

FROM THE TRENCHES

GAS PROPORTIONAL

Questions occasionally come up about problems with gas proportional detectors. Some problems are eliminated or reduced with simple preventive maintenance. Some can be corrected with minor changes in how the detectors are set up for use. The following information should assist you in preventing or resolving common problems with your gas detectors. As always, if you need more information, please call.

MAINTENANCE

- Dust Caps Plastic dust caps should always be in place on detector gas connectors when gas lines are disconnected. Dust caps prevent dust and other materials from interfering with the function of the check valves and should be in place when the detector is operating on a static charge.
- Gas Quality Ensure that the gas used is appropriate for the application and that it is supplied by a reputable vendor. Low-quality gas or gas containing contaminants or moisture can cause arcing and spurious counts. As an example of this, a gas detector that counted 5,000 - 10,000 counts per minute for background was returned to the factory, fully charged with P-10 gas, for examination. At the factory, charged with the "old" gas, the count rate was excessively high, as reported by the customer. However, the detector was purged and charged with P-10 used at the factory. The count rate dropped to the normal 300-400 counts per minute.

In addition, the mixture of the counting gas will affect the operating

voltage of the detector. LMI recommends the use of high-quality P-10 counting gas.

DETECTOR RESPONSE TO CHANGES IN PRESSURE

- Factory Settings The operating voltage is determined at the factory by "running a plateau" with the detector. It should be noted that the detector performance is sensitive to atmospheric pressure (and thus elevation above sea level of the calibration facility) because of gas compression and expansion.

The most common way to compensate for this effect is to apply a correction factor to the detector operating voltage. No correction factors are applied to detectors that are shipped to locations having elevations other than the 2,160 feet above sea level at Sweetwater, Texas. When a gas detector is used at elevations differing from Sweetwater's elevation by 1000 or more feet, LMI recommends reevaluating the operating voltage. (Instructions for determining the operating voltage are available from LMI.)

Preliminary testing at LMI on a Model 43-68 detector indicates a correction factor of -25 volts per 1000-foot increase in altitude. Additional testing is being performed.

- Detectors Used with Alpha/Beta Counters Changes in pressure are more critical for detectors used with alpha/beta counters due to the beta window. Thus, it is even more important that the operating voltage be reevaluated for elevations other than 2,160 feet above sea level. In this case, LMI recommends reestablishing the operating voltage

when the user's elevation deviates 500 feet or more from Sweetwater's elevation.

DETECTOR SETUP

- Purging As a general rule, gas detectors should be flushed for 15 - 25 minutes at a flow rate of 100 - 150 cc/minute before use. For a flowrate specific to the detector being used, consult the detector instruction manual. ✓NOTE: Most detectors use double-ended quick connects. Both the male and female quick connects have to be connected to allow counting gas to flow through the detector.

- Fast Flush A faster flush time can be realized if the output gas line (only) is removed at the output flow meter and the flow rate increased to maximum flow rate. Flush time may be reduced considerably. For a fast flush time specific to the detector being used, consult the detector instruction manual. ✓NOTE: The quick-disconnect fitting should not be removed. With the fitting in place, gas flows out the connection. With the fitting removed, a check valve is actuated that prevents output flow.

- Fitting and Regulator Ensure that the gas bottle valve matches its fitting to the regulator. The industry standard for a P-10 gas fitting is CGA 350. A good-quality 2-stage regulator, such as a Matheson 80350, should be used, along with a gauge that has a proper scale (0 - 30 psi is preferred). The scale on the gauge needs to be readable at the pressure used. For example, the recommended pressure for normal

DETECTORS

operation is less than or equal to 5 psi (2 - 3 psi is better). If the gauge scale range is 0 - 100 psi, it may be difficult to regulate the flow accurately at pressures lower than 5 psi.

Once the gas bottle valve is opened and the system is at the desired pressure, use either the valve between the regulator and the tubing or the flow meter valve to regulate the gas flow.

Please note that several parts are needed to assemble the system. Tubing is obviously required for the gas flow from the gas bottle to the detector. An extra fitting is required to fit the tubing (and tubing nut) onto the regulator valve (Swagelok B-400-7-4, LMI part number 13-7836). The nylon tubing nut which screws onto the fitting is LMI part number 22-9689, and the tubing part number is 22-9514. In addition, a brass insert is helpful when placed inside the tubing as a bearing surface to keep the tubing from collapsing when the tubing nut is tightened. The insert is LMI part number 22-9639. These parts (tubing, fitting, nut and insert) are available as a kit (LMI part number 4085-621) for convenience to LMI customers. The individual parts may also be ordered separately.

TROUBLESHOOTING

High Background Counts
or Low Efficiency -

POSSIBLE CAUSES AND FIXES

•Operating Voltage - If it is too high, the background count rate will be too high. If the operating voltage is too low, low efficiency will result. In

either case, re-plateau the detector and determine the proper operating voltage.

•Probe Contamination Clean or replace the screen and Mylar window. The screen may be cleaned with a special wash or soap and water.

•Low-quality gas Replace gas bottle. If the problem persists, notify the gas supplier.

•Light leak - Test the detector under low-light conditions. If the background or source count rate changes significantly, there is likely a light leak. For older detectors, the standoffs may be one source of the leak. While new detectors have black or internal standoffs that do not allow light to penetrate, older detectors have light-colored standoffs that may act as "conduits" for light. The situation may be corrected by covering the standoffs with black tape or painting them with quick-dry black paint.

Another possible light leak source for detectors with a Mylar window, is a small puncture or tear in the window. Such a hole, while not visible upon examination, may allow light to penetrate the window and cause spurious counts. If the window has been punctured, it requires replacement.

•Threshold Setting If the threshold on the counting instrument has been set too low, a high background count rate can result; if too high, low efficiency can result. This is more or less a last-resort check for problems with count rates or low efficiency, as the threshold

We are pleased to introduce Holly Banyard. Holly works in our PTH lab as a Quality Control Specialist, and has been with LMI since November of 1997.

She enjoys spending her spare time with her 2 sons, Joseph, 11, and Nicholas, 5. She also enjoys watching her boys play soccer, football and baseball, and spending time socially with others.



is set at the factory. It should be accurate unless it has been changed or the instrument is malfunctioning. Access to a Ludlum Model 500 Pulser or equivalent is required to check the threshold setting. Contact LMI or refer to the counting instrument manual for instructions on checking and setting the threshold.

DETECTORS

operation is less than or equal to 5 psi (2 - 3 psi is better). If the gauge scale range is 0 - 100 psi, it may be difficult to regulate the flow accurately at pressures lower than 5 psi.

Once the gas bottle valve is opened and the system is at the desired pressure, use either the valve between the regulator and the tubing or the flow meter valve to regulate the gas flow.

Please note that several parts are needed to assemble the system. Tubing is obviously required for the gas flow from the gas bottle to the detector. An extra fitting is required to fit the tubing (and tubing nut) onto the regulator valve (Swagelok B-400-7-4, LMI part number 13-7836). The nylon tubing nut which screws onto the fitting is LMI part number 22-9689, and the tubing part number is 22-9514. In addition, a brass insert is helpful when placed inside the tubing as a bearing surface to keep the tubing from collapsing when the tubing nut is tightened. The insert is LMI part number 22-9639. These parts (tubing, fitting, nut and insert) are available as a kit (LMI part number 4085-621) for convenience to LMI customers. The individual parts may also be ordered separately.

TROUBLESHOOTING

High Background Counts
or Low Efficiency -

POSSIBLE CAUSES AND FIXES

•Operating Voltage - If it is too high, the background count rate will be too high. If the operating voltage is too low, low efficiency will result. In

either case, re-plateau the detector and determine the proper operating voltage.

•Probe Contamination Clean or replace the screen and Mylar window. The screen may be cleaned with a special wash or soap and water.

•Low-quality gas Replace gas bottle. If the problem persists, notify the gas supplier.

•Light leak - Test the detector under low-light conditions. If the background or source count rate changes significantly, there is likely a light leak. For older detectors, the standoffs may be one source of the leak. While new detectors have black or internal standoffs that do not allow light to penetrate, older detectors have light-colored standoffs that may act as "conduits" for light. The situation may be corrected by covering the standoffs with black tape or painting them with quick-dry black paint.

Another possible light leak source for detectors with a Mylar window, is a small puncture or tear in the window. Such a hole, while not visible upon examination, may allow light to penetrate the window and cause spurious counts. If the window has been punctured, it requires replacement.

•Threshold Setting If the threshold on the counting instrument has been set too low, a high background count rate can result; if too high, low efficiency can result. This is more or less a last-resort check for problems with count rates or low efficiency, as the threshold



is set at the factory. It should be accurate unless it has been changed or the instrument is malfunctioning. Access to a Ludlum Model 500 Pulser or equivalent is required to check the threshold setting. Contact LMI or refer to the counting instrument manual for instructions on checking and setting the threshold.



MODEL 4



The Model 4 Survey Meter is a general purpose survey meter which is suitable for all detectors, but it has several features which make it an excellent choice when using alpha scintillators. This instrument offers an audible and visual overload indicator to warn of excessive counts due to possible light leaks, as well as a pulse width discriminator to enhance gamma rejection of alpha scintillators.

COMPATIBLE DETECTORS
G-M, proportional, scintillation

CONNECTOR
Series "C" (others available)

AUDIO
Built in unimorph speaker with ON/OFF switch (greater than 60 dB at 2 ft.)

METER DIAL
0-500 cpm, 0-2.5kV, BAT TEST (others available)

MULTIPLIERS
X1, X10, X100, X1k

LINEARITY
Reading within $\pm 10\%$ of true value with detector connected

CALIBRATION CONTROLS
Accessible from front of instrument (protective cover provided)

HIGH VOLTAGE
Adjustable from 200-2500 volts (can be read on meter)

DISCRIMINATOR
Adjustable from 2-40 mV

DEAD TIME
Adjustable to compensate for dead time of detector and electronics (can be turned on or off)

OVERLOAD
Senses detector saturation, indicated by red lamp on meter and meter going to full scale (adjustable depending on detector selected)

PULSE WIDTH DISCRIMINATOR
Enhances gamma rejection for alpha scintillators (internal adjustment)

PRICE: \$495.00

RESPONSE
Toggle switch for FAST (4 seconds) or SLOW (22 seconds) from 10% to 90% of final reading

RESET
Push-button to zero meter

POWER
2-each "D" cell batteries (housed in sealed compartment that is externally accessible)

BATTERY LIFE
Typically 600 hours with alkaline batteries (battery condition can be checked on meter)

METER
2.5" (6.4 cm) arc, 1mA analog type

CONSTRUCTION
Cast and drawn aluminum with beige polyurethane enamel paint

TEMPERATURE RANGE
-4°F (-20°C) to 122°F (50°C). May be certified for operation from -40°F (-40°C) to 150°F (65°C)

SIZE
6.5" (16.5 cm)H X 3.5" (8.9 cm)W X 8.5" (21.6 cm)L

WEIGHT
3.5 lbs (1.6 kg) including batteries