12 Troubleshooting

12.1 Troubleshooting Guide

The trouble shooting guide will help resolve many of the common problems that can occur.

NOTE

If it is necessary to return the analyzer to the factory for repair, refer to the Shipping the Analyzer section on page 55.

12.1.1 Problem Observations

Observation	Recommended Action (See Table Below)
1. Analyzer reads low	A B D E H I F J K
2. Analyzer reads high	A B C D E I J K
3. Analyzer output noisy	A E I K
4. Analyzer reads high with pump on	C K
5. Analyzer reads 0.00 or less at all times	D H K
6. Slow speed of response	G C D E F K
7. Electrolyte residue visible on the sensor	K
8. Electrolyte Condition indicator ON	E K

Table 9: Problems and Observations

12.1.2 Remedy Table

	Remedy Description
A.	Check the analyzer calibration using a gas of known oxygen concentration. See page 44.
B.	Check to see that the Zero Calibration Value agrees with the factory value marked on the sensor. See page 44
C.	Check the sample delivery plumbing for leaks using the procedure described in the Sample Gas and Plumbing Requirements section of this manual. See page 34
D.	Verify that the correct voltages are being supplied to the sensor. These voltages should be checked with the cable disconnected from the sensor. **Primary Electrodes** wht/yel (-) to wht/blk/red (+) = 1.3 +/- 0.03 VDC (For 25% sensors only = 1.4 +/- 0.03 VDC) **Secondary Electrodes** wht/blue (-) wht/red (+) = 7.0 +/- 0.5 VDC Voltage levels between any other combination of wires should be less than 0.1 VDC.
E.	Change the electrolyte using the procedure described in the Analyzer Start-up Procedure section of this manual on page 6. Rinse the sensor with de-ionized or distilled water prior to refilling and use only DF-E05 electrolyte. Allow several hours of operation on gas to equilibrate.
F.	Turn the analyzer off and reverse the position of the two lower leads on the sensor. Establish a gas flow and allow the analyzer to operate in this fashion for more than one hour but not more than three hours. Return the wires to their original position and change the electrolyte using the procedure described in the Analyzer Start-up Procedure section of this manual on page 6.. Rinse the sensor with deionized or distilled water prior to refilling and use only DF-E05 electrolyte. Allow several hours of operation on sample gas to equilibrate.
G.	Remove and check the filter element. Replace if necessary.
H.	Check for contaminated plumbing. This is most easily done by examining the flow meter or the plastic outlet tubing, if so equipped, for evidence of oil, powder, or other material that might have made its way into the analyzer.
I.	Remove all devices from the analyzer outputs including alarm connections, recorders, etc. Check the operation of the analyzer with those devices removed.
J.	Make sure that the sample gas is consistent with the calibration of the analyzer as noted on the Calibration Log on the inside of the door. For example, if the analyzer is calibrated for nitrogen, a helium sample gas will not be measured accurately.
K.	Call the Delta F Service line at 781/935-5808 for assistance.

Table 10: Possible Solutions

12.2 Troubleshooting Considerations

12.2.1 Gas Pressure Effects

Gas tubing should be kept as short as possible to minimize pressure drop and overall system response time. Larger diameter tubing will help avoid pressure drop but will lengthen the response time. In general 1/8 inch tubing should be limited to 15 foot runs. Longer runs should use 1/4 inch tubing.

If the analyzer is not vented to atmosphere, downstream conditions may impact sensor pressure. If the vent pressure is outside the range of +/- 2 psi, a recalibration under operating conditions may be desireable to remain within the stated analyzer accuracy.

12.2.2 Positive Pressure Operation

Gas pressure should be set to establish a nominal flow of 1.0 to 3.0 scfh. A regulator may be used to adjust the flow rate if there is no downstream restriction on the flow.

If the analyzer is not vented directly to atmosphere, downstream conditions may restrict flow. Keep downstream plumbing lengths and restrictions to a minimum. Do not exceed +/- 5 psi pressure on the sensor.

NOTE

All positive pressure flow control must be accomplished upstream of the sensor.

12.2.3 Negative Pressure Operation

If the gas stream is between 2.0 psig vacuum (12.7 psia) and 2.0 psig, a pump is recommended. If the analyzer is equipped with a pump, it will also have a flow control valve in the flowmeter.

If there is a valve or regulator up stream of the analyzer, it should be kept fully open and flow rate adjustments should be made with the downstream flow control valve in the flowmeter.

NOTE

All negative pressure flow control must be accomplished downstream of the sensor.

12.2.4 Temperature Effects on Sensor Performance

The output of the sensor, given a constant oxygen concentration, will vary slightly with sensor temperature. Temperature effects are most pronounced at concentrations near zero in the lower range analyzers. Percent range sensors will exhibit almost no temperature sensitivity.

The effects of temperature are expressed in Table 11.

Range	**Temp Range** (70ºF nominal)	**% of Reading/°F** (2% - 100% of range)	**Typical Drift** (lower 2% of range)
0-50 ppm	45ºF – 95ºF	±0.32	±65 ppb
0-100 ppm	45ºF – 95ºF	±0.32	±125 ppb
0-500 ppm	45ºF – 95ºF	±0.32	±250 ppb
0-1000 ppm	45ºF – 95ºF	±0.32	±500 ppb
0-5000 ppm	45ºF – 95ºF	±0.24	±2.5 ppm
0-10,000 ppm	45ºF – 95ºF	±0.20	±5 ppm
0-5%	45ºF – 95ºF	±0.12	±0.003%
0-10%	45ºF – 95ºF	±0.04	±0.005%
0-25%	45ºF – 95ºF	±0.01	±0.013%

Table 11: Typical Output Drift by Analyzer Range

12.2.5 Flow Rate Effects on Sensor Performance

Assuming a perfectly leak tight gas delivery system, flow rates above the standard 1.0 – 3.0 scfh may increase the O2 readout by a few percent of reading. Similarly, lower than standard flow rates may cause a decrease in the readout by a few percent of reading.

At very low flow rates (< .2 scfh) O2 readings are much more sensitive to flow rate changes. As a result, if the analyzer is recalibrated at lower than normal flow rates, the new flow rate must be held within +/- 10%.

The normal insensitivity of Delta F sensors to flow rate changes is the basis for the Flow Sensitivity Leak Check Method described in the section on Leaks found on page 34.