CHROMATOGRAPH MAINTENANCE AND TROUBLESHOOTING

Class # 5050.1

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SYNOPSIS

Covers the proper maintenance and troubleshooting methods for gas chromatographs.

ROUTINE CHROMATOGRAPH MAINTENANCE

The GC System will perform accurately for long periods with very little attention. However a bi-monthly record of certain parameters will assist greatly in assuring that your Analyzer is operating to specifications. The GC System Maintenance Checklist should be filled in bi-monthly, dated, and kept on file for access by maintenance technicians as necessary. See next page. This gives you a historical record of the operation of your Analyzer, enables a maintenance technician to schedule replacement of gas cylinders at a convenient time, and allows quick troubleshooting and repair when it becomes necessary. A chromatogram, a configuration report, and a raw data report should also be made and filed with the checklist, furnishing a positive dated record of the Analyzer. The chromatogram and reports will also prove valuable in comparison with the chromatograms and reports run during troubleshooting.

Copy the GC System Maintenance Checklist as necessary for your files. If you have a problem, please complete the checklist and reports, and have the results available when calling Customer Service with a problem.

Date Performed ____ / __ /
Sales Order No. HE-

BI-MONTHLY	AS FOUND	AS LEFT	NOMINAL
HELIUM CARRIER CYLINDER			
Cylinder Pressure Reading (High)	_____psig	_____psig	
Cylinder Pressure Outlet Reading	_____psig	_____psig	110 psig
CARRIER PRESSURE PANEL REGULATOR	_____psig	N/A	85 psig
SAMPLE SYSTEM			
Sample Line Pressure(s)	(1) __ psig (2) __ psig (3) __ psig (4) __ psig (5) __ psig	psig psig psig psig psig	20 psig 20 psig 20 psig 20 psig 20 psig
Sample Flows (Rotameter)	(1)___ cc/min (2)____cc/min (3)___ cc/min (4)___ cc/min (5)___ cc/min	cc/min cc/min cc/min cc/min cc/min	40-60 cc 40-60 cc 40-60 cc 40-60 cc 40-60 cc
Calibration Gas			
High Pressure Reading	_____psig	_____psig	
Outlet Pressure Reading	_____psig	_____psig	20 psig
Flow (Rotameter)	_____cc/min	_____cc/min	40-60 cc/min

ROUTINE MAINTENANCE PROCEDURES

a. Complete the GC System Maintenance Checklist bi-monthly. Place the Sales Order No., date and time on the form and file it. This gives you a basis for comparison in the future if you need it.

b. Save a Chromatogram of the operating Analyzer on the PC with the JSQSTsoftware. Print configuration, calibration, and raw data reports and file them with the Maintenance Check List.

ANALYZER TROUBLESHOOTING GUIDE

A process gas chromatograph can operate properly only if flows are balanced and constant, the temperature is constant, no leaks are present, and the GC Controller is correctly timed. Before going through the troubleshooting procedures, perform the routines of the Analyzer Maintenance Checklist. Checklist records performed regularly may indicate problems and prevent any sudden breakdown.

Do not adjust any values if they are within the nominal tolerance values on the Checklist. Compare the values with those obtained in preceding weeks. This may pinpoint your problem immediately.

The following is a guide for troubleshooting if a problem with sample analysis occurs. Table 5-2 is a Troubleshooting Checklist to obtain data for a problem diagnosis. This data will be useful if it becomes necessary to call the Daniel Customer Service for assistance.

Flow Balance Check

(1) Ensure that the flow panel gauge is properly set. Refer to the Analyzer Maintenance Checklist for values. Do not adjust; check with Daniel Customer Service if your reading is abnormal.

(2) Check flow at the measure vent and sample vent (see Troubleshooting Checklist).

Temperature

Ensure that the temperature is constant in both the Analyzer and Sample Conditioning System (SCS) oven, if an oven is used (refer to paragraph 5.5.7).

Baseline Drift

To ensure that the baseline is not drifting, compare the baseline upsets caused by valve actuations with those of the SPECTRUM chromatogram provided with the Operational Parameters Sheet. Ensure that no evidence of component elutions is present when no sample is being injected.

If differences exist between the two SPECTRUM chromatograms, the problem may be due to one or more of the following:

1. Programming of events
2. Contamination of valve sealing diaphragms by foreign matter
3. Improperly adjusted flows
4. Leaks in the carrier system
5. Column deterioration due to liquid contamination from a sample
6. Misidentifying peaks

A noisy baseline can be caused by carrier leaks, an electronic failure in the Preamplifier, a faulty power supply, or defective thermistors in the detector. If the baseline is still noisy after correcting for leaks, perform the Detector Bridge Balance procedure before replacing the detector thermistors or the preamplifier board.

ANALYZER TROUBLESHOOTING CHECKLIST

	AS FOUND	AS LEFT	NOMINAL
ANALYZER Leak check with "Snoop" from helium bottle to Analyzer regulator. Leak check with "Snoop" from calibration standard to auto-calibration solenoid. Pre-amp balance voltage (see par. 5.5.6)	mV	mV	0 ±0.5 mV
SAMPLE SYSTEM Leak check with "Snoop" from sample probe to sample solenoid			
MODEL 2350A INPUTS (See par. 5.6) GRI (CH.2) 0.8- 1.2 GRI (CH.3) 0.8- 1.2 GRI (CH.4) 0.8- 1.2 PAZl PAZ2 PAZ3 PAZ4			650 - 880 650 - 880 650 - 880 1150- 1500

ANALYZER TROUBLESHOOTING CHECKLIST (Continued)

	AS FOUND NOMINAL	AS LEFT	
ANALYZER POWER SUPPLY TB4: Terminals (+20V) 24 (common) 25 (-20 Volts), and (- 20V) 26 (+20 Volts) (+20V) (- 20V)	___Volts ___Volts ___mVAC ___mVAC		+20.0 ±.5V -20.0 ±.5 V 0.0 ±40 mV 0.0 ±40 mV
CHROMATOGRAM Check baseline Check component values on report Number of peaks Retention times Date and file			
TEMPERATURE (see par. 5.5.7) Detector Temperature Thermocouple Wire #1 (Type J) Heater Block Temperature Thermocouple Wire #2 (Type J) Sample System Temperature (if applicable)	°Cor mV °Cor mV °C	Tor mV °Cor mV °C	78-83°C 78-83°C *
MEASURE VENT FLOW (see par. 5.5.8) Analyzer Valve 3 ON Analyzer Valve 3 OFF	___cc/min ___cc/min	cc/min cc/min	12-18 cc/min

*Refer to System Operational Parameters

Leak-Checking the Analyzer

To perform a field-service leak check of the Analyzer, follow these steps:

(1) Plug all Analyzer vents.

(2) Make sure the setting of the carrier cylinder regulator is 115 pounds per square inch, gauge (psig).

(3) Check all fittings at the pressure regulator flow panel and at the carrier cylinder regulator with a leak detector. Correct any leaks detected by a bubble indication.

(4) Turn the Helium cylinder shut-off valve clockwise to close. Observe the carrier pressure for ten minutes to check for a drop in carrier pressure. The drop should be less than 200 psig on the high side of the regulator/gauge. If the carrier pressure remains constant, no leaks are present.

(5) Actuate the VALVE ON/OFF switches and observe the pressure with the valves in different positions than in step (4). (When the valves are switched, some pressure change is normal because of carrier loss. Momentarily open cylinder valve to restore pressure if necessary.)

(6) If the pressure does not hold constant, check all valve fittings for tightness.

(7) Repeat step (5) again. If leaks persist, check the valve ports with a commercial Helium leak detector. **Do not use a liquid leak detector on the valves or components in the upper Analyzer oven** (within the black insulated cover).

To perform a factory-level leak check of the Analyzer, follow these steps:

NOTE: The following are steps performed to leak-check the Analyzer at the factory when the Analyzer is quality-checked prior to release. This procedure is more thorough and is designed to isolate specific zones of the Analyzer where a leak may occur.

(1) Plug the Measure Vent (labeled "MV") vent line if it is open. (The "SV", or Sample Vent line should be left open, or unplugged.)

(2) Access the upper explosion proof box (XJT) of the Analyzer so that you will be able to manually operate the analyzer valve switches located on the switch panel inside the box.

(a) See Figure 5-2 for an illustration of the Analyzer XJT box locations.

(b) See Figure 5-3 for an illustration of the Analyzer Valve Switches, upper XJT.

(3) **Leak check the carrier gas (helium) line first, according to the steps that follow.**

(4) Purge the Analyzer Valves with carrier gas (helium), as follows:

(a) Open the helium bottle valve and slowly increase the carrier gas feed line pressure to 110 pounds per square inch gauge (psig), ±2%, with the dual-stage regulator at the helium bottle.

IMPORTANT: Do not use the "Carrier Pressure Adjust" valve (on the Flow Panel of the Analyzer) to adjust carrier gas line pressure. That valve is factory-set and should not be adjusted.

(b) Toggle each Analyzer Valve switch to OFF and ON positions about four to five times (Analyzer Valve switches are in upper XJT box).

(5) Pressurize and check the carrier gas (helium) feed line, as follows:

(a) Set all Analyzer Valve switches to the ON position.

(b) Open the carrier gas (helium) bottle valve, and ensure that the carrier gas feed line pressure is 110 pounds per square inch gauge (psig), ±2%.

(c) Shut the helium bottle valve.

(d) Observe the pressure on the high-side regulator gauge of the helium bottle. Because the "MV" vent line is plugged, the pressure should not decrease during a period of 2-3 minutes.

(e) Set all Analyzer Valve switches to the OFF position.

(f) Repeat steps (5)(b) through (5)(d)

(g) Set all Analyzer Valve switches to the AUTO position for regular operation.

(6) This completes the carrier gas (helium) line leak check. **Next, leak check the calibration gas feed line, according to the steps that follow.**

(7) Plug the Sample Vent (labeled “SV”) vent line.

(8) Pressurize the calibration gas line to 50 psig.

NOTE: Calibration gas line pressure of 50 psig is for leak check and test purposes only. For normal operation, the calibration gas line pressure is maintained at 20-30 psig.

(a) Shut the calibration gas bottle valve.

(b) Observe the pressure on the high-side regulator gauge of the calibration gas bottle. Because the "SV" vent line is plugged, the pressure should not decrease during a period of 2-3 minutes.

(9) This completes the calibration gas line leak check. **Next, leak check the sample gas lines, according to the steps that follow.**

(10) Plug the "SV" vent line (it may already be plugged if you performed steps (6) through (8), above, to leak-check the calibration gas line).

(11) Pressurize the sample gas line to 50 psig or a known pressure.

NOTE: Sample gas line pressure of 50 psig is for leak check and test purposes only. For normal operation, sample gas line pressure is maintained at 20-30 psig.

(a) Shut off the sample gas.

(b) Observe the pressure on any gauge that indicates pressure between the closed sample gas block valve and die closed Analyzer meter valve. Because the "SV" vent line is plugged, the pressure should not decrease during a period of 2-3 minutes.

(12) Leak test all other sample stream lines by connecting gas to each of the sample streams and repeating steps (10) through (ll)(b).

(13) **Finish the test and** set **up the Analyzer for normal operation.,** as **follows:**

(a) Ensure that all Analyzer Valve switches, upper XJT box, are set to the AUTO position.

(b) Unplug, or open the "MV" and "SV" vent lines.

(c) If the calibration gas bottle was used to leak check the sample stream lines, reconnect the calibration gas bottle to the calibration gas line on the SCS mounting plate, and reconnect the sample stream lines.

Plugged Lines, Columns, or Valves

To ensure that lines, columns, and valves are not plugged, check the gas flow at valve ports. For a reference, use the flow diagram in the drawing package, and remember these points about flow diagrams:

-Port-to-port flow paths are indicated by solid or dashed lines.

-A dashed line indicates flow direction when the valve is ON, that is, energized.

-A solid line indicates flow direction when the valve is OFF, that is, deenergized.

-A combination of solid and dashed lines indicates a constant flow path regardless of the ON/OFF state of the valve.

Reference

Emerson/Daniel Chromatograph Manual