



Technical Support Note

Title: 900601 Oxygen Analyzer 'Lo' and 'Off' Oxygen Sensor Prompts-Troubleshooting Guide

TSN Number: 32

File:S:\Bridge_Analyzers\Customer_Service_Documentation\Technical_Support_Notes\32_900601 'Lo' 02 Troubleshooting.docx

Created by: R. Schrader

Last Revision Date: 08-Dec-11

What causes a 'Lo' or 'Off' prompt:

The electro-chemical O₂ sensor used in Bridge gas analyzers generally has a service life of 12 to 18 months when exposed to ambient air containing 20.9% oxygen. The analyzer automatically tests the sensor for degradation when the oxygen sensor is calibrated on ambient oxygen during the 'Zero/Calibrate' process – and notifies the user if degradation is detected by displaying either 'Lo' or 'Off' on the oxygen display at the end of the Zero process:

A '**Lo**' prompt indicates that the oxygen sensor has low sensitivity, and is due for replacement within the next month.

An '**Off**' prompt means that the sensor output is either disconnected or so low sensitivity that it is unusable.

(Either of these prompts may be cleared by pressing any button on the front panel.)

Background:

When the analyzer calibrates the Oxygen sensor during the Zero/Calibrate cycle, it switches gas input from the sample port to the ambient air port by a solenoid – so the analyzer pump pulls in ambient air for the Zero for sensor calibration. If, during this calibration routine, the analyzer sees low output from the oxygen sensor, it raises a 'Lo' warning on the oxygen display at the conclusion of the Zero/Calibration cycle. The issue here is that a low output from the oxygen sensor can be due to either:

- 1 A low sensitivity oxygen sensor.
- 2 Low oxygen gas at the oxygen sensor.

Since the analyzer may be measuring low oxygen gas at the time the Zero/Calibrate routine is initiated, a failure to purge the analyzer of test gas with ambient air properly during the Zero/Calibrate cycle can cause a 'Lo' or 'Off' indication.

While the most common cause for a 'Lo' or 'Off' display is an expiring O₂ sensor, the following procedure should be used to verify that the sensor is weak before it is replaced.

Bridge Analyzers, Inc.
PO Box 39325
Solon, Ohio 44139 USA

(510) 337-1605 office
(216) 274-9262 fax
support@bridgeanalyzers.com



Technical Support Note

Troubleshooting a 'Lo' or 'Off' display:

1. **Verify Gas Flow During Zero**– Execute a manual Zero/Calibrate using the front panel controls and verify that the gas flow momentarily stops for the first few seconds of the Zero, and then continues at between 300 and 500 mL/Min during the remainder of the Zero/Calibrate cycle. If low gas flow is seen, this is an indication that there is a flow restriction or pump flow problem in the analyzer. Low gas flow through the analyzer can cause test gas to remain in the analyzer during the Zero/Calibrate cycle – causing a low O₂ sensor indication. If good gas flow is seen, proceed to **Step 2**. If low gas flow is seen, go to **Step 5**.
2. **Verify Oxygen Response**–If good gas flow rates are seen, leave the analyzer measuring normally, and remove the sample line from the analyzer Gas In port, so that it will sample ambient air. You should see that analyzer respond to ambient air oxygen (at or above 20.9% reading). The analyzer calibrates the oxygen sensor at 20.9%, so a reading 22.0% or greater is the first indicator that the previous oxygen calibration was faulty – probably due to incomplete gas purging during the previous Zero/Calibration cycle. Regardless of the response you see, proceed to **Step 3**.
3. **Manually Zero/Calibrate the analyzer with the sample line removed** - This will cause the analyzer to execute a Zero/Calibrate cycle with ambient air at the sensor – bypassing the need for gas purging. This will confirm the oxygen sensor sensitivity independently of the purge issue. The reading at the end of the Zero/Calibrate cycle should be 20.90% - and there should be no 'Lo' or 'Off' indication. If there is still a 'Lo' or 'Off' prompt, proceed to **Step 4**. Otherwise, go to **Step 5**.
4. **Confirm Oxygen Sensor output -remove the oxygen sensor and measure its voltage** – A new oxygen sensor produces about 12.0 mV of output voltage when exposed to ambient air, so a low sensitivity sensor can be verified by removing it from the analyzer, and measuring the output voltage.
5. Open the enclosure, disconnect and remove the oxygen sensor from its mount, and measure the voltage between the outside two pins at the connector using a Digital Voltmeter. If it is less than 5 mV (0.005V), it is low enough to trigger the 'Lo' prompt. If it measures less than 2 mV, (0.002V), it is low enough to trigger the 'Off' prompt. In either case, the sensor should be replaced. If it is above 5.0mV then the sensor is OK – and additional troubleshooting is necessary. Proceed to **Step 5**.

Bridge Analyzers, Inc.
PO Box 39325
Solon, Ohio 44139 USA

(510) 337-1605 office
(216) 274-9262 fax
support@bridgeanalyzers.com



Technical Support Note

6. **NOTE:** Every oxygen sensor is Serial Numbered. Bridge retains shipping records of each oxygen sensor by Serial Number and if the S/N is provided, can confirm the service age of the sensor to be replaced.
7. **Low Zero Gas Flow - Check for pump operation** – Operate the analyzer normally and verify the output flow rate through the analyzer is between 300 and 500 mL/Min. If the gas flow is correct during normal operation, proceed to **Step 6**. If proper gas flow is not seen, this is an indication that there is a sample pump fault (low gas flow under both normal and Zero conditions), and the analyzer should be returned to Bridge for service.
8. **NOTE:** **This diagnosis is only valid if low gas flow is seen during BOTH normal and Zero operation. If no or low gas flow is seen only during normal operation, and good gas flow is seen during the Zero procedure – the indication is that the internal protective filter or another component of the sample path is blocked and should be replaced or corrected.**
9. **Low Zero Gas Flow - Check for blocked flow in the Zero gas path** - Open the enclosure and inspect the gas input line from the Zero gas port (located above the Gas Input Port on the right side of the enclosure) to the Zero solenoid NC port. The port and line should be free of obstructions or other blockage (kinking, etc.). Note that the Zero port line runs under the main analyzer module cover – so be sure that it is not crimped between the cover and the main pcb.
10. If the Zero line is clear and free flowing, but Zero flow is still not seen during the Zero conditions, but is verified under normal conditions, the most likely fault is a blocked or defective Zero solenoid, and the analyzer should be returned to Bridge for service.

Bridge Analyzers, Inc.
PO Box 39325
Solon, Ohio 44139 USA

(510) 337-1605 office
(216) 274-9262 fax
support@bridgeanalyzers.com