

HOW TO CALIBRATE A METER

Accurate calibration of fuel dispensing meters is an important responsibility of a service station equipment technician.

By taking care to conduct your tests in a precise and consistent manner, you will accomplish several things:

- Ensure that the meter will pass inspection by local Weights and Measures officials.
- Provide the station an accurate meter, one which is fair to both the owner and the customer.
- Increase your company's sales by detecting meters that need to be replaced.
- Ensure that the tank leak detection system has accurate data so that leaks will be detected and false alarms avoided.
- Demonstrate your professionalism.

Note: The National Institute of Standards and Technology (NIST) Handbook 44 states equipment in service at a single place of business found to be in error predominantly in a direction favorable to the device owner and near the tolerance limit shall not be considered maintained in a proper operational condition. This means that a station cannot attempt to calibrate all their meters to under deliver. The calibration must be as close to zero as possible.

Your local Weights and Measures regulations and tolerances may be different than Handbook 44. It is important that once a meter has been calibrated, you should follow whatever procedure is specified locally. Many localities require notification of the Weights and Measures official.

At PMP our test standard is: the meter must be within +/- 1 cubic inch of zero on "fast flow" and no more than 2 cubic inches between the "fast flow" and the "slow flow" readings. All of our test can drain times are clocked. Our test cans are level and mounted at eye level. "Fast flows" are run at 11 to 13 gallons per minute, and "slow flows" are run at 3.5 to 4.5 gallons per minute.

For safety reasons, we conduct our tests with mineral spirits. The difference between gasoline and mineral spirits generally will shift the test results about 2 cubic inches; therefore, we make our adjustments accordingly. However, due to the great variations between different fuels, it is very important that all newly installed meters be calibrated in the field.

Helpful Hints...

- Meter calibration must be verified by performing a test, not just by turning the dial.
- Your eye must be level with the meniscus when you read the sight tube. Readings must be taken from the bottom of the meniscus.
- Seal calibration mechanism with a "tamper proof seal".
- Rule of Thumb - Every .001 gallon off from "0" is equivalent to 1/4 cubic inch. For example 5.004 will be over "0" by approximately one cubic inch if the meter is already properly calibrated.
- All meters to be shipped must be drained of all flammable fluids due to DOT regulations. The inlet and outlet should be sealed with cap plugs, plates with gaskets, o-rings, or the equivalent.



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The following procedure is suggested by our staff for conducting field meter tests. We have found it to be an accurate and fast method for testing and calibrating meters.

Step 1: (New or remanufactured meters) Slowly dispense several gallons of fuel through the meter before attaching it to the computer or pulser. The purpose of this step is to prevent damage to the computer or pulser. The meter will spin rapidly as the air in the lines is displaced by fluid. Run several 5 gallon drafts through the meter to completely purge it of air. Use the air bleed plug found on certain meters (older A.O. Smith, Gilbarco, and Southwest) to allow the air to escape. All air must be purged from the meter to obtain consistent results. (If the nozzle will reach the tank fill pipe, run 50 to 100 gallons through the meter.) This ensures that all meter parts are "broken in" and all air is purged. Meter parts will "take a set" if left in storage for a long time and must be broken in again.

Step 2: "Wet the can" by filling your test measure with fuel. Dump the fluid back into the tank until it stops flowing and starts to drip. Continue to drain, while counting to 10 seconds. This procedure leaves a very thin film of fluid on the inside of the can. By using a "wet can" and allowing a 10 second drain after each 5-gallon draft, you will be able to test the meter very accurately. The key is to consistently drain the test can the same way. Otherwise, the variation in thickness of the film of fluid will cause your results to vary by several cubic inches.

Step 3: Run your first test after resetting the computer or electronic readout to zero. Fill the test measure at "fast flow". The nozzle clip is on the highest flow notch. If the nozzle has no clip, hold it wide open. Observe whether there was a "computer jump" when the pump was activated. If there was a jump, your results will be invalid. Fill the can until you come to exactly 5 gallons on the computer or electronic readout.

For electronic computers, each .001 of a gallon you run over or under 5,000 gallons represents .231 cubic inches of fluid. Hence, .004 gallons is approximately 1 cubic inch.

For mechanical computers, it is essential to bring the gallon wheel back to the exact starting position. The width of the "0" line on the wheel is approximately equivalent to one cubic inch of fluid. One "trick of the trade" for mechanical computers is to set the price per gallon at \$2.310 and observe the money readout. Since there are 231 cubic inches per gallon, 5 gallons would display \$11.55 (5 x 2.31) on the money wheel. Each 1¢ off from \$11.55 is equivalent to 1 cubic inch in your test measure. If you failed to stop exactly at \$11.55 (5.000 gallons), you will know how many cubic inches you ran over or under. Thereby, you will be able to make a more accurate meter adjustment and save time.

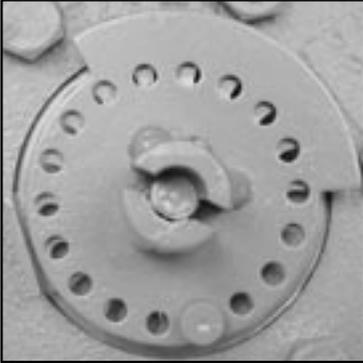
Step 4: Observe the position of the fluid in the test can and adjust the meter in the direction that will bring it to the zero position. When reading the test can, it is important that you not introduce parallax into your observations. That is, your eyes should be level with the fluid level in the sight glass and the indicator line on the test can. The can must be level.

Step 5: Run another 5-gallon "fast flow" test after draining the test measure and resetting the computer or readout. To obtain accurate results, it is important that the "fast flow" rate for the tests be as consistent as possible. Observe the results. Repeat Steps 3 - 5 until the meter is calibrated to the "zero" line within +/- 1 cubic inch.

Step 6: Run a 5-gallon "slow flow" test after draining the test measure and resetting the computer or readout. Set the nozzle clip to the lowest flow position. If the nozzle has no clip, test the device at 5 gallons per minute, or the minimum discharge rate marked on the device, whichever is less. Once again, this flow rate must be consistent for accurate results. Note: Most meters will over-deliver at very low flow rates.

Step 7: Observe the test results. If the meter has been in service 30 days or less, National Institute of Standards and Technology (NIST) Handbook 44 allows a tolerance of +/- 3 cubic inches from "0" for both the fast and slow tests. If the unit has been in service longer than that, the allowable tolerance is doubled to +/-6 cubic inches. Metric tolerances are +/-50 milliliters from "0" in a 20 liter test for new or replaced meters and +/- 100 milliliters for older units.

Meter Calibration Guide



Bennett - 4000

- To increase, move pin and turn lower dial counter-clockwise until the pin drops into an aligned hole. There is a tab on the lower dial to facilitate turning.
- To decrease, move pin and turn lower dial clockwise.
- Three holes equal approximately one cubic inch in a 5-gallon test measure.



Bennett - SB-100

Calibration - direction is marked on meter body

- To increase, remove pin, turn calibration dial counter-clockwise, and replace pin.
- To decrease, remove pin, turn calibration dial clockwise, and replace pin.
- One hole equals approximately one cubic inch in a 5-gallon test measure. Use of the pin retainer on the opposite side of the dial allows adjustment by approximately one-half cubic inch.



Gilbarco - Advantage, Highline, Trimline

Calibration - direction is marked on meter body.

- To increase, remove pin, turn dial in counter-clockwise direction, and replace pin. Always complete the adjustment by turning the calibration mechanism in a clockwise direction. First turn it in a counter-clockwise direction past the point where you want it and then back again. This takes out the clearance between the screw thread.
- To decrease, remove pin, turn dial in clockwise direction, and replace pin.
- One hole equals approximately one cubic inch in a 5-gallon test measure. Use of the bottom pin retainer allows adjustment by approximately one-half cubic inch.



Gilbarco - Encore, Eclipse C+

Calibration is performed electronically. There is no manual calibration adjustment mechanism on the meter. Refer to the dispenser operation manual for calibration instructions.

Meter Calibration Guide



LC / Liquid Controls - M5 (used in many high flow dispensers)

- Loosen the screw on the collar that holds the adjuster thimble in place.
- To increase, turn adjuster thimble to the left (unscrew).
- To decrease, turn adjuster thimble to the right (screw in).

The numbers shown horizontally on the thimble represent tenths of one percent (0.001) of adjustment.

This is equivalent to approximately one cubic inch in a 5-gallon test measure, or 23 cubic inches in a 100-gallon test measure.

The smaller graduations between the numbers represent (0.0002) of adjustment. Each small graduation is equivalent to approximately 1/5th of one cubic inch in a 5-gallon test measure, or 4½ cubic inches in a 100-gallon test measure. The numbers shown on the upper portion of the adjuster (0 through 5) represent one percent of adjustment.

Tighten the screw on the collar that holds the adjuster thimble securely.

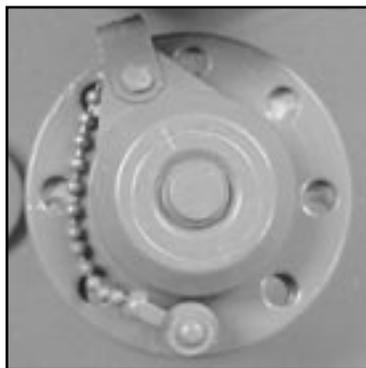


Schlumberger Centurion - SM100A / Tokheim 100

- To increase, turn BOTH adjusting screws counter-clockwise.
- To decrease, turn BOTH adjusting screws clockwise.

Turning BOTH screws one "click" equals approximately one cubic inch in a 5-gallon test measure.

NOTE: BOTH SCREWS MUST BE TURNED THE SAME NUMBER OF "CLICKS".



Southwest/Schlumberger - E-400

- To increase, move pin clockwise and turn upper dial counter-clockwise until pin drops into an aligned hole.
- To decrease, move pin counter-clockwise and turn upper dial clockwise until pin drops into an aligned hole.
- Four holes equal approximately one cubic inch in a 5-gallon test measure.



Tokheim

- To increase, move pin and turn upper dial clockwise.
- To decrease, move pin and turn upper dial counter-clockwise.
- Five holes equal approximately one cubic inch in a 5-gallon test measure.

(continued)

Meter Calibration Guide



Universel Epsco / A.O. Smith

- To increase, move pin and turn upper dial clockwise
- To decrease, move pin and turn upper dial counter-clockwise
- One hole equals approximately one cubic inch in a 5-gallon test measure.



Wayne - 2PM 4,5,6

- To increase, lift and rotate the adjustment knob in clockwise direction.
- To decrease, lift and rotate the adjustment knob in counter-clockwise direction.
- One notch equals approximately one cubic inch in a 5-gallon test measure.



Wayne iMeter

Calibration is performed electronically. There is no manual calibration adjustment mechanism on the meter. Refer to the dispenser operation manual for calibration instructions.

