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T023. BioTector General Troubleshooting Check List

When a BioTector problem/fault has not been rectified, please complete below check list and carry out all measurements and procedures by referring to the BioTector User Manual, before contacting the distributor or manufacturer.

Check and record the last time service is carried in the BioTector.	_____
Before carrying out any tests or making any system modifications, "if possible" take photos of the BioTector and the sampling system setup and download BioTector "All Data" in text format into the MMC/SD card or into a PC/Laptop using the SEND ALL DATA function in the Data Output menu. Looking at the All Data download, compare and confirm the system configuration settings against the factory configuration, which is printed and supplied with the user manual. The factory configuration is also available in electronic format inside the SD card located at the back of the motherboard and in the CD supplied with the user manual.	_____
Confirm that the mains supply voltage and the frequency on site match the analyzer requirements. Check all electrical connections and wiring in the BioTector and confirm that there are no loose connections within the BioTector.	_____
Check all fuses in the BioTector and confirm that the each fuse holder has a tight grip on the fuse. If necessary, remove the fuse and tighten the legs of the fuse holder.	_____
Check that pressure on the BioTector oxygen regulator is 350 mbar at 20 l/hr MFC (Mass Flow Controller) set-point. Adjust the pressure if necessary.	_mbar
If there is an oxygen supply pressure problem at the regulator, confirm that there is oxygen supply and the oxygen supply pressure is i) between 1250 and 2000 mbar from the oxygen concentrator with instrument air, ii) between 550 mbar and 750 mbar from the oxygen concentrator with compressor, iii) at ~1000 mbar from the welding grade oxygen cylinder. If necessary, replace the regulator.	_____
Check all Swagelok / PFA tube connections and confirm there are no loose connections in and outside the BioTector.	_____
Check and confirm that there are no restrictions in the EXHAUST port and the exhaust tubing is connected to a well-ventilated area or to open atmosphere. Confirm that the exhaust tubing is installed with a downward slope to prevent any condensation or liquid buildup in the tubing.	_____
Check that the Acid (1.8N Sulfuric Acid, H ₂ SO ₄ containing 40mg/L MnSO ₄ .H ₂ O) and Base (1.2N Sodium Hydroxide, NaOH) reagent containers are connected to the correct ACID and BASE ports respectively.	_____
Confirm that a CO ₂ filter is installed on to the Base container and there is no breathing hole drilled on the reagent cap, which should be sealed well. Check the bulkhead fittings on the cap and confirm that it is not loose. If necessary, replace the cap or tighten the fittings assuring a good seal.	_____
Check that the sample or samples are supplied to the analyzer at sufficient flow rate. Confirm that the samples are at ambient pressure and the sample tubing are positioned correctly to minimize the sampling of sand, silt, grit and mud. Check and confirm that there are no air bubbles introduced into the sample tubing from the sample points.	_____
Check and confirm the BYPASS and SAMPLE OUT ports are connected to BioTector PVC-U Drain Pipe or to a pressure free drain and there are no restrictions in these lines.	_____
Check the MANUAL/CALIBRATION ports and tubing and confirm that there are no restrictions in these lines and the ports are not isolated on purpose. Manual/Calibration Valve is activated during online operation to remove any possible positive/negative pressure on the sample lines. To prevent any sample/standard connected to this port getting discharged to drain as system operates, confirm that Manual/Calibration tubing is left open to atmosphere when it is not used.	_____

Check that the elastic EMPP pump tubing installed in all peristaltic pumps are at correct length, and they are positioned and installed correctly inside the pumps. Check that the tube rails of reagent pumps (e.g. Acid, Base Pumps) are installed correctly.	_____
Check and confirm that the elastic EMPP pump tubing in all Pinch Valves are installed correctly, and there is no twisted tubing and no pull or push effect on the tubing placed inside these valves. Check that all Pinch Valves are working. Place your hand under each valve and confirm correct operation when the valve is activated. Check and confirm that there is no cross contamination from one port to another by observing that there are no air bubbles moving from the isolated port to the open port at the Y fittings located between the Pinch Valves.	_____
Check that the Acid Pump is pumping correctly by removing the fitting at the pump outlet port and using a 10ml graduated cylinder. At 20 pulses, the measured volume should be ~4.2ml (± 0.3 ml) in ~13 seconds.	_____ ml
Check that the Base Pump is pumping correctly. At 20 pulses, the measured volume should be ~4.2ml (± 0.3 ml) in ~13 seconds.	_____ ml
Check that the HCl Water Pump (if fitted for FMI Heavy Duty Circulation Pump) is pumping correctly. The pump rate should be ~10ml (± 1.5 ml) in ~18 seconds.	_____ ml
Check that the WMM60 Sample Pump is pumping correctly. At 16 pulses, the measured volume should be ~6.5ml (± 1.0 ml) in ~8 seconds.	_____ ml
Check and confirm that the Circulation Pump is working.	_____
Check that all Burkert Valves (e.g. Exhaust, Sample Out, TOC Acid etc.) are working.	_____
Check and confirm that the Sample (ARS) Valve is working.	_____
In Sample Pump menu, confirm that the Sample Pump FORWARD and REVERSE times are correct. Test the Sample Pump forward and reverse times. Go to Process Test, Sample Pump Test menu and select the PUMP FORWARD TEST and PUMP REVERSE TEST. Adjust the Sample Pump FORWARD times and confirm that sample liquid coming from each stream bypasses the system and drips into the drain pipe on the side of the BioTector.	_____
In Stream Program menu, check and confirm that the operation range of each stream in a multi-stream system is programmed correctly. See System Range Data screen for the available system operation ranges. Confirm that automatic (A) range change function is not selected for any stream in a multi-stream system.	_____
In 4-20ma Program menu, confirm that the full scale of each 4-20mA signal channel is programmed correctly.	_____
Go to Operation, Reagents Setup, Install New Reagents menu and select the "START NEW REAGENT CYCLE" function to prime the reagents. Let the system to complete the Zero Calibration cycle and to set/adjust the Zero Adjust (zero offset) values automatically.	_____
When the Zero Calibration cycle is complete, go to Operation, Start Stop menu and stop the analyzer. Run 5 reactions on DI Water using the manual sample port. If manual port is not available, use the SAMPLE 1 port, but first set the Sample Pump REVERSE time to 0 seconds in Sample Pump menu. Check and confirm that the zero response is stable and correct. If the BioTector has been in storage for a long period, and if the zero readings are not stabilized, a second "Install New Reagents" cycle may be required.	_____
Connect a standard solution to the MANUAL/CALIBRATION port. If both of these ports are not available, use the SAMPLE 1 port, but first set the Sample Pump REVERSE time to 0 seconds in Sample Pump menu. Program the concentration of the standard solution in Span Calibration menu. Run a Span Calibration (or Span Check) cycle using the "RUN SPAN CALIBRATION (or RUN SPAN CHECK)" function in Span Calibration menu.	_____
Observe the oxidized liquid discharged from the reactor. The liquid discharged at the end of each analysis cycle should have the characteristic pink/purple color.	_____

<p>It is recommended to avoid the manual purging of the calibration, manual grab sample and online sample lines using the Simulate menu, because the system reactor may get contaminated during the automatic valve and pump synchronization process. To purge these lines, it is recommended to use PUMP FORWARD and REVERSE TEST functions in the Sample Pump Test menu.</p>		___ %
<p>Complete the span cycle and confirm that a minimum of five span reactions are completed. If any work/test is carried out in the BioTector, as the next analysis result may be affected, it may be necessary to neglect the first one or two analysis results. Confirm that the results of the last three reactions are within +/- 3% of reading. If the span readings are not stabilized, a second "Span Calibration/Check" cycle may be required.</p>		
<p>If the zero and span readings are stable and accurate and if the CO₂ peaks generated are correct, items from 1 to 4 below can be skipped.</p>		_____
1	<p>Confirm that the pH in the reactor is correct, using the test sequence in the pH Test menu.</p>	_____
2	<p>Check for a pH of 0 during the TIC phase.</p>	pH ___
3	<p>Check for a pH of 14 during the Base Oxidation phase.</p>	pH ___
4	<p>Check for a pH of 0 during the TOC phase.</p>	pH ___
<p>If the zero and span readings are not stable and not accurate and if the CO₂ peaks generated are not correct check the pH and the strength of the reagents. Replace the reagents with a new batch and test a new standard solution.</p>		_____
<p>To check and confirm that there is no sample delivery/injection problem due to sample valve or pinch valves, run the BioTector on a standard solution by bypassing all the pinch valves and connecting the standard solution directly to the Sample Pump. When the sample lines are full of liquid sample, observe the elbow fitting on the top port of the Sample ARS Valve for any air bubbles during Pressure Test phase. If necessary, test a TIC (Total Inorganic Carbon) standard to check sample and acid injection evaluating system TIC response.</p>		_____
<p><u>Check the purity of Oxygen:</u> In the Simulate menu, test the oxygen purity by turning on the Mass Flow Controller "MFC" with a setting of 10 l/hr, and flowing gas through the CO₂ analyzer for 5 minutes. At the end of this period, the CO₂ analyzer zero reading should be ±0.5% of full scale of the CO₂ analyzer range, which is typically ±50ppm CO₂. Record the CO₂ analyzer zero reading.</p>		_ ppm
<p>If the CO₂ analyzer zero reading is outside the specifications, confirm that there is no CO₂ in the oxygen by connecting the CO₂ filter (used with the sodium hydroxide reagent container) between the oxygen source and BioTector OXYGEN port and set the MFC to 10 l/h. Keep the 10 l/h gas flow running for at least for 5 minutes and record the CO₂ readings at the end of the test. If the CO₂ readings do not drop significantly with the CO₂ filter in place, this will indicate that there is no CO₂ contamination in the oxygen supply.</p>		_ ppm
<p><u>Check Ozone current and concentration:</u> When the ozone generator is off, confirm that only the green LED 8 (L8) is lighting. Turn on the ozone generator and confirm that three green LEDs L8, L1 and L5 are on. This test shows that the ozone generator is activating. To measure ozone current and to measure % ozone concentration (using an ozone tester kit), carry out the procedures described in information sheets:</p> <p style="padding-left: 40px;">"T003 Ozone Generator and Ozone PCB Tests and Fault Troubleshooting" and "T006 Procedure to check the ozone level".</p> <p>If an ozone tester kit is not available on site, increase the Base Oxidation time (e.g. from 150s to 300seconds) in System Program 1 menu and test a standard solution. If there is significant increase in the results with the increased Base Oxidation time, this will indicate possible problem with the oxygen quality and ozone concentration. When the system reagents, oxygen quality and the ozone concentration are correct, the oxidized fluid discharged from the reactor should have the characteristic pink/purple color.</p>		_ Amp ___ %

<p><u>Check the Circulation Pump and Flow:</u> Check the flow in the circulation pump by following the procedures described in information sheet “T005 Procedure to check the flow in the circulation pump”. If necessary, service or replace the pump.</p>	<p>_____</p>
<p><u>Check the CO₂ Analyzer:</u> Check the CO₂ analyzer response by following the procedures described in information sheet “T019 BioTector CO₂ Analyzer Troubleshooting”. If necessary, remove the CO₂ analyzer and clean the analyzer lenses.</p>	<p>_____</p>
<p><u>Check the Reactor:</u> There could be some material build up inside the Reactor or inside the PFA Glass Beads Chamber. If necessary, remove the Reactor or the Glass Beads Chamber and clean them using DI Water. If the reactor is a Hastelloy metal reactor, investigate the reactor by holding a flashlight (a torch) and by looking at the threads at the bottom port. Check for any damage on the reactor threads and on the inside surface of the reactor. It is highly unlikely but if any metal particulates are found on the Circulation Pump diaphragm (requiring frequent pump service) and/or in the Sample Out Valve, the reactor may need to be replaced.</p>	<p>_____</p>
<p>When all tests are complete, download BioTector “All Data” in text format into the MMC/SD card or into a PC/Laptop using the SEND ALL DATA function in Data Output menu. Looking at All Data download, analyze the reaction archive by examining system faults/warnings and system response.</p>	<p>_____</p>
<p>When a BioTector problem/fault has not been rectified, go to Install New Reagents menu, select the “START NEW REAGENT CYCLE” to prime the reagents and let the system to complete the Zero Calibration cycle. When the Zero Calibration cycle is complete, stop the analyzer and carry out a Span Calibration cycle using a standard solution before returning the system back to online operation.</p>	<p>_____</p>