



FAR WEST TECHNOLOGY

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Product Application Literature
PAL-I1 Aug 2001 REV

ABSTRACT

This PAL discussed the use and operation of the FWT GFS-1 Gas Fill System used for filling and refilling LET and proportional detectors.

I. GENERAL

All of the LET detectors made by Far West Technology need to be filled and refilled with an appropriate filling gas. Most detectors are not permanently sealed and are filled before use with the GFS-1 Gas Filling System. You will want to fill your detector with the appropriate filling gas. Usually this is TE, methane, propane or argon.

II. EQUIPMENT

Along with the GFS-1 you will need the following equipment:

Mechanical Vacuum Pump

>30 Liters per minute pumping speed
5 x 10E-5 mm Hg ultimate vacuum

Filling Gas

2 Stage Regulator on a bottle of pressurized gas.
1 stage regulators may be used on low pressure gas containers such as propane. You need to accurately control the amount of gas.

Hoses

Vacuum pump to GFS-1

The inlet for the GFS-1 is designed to clamp a 1/2 to 3/4 inch ID vacuum hose.

Gas Tank to GFS-1

One end should mate with the gas regulator and the other end fitted with a Swagelock B-QC4-D-400. 1/4 inch Tagon tubing is suitable.

Detector to GFS-1

Both ends should be fitted with a Swagelock B-QC4-D-400 1/4-inch Tagon tubing is suitable.

III. GUIDELINES

When operating the gas fill system it is easy to damage the gauge, vacuum pump or detector. We therefore offer the following guidelines.

1. Always open each valve slowly. If you open a valve fast, it may destroy or damage a part of your system.
2. The Gauge is easily damaged so always isolate it from the system by closing valve #3 if you are going to unplug a connector, or do anything that may result in a fast pressure change.
3. It is best to maintain the detector either under vacuum or filled with filling gas.
4. The high quality bellows seal valves with Teflon valve seats that are used in the GFS-1 are easily ruined if overtightened. Just tighten them enough to close and they will seal perfectly.

When you are using the system, do not leave a hose closed off at both ends that has a vacuum in it. If it has a slight leak it will fill with air and you do not want any air in your detector. Therefore either isolate a hose by filling it to above atmospheric pressure or keep it connected to the vacuum pump until you need it

The Swagelock Quick-Disconnect vacuum couplings push together and lock. The red collar on the hose fitting must be pulled back to release the lock mechanism. Each fitting has an "O" ring sealing system that prevents entry of air when either mated or unmated. These connectors must be kept free of dirt. The system should not be allowed to be contaminated because this will adversely affect detector operation.

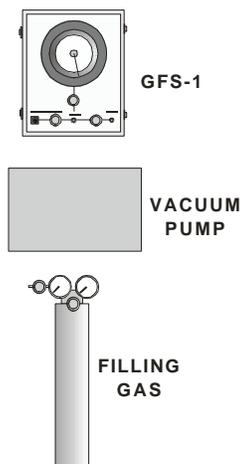


Figure 1 List of equipment (hoses not shown)

IV. SYSTEM SETUP

The GFS-1 is hooked up as shown in figure 2. Before connecting anything, make sure that valve to the gauge (#3 in Figure 2) is turned off. This will prevent damage to the gauge.

First preset the gas fill regulator. If you have it already connected to the system, just unconnect it. You should check the setting of the regulator periodically or whenever you change the tank of gas.

1. Make sure valve 5 and 6 on the filling gas are closed.
2. Turn down the pressure on the regulator as far as it will go.
3. Open the tank valve #6 and also valve #5.
4. Slowly increase the regulator until the exit gauge reads a few PSI. You want the regulator to have some pressure but not very much. You will be filling the detector below atmospheric pressure so any reading on the gauge will be enough. If it is set too high it will be difficult to control the amount of gas when you fill the detector.
5. Close valve 5 and 6.

Now connect the system together.

1. Connect the vacuum pump to the hose barb on the GFS-1 using ½ to ¾ inch vacuum hose.
2. Connect the supply of filling gas to the port marked GAS on the GFS-1.
3. Make sure the valve to the detector #4 is closed then connect the detector to the port marked DET on the GFS-1

V. STARTUP / EVACUATION

The lines need to be evacuated before you can fill the detector. The desire is to open all of the sections of the system to the vacuum and let them pump down. This way you know that each line is free of air. This step often takes several minutes.

1. Make sure the gauge valve #3 is closed. This protects the gauge.
2. Make sure valve to the detector #4 is closed.
3. Make sure the valve to the filling gas #5 is closed. This isolates the filling gas.
4. Make sure the valve to the tank of filling gas #6 is closed.
5. Turn on the vacuum pump.
6. Open the vacuum pump valve #1.
7. Open the gas tank valve #2. The system will now evacuate the manifold and the lines. Wait several minutes to give the system time to evacuate. The sound of some mechanical pumps will change when they have evacuated the lines.

8. Open the gas fill valve #5 and wait several minutes for the system to evacuate the regulator.
9. Slowly open the gauge valve #3. Keep pumping until the gauge reads 0.
10. When the system is pumped down, close the filling gas valve #2 and open the tank valve #5 and 6. This will pressurize the regulator and lines with only filling gas.
11. Slowly open the LET detector valve #4. Wait until the gauge reads zero before proceeding to the filling phase.

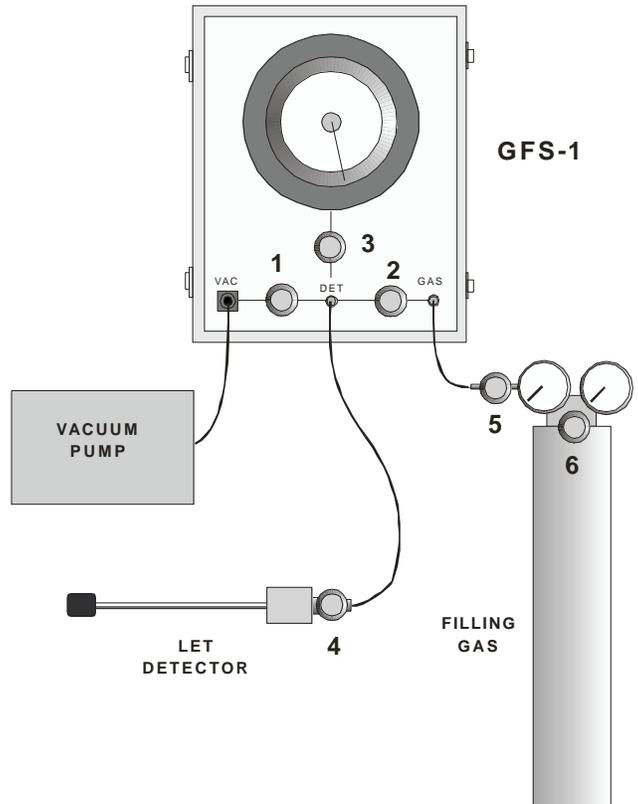


Figure 2 Location of Valves

VI. FILLING THE DETECTOR

Once the system has been evacuated you can fill the detector. Valves 1, 3, 4, 5, and 6 should be open and the system evacuated. Also the regulator should have been evacuated and filled with gas. If you performed the previous steps under Startup/evacuation then you may proceed.

1. Close the vacuum pump valve #1.
2. Very slowly open the gas valve #2 until the pressure on the gauge is higher than the desired fill amount. Usually we will fill it to 10 times the desired fill pressure but never higher than the maximum on the gauge. If we wanted the final fill to be 15 mmHg then we would fill it to around 150 mmHg. This is not a precise amount and does not have to be exact. Any amount around this value is fine. The idea is to put more gas into the detector than required.

3. Close the gas valve #2 and then open the vacuum valve #1. This will evacuate the system again. Wait until the vacuum gauge reads 0.
4. Repeat steps 4 and 5 two times and on the last evacuation close the vacuum gauge when the reading is at the desired amount.
5. Close the LET detector valve #4. Disconnect the hose from the LET detector and it is filled and ready to use.
6. Close the gas fill valve #2
7. Close the tank valves #5 and 6.
8. Open the Vacuum pump valve #1. This will evacuate the system again but not the detector.
9. When the gauge reads 0 close the gauge Valve #3. This closes off the system.

VII. SHUTDOWN

When finished for the day the vacuum gauge should be left at vacuum reading 0 (valve #3 closed) and the vacuum pump should be let up to atmosphere (valve #1 open). Leave the counting gas in the hose going between valve #2 and #5 and turn off all valves associated with the filling gas (#2, 5, and #6).

It may seem difficult to bring the system up to atmospheric pressure because all of the fittings are sealed when you disconnect them. There is a small trick that allows you to open the valve on the end of the hoses with Swagelock fittings. Just press the end of the Swagelock fitting on something hard and the valve inside the connector will open.

Therefore to bring the manifold to atmospheric pressure and thus the vacuum pump, open valve #1. Make sure you have a hose connected to the DET port. Press the free end of the Swagelock connector on something hard to bring the system up to atmosphere.