NOTE

If the analyzer is used in a portable mode, the optional isolation valves should be used during transport to preserve the stability of the zero calibration.

9.2.2 Storage Conditions

If the analyzer is to be stored for extended periods of time, be sure that the temperature of storage location does not exceed 70° C (160° F). Storage in direct sunlight can cause temperatures to exceed the recommended limits even though ambient temperatures may be below the maximum temperature.

9.2.3 Sensor Maintenance

The oxygen sensor requires no maintenance.

9.3 Replaceable Spare Parts List

When ordering spare parts, be sure to include the analyzer serial and model numbers.

Description	P/N
Connector – (10 pin)	50980743
Connector – (4 pin)	50980755
Display assembly with PCB	15330110
Filter Element – Coarse	64005011
Filter Element – Fine	64005012
Flow Meter	11220841
Flow Meter w/Valve	11220842
Fuse 1A 24V Operation	45002421
Fuse 2.5A 100-240VAC Operation	45002521
Manual - Instruction	99000039
Pump – 24 VDC	63000310
Sensor	Call Delta F

Table 11: Replaceable Spare Parts

9.4 Troubleshooting

The following *Troubleshooting Guide* helps the user resolve many of the common operational situations that occur with the analyzer. Investigate possible remedies in the listed order.

9.4.1 Sample System Leak Test (Low Flow Sensitivity)

By far the most common reason for high Oxygen readings is a leak in the sample delivery system. Leaks are divided into two types: real leaks and virtual leaks. A real leak is due to a lack of integrity in the sample delivery system. A virtual leak is caused by Oxygen that is trapped in the upstream plumbing and components, such as regulators and filters. This Oxygen

is slowly being purged out of the system. Virtual leaks are most common in new installations. Determining the nature of the leak is not a difficult task. It is important to be consistent in the approach and technique. The steps listed below will be helpful toward resolving any leak related problems.

1) Determine if the high reading is due to a leak or is a real indication of Oxygen level. This can be easily done by performing a "Flow Sensitivity Test". If the Analyzer is equipped with a pump, it is recommended that it not be used during the Flow Sensitivity Test. This test requires a positive pressure sample delivery system. If it is not possible to provide positive sample pressure to the Analyzer, skip to Step 2. Perform the Flow Sensitivity Test as follows:

a) Establish a flow rate that is within the normal operating tolerances of the Analyzer. Generally a flow rate of around 1 LPM or 2 SCFH is ideal.

b) Give the Analyzer a couple of minutes to stabilize, and then carefully note the flow rate and the Oxygen level displayed.

c) Reduce the flow rate by 75%. In a system with good integrity, there should be little change in the front panel display. If a leak exists, however, the reading will rise noticeably. Allow it time to stabilize, and carefully note the flow rate and the Oxygen level displayed.

d) Re-establish a normal flow rate and allow the Analyzer to purge for ½ hour. Note again the flow rate and Oxygen level displayed.

e) Repeat step c. If the Oxygen level stabilizes at a level that is close to the prior value from step c, then the leak is real. If the reading shows a lower Oxygen level than the prior value from step c, the leak is probably a virtual leak and continued purging should rectify the problem.

2) Once it has been determined that there is a leak, the next logical step is to locate it. The easiest way to locate a leak is to close off the feed to the Analyzer from the sample delivery system, and to allow the system to pressurize. Apply Snoop® or another type of liquid leak detector to all of the fittings on the system. Any fitting that shows bubbles should be tightened or replaced.

3) If it is not practical to remove the Analyzer from the sample delivery system, leaks can be located by monitoring Analyzer output while applying Snoop® or another liquid leak detector to one fitting at a time. Snoop® will not show bubbles at the low pressure required for proper Analyzer operation. However, Snoop® will temporarily block any leak, at the fitting being checked, and the Analyzer output will drop. It is important to give sufficient time for the Analyzer to respond before going on to the next fitting.
The more distance between the fitting and the Analyzer, the more time should be given for the Analyzer to respond.

9.4.2 Basic Troubleshooting

Solutions are listed in the order that they should be attempted.

	PROBLEMS	SOLUTIONS
1)	Analyzer reads low	A B D H I J Z
2)	Analyzer reads high	A B C D I J Z
3)	Analyzer output is noisy	A I Z
4)	Analyzer reads high with pump on	C Z
5)	Analyzer reads 0.00 at all times	Q D Z
6)	Slow speed of response	G C D Z
8)	Display is blank, or shows an unusual appearance	K O Z
9)	Display reads any of the following:	
	- NOVRAM Failure	Z
	- Uncalibrated	Z
10)	Span reading is unacceptably high (>50% high)	R C J Z
11)	Span reading is unacceptably low (>50% low)	R J Z

SOLUTIONS KEY

A) Check instrument performance using a gas standard of known Oxygen content (Span Gas).
B) Check that the Analyzer zero setting matches the original factory setting. Consult the manual or the factory to verify these settings.
C) Check the sample delivery system for leaks.
D) With the sensor connected, verify that the correct voltages are being supplied.
Sensor Voltage (S+/-): Green (-) to White (+) = 0.7 – 1.3 VDC
Heater Voltage (H+/-): Black (-) to Red (+) = 2.2 – 4.0 VDC
Voltage levels between any other combination of wires should be less than 0.10 VDC. If there is any deviation from these values, contact the Delta F Customer Support Service Department at 781-935-5808.
G) Remove and check the filter element. Replace if needed.
H) Check for contaminated plumbing. This is most easily done by examining the rotameter (if so equipped) or Tygon tubing downstream from the sensor for evidence of oil, powder, or other material that may have made its way from the process to the Analyzer.
I) Remove any devices being driven by the Analyzer output, i.e., chart recorders, data acquisition systems, etc. Also, disconnect anything controlled by the Analyzer alarm relays. Attempt operation with these devices removed.
J) Ensure that the background gas is compatible with the Analyzers' current calibration.
K) Press the ↵ key once. If the display remains unchanged, power the Analyzer down momentarily, and then power it back up.
L) Ensure that the Analyzer has adequate sample flow.
M) Ensure that the sensor polarization voltage is turned on.

O) Confirm that the power supply is turned on, operating at the proper voltage and is connected properly to the analyzer.
Q) Check the sensor wiring. Trace the wires from the sensor back to the sensor connector. Make sure that the terminal pins are seated correctly in the connector plugs and are making good contact through the connector. Trace the wires further back to the backplane. Make sure the wires are soldered in and none have broken loose.
R) Check the accuracy and age of the calibration reference cylinder. Trace O_2 standards in steel cylinders decay over time due to oxidation of the cylinder walls. Standards below 100 ppm, in steel cylinders, should be re-analyzed or calibrated every three months. Ideally, standards below 100 ppm, and certainly standards below 10 ppm, should be prepared in aluminum cylinders.
Z) Contact the Delta F Customer Support Services Department. The phone number is 781-935-5808, fax number is 781-932-0053 and e-mail address is service@delta-f.com. For faster service, have the instrument serial number and model number in hand before calling.

9.4.3 Fuse Replacement

DANGER

The instrument power must be shut off before removing the fuse.
Failure to do so may expose the operator to hazardous voltages.

The operating voltage of the analyzer is marked on a label located on the rear of the cabinet. Always use the proper fuse for the operating voltage of the analyzer.

9.4.3.1 AC Power Fuse

If configured with an integral 100-240 VAC power supply, the 5X20 mm, 250 VAC, IEC Sheet III, Type T fuse is rated at 2.5A. There are two fuses that are located in the AC input connector located behind the cover on the rear of the cabinet.

Refer to the spare parts list on page 70 for Delta F replacement part numbers.

9.4.3.2 DC Power Fuse

If configured for 24 VDC operation, the 5X20 mm, 250 VAC, IEC Sheet III, Type T fuse is rated at 1A and is located in a holder on the front panel of the analyzer.

Refer to the spare parts list on page 70 for Delta F replacement part numbers.

9.4.3.3 4-20mA Output Fuse

The 4-20mA analog output is fused by a fast acting, automatically resetting, 100mA circuit breaker.

9.5 Shipping

If it becomes necessary to return the analyzer to the factory or ship it to another location, please follow the packaging and shipping procedure below in order to prevent damage to the analyzer