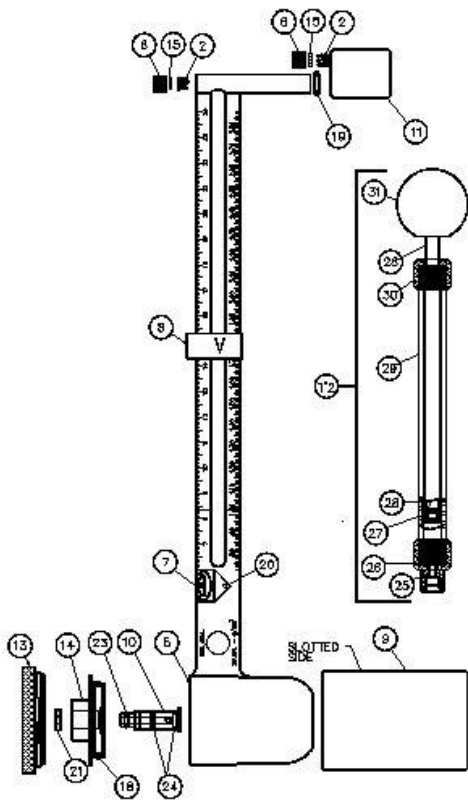
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?? Mount the Counterweight (11) by sliding it up onto the end of the arm until the notch fully engages the arm. It is held in place by the friction of an O-Ring.

### **PRESSURIZED DENSITY MEASUREMENT PROCEDURE**

The Balance Cup should be clean and dry before it is filled with the fluid sample.

1. Place the base stand with fulcrum on a surface that is approximately level. If a case with a built in fulcrum is being used, place the open case on a surface that is approximately level.
2. Fill the Balance Cup with the sample to be tested to between 1/4 and 1/8 inch (6 mm and 3 mm) of the top. Save some of the sample for use later in filling the pressurizing pump. Tap the side of the Balance Cup several times to break up any entrained air or gases.
3. Make sure the valve in the Pressure Lid (14) is open (down). Place the Pressure Lid on the cup. When the Pressure Lid flange seats on the cup, a small amount of sample may be forced out of the pressurization port.
4. Wipe or wash clean any sample spilled from the pressurization port and then dry the balance.
5. Slide the Cup Housing (9) over the Balance Cup from the bottom, aligning the slot with balance arm. Screw the Closure (13) over the Pressure Lid and tighten as tight as possible by hand to insure the Pressure Lid is completely seated. This will cause sample to be forced out of the port which must be wiped clean in step 9.



**Fig. 2**  
**Pressurized Density Balance**

6. Load the Pressurization Pump (12) from the remaining sample:
  - ?? Push the piston (28) all the way in.
  - ?
  - ?? Submerge the nose end of the pump in the sample saved when the cup was filled.
  - ?
  - ?? Pull the piston rod toward the knob end to load it with sample. Make sure no air is sucked into the pump.
7. Set the balance on a sturdy surface. Slip the nose end of the pump on to the pressure port of the lid and press the pump knob and body downward with 50 to 70 pounds (23 to 32 kg) force to pressurize the sample in the cup.
8. Slowly transfer the downward force from the pump body to the knob of the pump. This will allow the pressure in the cup to close the valve and maintain cup pressure. The pump body may have to be lifted slightly to allow the valve to close. Once the valve is closed, the force on the pump can be released and the pump can be removed. Make sure the force on the pump knob is completely removed before disconnecting to prevent squirting the fluid remaining in the pump everywhere.
9. Wipe or wash clean any sample spilled from the pressurization port and then dry the balance.
10. Place the Knife-edge (7) of the filled balance on to the fulcrum. Balance the assembly by moving the Rider (8) along the arm. The Balance Arm is horizontal when the level bubble fluctuates an equal distance to either side of the center line.
11. Take the reading from the side of the Rider nearest the balance cup. The arrow on the Rider is pointing to this side.

12. Slip the nose of the empty pump on to the pressure port and press downward to open the valve and bleed off the pressure into the pump
13. Remove the closure (13) and cup housing (9). Remove the pressure lid (14), being careful not to spill the sample; then pore out the sample. Clean and dry all of the parts of the balance as soon as possible.

The density of the sample should be reported as the "Pressurized" density to the same accuracy as the Non-Pressurized density measurement. (See bottom pg. 4)

#### **CALIBRATION CHECK**

The Density Balance calibration can be checked using distilled water. At 70°F (21°C) pure water should give a reading of  $1.00 \pm 0.005$  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. Small amounts of debris anywhere on the balance can cause inaccurate readings. If the balance does not give the correct reading for distilled water, the instrument should be thoroughly cleaned and checked again.

If it is determined that the balance needs re-calibration, it should be sent to Fann. Factory procedures are required to insure that the balance reads correctly when operated in either the pressurized or non-pressurized mode.

#### **CAUTION**

**PARTS MARKED WITH (⚡) IN THE PARTS LIST WILL REQUIRE COMPLETE RECALIBRATION OF THE DENSITY BALANCE IF REPLACED.**

**DO NOT MIX ANY PARTS WITH THOSE FROM A DIFFERENT BALANCE OR BOTH WILL HAVE TO BE RECALIBRATED. WE RECOMMEND MARKING THE PARTS OF THE BALANCE FOR IDENTIFICATION.**

## O-RING REPLACEMENT

**Where lubrication is directed, use a water resistant grease such as (P/N F4160).**

**Valve** - The Pressure Cap valve has three O-Rings. These are replaced as follows:

1. Remove the pump connection ORing (23) with a small screwdriver. Install and lubricate the new O-Ring.
2. The valve (10) must be removed from the lid to replace the two O-Rings (24). Remove the Retainer Ring (21) using a small screw driver or knife blade to pry one end of the spiral ring out of its groove, then work the rest of the ring out of the groove and remove it.
3. Remove valve from lid.
4. Both ORings can now be replaced. Install and lubricate the O-Rings, then reassemble the valve into the lid, and reinstall the retainer ring.

**Counterweight** - The Counterweight is held in place by an O-Ring. Replace this O-Ring as follows:

1. Remove Counterweight (11) from the end of the balance arm.
2. Use a small screwdriver, through the slot in the counterweight, to pry one side of the O-Ring downward out of its groove. Then push the O-Ring (19) out the bottom of the counterweight.
3. Install a new O-Ring by pushing it into the hole from the top and then using a small screwdriver to start one side into the groove. Then work the rest of the O-Ring into the groove. Do not lubricate this O-Ring.

**Pump** - The pump has two O-Rings. These are replaced as follows:

### **Pump Adapter O-Ring Replacement**

1. Unscrew the Adapter (25) from the tube of the pump. The O-Ring (26) will be at the bottom of the female thread of the adapter. Remove it using a small screwdriver.
2. Install and lubricate the new O-Ring and reassemble the pump.

#### **Pump Piston O-Ring Replacement**

1. Unscrew the Cap (30) from the knob end of the tube. Pull the Piston Rod (28) out of the tube. The O-Ring (27) is on the end of the Piston Rod. A small screwdriver is helpful in removing this O-Ring.
2. Lubricate and install the new O-Ring. Also apply a small amount of lubricant to the bore of the pump tube. Then reassemble the pump.

#### **PARTS LIST**

<b>Bubble No.</b>	<b>Part No.</b>	<b>Description</b>
1	≈12400	Lid, Mud Balance
2	≈12404	Shot, Lead
6	≈14015	Plug, Pipe, 1/8
7	≈14016	Knife-edge
8	≈14020	Rider
9	≈14414	Housing, Cup
10	≈14417	Valve
11	≈14419	Counterweight
12	14423	Pump
13	≈14428	Closure Assembly
14	≈14429	Lid & Flange Assembly
15	33720	Stop, Felt
18	E8010	O-Ring, 1-3/4 x 1/8 Nit
19	E8030	O-Ring, 1/2 x 1/8 Nit
20	E9001	Pin, Roll, 3/32 x 11/16
21	F9014	Retainer Ring Spiral

Continued on next page

Bubble No.	Part No.	Description
23	L4505	O-Ring, 1/4 x 1/16 Nit
24	L4507	O-Ring, 3/8 x 1/16 Nit
25	14426	Adapter, f/Pump
26	L4511	O-Ring, 9/16 x 3/32 Nit
27	11574	O-Ring, 1/4 x 1/2 Nit
28	14424	Rod, Pump Piston
29	14427	Tube, Pump
30	14425	Cap, Pump End
31	J4073	Knob, Ball
Not Shown	13400	Case Balance
Not Shown	14418	Balance, Mud Density w/Case
Not Shown	E1085	Instructions
Not Shown	≈14030	Fulcrum with Base

≈Not required if the 13400 carrying case is used.

≈Parts cannot be replaced without re-calibration.

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