Vaporless

VMI

An OMNTEC Company

ALLD Overview & Catastrophic (3gph at 10psi) Line Leak Detector Testing

Gabe Messerly

December 2023

40 CFR § 280.44 USEPA Piping Regulations Methods of Release Detection

"Each method of release detection for piping used to meet the requirements of 280.41 must be conducted in accordance with the following:"

"Methods which alert the operator to the presence of a leak by restricting or shutting off the flow of regulated substances through piping or triggering an audible or visual alarm."

"May be used only if they detect leaks of 3 gallons per hour at 10 psi line pressure within one hour."

"An annual test of the operation of the leak detector must be conducted in accordance with the manufacturer's requirements."

VMI Vaporless An OMNTEC Company

Vaporless' Requirements for Post-Installation & Annual Testing of Catastrophic Line Leak Detection for MLLDs & ELLDs are met using either the Vaporless LDT-890, LDT-890\AF (All Fuels) or the Tanknology TLDT-5000.

Testers must pass the Certification Test for the appropriate equipment, VMI LDT-890(\AF) or the Tanknology TLDT-5000 and recertify every two years.

VMI Vaporless An OMNTEC Company

The LDT- 890(\AF) must be recalibrated every two years.

The Tanknology TLDT-5000 has dual gauges. Both gauges shall be the same pressure (no more than ½ psi difference).

VMI Vaporless An OMNTEC Company

Can Line Leak Detection Equipment be Tested Out of the Line System?

- Each line is unique
- There is no way to simulate the variables in the line system such as:
  - Pump pressure
  - Head pressure / elevation change
  - Type of line, the length of line, the number of connections
  - Line resiliency
  - Hydraulic shock
  - Viscosity of the fuel

VMI Vaporless An OMNTEC Company

Viscosity, Affect on Leak Testing

- All devices that generate leak rates for annual testing are affected by viscosity
- All leak generating devices need to validate the leak rate of 3 GPH @ 10 PSI by measurement
- Fixed orifice testers do not compensate for viscosity
- Fixed orifices wear and change dimension during orifice cleaning

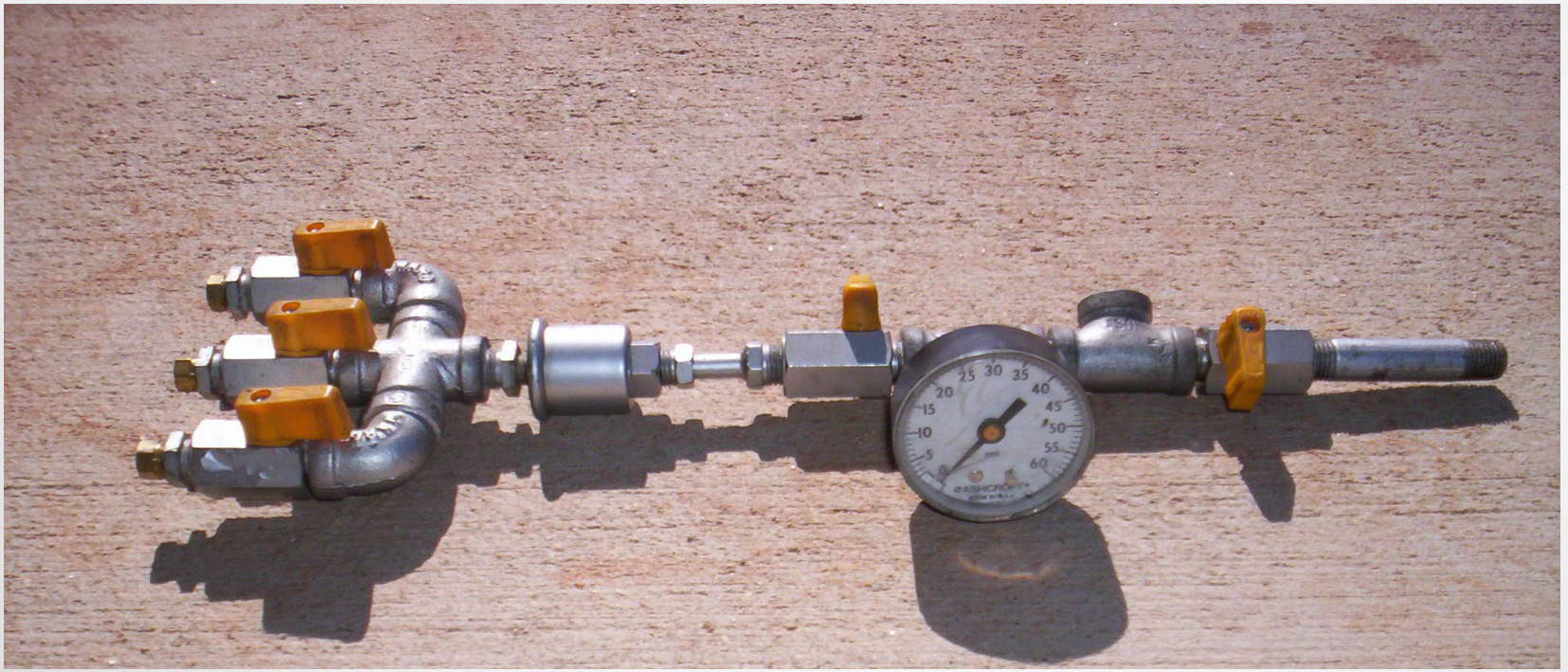
VMI Vaporless An OMNTEC Company

VMI does not recognize the Red Jacket FX Tester or any fixed orifice tester

For generating Catastrophic (3 GPH@10 PSI) Line Leaks or for being used to perform annual testing of Vaporless MLLDs or ELLDs. Reasons include:

1. **The inability to compensate for the viscosity of the fuel being tested.**
2. **The inability of the operator to verify the flow (leak) rate at 10 PSI as per EPA Regulations.**
3. **No factory quality control and recalibration services.**

VMI Vaporless An OMNTEC Company



An example of fixed orifice test equipment that does not meet the quality standard. Estabrook's Leak Detector Tester

VMI Vaporless An OMNTEC Company

Catastrophic Line Leak Detection is Performed By:

- Mechanical line leak detectors
- Electronic line leak detection

Importance of Field Generated Leak Testing

- The leak detector (mechanical or electronic) may be installed
- The wires may be attached
- The light may be on
- Will the equipment detect a catastrophic leak in this line?

VMI Vaporless An OMNTEC Company

This test and equipment is specific to **VMI** MLLDs and ELLDs and **is also applicable** to any mechanical or electronic catastrophic line leak detection system insofar as manufacturer guidelines do not exclude this method or equipment for generating catastrophic leaks.

VMI Vaporless An OMNTEC Company

Start With an Inspection of the Submersible Pump

- Is the line leak detection equipment installed and programmed correctly?
- Is it mechanical or electronic?
- Leaks or weeps?

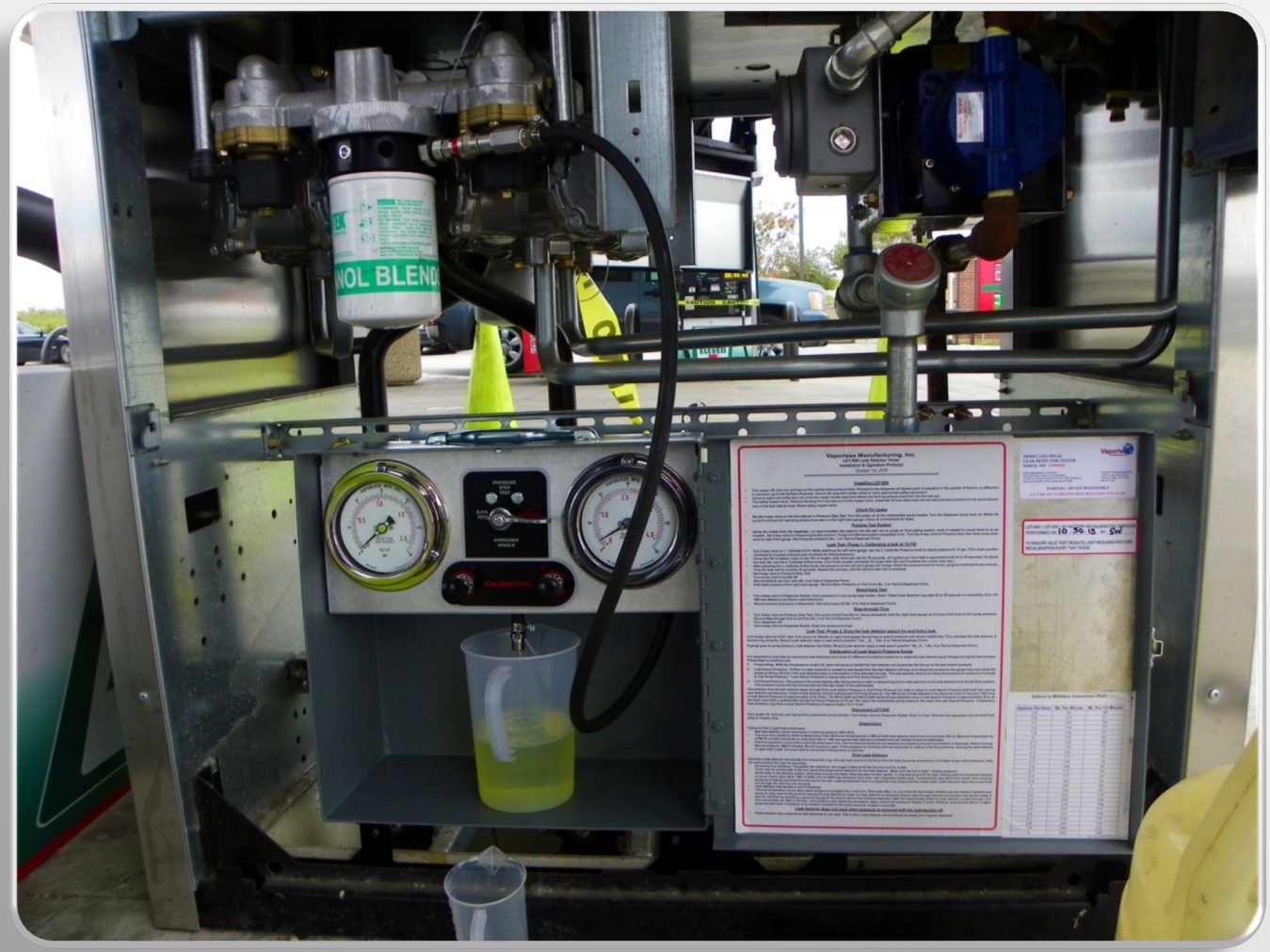
Install Test Equipment

- Lockout / Tagout pump for the line that will be tested
- Determine where to install test equipment
  - If elevation change, test from highest dispenser
  - If no elevation change, test at dispenser furthest from pump

VMI Vaporless An OMNTEC Company

Something To Look For

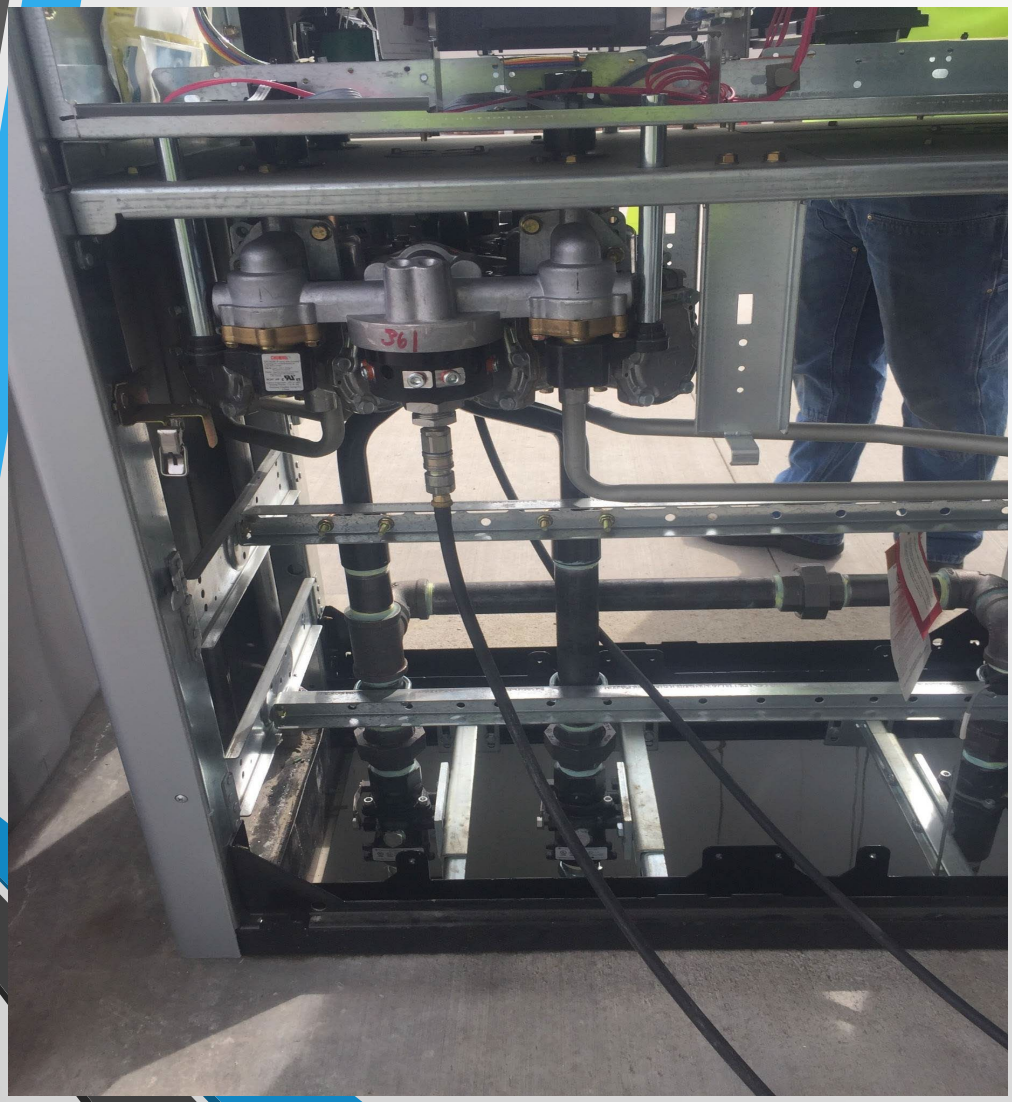
- Has a test fitting been left in the shear valve?
- Do not allow permanent installation of test fitting!



LDT-890\AF testing through the Safety Port

VMI
Vaporless
An OMNTEC Company

LDT-890\AF testing through the Technician Access Port



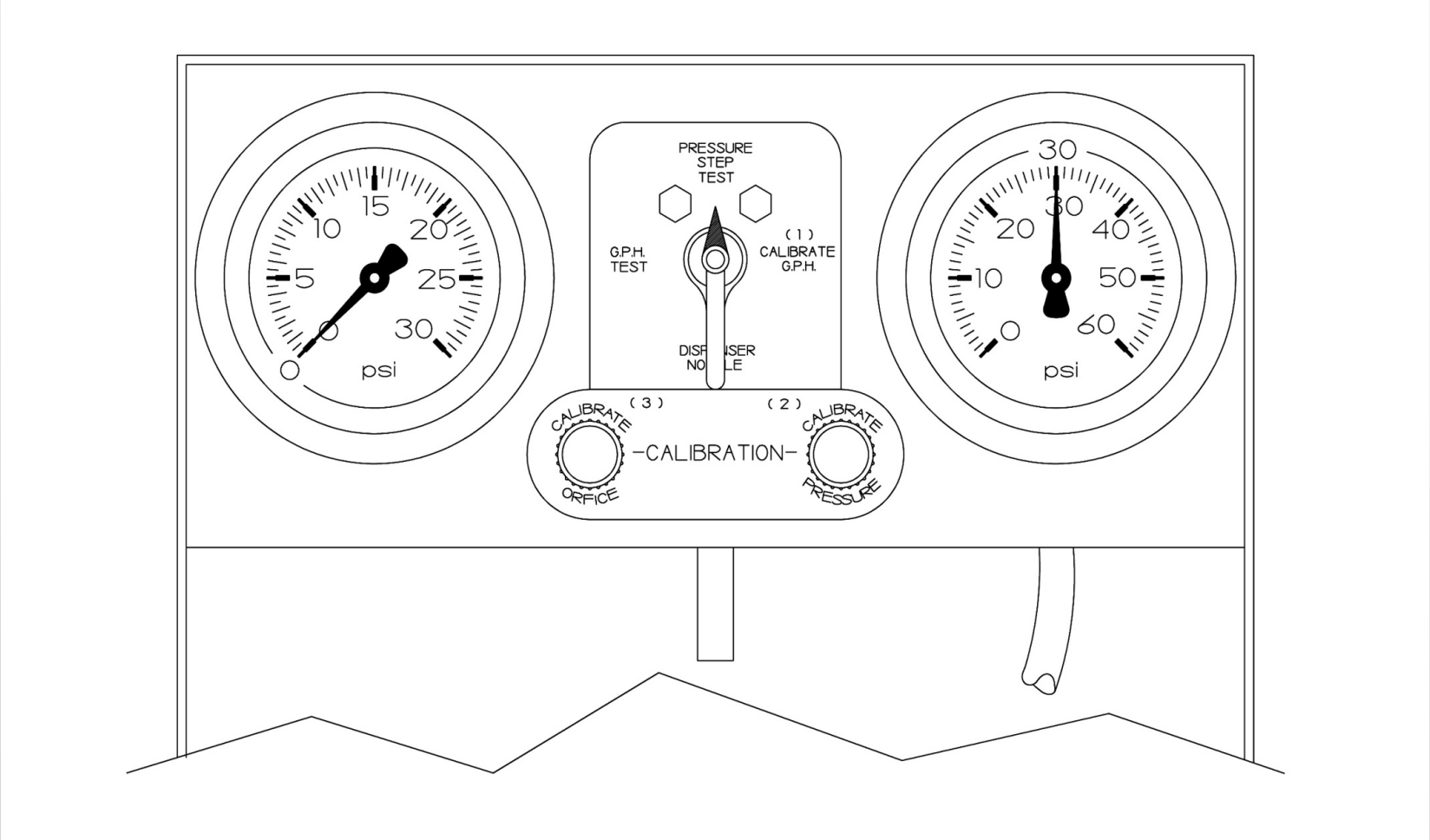
LDT-890 testing through the shear valve

Calibration of 3 gph @ 10 psi for MLLD

- Start with the pump running
- Check for any leaks
- Fuel approximately 2 gallons into a safety can to purge any air introduced when installing tester
- Leak detector needs to be open: Line pressure should be full submersible working pressure (~14-50 psi)
- Document full operating pressure

VMI Vaporless An OMNTEC Company

Full Pump Pressure



VMI Vaporless An OMNTEC Company

Calibration Verification

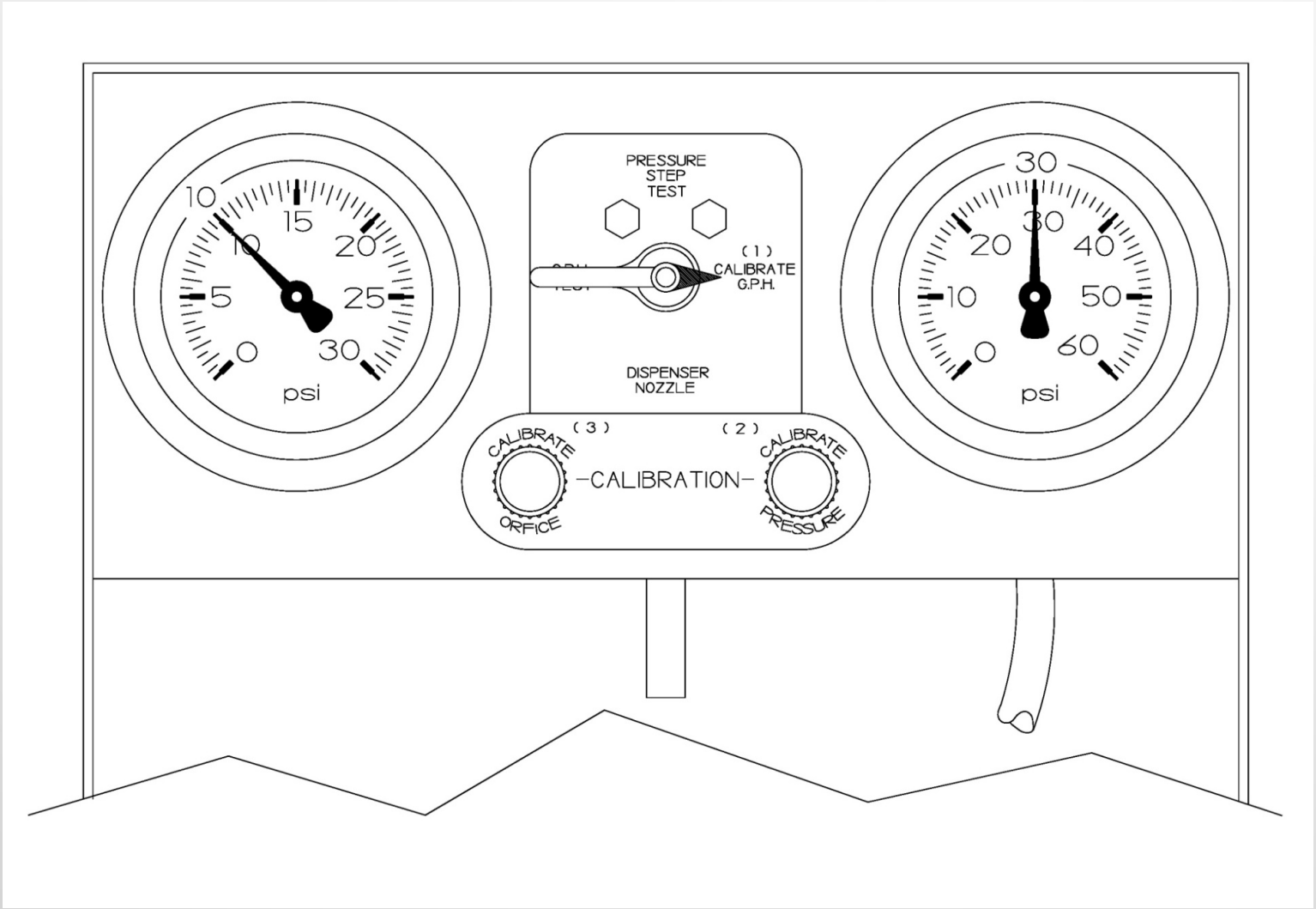
1. Turn 4-way valve to Calibrate GPH
2. Adjust Calibrate Pressure knob

   The line pressure is reduced to 10 psi to confirm an orifice of 3 gph @ 10 psi leak (left side gauge)
3. Measure in a graduated beaker

   - 95 milliliters in 30 seconds
   - 189 milliliters in 60 seconds

VMI Vaporless An OMNTEC Company

Calibrate leak rate @ 10 psi



Adjust Pressure to 10 psi

VMI Vaporless
An OMNTEC Company

Measure in a Calibrated Beaker @ 10 psi to Ensure Leak Rate Compensates for:

- Pump pressure
- Viscosity changes in fuels due to:
  - Temperature differences
  - Fuel stock differences
  - Fuel grade differences
  - Fuel type differences – bio vs. non-biofuels

VMI Vaporless An OMNTEC Company

Increase or Decrease Flow to Meet 3 gph @ 10 psi

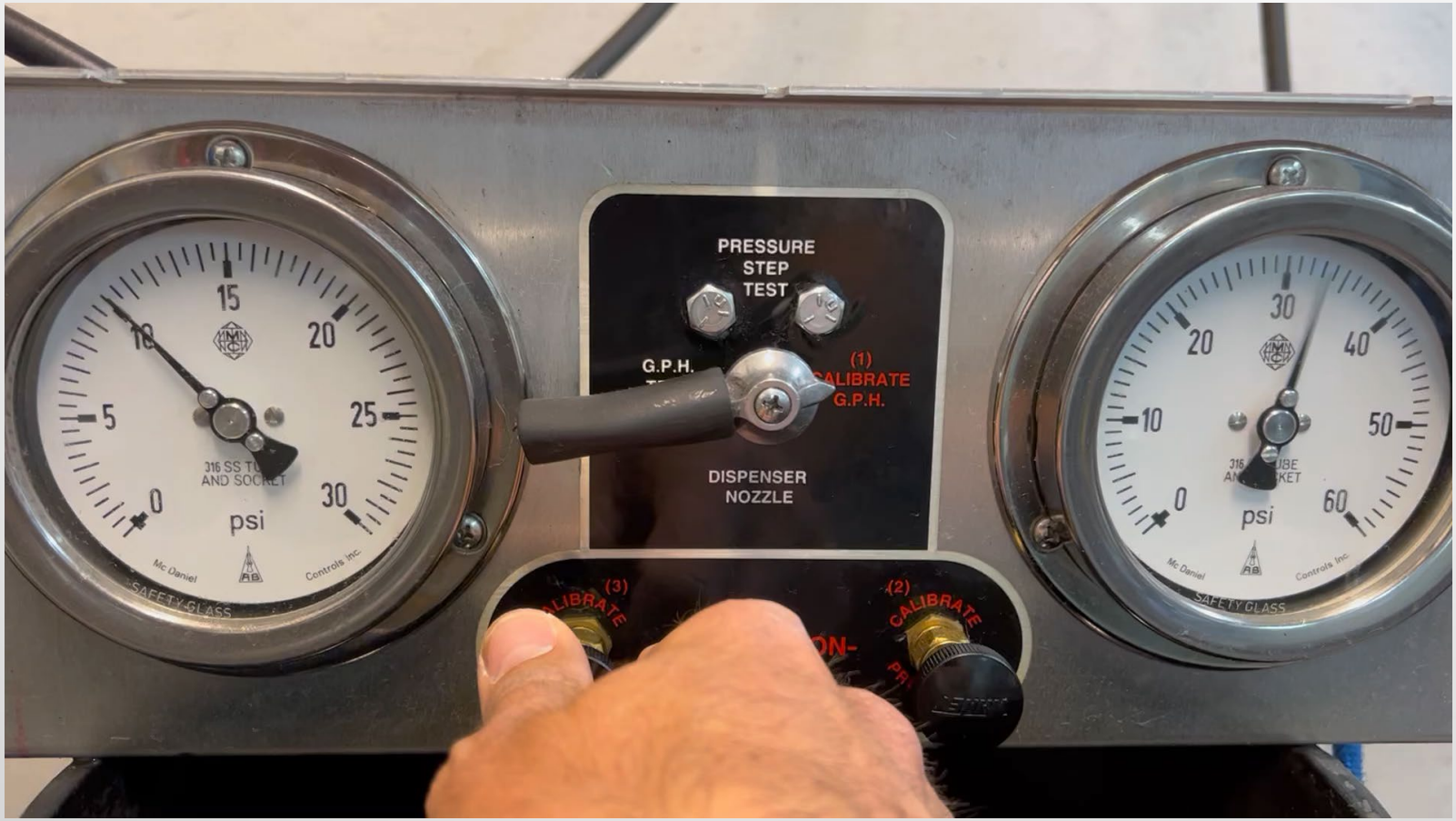
1. **First adjust Orifice knob - more or less fuel**
2. **Then adjust Pressure knob back to 10 psi**

Continue to adjust until 3 gph @ 10 psi is achieved

Once proper leak is established, close off leak and turn off pump

VMI Vaporless An OMNTEC Company

Adjust Orifice, then Adjust Pressure



VMI Vaporless An OMNTEC Company

Static Pressure

- After unit calibrated for 3 gph @ 10 psi, turn 4-way valve to Pressure Step Test, turn off pump, and document static (resting) pressure
- Depending on installed MLLD, may be brief bleed down period before pressure stabilizes
- If pressure falls to 0 psi, determine why and correct before proceeding
  - Use ball valve to determine line problem or check valve problem

VMI Vaporless An OMNTEC Company

Line Resiliency or Bleed-back

- Bleed the line pressure down to 0 psi
  - Collect in graduated beaker
- Measure and record the amount of product that escapes system from bleeding pressure down to 0 psi

This is Line Resiliency or Bleed-back

VMI Vaporless An OMNTEC Company

Line Resiliency or Bleed-back

- The higher the line resiliency:
  - The longer it takes for an MLLD to open
  - The more difficult it is for MLLDs to detect leaks and stay in slow flow due to hydraulic shock
  - ELLDs lose accuracy due to the time differences to bleed from high pressure to low pressure

VMI Vaporless An OMNTEC Company

Step Through Time

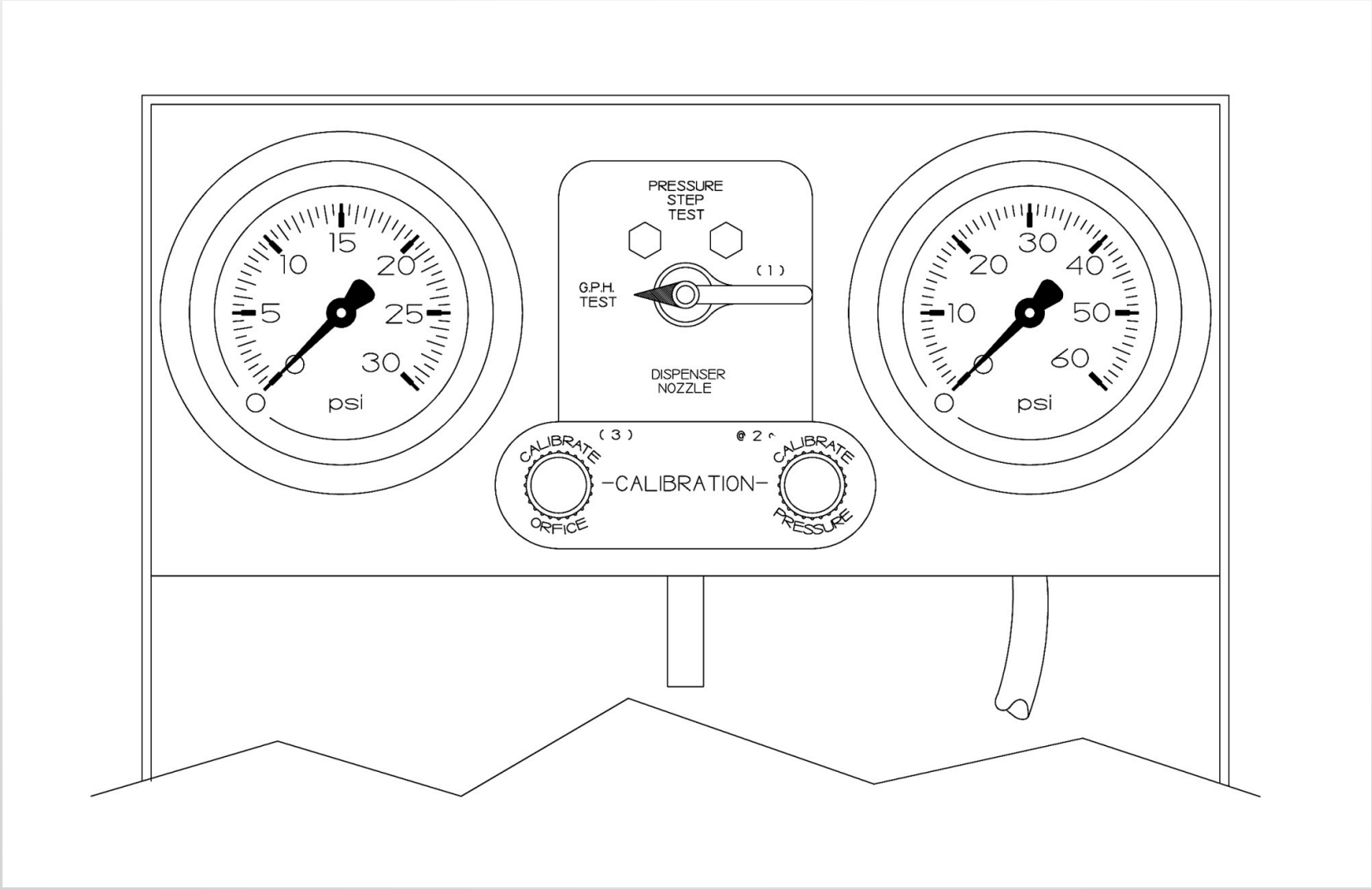
- Step through time is the length of time it takes for pressure to go from 0 psi to full pump operating pressure with no leak
- Measure and document step through time
- Compare step through time and line resiliency

Begin Mechanical Line Leak Detector Test

- Once 3 gph at 10 psi leak rate has been achieved through the calibrated orifice
- Bleed line pressure to 0 psi
- Turn 4-way valve to GPH Test on LDT-890(\AF) to open the calibrated leak
- Turn on the pump

VMI Vaporless An OMNTEC Company

Start Test

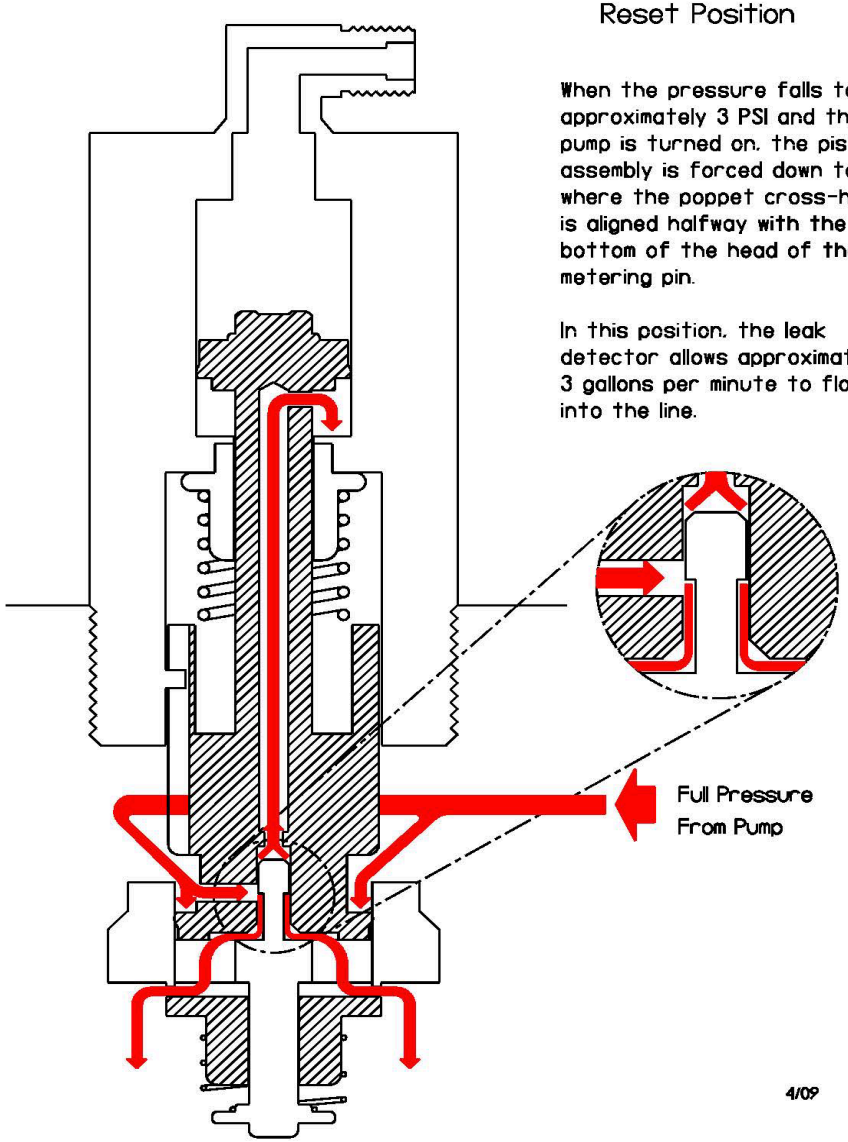

PRESSURE
STEP
TEST
G.P.H.
TEST
(1)
DISPENSER
NOZZLE
(3)
@2
CALIBRATE
ORFICE
-CALIBRATION-
CALIBRATE
PRESSURE
0
5
10
15
20
25
30
psi
0
10
20
30
40
50
60
psi

VMI LD2000 LEAK DETECTOR

Reset Position

When the pressure falls to approximately 3 PSI and the pump is turned on, the piston assembly is forced down to where the poppet cross-hole is aligned halfway with the bottom of the head of the metering pin.

In this position, the leak detector allows approximately 3 gallons per minute to flow into the line.



4/09

Watch Pressure Gauge (Right Side Gauge)

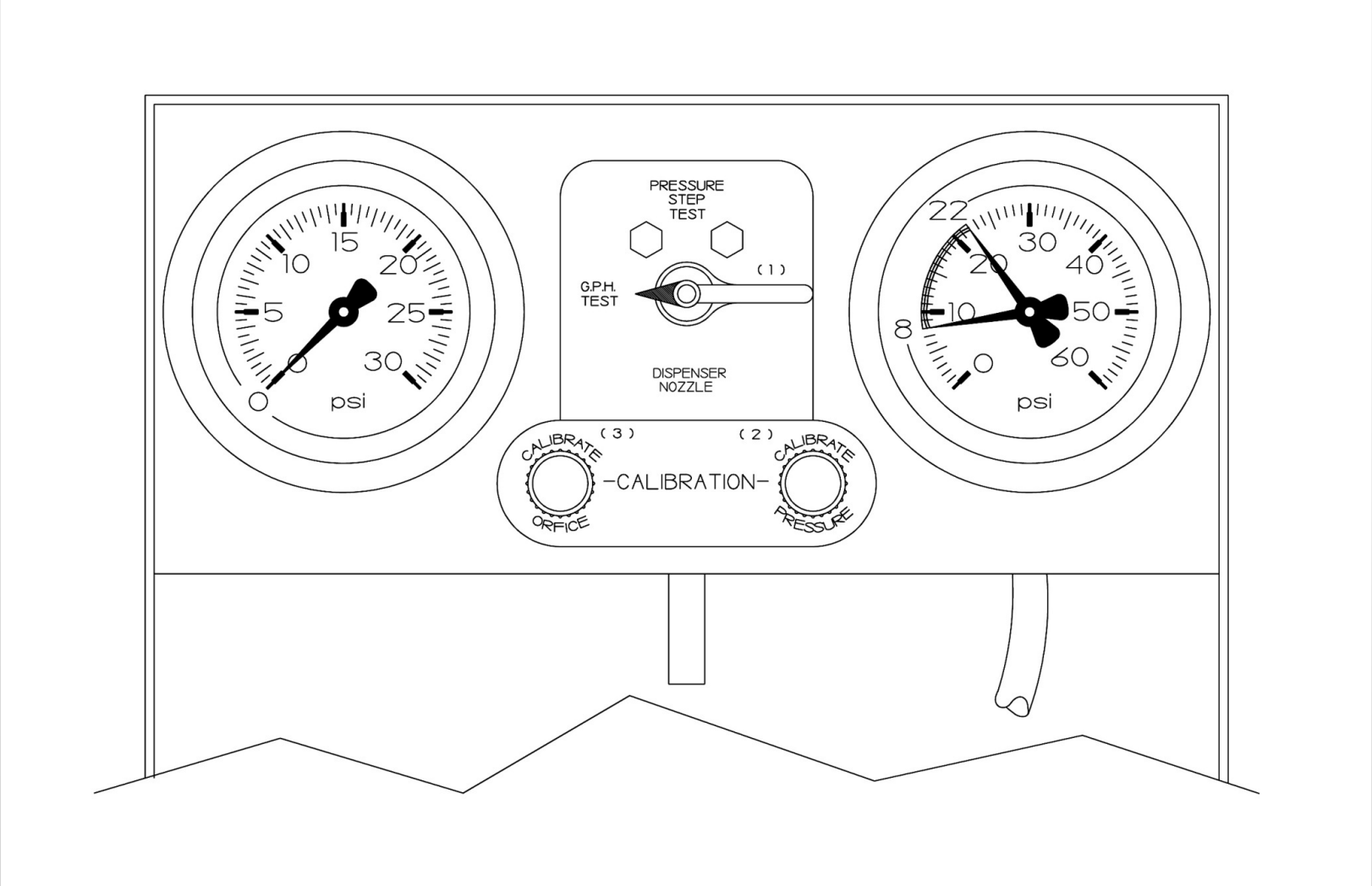
All MLLDs go through 3 positions

1. 0 PSI - Reset for Leak Search / Fast Fill
2. 8 – 25 PSI - Leak Search / Tripped
   Will vary by manufacturer
3. 14 – 50 PSI - Full Flow (pump pressure)

Due to the leak, the Leak Detector should stay in the Leak Search Position

VMI Vaporless An OMNTEC Company

Leak Search Position

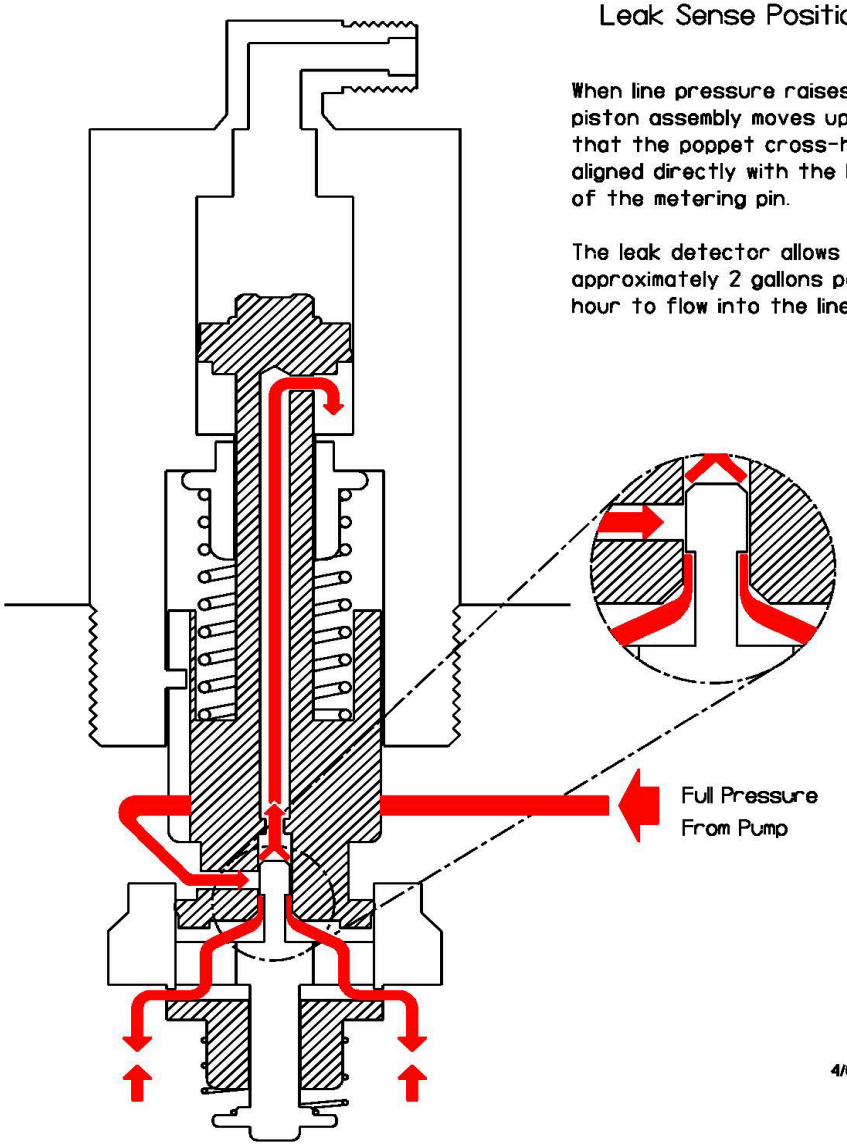


VMI LD2000 LEAK DETECTOR

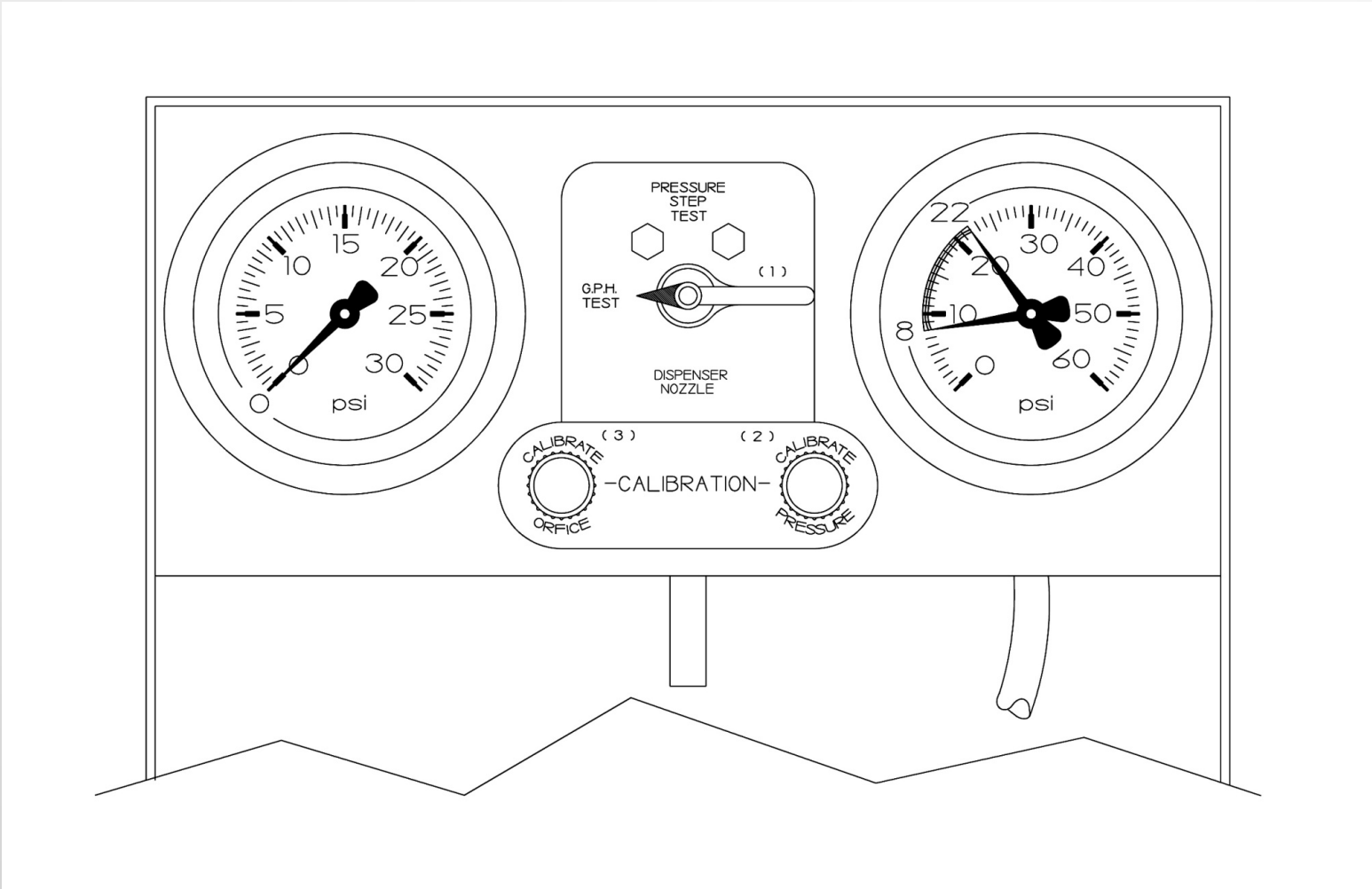
Leak Sense Position

When line pressure raises, the piston assembly moves up so that the poppet cross-hole is aligned directly with the head of the metering pin.

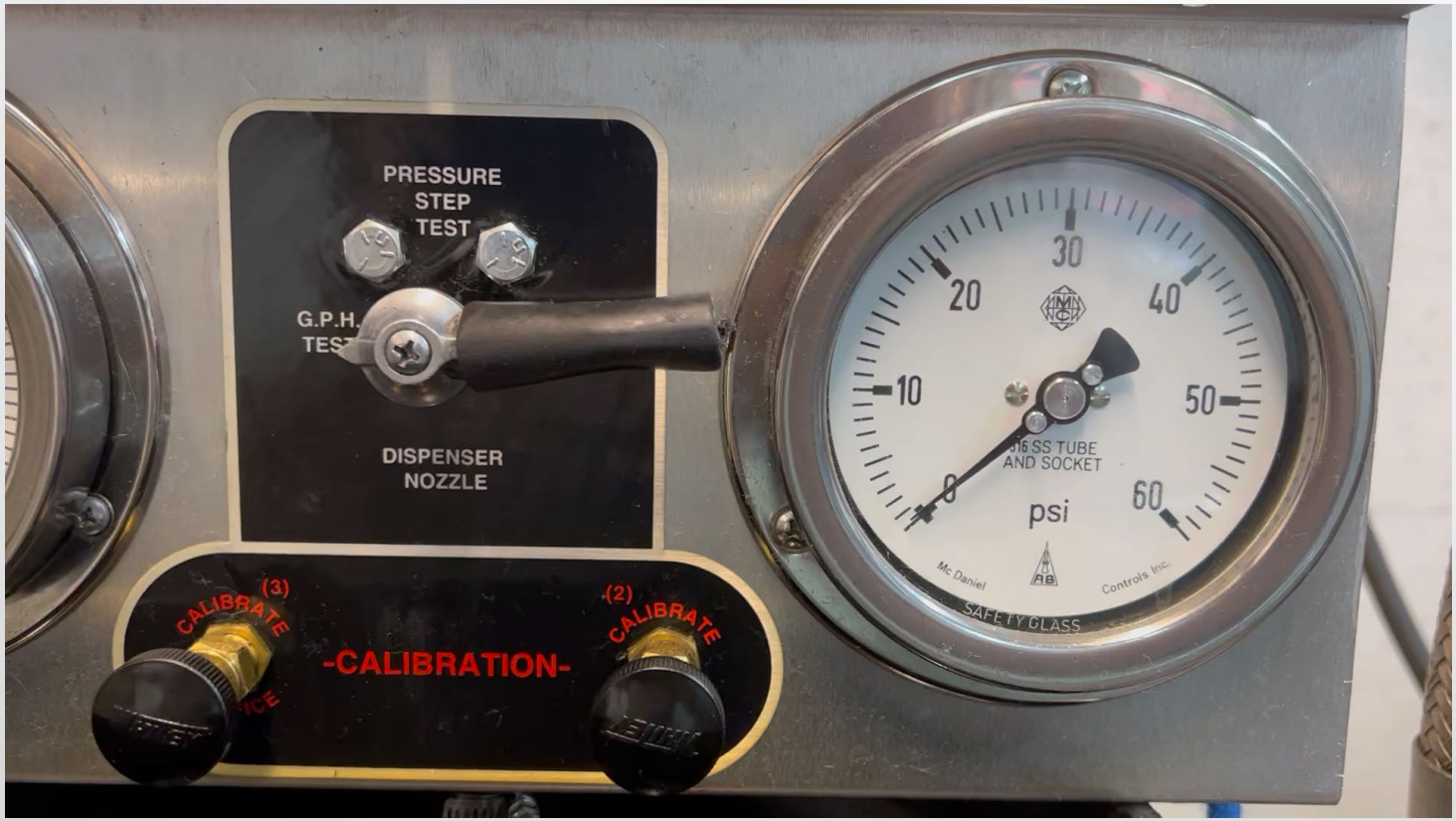
The leak detector allows approximately 2 gallons per hour to flow into the line.



If the Mechanical Line Leak Detector stays in leak search range, the leak detector has passed.

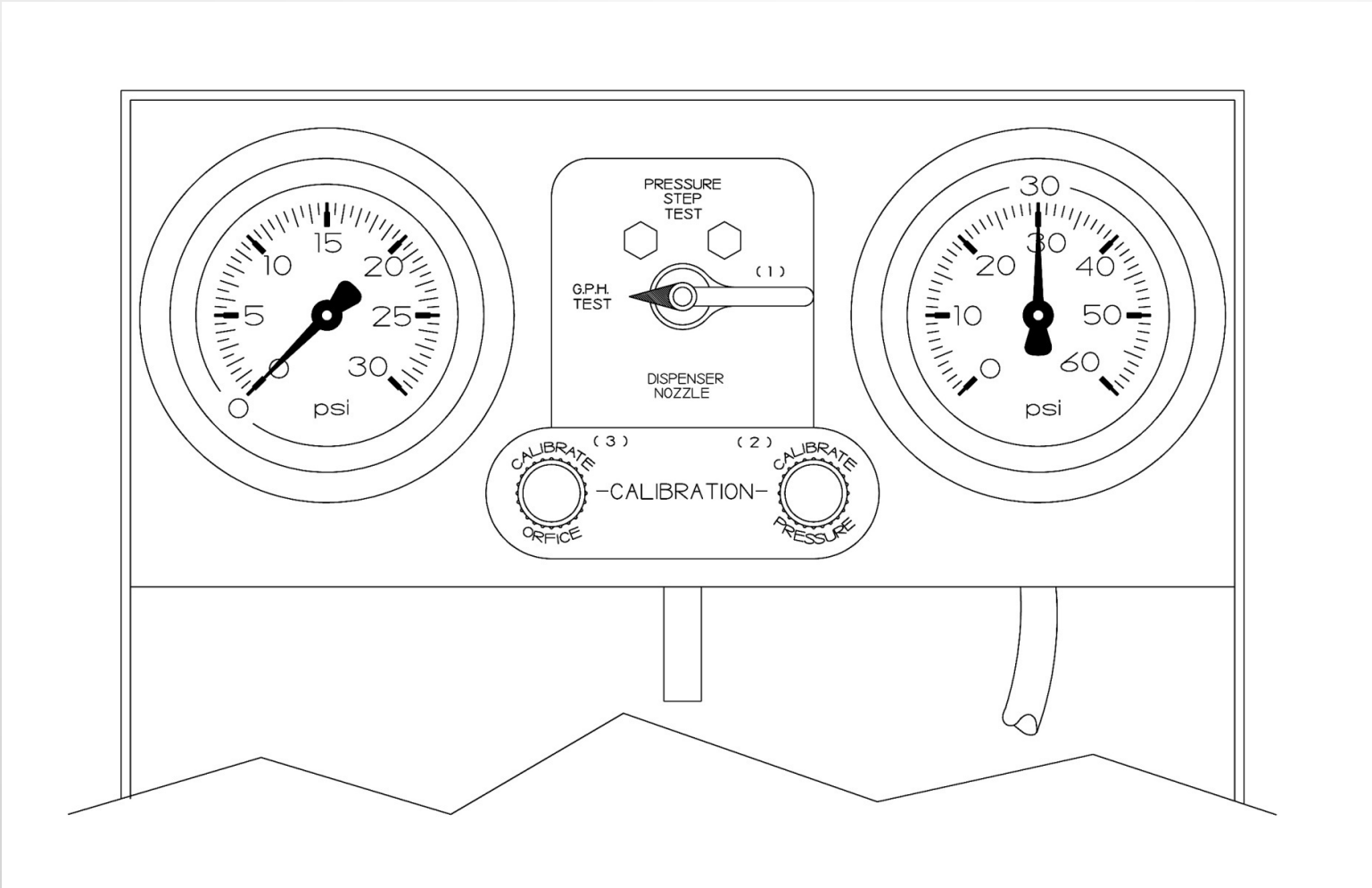


3 GPH Test Pass



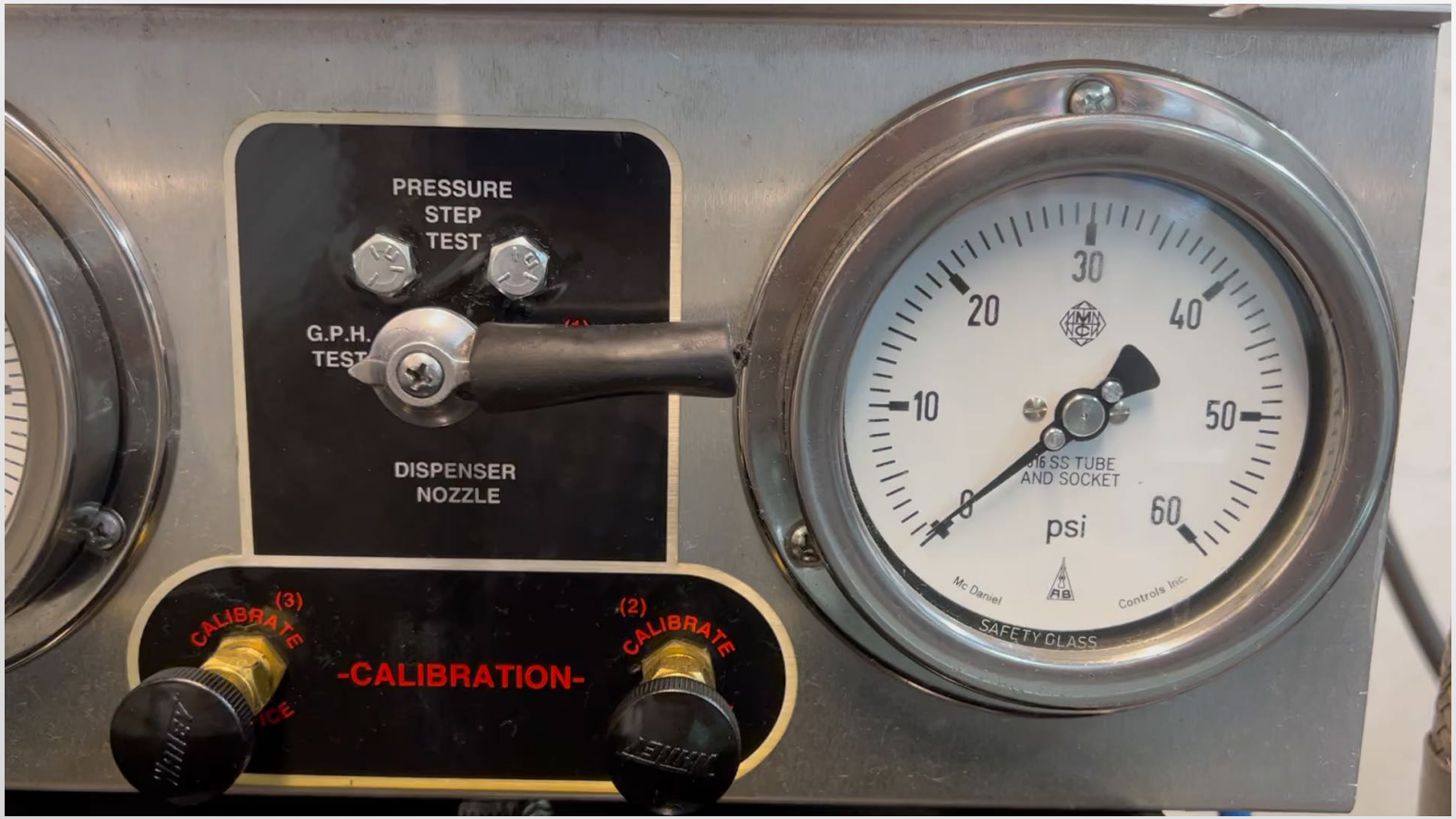
VMI
Vaporless
An OMNTEC Company

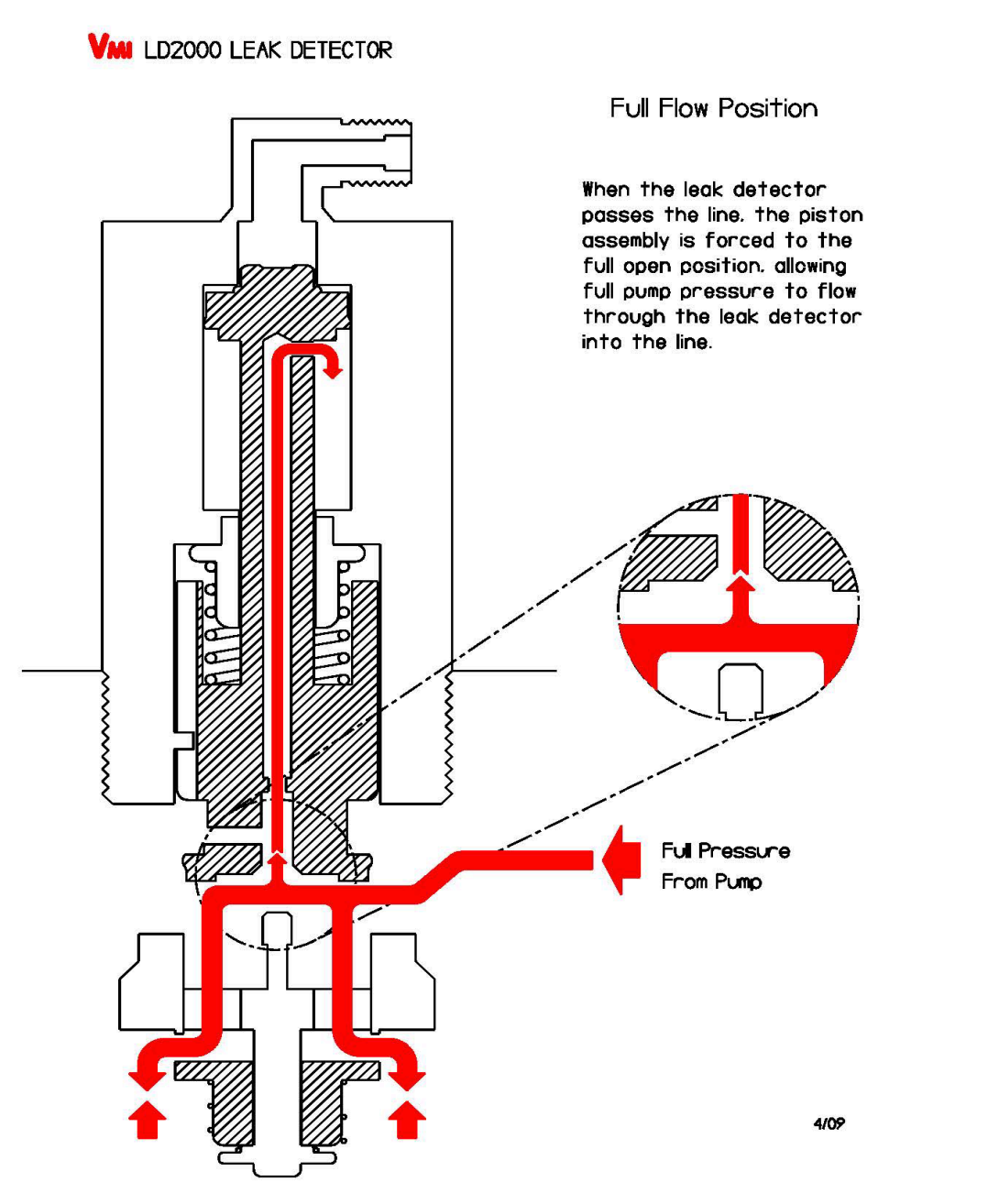
If the Mechanical Line Leak Detector does not stay in leak search, the leak detector has failed.



VMI Vaporless An OMNTEC Company

3 GPH Test Fail





VMI Vaporless An OMNTEC Company

How many positions do mechanical line leak detectors go through?

MLLDs Go Through 3 Positions

- 0 PSI - Reset for Leak Search / Fast Fill
- 8 – 25 PSI - Leak Search / Tripped
  - Will vary by manufacturer
- 14 – 50 PSI - Full Flow (pump pressure)

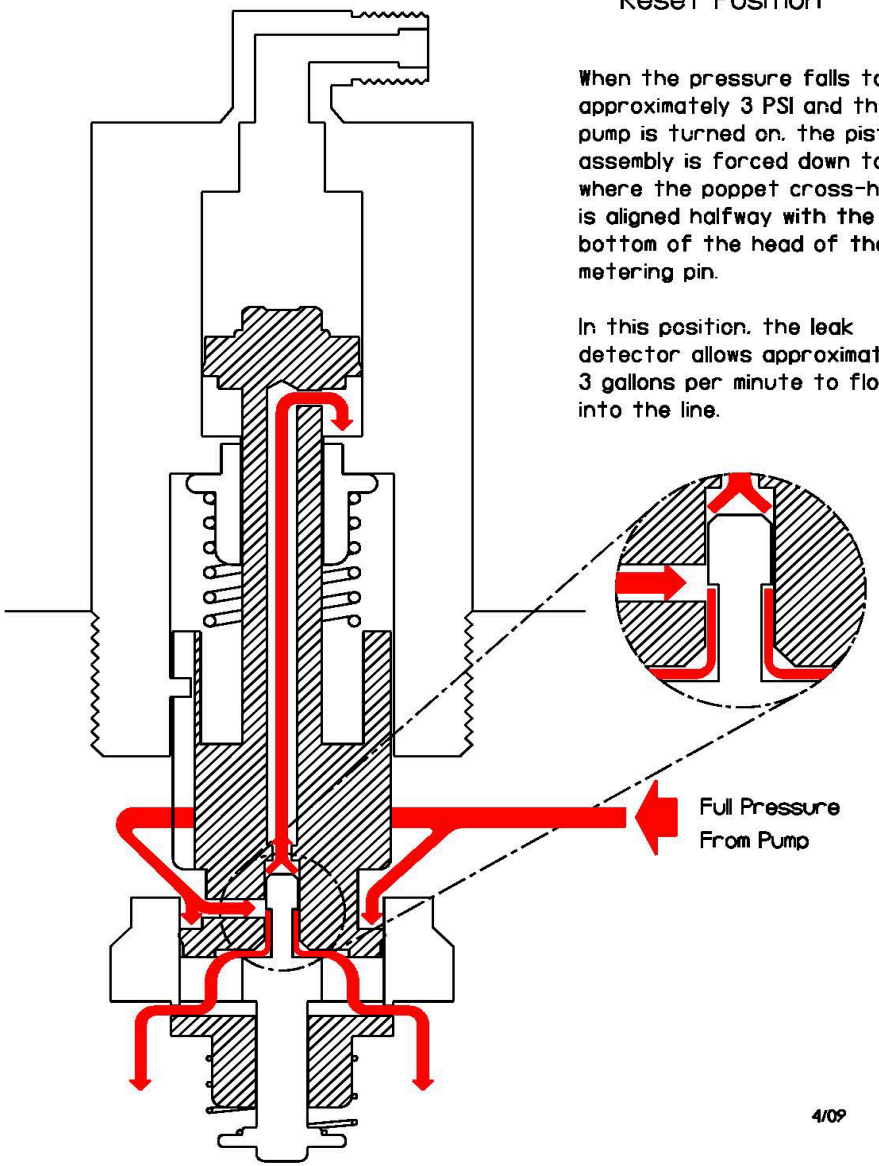
VMI Vaporless An OMNTEC Company

VMI LD2000 LEAK DETECTOR

Reset Position

When the pressure falls to approximately 3 PSI and the pump is turned on, the piston assembly is forced down to where the poppet cross-hole is aligned halfway with the bottom of the head of the metering pin.

In this position, the leak detector allows approximately 3 gallons per minute to flow into the line.



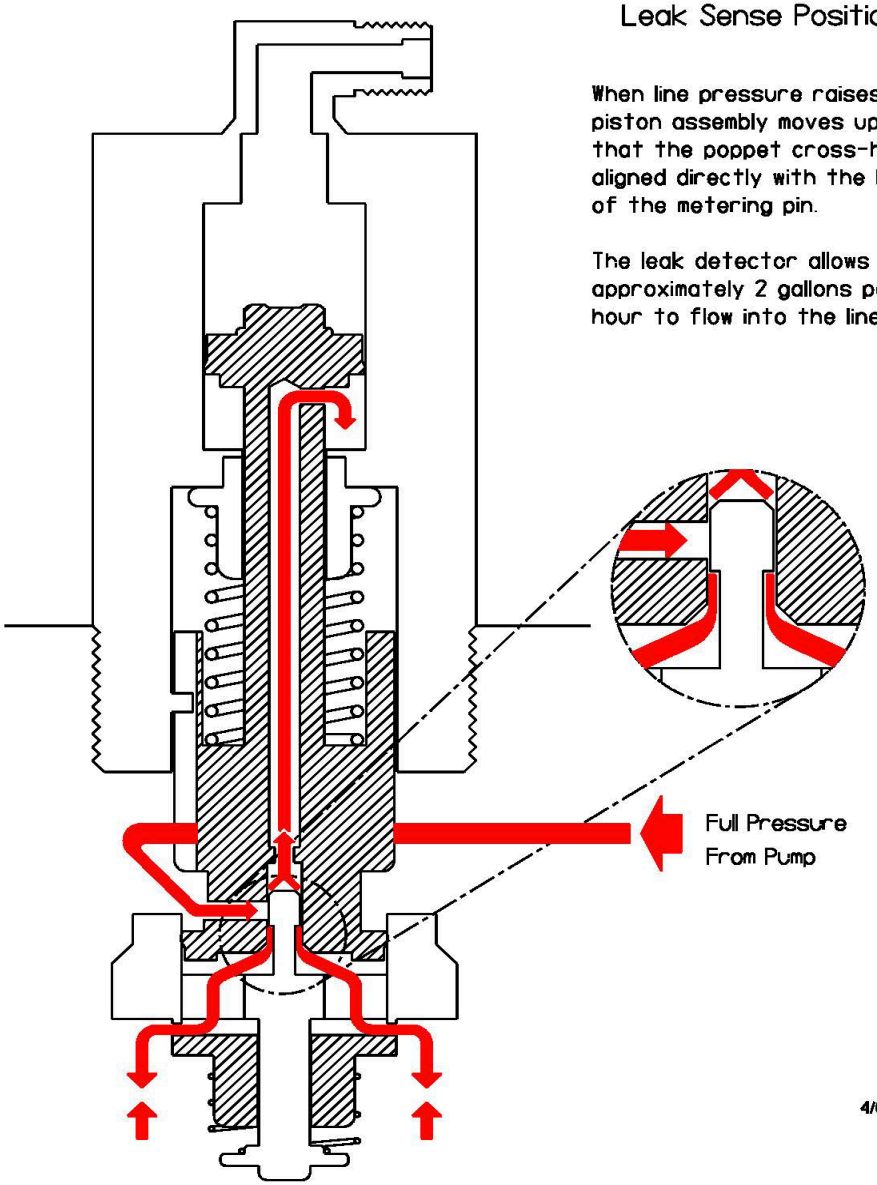
4/09

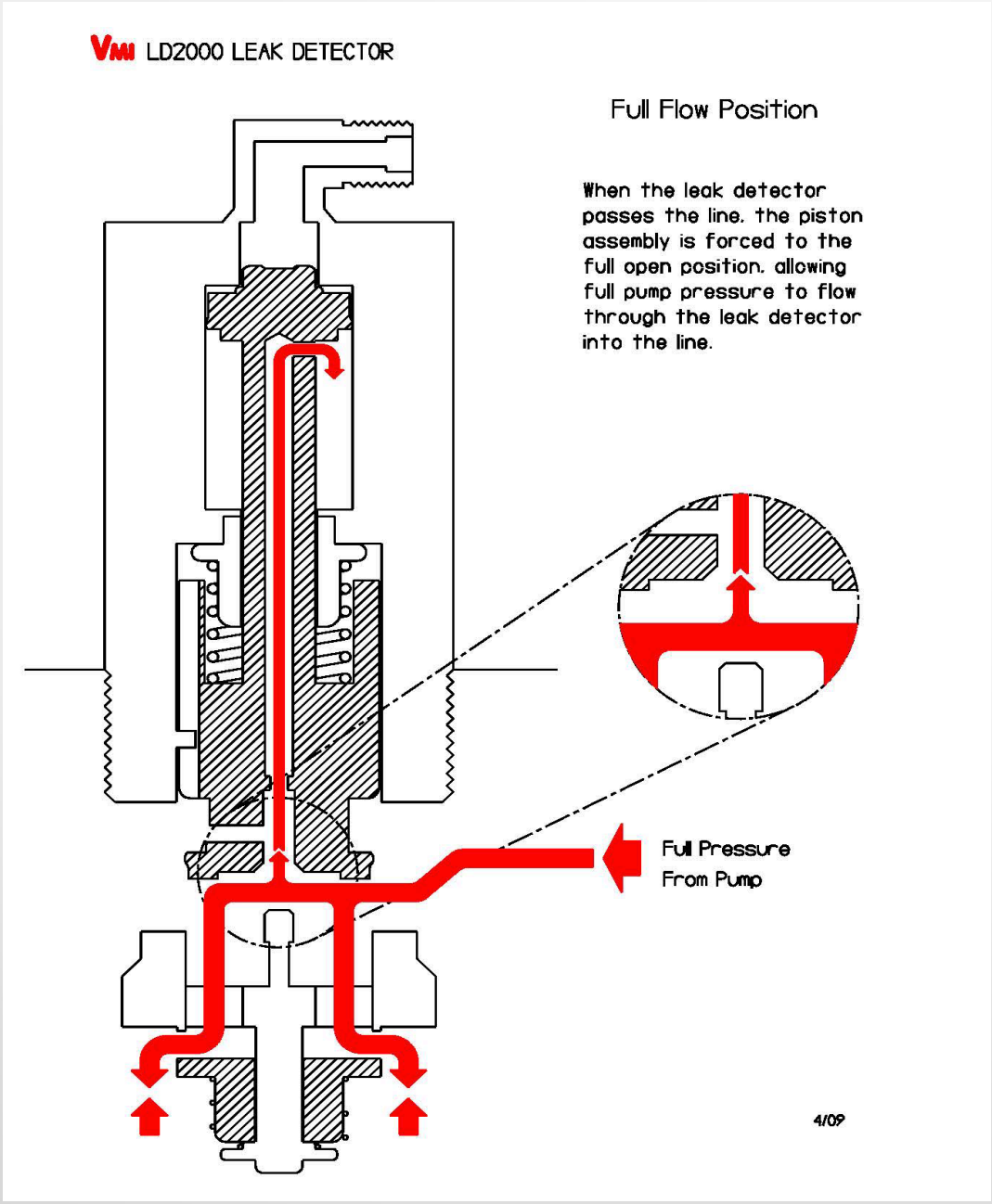
VMI LD2000 LEAK DETECTOR

Leak Sense Position

When line pressure raises, the piston assembly moves up so that the poppet cross-hole is aligned directly with the head of the metering pin.

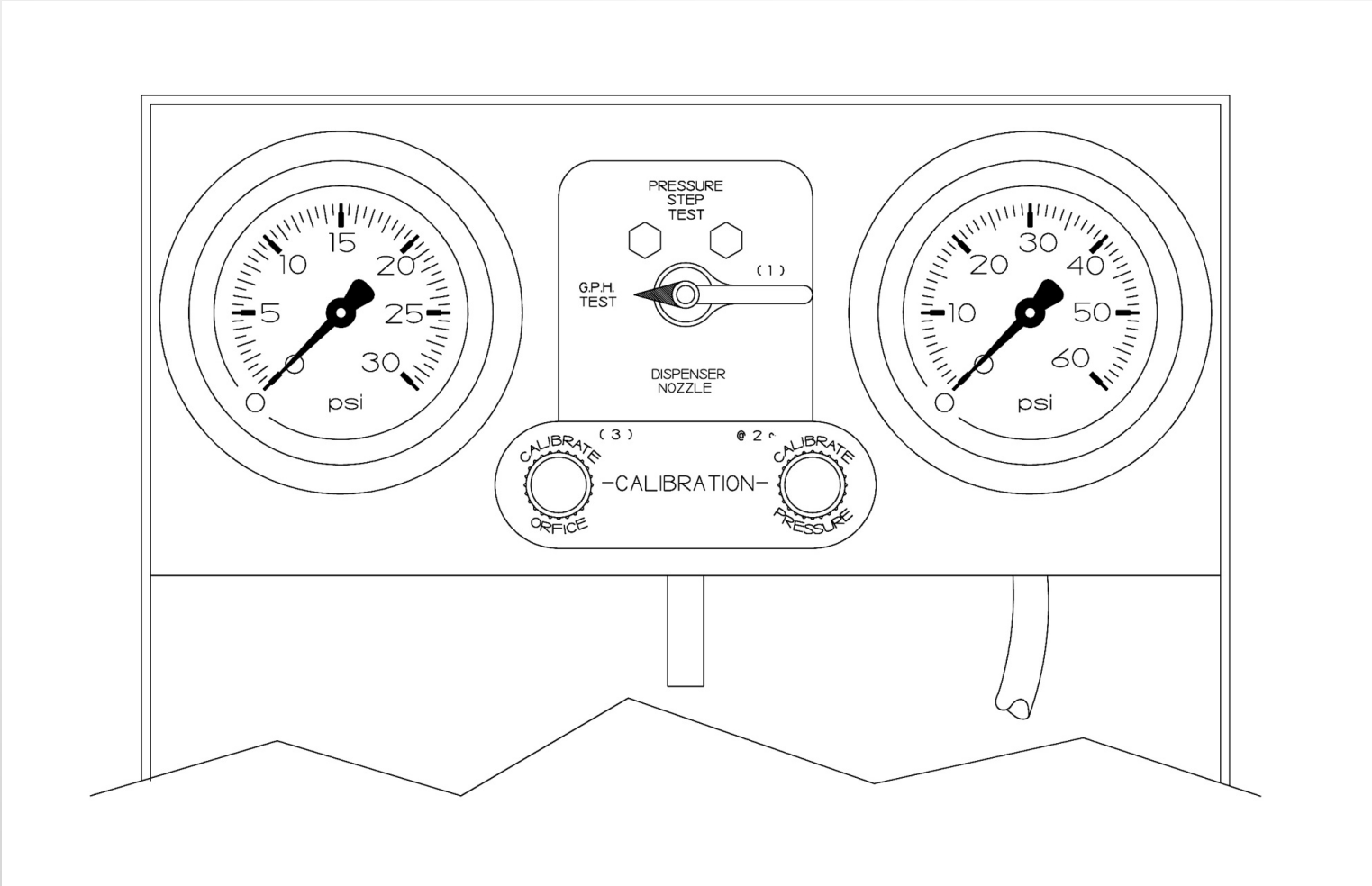
The leak detector allows approximately 2 gallons per hour to flow into the line.





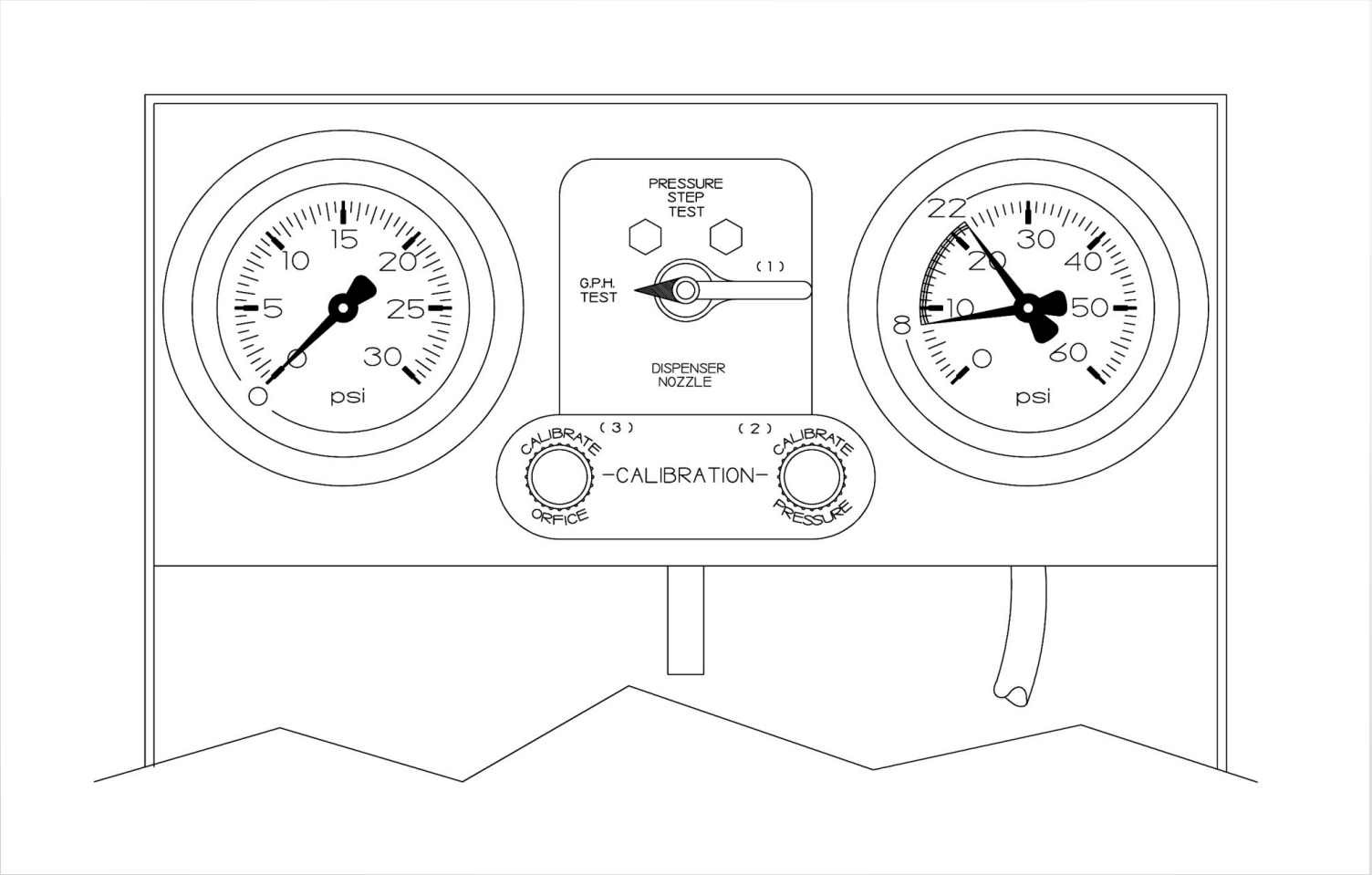
VMI Vaporless An OMNTEC Company

Leak Introduced, Pump Off

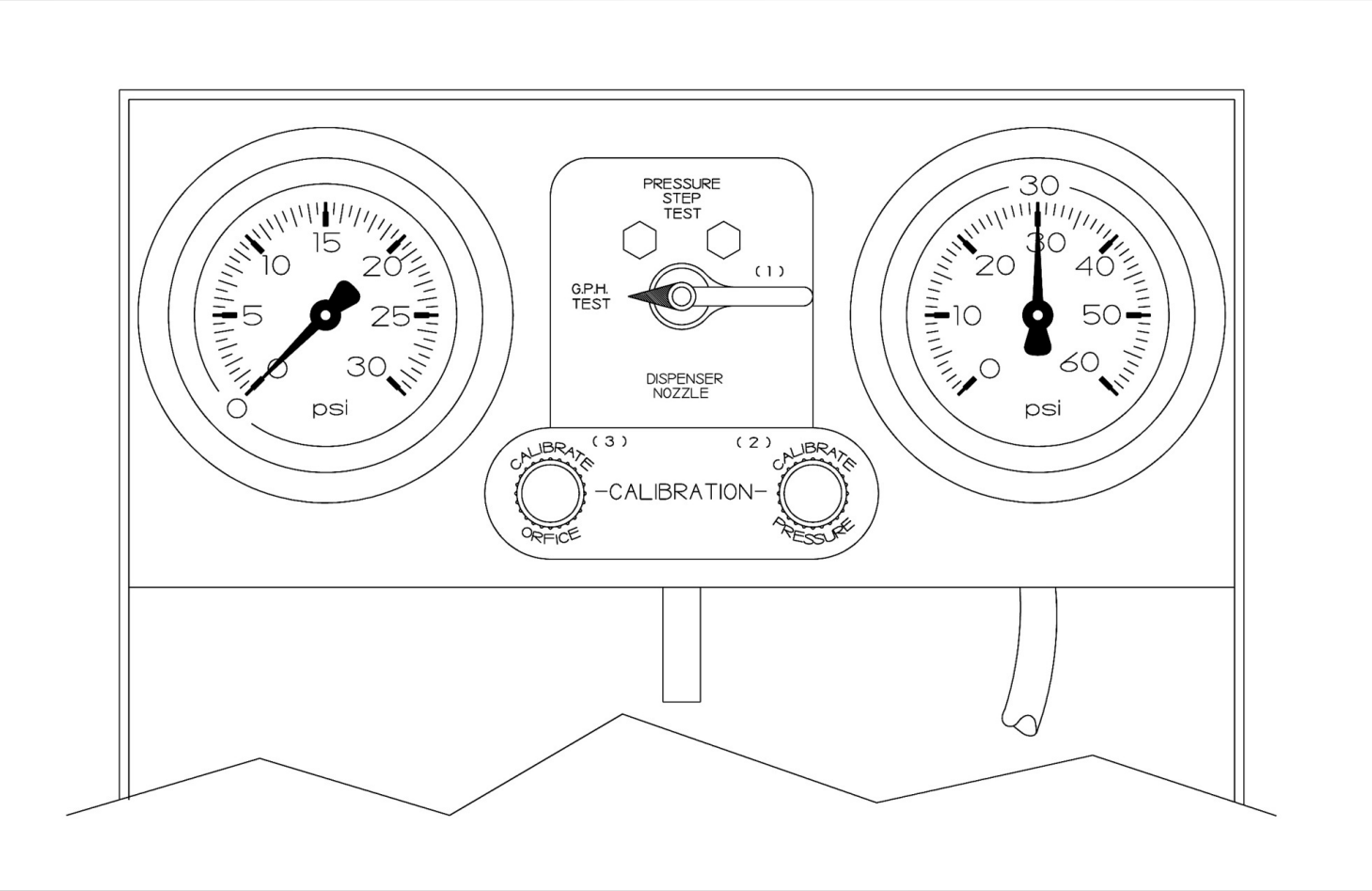


VMI Vaporless An OMNTEC Company

Leak Introduced, Pump On, MLLD in Leak Search Range



Leak Introduced, Pump On, Failed Leak Test



How Long Should a Leak Detector Stay in Leak Search When a Test is Being Performed?

- Forever
- Must be tested for at least 30 seconds beyond the length of time the leak detector takes to step through if there is no test being performed

Determining Cause of MLLD Failure

- Is the leak detector going from 0 psi to full flow without a pause?
  - Is there an in-line check valve?
    - Swing checks are acceptable, spring-based check valves can prevent MLLD function
  - The MLLD may not be resetting due to head pressure
    - What is the elevation change from leak detector to test port (head pressure)?
    - Head pressure over 8’ makes leak detector reset difficult to impossible

The LD-2000\HH functions against 15’ of head pressure

Determining Cause of Failure

- Is the leak detector pausing at leak search, then stepping through?
  - What is the bleed-back (line resiliency measurement)? High bleed-back (anything over 250 ml for 2" MLLDs, 350 ml for 3" MLLDs) may cause an MLLD to be "bumped" out of leak sense mode.
  - Try adjustment of the VMI leak detector.
  - VMI has a leak detector certified for this type of problem, the LD-2000\E and LD-3000\E.
- High bleed-back also causes ELLDs to lose sensitivity.

VMI Vaporless An OMNTEC Company

In The Event A VMI MLLD Fails: Adjusting the VMI MLLD

- VMI Leak Detectors can be adjusted to slow down the flow into the line. This reduces the hydraulic hammer that opens the leak detector in high bleed-back lines.
- Retest after each adjustment to the MLLD.
- If the MLLD will not adjust to meet 3 GPH @ 10 PSI, contact the factory with test information for consultation.

VMI Vaporless An OMNTEC Company

Adjustment of VMI Leak Detector

March 28th, 2005

Certain piping conditions may affect the ability of any leak detector to find a leak. They include high head pressures and high bleed-backs. High bleed-back may occur due to dips in the lines, stubbing for future dispensers, long pipe runs, and extremely flexible pipe.

Bleed-back can be interpreted as energy coming back on the leak detector and trying to force the leak detector open. When a leak detector initially is installed and the line pressure is zero psi, the leak detector is in the reset position. When the pump starts, the leak detector allows approximately 1.5 gallon per minute to pass through. In this position, the line is being filled with product and the pressure in the line is slowly rising.

With the line filled with product, the pump still running, the line starts to expand as a balloon might. The expansion of the line is creating energy that is being forced back onto the leak detector piston.

Naturally, steel pipe has less expansion than fiberglass pipe, and much less expansion than flexible pipe.

Air pockets in the line also raise the bleed-back level, so every effort should be made to eliminate those air pockets by purging the line.

If a VMI leak detector fails to find a 3 GPH leak, the leak detector is not staying at the leak sense position, but instead is going through to full flow.

If, when testing the leak detector, the pressure gauge shows a starting pressure of 0 psi and continues to pump operating pressure without hesitating at leak search pressure, the piston assembly may not have completely reset. If this occurs 2 times in a row; you should (1) turn the pump off, (2) bleed the line pressure to 0 psi, (3) remove the vent line, (4) push the piston assembly down. Turn the pump on and re-test the leak detector to assure it finds a leak. Perform at least 2 additional tests to ensure the leak detector is resetting on its own.

If, when testing the leak detector, it hesitates at leak search pressure but does not hold in leak search position, an adjustment to the piston assembly may be made. The purpose is to make the leak detector more sensitive to a leak.

To adjust the leak detector first remove the vent line and fitting from the top of the 99 LD-2000 or LD-2200 leak detector (99 LD-3000 remove the cap). You will now be looking at the top of the piston assembly.

VMI Vaporless An OMNTEC Company

With a 7/16-inch socket (99 LD-3000 requires a 11/16-inch socket), turn the nut no more than 3 seconds as if looking at an analog clock dial face in a clock-wise direction. (NEVER TURN COUNTER CLOCK-WISE!)

Re-test the leak detector and note step through time and bleed-back.

If a 3 GPH leak is not detected, perform another adjustment and re-test.

You may have to perform this adjustment several times before the leak detector slows down and detects the leak.

To explain what is occurring during the adjustment you should know that the piston assembly consists of a piston, hollow shaft, spring, and metering poppet. While turning the retaining nut of this assembly, you are turning the whole assembly. The metering poppet is what contacts the metering pin of the leak detector while in the reset position and the leak search position.

The metering pin will never move. By changing the position of the metering poppet to the pin, the flow rate will change when adjusting. This also changes the step through time of the leak detector.

By adjusting to find a 3 GPH leak, we are reducing flow into the line to make the leak detector more sensitive to finding a leak.

You may notice that when performing the adjustment, the step through time may start to speed up. The slowest position may be 180 degrees from the fastest position. If the time is speeding up, continue the adjustment and you will see the leak detector start to slow down.

Always test for a 3 GPH leak after each adjustment. Always adjust in a clock-wise direction.

If this is the first time you have attempted to adjust a VMI leak detector, we ask that you call (800 367-0185) for Vaporless technical assistance.

Common Causes of MLLD Failure

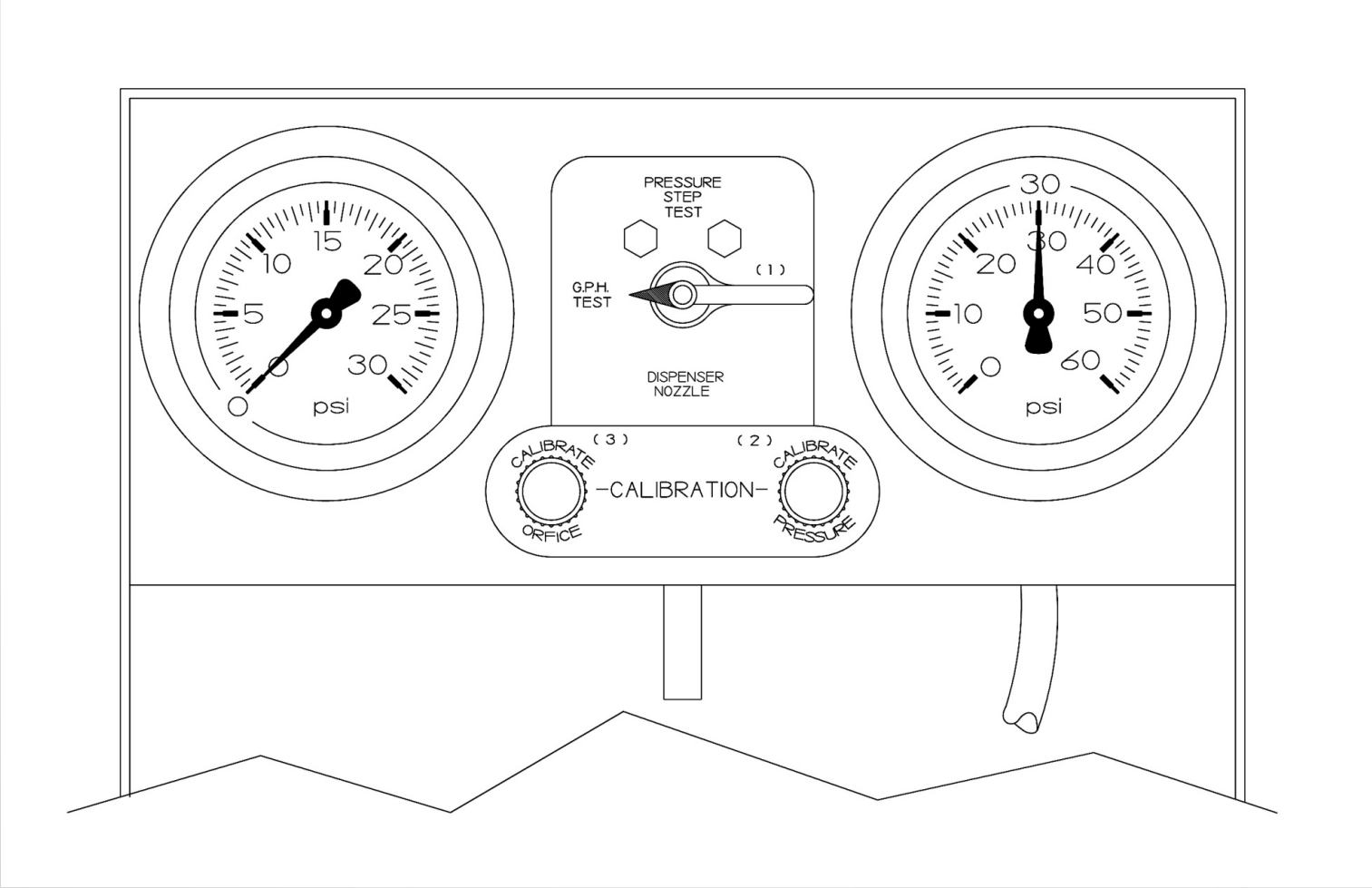
- High bleed-back
  - Length of line
  - Type of line
  - Number of flex connectors
  - Line with high spot(s)
  - Line stub(s)
- Extremely low bleed-back
- Excessive pump pressure
- Deep burial
- Extreme thermal expansion
- Wrong fuel viscosity for installed MLLD
- Defective MLLD

VMI Vaporless An OMNTEC Company

Electronic Line Leak Detector Test

- Calibrate a 3 gph @ 10 psi leak, as previously described, at the dispenser
- Turn 4-way valve to GPH Test
- With the calibrated leak in the line (pump still running) turn off the dispenser authorization (hang up nozzle)

Start of ELLD Test



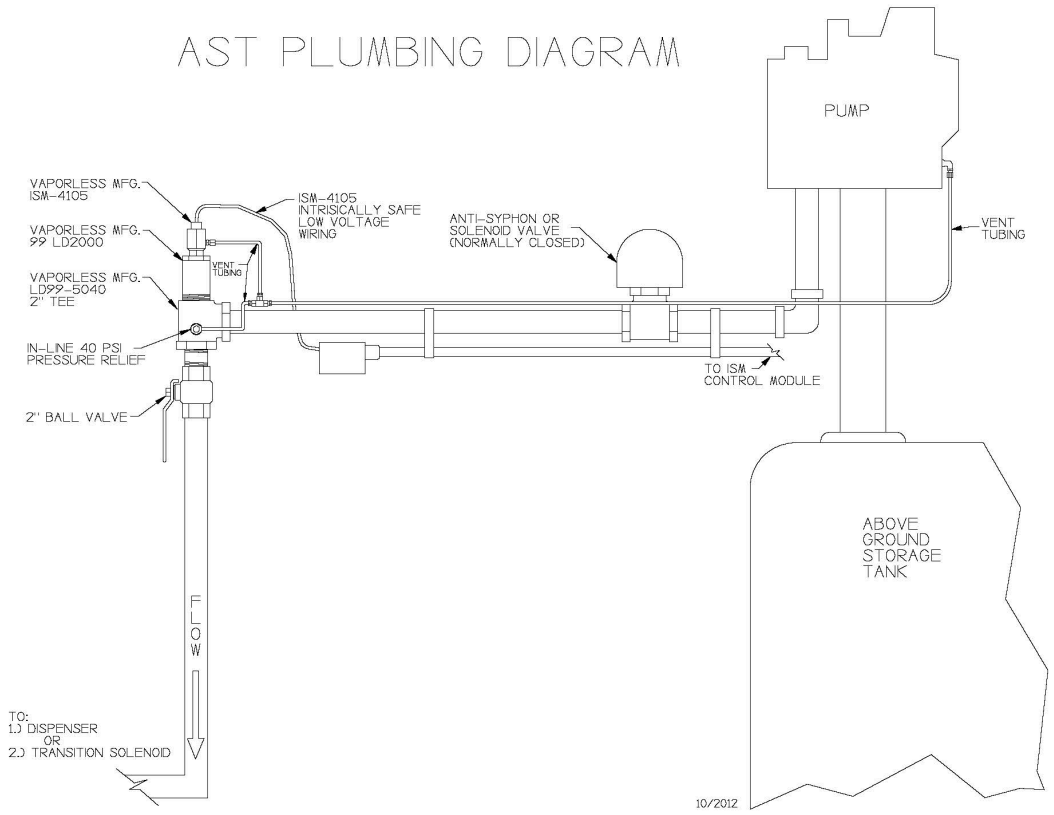
ELLD Test

- Pressure will fall
- Pressure will rise
- ELLD is determining whether monitoring leak or thermal event
- After pressure cycling, needle should settle at o psi
- Turn 4-way valve to Pressure Step Test, proceed to breaker room to confirm ELLD console in alarm

ELLD Test

- Electronic line leak detection system should detect leak, issue the appropriate alarm and/or shut off the submersible
- Time will vary by manufacturer and pipe system
- Authorization of any dispenser during test will abort the test

AST Applications

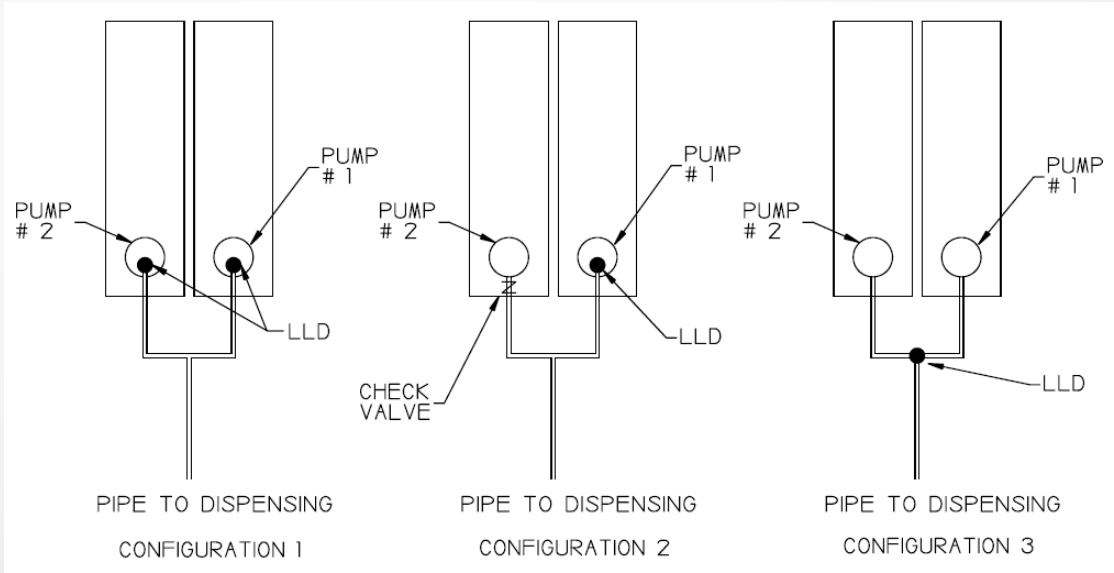


- Downhill piping runs create the potential for syphoning fuel from the tank
- Install MLLD in-line with anti-syphon or N.C. solenoid valve between pump and MLLD
- Include thermal expansion provisions

VMI Vaporless An OMNTEC Company

Line Manifold Applications

- 3 gph compliance must be reviewed on manifolded line applications
- Two or more pumps energizing simultaneously negate 3 gph LLD
- Pumps must alternate operation or be staged so that lead LLD has opportunity to test line before additional pumps start



Federal Regulation Update

"The 2015 UST regulation removes the deferral for UST systems that store fuel solely for use by emergency power generators (emergency generator tanks)…"

https://www.epa.gov/ust/release-detection-underground-storage-tanks-usts#pipe-rd

VMI Vaporless An OMNTEC Company

Genset Applications

- Typically one or more large supply tanks (UST or AST) that feed day tank(s) located near the generator(s)
- Same LLD compliance requirements as typical fueling facilities
  - Must be tested in situ – do not let tester modify system prior to testing (prime system, close valving, etc.)
- Hazard inherent with MLLD – potential of starving the day tank
- Alarm only vs. shutdown
  - Alarm only has the potential of creating a more hazardous situation
  - Positive shutdown and alarm allows site operator to review safety concerns prior to overriding LLD system to fuel

VMI Vaporless An OMNTEC Company

Questioning Equipment Function and/or Testing

- When equipment functions different from expectations, call factory.
- Is the equipment meeting criteria: 3rd party certification, 3rd party description, manufacturer's explanation, other manufacturer's concerns.

VMI Vaporless An OMNTEC Company

Recommended Replacement

- No equipment lasts forever.
- VMI mean time to failure is 5 – 6 years.
- VMI recommends that something as important as catastrophic line leak detection should be replaced before it fails.
- We recommend replacement of a VMI MLLD after it has passed the post install and 5 annual tests. At time of the 5th annual test due date, replace MLLD. The probability of the MLLD failing is exponentially higher each year, potentially leaving the site unprotected for some or all the year.

VMI Vaporless An OMNTEC Company

Review VMI literature online: www.vaporless.com

- Leak Detector Installation
- Catastrophic Line Leak Detection Testing Using the LDT-890(\AF)
- Equipment Specifications
- Online Certification Testing for Installers and Testers
- More!

VMI Vaporless An OMNTEC Company

Vaporless

VMI Manufacturing, LLC

Designed & Manufactured in USA

Contact:

VMI Manufacturing, LLC

www.vaporless.com

sales@vaporless.com

928-775-5191 or 800-367-0185