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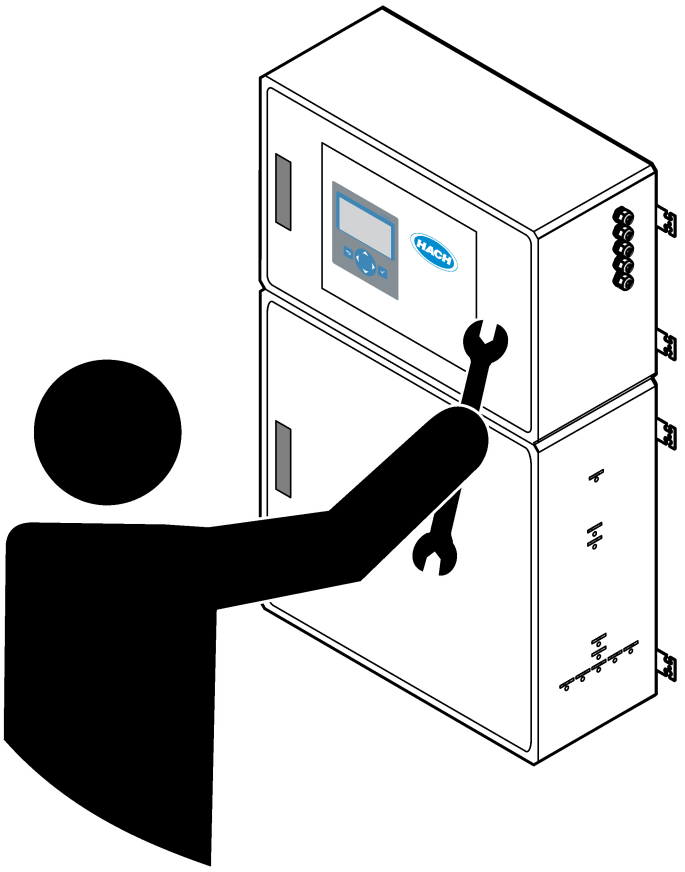
BioTector B7000i Dairy Online TOC Analyzer

Maintenance and Troubleshooting

01/2024, Edition 3



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Section 1 Maintenance

DANGER	
	Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

1.1 Safety information

Please read this entire manual before maintenance tasks or troubleshooting is done on this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

1.1.1 Safety symbols and markings

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

The safety symbols and marking that follow are used on the equipment and in the product documentation. The definitions are in the table that follows.

	Caution/Warning. This symbol identifies that an appropriate safety instruction should be followed or a potential hazard exists.
	Hazardous voltage. This symbol indicates that hazardous voltages are present where a risk of electrical shock exists.
	Hot surface. This symbol indicates that the marked item can be hot and should not be touched without care.
	Corrosive substance. This symbol identifies the presence of a strong corrosive or other hazardous substance and a risk of chemical harm. Only individuals qualified and trained to work with chemicals should handle chemicals or perform maintenance on chemical delivery systems associated with the equipment.
	Toxic. This symbol indicates a toxic/poisonous substance hazard.
	This symbol indicates the presence of devices sensitive to Electro-static Discharge (ESD) and indicates that care must be taken to prevent damage with the equipment.
	This symbol indicates a flying debris hazard.
	Protective earth. This symbol indicates a terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault (or the terminal of a protective earth (ground) electrode).
	Noiseless (clean) earth. This symbol indicates a functional earthing (grounding) terminal (e.g., a specially designed earthing (grounding) system) to avoid a malfunction of the equipment.
	This symbol indicates an inhalation hazard.
	This symbol indicates there is a lifting hazard because the object is heavy.

	This symbol indicates a fire hazard.
	Electrical equipment marked with this symbol may not be disposed of in European domestic or public disposal systems. Return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.

1.1.2 Use of hazard information

The alert boxes that follow are used in this document to indicate important instructions for the safe operation of the equipment.

⚠DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING

Indicates an instruction for a potentially hazardous situation that may result in death or a serious injury.

⚠CAUTION

Indicates that a precaution must be followed for a potentially hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

1.1.3 Electrical safety precautions

The power supplies in the electrical enclosure contain capacitors that are charged to hazardous voltages. After the main power is disconnected, let the capacitors discharge (1 minute minimum) before the electrical enclosure is opened.

1.1.4 Ozone precautions

⚠CAUTION

	Ozone inhalation hazard. This instrument produces ozone that is contained within the equipment, specifically within the internal plumbing. The ozone could be released under fault conditions.

It is recommended to plumb the exhaust gas port to a fume hood or to the building exterior in accordance with local, regional and national requirements.

Exposure to even low concentrations of ozone can damage delicate nasal, bronchial and pulmonary membrane. In sufficient concentration, ozone can cause headaches, coughing, eye, nose and throat irritation. Immediately, move the victim to uncontaminated air and seek first aid.

The type and harshness of symptoms are based on the concentration and exposure time (n). Ozone poisoning includes one or more of the symptoms that follow.

- Irritation or burning of the eyes, nose or throat
- Lassitude
- Frontal headache
- Sensation of sub-sternal pressure
- Constriction or oppression

- Acid taste in mouth
- Asthma

In case of more severe ozone poisoning, the symptoms can include dyspnea, cough, choking sensation, tachycardia, vertigo, lowering of blood pressure, cramping, chest pain, and generalized body pain. Ozone can cause a pulmonary oedema one or more hours after exposure.

1.2 Maintenance schedule

NOTICE

To prevent instrument damage, weekly maintenance must be done by a Hach trained operator or Hach trained maintenance personnel.
To prevent instrument damage, 6-month maintenance and troubleshooting must be done by Hach trained maintenance personnel.

Table 1 shows the recommended schedule of maintenance tasks. Facility requirements and operating conditions may increase the frequency of some tasks.

Table 1 Maintenance schedule

Task	1 week	6 months	12 months	As necessary
Weekly maintenance on page 5	X			
6-month maintenance[1]		X		
Fill or replace the reagents on page 6				X
Replace a fuse on page 6				X
Shutdown procedure on page 8				X

1.3 Weekly maintenance

Use the checklist that follows to complete weekly maintenance. Do the tasks in the order given.

Task	Initial
Select OPERATION > START,STOP > FINISH & STOP or EMERGENCY STOP.	
Wait for the display to show "SYSTEM STOPPED".	
Make sure that the instrument air pressure supplied to the analyzer is correct. • Instrument air plumbed to analyzer—1.5 bar • BioTector compressor plumbed to analyzer—1.2 bar	
Select MAINTENANCE > DIAGNOSTICS > SIMULATE. Select MFC. Set the flow to 20 L/h. Push ✔ to start the mass flow controller (MFC). The measured flow shows on the display.	
Make sure that the oxygen pressure regulator shows 400 mbar at 20 L/h. Refer to Analysis enclosure on page 31 for the location.	
Make sure that the reagent levels are sufficient. Fill or replace reagent containers as necessary. Refer to Fill or replace the reagents on page 6.	

[1] Refer to the documentation supplied with the maintenance kit for instructions.

Task	Initial
Make sure that there are no leaks at the reagent pumps. Refer to Analysis enclosure on page 31 for the location.	
Make sure that there are no leaks at the sample pump.	
Make sure that there are no leaks at the valves in the analyzer. Refer to Analysis enclosure on page 31 for the location.	
Make sure that there are no blockages in the sample lines to the analyzer or the sample lines in the analyzer.	
Make sure that there are no blockages in the drain lines from the analyzer or the drain lines in the analyzer.	
Make sure that there is sufficient sample flow to the sample tubing for a fresh sample for each analysis cycle.	
Make sure that there is no blockage in the exhaust tubing.	
Make sure that there are no blockages in the filter in the fan housing and the vent housing on the side of the analyzer.	
If a sampler is used, make sure that the operation of the sampler is correct. Make sure that there is sufficient flow to the sample pipe.	

1.4 Fill or replace the reagents

⚠ CAUTION

Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

⚠ CAUTION

Chemical exposure hazard. Dispose of chemicals and wastes in accordance with local, regional and national regulations.

Fill or replace the acid and base reagent containers as necessary when the analyzer is stopped.

1. Select OPERATION > START,STOP > FINISH & STOP or EMERGENCY STOP.
2. Fill or replace the reagents.
3. Select MAINTENANCE > COMMISSIONING > REAGENTS MONITOR.
4. Set the reagents volumes.
5. Select OPERATION > REAGENTS SETUP> INSTALL NEW REAGENTS to prime the reagent tubing and do a zero calibration.

1.5 Replace a fuse

⚠ DANGER

Electrocution hazard. Isolate all power to the instrument and disconnect all power from the instrument and relay connections before this maintenance task is started

⚠ DANGER

Electrocution hazard. Use the same type and current rating to replace fuses.

Replace a blown fuse for correct operation. Refer to Figure 1 for the fuse locations. Refer to Table 2 for the fuse specifications.

In addition, a diagram of the fuse locations is available on the top door.

Figure 1 Fuse location diagram

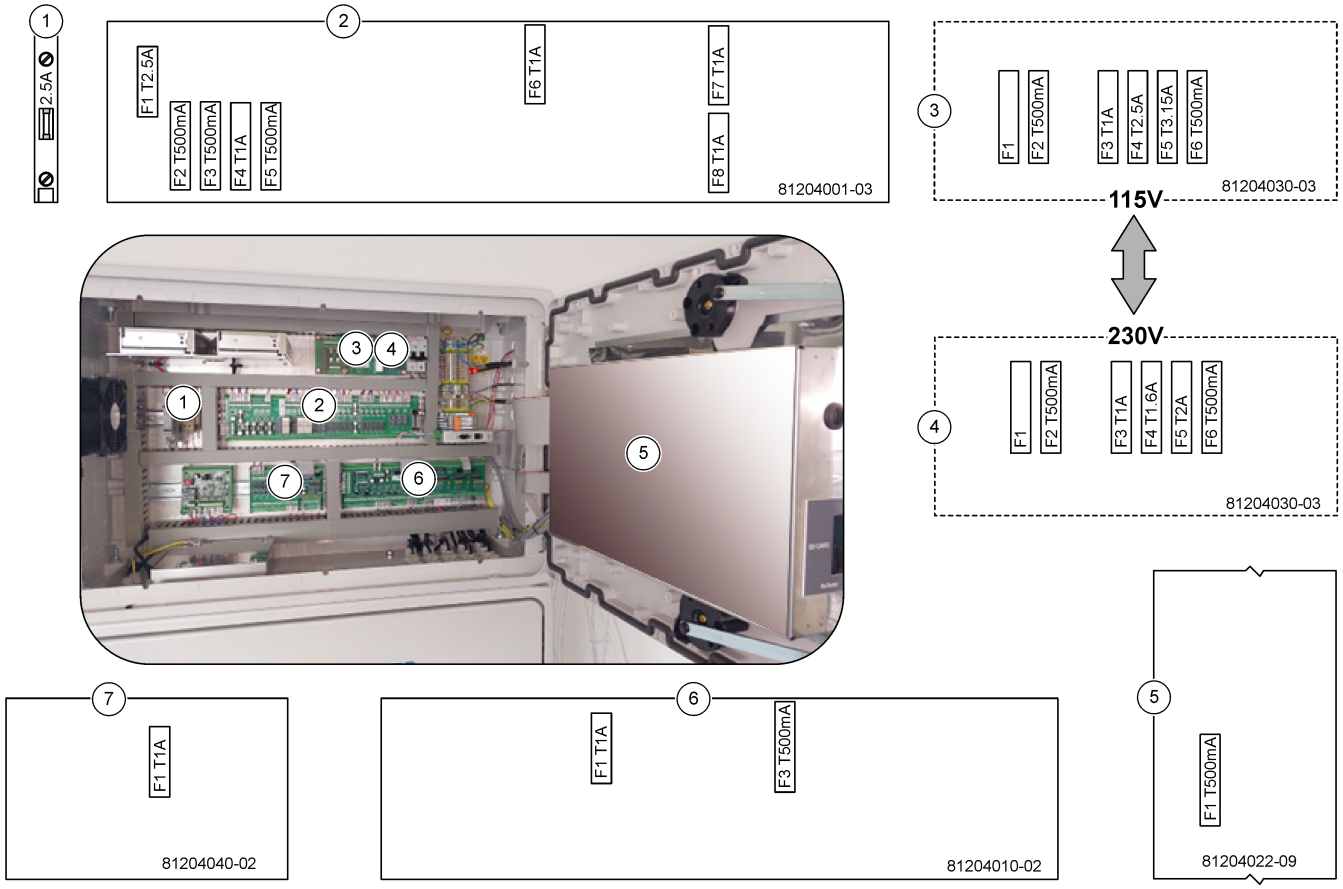


Table 2 Fuse specifications

Item	Name	Number	Size	Material	Number	Current	Type
1	Cooler DIN rail	Terminal 47	Miniature 5 x 20 mm	Ceramic	F1	2.5 A (DC)	T 2.5A H250V
2	Relay PCB	81204001-03	Miniature 5 x 20 mm	Glass	F1	2.5 A (DC)	T 2.5 A L125V DC
					F2	0.5 A (DC)	T 500mA L 125V DC
					F3	0.5 A (DC)	T 500mA L 125V DC
					F4	1.0 A (DC)	T 1A L125 V DC
					F5	1.0 A (DC)	T 1A L125 V DC
					F6	1.0 A (DC)	T 1A L125 V DC
					F7	1.0 A (DC)	T 1A L125 V DC
					F8	1.0 A (DC)	T 1A L125 V DC

Table 2 Fuse specifications (continued)

Item	Name	Number	Size	Material	Number	Current	Type
3	115 VAC Power PCB (Mains PCB)	81204030-03	Miniature 5 x 20 mm	Ceramic	F1	T 2.5 A	T 2.50A H250V
					F2	0.5 A	T 500 mA H250V
					F3	1.0 A	T 1A H250V
					F4	2.5 A	T 2.50A H250V
					F5	3.15 A	T 3.15A H250V
					F6	0.5 A	T 500mA H250V
4	230 VAC Power PCB (Mains PCB)	81204030-03	Miniature 5 x 20 mm	Ceramic	F1	T 2.5 A	T 2.50A H250V
					F2	0.5 A	T 500mA H250V
					F3	1.0 A	T 1A H250V
					F4	1.6 A	T 1.60A H250V
					F5	2.0 A	T 2A H250V
					F6	0.5 A	T 500mA H250V
5	Main board (Motherboard)	81204022-09	Miniature 5 x 20 mm	Glass	F1	0.5 A (DC)	T 500mA L125V DC
6	Signal PCB	81204010-02	Miniature 5 x 20 mm	Glass	F1	1.0 A (DC)	T 1A L125V DC
					F3	0.5 (DC)	T 500mA L125V DC
7	Stream Expansion PCB	81204040-02	Miniature 5 x 20 mm	Glass	F1	1.0 A (DC)	T 1A L125V DC

Key:
A—Amperes
F—Fuse
H—High interrupt
ID—Identification
L— Low interrupt
mA—Milliamperes
PCB—Printed circuit board
T—Time lag (time delay)
V—Volts

1.6 Shutdown procedure

If power will be removed from the analyzer for more than 2 days, use the checklist that follows to prepare the analyzer for shutdown or storage. Do the tasks in the order given.

Task	Initial
Select OPERATION > START,STOP > FINISH & STOP or EMERGENCY STOP.	
Wait for the display to show "SYSTEM STOPPED".	
Remove the reagent from the reagent lines for safety. Refer to Flush the reagent lines on page 9.	
Disconnect the SAMPLE fittings from the sample sources. Connect the SAMPLE fittings to an open drain or empty plastic container.	
Remove power to the analyzer.	

1.6.1 Flush the reagent lines

⚠CAUTION

Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

⚠CAUTION

Chemical exposure hazard. Dispose of chemicals and wastes in accordance with local, regional and national regulations.

Remove the reagent from the reagent lines for safety.

1. Put on the personal protective equipment identified in the safety data sheets (MSDS/SDS).
2. Remove the tubes from the ACID and BASE ports on the side of the analyzer.
3. Plumb the ACID and BASE ports to a deionized water container. If deionized water is not available, use tap water.
4. Select CALIBRATION > ZERO CALIBRATION > RUN REAGENTS PURGE to start a purge cycle.
5. Do step 4 a second time.

   The analyzer replaces the reagents in the reagents lines with water.
6. When the reagent purge cycle is complete, remove the tubing from the deionized water container and put them in open air.
7. Do step 4 two times.

   The analyzer replaces the water in the reagents lines with air.

Section 2 Troubleshooting

2.1 System Faults

Select OPERATION > FAULT ARCHIVE to see the system faults that have occurred. Faults and warnings with an asterisk (*) are active.

When "SYSTEM FAULT" shows in the top-left corner of the Reaction Data screen or the Reagent Status screen, a system fault has occurred. Measurements have stopped. The 4–20 mA outputs are set to the fault level (default: 1 mA). The system fault relay is set to onif configured..

To start the analyzer again, complete the troubleshooting steps for the system fault. Refer to Table 3. To acknowledge the fault, select the fault and push ✔.

Note: *There are system faults (e.g., 05_Pressure Test Fail) that cannot be acknowledged by the user. These faults are reset and acknowledged automatically by the system when the system is started, the system is rebooted or when the fault condition is removed.*

Table 3 System Faults

Message	Description	Cause and solution
01_LOW O2 FLOW - EX	The oxygen flow through the exhaust (EX) valve (MV1) was less than 50% of the oxygen flow MFC (mass flow controller) setpoint for more than the LOW O2 FLOW TIME setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > FAULT SETUP > LOW O2 FLOW TIME.	• Oxygen supply problem. The oxygen pressure should be 400 mbar (±10 mbar) at 20 L/h MFC flow. Select MAINTENANCE > DIAGNOSTICS > O2-CTRL STATUS. • Blockage in the ozone destructor • Blockage in the tube after the MFC • Failure of or blockage in the exhaust valve • Failure of the MFC. Do a flow test. Refer to Do a flow test on page 21.
02_LOW O2 FLOW - SO	The oxygen flow through the sample out (SO) valve (MV5) was less than 50% of the MFC setpoint for more than the LOW O2 FLOW TIME setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > FAULT SETUP > LOW O2 FLOW TIME.	• Oxygen supply problem. The oxygen pressure should be 400 mbar (±10 mbar) at 20 L/h MFC flow. Select MAINTENANCE > DIAGNOSTICS > O2-CTRL STATUS. • Failure of or blockage in the sample out valve • Failure of or blockage in the exhaust valve (MV1) • Failure of the MFC. Do a flow test. Refer to Do a flow test on page 21.
03_HIGH O2 FLOW	The oxygen flow through the exhaust valve (MV1) was more than 50% of the MFC setpoint for more than the HIGH O2 FLOW TIME setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > FAULT SETUP > HIGH O2 FLOW TIME.	• Failure of the MFC • Oxygen supply problem. The oxygen pressure should be 400 mbar (±10 mbar) at 20 L/h MFC flow. Select MAINTENANCE > DIAGNOSTICS > O2-CTRL STATUS.
04_NO REACTION (can be set as a fault or warning)	No TOC (or TC) CO_2 peak or the CO_2 peak is less than the CO2 LEVEL setting for three consecutive reactions. Refer to MAINTENANCE > SYSTEM CONFIGURATION > REACTION CHECK > CO2 LEVEL.	• The acid reagent and/or base reagent are the incorrect concentration. • The acid reagent container and/or base reagent container are empty. • The acid and/or base reagent lines have a blockage or air bubbles. • The operation of the acid pump and/or base pump is incorrect. • The operation of the mixer reactor is incorrect. Do a pH test. Refer to Do a pH test on page 23.

Table 3 System Faults (continued)

Message	Description	Cause and solution
05_PRESSURE TEST FAIL	The MFC flow did not decrease to less than the PRESSURE TEST FAULT setting during the pressure test. Refer to MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > PRESSURE/FLOW TEST > PRESSURE TEST FAULT.	• The analyzer has a gas and/or liquid leak. • A valve has a leak. • Examine the sample out valve, sample (ARS) valve and analyzer fittings for leaks. • Examine the mixer reactor for leaks. Do a pressure test. Refer to Do a pressure test on page 21.
06_PRESSURE CHCK FAIL	The MFC flow did not decrease to less than the PRESSURE CHCK FAULT setting during the pressure check for three consecutive reactions (default). Refer to MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > PRESSURE/FLOW TEST > PRESSURE CHCK FAULT.	
08_RELAY PCB FAULT	• 81204001 relay board has a blown fuse. • 81204010 signal board has a blown fuse, F3. • The operation of the 24V PSU is incorrect.	Examine the 24V DC input power. Examine the fuses on the relay board. Refer to Control enclosure components on page 35 for the location. Examine the fuse F3 on the signal board. LED 6 on the signal board is set to off when the fault is corrected.
09_OZONE PCB FAULT	The operation of the ozone board is incorrect.	Replace the ozone board. Contact technical support.
11_CO2 ANALYZER FAULT	The operation of the CO_2 analyzer is incorrect.	Examine the 24V DC input power to the CO_2 analyzer from the motherboard wires 101 and 102). Refer to Control enclosure components on page 35 for the location. Examine the signal from the CO_2 analyzer. Open the CO_2 analyzer and clean the lenses. Remove and then apply power to the analyzer. For more tests, refer to the information sheet *T019. BioTector CO_2 Analyzer Troubleshooting*.
12_HIGH CO2 IN O2	There is a high level of CO_2 in the input oxygen gas.	Select MAINTENANCE > DIAGNOSTICS > SIMULATE. If the CO_2 value on the display is more than 250 to 300 ppm, examine the oxygen purity. Identify if there is CO_2 contamination in the oxygen supply. Refer to *Examine the oxygen supply* in the Operation and Installation Manual. If the oxygen purity is sufficient, open the CO_2 analyzer and clean the lenses. If the problem continues, replace the CO_2 analyzer filters. If the oxygen purity is not satisfactory, replace the oxygen concentrator.

Table 3 System Faults (continued)

Message	Description	Cause and solution
13_SMPL VALVE SEN SEQ	The sample valve sensors are in a wrong sequence. The sample valve sensors should be in the sequence Sensor 1, 2, 3 and 4.	Make sure that the switches 1 and 2 are both at the on (4 sensors) position on the sample valve sensor PCB. Identify if faults 14_SAMPLE VALVE SEN1, 15_SAMPLE VALVE SEN2 or 16_SAMPLE VALVE SEN3 have occurred. Examine fuse F6 on the Relay PCB. Select MAINTENANCE > DIAGNOSTICS > SAMPLE VALVE. Examine the operation of the sample valve. Examine the sample valve sensor wiring.
14_SAMPLE VALVE SEN1 15_SAMPLE VALVE SEN2 16_SAMPLE VALVE SEN3 130_SAMPLE VALVE SEN4	Sample Valve Sensor 1, 2, 3 or 4 did not show the position of the valve.	Examine fuse F6 on the Relay PCB. The operation of the sample valve sensors is incorrect or there is an orientation problem. Examine the wiring on the valve board and on the Signal PCB. Refer to Control enclosure components on page 35 for the location. Examine the sensor signals. Look at LEDs 12, 13 and 14 on the Signal PCB and DI01, DI02 and DI03 in the DIGITAL INPUT menu. Select MAINTENANCE > DIAGNOSTICS > INPUT/OUTPUT STATUS > DIGITAL INPUT for sensors 1, 2 and 3. Refer to Control enclosure components on page 35 for the board location. Look at LEDs 12 and 13 on the Signal PCB and DI01 and DI02, which are on for sensor 4. Replace the valve assembly.
17_SMPL VALVE NOT SYNC	The correct sensor position (Sensor 1) was not identified in the sample valve when the sample pump is in operation.	Replace Relay 4 on the Relay PCB. Refer to Control enclosure components on page 35 for the location. Examine the sensor signal. Look at LED 12 on the signal board and DI01 in DIGITAL INPUT menu. Select MAINTENANCE > DIAGNOSTICS > INPUT/OUTPUT STATUS > DIGITAL INPUT. Refer to Control enclosure components on page 35 for the board location. Select MAINTENANCE > DIAGNOSTICS > SAMPLE VALVE. Examine the sample valve SEN1 position and SEN1 signal. For more tests, refer to the information sheets *T018. BioTector Sample Valve Not Synchronized Fault Troubleshooting* and *TT002. BioTector Sample Valve Not Sync Fault Quick Troubleshooting*.
18_LIQUID LEAK DET	A liquid leak detector in the analyzer is active. There is a liquid leak.	Look for a liquid leak in the analyzer enclosure. Disconnect the leak detector connector on the bottom of the reactor to identify if the reactor has a leak. Examine the liquid leak detector.
20_NO REAGENTS (can be set as a fault, warning or notification)	The calculated reagent levels identify that the reagent containers are empty.	Replace the reagents. Refer to Fill or replace the reagents on page 6.
129_REACT PURGE FAIL	There is a blockage in the reactor, sample out valve or the associated tubing and fittings. The MFC operation is not correct or the MFC tubing has a blockage.	There is an air or oxygen supply problem. Look at the O2-CTRL STATUS menu to examine the oxygen pressure. The pressure is usually 400 mbar (±10 mbar) at 20 L/h MFC flow. Do a flow test. Refer to Do a flow test on page 21.

2.2 System warnings

Select OPERATION > FAULT ARCHIVE to see the warnings that have occurred. Faults and warnings with an asterisk (*) are active.

When "SYSTEM WARNING" shows in the top-left corner of the Reaction Data screen or the Reagent Status screen, a warning occurred. Measurements continue. The 4-20 mA outputs do not change. The system fault relay is not set to on.

Complete the troubleshooting steps for the warning. Refer to Table 4. To acknowledge the warning, select the warning and push ✔.

If there are multiple warnings in the instrument, examine the fuses on the relay board and signal board.

Table 4 System warnings

Message	Description	Cause and solution
21_CO2 ANL LENS DIRTY	The optical device of the CO_2 analyzer is dirty.	Clean the CO_2 analyzer. Clean the lenses in the CO_2 analyzer.
22_FLOW WARNING – EX	The oxygen flow through the exhaust (EX) valve (MV1) decreased to less than the FLOW WARNING setting during the pressure test. Refer to MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > PRESSURE/FLOW TEST > FLOW WARNING.	• Oxygen supply problem. The oxygen pressure should be 400 mbar (±10 mbar) at 20 L/h MFC flow. Select MAINTENANCE > DIAGNOSTICS > O2-CTRL STATUS. • Blockage in the ozone destructor • Blockage in the tube after the mass flow controller (MFC) • Failure of or blockage in the exhaust valve • Failure of the MFC. Do a flow test. Refer to Do a flow test on page 21.
23_FLOW WARNING – SO	The oxygen flow through the sample out valve (MV5) decreased to less than the FLOW WARNING setting during the pressure test. Refer to MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > PRESSURE/FLOW TEST > FLOW WARNING.	• Oxygen supply problem. The oxygen pressure should be 400 mbar (±10 mbar) at 20 L/h MFC flow. Select MAINTENANCE > DIAGNOSTICS > O2-CTRL STATUS. • Failure of or blockage in the sample out valve • Blockage in the tube after MFC • Failure of the MFC. Do a flow test. Refer to Do a flow test on page 21.
26_PRESSURE TEST WARN	The MFC flow did not decrease to less than the PRESSURE TEST WARN setting during the pressure test. Refer to MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > PRESSURE/FLOW TEST > PRESSURE TEST WARN.	• The analyzer has a gas and/or liquid leak. • A valve has a leak. • Examine the sample out valve, sample (ARS) valve and analyzer fittings for leaks. • Examine the mixer reactor for leaks. Do a pressure test. Refer to Do a pressure test on page 21.
28_NO PRESSURE TEST	The pressure test was not done during the system startup sequence. ***Note:*** *The warning stays active until a pressure test is passed.*	The analyzer was started with a quick startup. The RIGHT arrow key was pushed when START was selected.
29_PRESSURE TEST OFF	The daily pressure test and flow test functions are set to off.	Set the pressure test and flow test functions to on in the MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > PRESSURE/FLOW TEST menu.

Table 4 System warnings (continued)

Message	Description	Cause and solution
30_TOC SPAN CAL FAIL 31_TIC SPAN CAL FAIL	The result of the TIC or TOC span calibration is not within the TIC BAND or TOC BAND setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > SPAN PROGRAM > TIC BAND or TOC BAND.	Make sure that the concentration of the prepared standard solution is correct. Make sure that the settings in the CALIBRATION > SPAN CALIBRATION menu are correct. Examine the operation of the analyzer.
33_TOC SPAN CHCK FAIL 34_ TIC SPAN CHCK FAIL	The result of the TIC or TOC span check is not within the TIC BAND or TOC BAND setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > SPAN PROGRAM > TIC BAND or TOC BAND.	
42_ZERO CAL FAIL	The zero calibration result is not within the ZERO BAND setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > ZERO PROGRAM > ZERO BAND.	Examine the stability of the zero reactions and the quality of the reagents. Do a zero calibration. Refer to the Installation and Operation Manual.
43_ ZERO CHCK FAIL	The zero check result is not within the ZERO BAND setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > ZERO PROGRAM > ZERO BAND.	
50_TIC OVERFLOW	The TIC reading at the end of the TIC analysis is more than the TIC CHECK setting. In addition the TIC reading is more than the TIC CHECK setting after the TIC sparge time was increased 300 seconds. Refer to MAINTENANCE > SYSTEM CONFIGURATION > REACTION CHECK > TIC CHECK.	Unusually high TIC reading. Look at the operation ranges in OPERATION > SYSTEM RANGE DATA menu. Change the operation range (e.g., from 1 to 2) in the MAINTENANCE > COMMISSIONING > STREAM PROGRAM menu to decrease the sample volume added to the reactor. Increase the TIC SPARGE TIME setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > OXIDATION PROGRAM 1 > TIC SPARGE TIME.
51_TOC OVERFLOW	The TOC reading at the end of the TIC analysis is more than the TOC CHECK setting, even after the TOC sparge time was increased 300 seconds. Refer to MAINTENANCE > SYSTEM CONFIGURATION > REACTION CHECK > TOC CHECK.	Unusually high TOC reading. Look at the operation ranges in OPERATION > SYSTEM RANGE DATA menu. Change the operation range (e.g., from 1 to 2) in the MAINTENANCE > COMMISSIONING > STREAM PROGRAM menu to decrease the sample volume added to the reactor. Increase the TOC SPARGE TIME setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > OXIDATION PROGRAM 1 > TOC SPARGE TIME.
52_HIGH CO2 IN BASE	The CO_2 level in the base reagent is more than the BASE CO2 ALARM setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > FAULT SETUP > BASE CO2 ALARM. ***Note:*** *The CO_2 level in the base reagent is identified during a zero calibration or zero check.*	Make sure that the CO_2 filter on the base reagent container is in good condition. Make sure that the base reagent container has no air leak. Identify the quality of the base reagent. Replace the base reagent.

Table 4 System warnings (continued)

Message	Description	Cause and solution
53_TEMPERATURE ALARM	The analyzer temperature is more than the TEMPERATURE ALARM setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > FAULT SETUP > TEMPERATURE ALARM. ***Note:*** *The analyzer fan operates in backup mode until the warning is acknowledged.*	Identify the internal analyzer temperature. Examine the filters in the fan and the vent. Examine the operation of the fan. ***Note:*** *At temperatures below 25 °C (77 °F), the analyzer sets the fan to off.*
54_COOLER LOW TEMP	The cooler temperature is less than 2 °C for more than 600 seconds.	Look at the flashing LED 3 on the signal board to examine the operation of the cooler. The operation of the temperature sensor is incorrect. Replace the cooler.
55_COOLER HIGH TEMP	The cooler temperature is 5 °C (9 °F) more than the cooler setpoint temperature and more than 8 °C (14 °F) below the ambient temperature for more than 600 seconds.	Look at the flashing LED 3 on the signal board to examine the operation of the cooler. The operation of the temperature sensor or cooler peltier element is incorrect. Identify if the current received by the peltier element is approximately 1.4 A. If not, replace the cooler. For more tests, refer to the information sheet *T022. BioTector Cooler Troubleshooting*.
62_SMPL PUMP STOP ON	The sample pump stopped with its rotation sensor set to on or the operation of the rotation sensor is incorrect (continuously on). ON = LED 15 is on (signal board)	Examine the rotation of the sample pump. Replace Relay 2 on the relay board. Examine the pump sensor signal. Look at LED 15 on the signal board and DI04 in the DIGITAL INPUT menu. Refer to MAINTENANCE > DIAGNOSTICS > INPUT/OUTPUT STATUS > DIGITAL INPUT. Replace the sample pump. Refer to Replacement parts and accessories on page 37 For more tests, refer to the information sheet *TT001. BioTector Sample Pump Stop On and Off Warning_Quick Troubleshooting*.
63_SMPL PUMP STOP OFF	The sample pump stopped with its rotation sensor set to off or the operation of the rotation sensor is incorrect (no rotation sensed). OFF = LED 15 is off (signal board)	
64_ACID PUMP STOP ON	The acid pump stopped with its rotation sensor on or the operation of the rotation sensor is incorrect (continuously on). ON = LED 16 is on (signal board)	Examine the rotation of the acid pump. Examine the pump sensor signal. Look at LED 16 on the signal board and DI05 in the DIGITAL INPUT menu. Refer to MAINTENANCE > DIAGNOSTICS > INPUT/OUTPUT STATUS > DIGITAL INPUT. Replace the pump.
65_ACID PUMP STOP OFF	The acid pump stopped with its rotation sensor off or the operation of the rotation sensor is incorrect (no rotation sensed). OFF = LED 16 is off (signal board)	
66_BASE PUMP STOP ON	The base pump stopped with its rotation sensor on or the operation of the rotation sensor is incorrect (continuously on). ON = LED 17 is on (signal board)	Examine the rotation of the base pump. Examine the pump sensor signal. Look at LED 17 on the signal board and DI06 in the DIGITAL INPUT menu. Refer to MAINTENANCE > DIAGNOSTICS > INPUT/OUTPUT STATUS > DIGITAL INPUT. Replace the pump.
67_BASE PUMP STOP OFF	The base pump stopped with its rotation sensor off or the operation of the rotation sensor is incorrect (no rotation sensed). OFF = LED 17 is off (signal board)	

Table 4 System warnings (continued)

Message	Description	Cause and solution
81_ATM PRESSURE HIGH	The reading of the atmospheric pressure sensor is more than 115 kPa. The atmospheric pressure sensor reading is set to 101.3 kPa (fault operation mode).	Examine ADC[8] in the ANALOG INPUT menu. Refer to MAINTENANCE > DIAGNOSTICS > INPUT/OUTPUT STATUS > ANALOG INPUT. The reading should be approximately 4 V. The operation of the pressure sensor is incorrect. Replace the motherboard. Refer to Replacement parts and accessories on page 37
82_ATM PRESSURE LOW	The reading of the atmospheric pressure sensor is less than 60 kPa. The atmospheric pressure sensor reading is set to 101.3 kPa (fault operation mode).	
83_SERVICE TIME	Service is necessary (200 day interval)	Complete the necessary service tasks. Then, reset the service counter to acknowledge the warning. Select MAINTENANCE > DIAGNOSTICS > SERVICE > RESET SERVICE COUNTER.
84_SAMPLER ERROR	There is no/low sample or low air pressure/vacuum in the sampler.	Examine the LCD screen of the sampler for more information. Refer to the sampler user manual.
88_O2 CONTROLLER WARN	There is a communication problem between the motherboard and the O_2 Controller Board.	Make sure that LED 2 (L2) on the O_2 Controller Board is on. Examine the 24 VDC power on the O_2 Controller board at terminal J6. Examine the ribbon cable connections on the board. Removed and then apply power to the analyzer. Replace the O_2 Controller Board if necessary. Refer to Replacement parts and accessories on page 37.
89_TC SPAN CAL FAIL	The TC span calibration result is not within the TC BAND setting.	Examine the concentration of the standard solution. Examine the SPAN CALIBRATION settings.
90_TC SPAN CHCK FAIL	The TC span check result is not within the TC BAND setting.	
91_TC OVERFLOW	The TC readings are high even after the TC time was extended to the maximum time of 300 seconds.	Examine the operation ranges in the SYSTEM RANGE DATA menu. Increase the operation range to decrease the sample volume. Increase the TC SPARGE TIME in SYSTEM PROGRAM > SYSTEM PROGRAM 1.
92_HI AIR PRESSURE 2	The air pressure supply was more than 2.0 bar for more than 5 seconds. When the oxygen concentrator is on, the air pressure supply is normally between 0.9 bar to 1.5 bar. If the air pressure does not decrease to normal values, the air supply is isolated from the analyzer and oxygen is not made.	The external air regulator is not operating correctly. Decrease the external air supply pressure to 1.5 bar when the oxygen concentrator is not in operation. When the problem is fixed, acknowledge the warning to reset the O_2 Controller Board.
93_HI AIR PRESSURE 1	The air pressure supply was more than 1.8 bar for more than 60 seconds. When the oxygen concentrator is on, the air pressure supply is normally between 0.9 bar to 1.5 bar.	The external air regulator is not operating correctly. Stop the analyzer. Decrease the external air supply pressure to 1.5 bar when the oxygen concentrator is not in operation. When the problem is fixed, acknowledge the warning to reset the O_2 Controller Board.

Table 4 System warnings (continued)

Message	Description	Cause and solution
94_LO AIR PRESSURE 2	The air pressure supply was less than 0.6 bar for more than 5 seconds. When the oxygen concentrator is on, the air pressure supply is normally between 0.9 bar to 1.5 bar. If the air pressure does not increase to normal values, the air supply is isolated from the analyzer and oxygen is not made.	The external air regulator is not operating correctly. Increase the external air supply pressure to 1.5 bar when the oxygen concentrator is not in operation. When the problem is fixed, acknowledge the warning to reset the O_2 Controller Board.
95_LO AIR PRESSURE 1	The air pressure supply was less than 0.8 bar for more than 60 seconds. When the oxygen concentrator is on, the air pressure supply is normally between 0.9 bar to 1.5 bar.	The external air regulator is not operating correctly. Stop the analyzer. Increase the external air supply pressure to 1.5 bar when the oxygen concentrator is not in operation. When the problem is fixed, acknowledge the warning to reset the O_2 Controller Board.
96_HI O2 PRESSURE 2	The oxygen pressure supply was more than 500 mbar for more than 5 seconds. If the oxygen pressure does not decrease to normal values, the air supply is isolated from the analyzer and oxygen is not made.	Select MAINTENANCE > DIAGNOSTICS > O2-CTRL STATUS. Use the oxygen pressure regulator to decrease the oxygen pressure to 400 mbar (±10 mbar) at 20 L/h MFC flow. When the problem is fixed, acknowledge the warning to reset the O_2 Controller Board.
97_HI O2 PRESSURE 1	The oxygen pressure supply was more than 450 mbar for more than 60 seconds. If the oxygen pressure does not decrease to normal values, the air supply is isolated from the analyzer and oxygen is not made.	Select MAINTENANCE > DIAGNOSTICS > O2-CTRL STATUS. Use the oxygen pressure regulator to decrease the oxygen pressure to 400 mbar (±10 mbar) at 20 L/h MFC flow.
98_LO O2 PRESSURE 2	The oxygen pressure supply was less than 150 mbar for more than 5 seconds. If the oxygen pressure does not increase to normal values, the air supply is isolated from the analyzer and oxygen is not made.	Select MAINTENANCE > DIAGNOSTICS > O2-CTRL STATUS. Use the oxygen pressure regulator to increase the oxygen pressure to 400 mbar (±10 mbar) at 20 L/h MFC flow. When the problem is fixed, acknowledge the warning to reset the O_2 Controller Board.
99_LO O2 PRESSURE 1	The oxygen pressure supply was less than 200 mbar for more than 60 seconds. If the oxygen pressure does not decrease to normal values, the air supply is isolated from the analyzer and oxygen is not made.	Select MAINTENANCE > DIAGNOSTICS > O2-CTRL STATUS. Use the oxygen pressure regulator to increase the oxygen pressure to 400 mbar (±10 mbar) at 20 L/h MFC flow.
100_ROTARY V STOP:ON	The rotary valve stopped with the rotation sensor on (sensor signal 1). The sensor it not operating correctly because it always shows on (sensor signal 1).	Select MAINTENANCE > DIAGNOSTICS > SIMULATE > MFC. Set the MFC to 20 L/h. Examine the rotation of the rotary valve. Select MAINTENANCE > DIAGNOSTICS > O2-CTRL STATUS. Look at the rotary valve signals (1 = on, 0 = off) as the valve rotates. Replace the rotary valve for the oxygen concentrator. Refer to Replacement parts and accessories on page 37. When the warning is gone, the green LED (Stepper) on the Oxygen PCB is on.
101_ROTARY V STOP:OFF	The rotary valve stopped with the rotation sensor off (sensor signal 0). The sensor it not operating correctly because it always shows off (sensor signal 0).	

Table 4 System warnings (continued)

Message	Description	Cause and solution
114_I/O WARNING	Changes in the Input/Output bus extender MCP23S17 chips were identified during the periodic checks done automatically. The Input/Output bus extender MCP23S17 chips have read/write control registers. ***Note:*** *The Input/Output bus extender MCP23S17 chips have read/write control registers.*	When the analyzer senses a difference between the requested and the read configuration registers values, all of the devices on the SPI (serial peripheral interface) bus are reset and re-initialized automatically. Select OPERATION > FAULT ARCHIVE. Acknowledge the warning and tell technical support.
128_REACT PURGE WARN	The gas flow is not normal. There is an instrument air or oxygen supply problem.	• Blockage in the mixer reactor, the sample out valve or the sample out tubing and fittings • Blockage in the tube after MFC • Failure of the MFC Select MAINTENANCE > DIAGNOSTICS > O2-CTRL STATUS. The oxygen pressure is normally 400 mbar (±10 mbar) at 20 L/h MFC flow. Do a flow test. Refer to Do a flow test on page 21.
133_BACKUP BAT LOW	The voltage of the cell/coin backup battery on the motherboard is less than 2.6 V.	Replace the cell/coin backup battery on the motherboard. Refer to Replacement parts and accessories on page 37.
135_MODBUS WARN	Internal Modbus tasks are in an unknown condition.	When this warning occurs, the Modbus circuit starts again automatically. Acknowledge the warning and tell the distributor or the manufacturer. If the warning continues, replace the motherboard. Refer to Replacement parts and accessories on page 37.

2.3 Notifications

Select OPERATION > FAULT ARCHIVE to see the notifications. When "SYSTEM NOTE" shows in the top-left corner of the Reaction Data screen or the Reagent Status screen, a notification has occurred. Refer to Table 5.

Table 5 Notifications

Message	Description	Solution
85_LOW REAGENTS (can be set as a warning or note)	The calculated reagent levels identify that the reagent containers are at a low level.	Replace the reagents. Refer to Fill or replace the reagents on page 6. To increase the number of days before a LOW REAGENTS notification occurs, select MAINTENANCE > COMMISSIONING > REAGENTS MONITOR > LOW REAGENTS AT.
86_POWER UP	Power was supplied to the analyzer or a power reboot was done after the processor watchdog timeout.	This notification is automatically acknowledged. No action is necessary.
87_SERVICE TIME RESET	The service counter has been set to 200 days (default). RESET SERVICE COUNTER was selected.	This notification is automatically acknowledged. No action is necessary.

Table 5 Notifications (continued)

Message	Description	Solution
116_LOW/NO SAMPLE 1 117_LOW/NO SAMPLE 2 118_LOW/NO SAMPLE 3	The sample sensor does not sense sample or the sample quantity is less than the limit for the sample source (default: 75%).	Examine the sample liquid level and the sampling system for each sample source. Select MAINTENANCE > DIAGNOSTICS > SIMULATE > SAMPLE PUMP. Select PUMP FORWARD TEST. Examine the sample delivery and the sample bypass tubing. Identify if there are air bubbles in the sample tubing.
122_SAMPLE FAULT 1 123_SAMPLE FAULT 2 124_SAMPLE FAULT 3	An external device sent a sample fault input signal to the analyzer.	Examine the external sample liquid level and sampling system for the sample channel. Examine the external sample monitoring device and the external input signal wiring.

2.4 Show the status history before a fault

Show a short status history of some analyzer components before a fault occurs. The default 0.0 value identifies that there are no faults for the component.

1. Select MAINTENANCE > SYSTEM CONFIGURATION > FAULT STATUS.
2. Select an option.

Option	Description
O2 FLOW	Shows 120 entries for the MFC (mass flow controller) setpoint value (first column) and MFC flow value (second column). The entries are at 1 second intervals. If a fault occurs, the entries are kept in the O2 FLOW fault archive until a new fault occurs.
RELAY PCB FAULT	Shows 120 readings of the input to terminal S41 FLT on the signal board. If a fault occurs, the number logged is “1”. The readings are kept in the RELAY PCB FAULT archive until a new fault occurs. Use the readings to identify if the fault was an sudden fault or an intermittent fault.
OZONE PCB FAULT	Shows 120 readings of the input to terminal S42 FLT O3 on the signal board. If a fault occurs, the number logged is “1”. The readings are kept in the OZONE PCB FAULT archive until a new fault occurs. Use the readings to identify if the fault was an sudden fault or an intermittent fault.
CO2 ANALYZER FAULT	Shows 120 readings of the input to terminal S11, which is the 4–20 mA signal from the CO_2 analyzer on the signal board. The readings are at 2 second intervals (4 minutes total). If a fault occurs, the readings are kept in the CO2 ANALYZER FAULT archive until a new fault occurs.
BIOTECTOR TEMPERATURE	Shows 120 readings of the analyzer temperature. The readings are at 2 seconds intervals (4 minutes total). If a fault occurs, the readings are kept in the BIOTECTOR TEMPERATURE fault archive until a new fault occurs.
COOLER TEMPERATURE	Shows 120 readings of the cooler temperature. The readings are at 10 seconds intervals (20 minutes total). If a fault occurs, the reading are kept in the COOLER TEMPERATURE fault archive until a new fault occurs.

Section 3 Diagnostics

3.1 Do a pressure test

Do a pressure test to identify if there is a gas leak in the analyzer.

1. Select MAINTENANCE > DIAGNOSTICS > PROCESS TEST > PRESSURE TEST.
2. Select PRESSURE TEST, then push ✔.

   A pressure test starts (60 seconds). The information that follows shows.

Item	Description
TIME	Shows the remaining time for the test.
MFC SETPOINT	Shows the mass flow controller (MFC) setting for the test (default: 40 L/hr).
MFC FLOW	Shows the flow from the MFC. If there is no gas leak, the flow will slowly decrease to near 0 L/hr after 25 seconds.
STATUS	Shows the results of the test. **TESTING**—Test in progress **PASS**—The flow from the MFC at the end of the test is less than 4 L/hr (default). **WARNING**—The flow from the MFC at the end of the test is more than 4 L/hr but less than 6 L/hr (default). **FAIL**—The flow from the MFC at the end of the test is more than 6 L/hr (default). ***Note:*** *To change the default limits for the test, select MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > PRESSURE/FLOW TEST.*

3. If the pressure test fails, select PRESSURIZE REACTOR, then push ✔ to find the location of a leak. A longer test starts (999 seconds).

3.2 Do a flow test

Do a flow test to identify if there is blockage in the gas exhaust or the sample out lines.

1. Select MAINTENANCE > DIAGNOSTICS > PROCESS TEST > FLOW TEST.
2. Select EXHAUST TEST, then push ✔.

   A flow test starts (30 seconds). The information that follows shows.

Item	Description
TIME	Shows the remaining time for the test.
MFC SETPOINT	Shows the mass flow controller (MFC) setting for the test (default: 60 L/hr).
MFC FLOW	Shows the flow from the MFC. If there is no blockage, the flow is approximately 60 L/hr.
STATUS	Shows the results of the test. **TESTING**—Test in progress **PASS**—The flow from the MFC at the end of the test is more than 45 L/hr (default). **WARNING**—The flow from the MFC at the end of the test is less than 45 L/hr but more than 30 L/hr (default). **FAIL**—The flow from the MFC at the end of the test is less than 30 L/hr (default). ***Note:*** *To change the default limits for the test, select MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > PRESSURE/FLOW TEST.*

3. If the exhaust test fails, select EXHAUST FLOW, then push ✔ to find the location of the blockage (e.g., at the exhaust valve). A longer test starts (999 seconds).
4. Select SAMPLE OUT TEST, then push ✔.

   A sample out test is started. The test identifies if there is a blockage sample out lines.
5. If the sample out test fails, select SAMPLE OUT FLOW, then push ✔ to find the location of the blockage (e.g., at the sample out valve). A longer test starts (999 seconds).

3.3 Do an ozone test

Do an ozone test to identify if the operation of the ozone generator is correct.

1. Install the ozone tester in the analyzer. Refer to information sheet *T029. Procedure to check the ozone level in a BioTector B3500 and B7000 using a universal ozone tester.*.
2. Select MAINTENANCE > DIAGNOSTICS > PROCESS TEST > OZONE TEST.
3. Select START TEST.

   The analyzer does a pressure test. Then the ozone generator is set to on. An ozone warning message shows on the display.
4. When the O-ring in the tester breaks, select STOP TEST.

   The analyzer removes all of the ozone from the ozone tester (30 seconds). The test results show on the display.

Item	Description
TIME	Shows the time for the O-ring to break.
STATUS	Shows the results of the test. **TESTING**—Test in progress **PASS**—The time to break the O-ring was less than 18 seconds (default). **LOW OZONE**—The time to break the O-ring was more than 18 seconds but less than 60 seconds (default). **FAIL**—The time to break the O-ring was more than 60 seconds. ***Note:*** *To change the default limits for the test, select MAINTENANCE > SYSTEM CONFIGURATION > FAULT SETUP > OZONE TEST TIME.*

3.4 Do a sample pump test

Do a sample pump test to identify the correct forward and reverse times for the sample pump for each sample stream.

1. Select MAINTENANCE > DIAGNOSTICS > PROCESS TEST > SAMPLE PUMP TEST.
2. Select an option.

Option	Description
VALVE	Sets the SAMPLE or MANUAL fitting used for the test. For example, to select the SAMPLE 1 fitting, select STREAM VALVE 1.

Option	Description
PUMP FORWARD TEST	Starts the sample pump in the forward direction. ***Note:*** *First select PUMP REVERSE TEST to empty the sample lines, then select PUMP FORWARD TEST.* **1.** Push ↩ to stop the timer when the sample is through the sample (ARS) valve and the sample drips into the drain pipe on the side of the analyzer. **2.** Record the time on the display. The time is the correct forward time for the selected stream.
PUMP REVERSE TEST	Starts the sample pump in the reverse direction. **1.** Push ↩ to stop the timer when the sample lines are empty. **2.** Record the time on the display. The time is the correct reverse time for the sample pump.
SAMPLE PUMP	Goes to the MAINTENANCE > COMMISSIONING > SAMPLE PUMP menu to set the forward and reverse times for each sample stream.

3.5 Do a pH test

⚠CAUTION

Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

⚠CAUTION

Chemical exposure hazard. Dispose of chemicals and wastes in accordance with local, regional and national regulations.

Do a pH test to identify if the pH of the solution in the reactor is correct at the different steps of a reaction.

Items to collect:

- pH paper
- Glass beaker
- Personal protective equipment (refer to MSDS/SDS)

1. Put on the personal protective equipment identified in the safety data sheet (MSDS/SDS).
2. Select MAINTENANCE > DIAGNOSTICS > PROCESS TEST > pH TEST.
3. Select RANGE,VALVE.
4. Set the operation range (e.g., 1) and the stream (e.g., STREAM 1) to use for the test.

   Refer to the OPERATION > SYSTEM RANGE DATA screen to see the operation ranges. Select the operation range that agrees with normal measurements for the sample stream.
5. Select MODE.
6. Select the test mode (e.g., TIC+TOC or TC).
7. Select START TEST.
8. Push ✔ again to confirm that the previous reaction completed normally.

The analyzer does the items that follow in sequence:

- A normal startup completes in approximately 210 seconds (ozone purge, reactor purge, pressure test and flow test).
- Adds the sample and TIC acid to the reactor. Then the program pauses so the TIC pH can be measured by the user.
- Adds the base reagent to the solution in the reactor. Then the program pauses so the base pH can be measured by the user.
- Adds the TOC acid to the solution in the reactor. Then the program pauses so the pH can be measured by the user.
- The reactor and CO_2 analyzer purge phase is completed.

9. When "TEST TIC pH" shows on the display, select an option.

Option	Description
TAKE SAMPLE	Sets the sample out valve to on for 0.1 seconds. Select TAKE SAMPLE four times to remove old sample from the sample out line, then collect a sample in the glass beaker. Use a pH paper to identify the pH of the sample. The expected pH shows on the display. ***Note:*** *The loss of volume in the reactor when a sample is collected can have a negative effect on the pH of the samples collected at the next step. For the best accuracy, collect only one sample during a pH test, then complete the test. Start the pH test again and collect a sample at a different step (e.g., TEST BASE pH).*
CONTINUE TO NEXT PHASE	The analyzer goes to the next step of the program.
STOP TEST	The analyzer goes to the last step of the program, reactor purge.

10. When "TEST BASE pH" shows on the display, select an option. The options are the same as for the previous step.

11. When "TEST TOC pH" shows on the display, select an option. The options are the same as for the previous step.

12. When "CONFIRM ALL TUBES RE-CONNECTED" shows, push ✔ to confirm.

The reactor and CO_2 analyzer purge phase is done.

3.6 Do a sample valve test

Identify if the sample ball valve is aligned with the sample valve ports. Adjust the alignment as necessary.

1. Select MAINTENANCE > DIAGNOSTICS > PROCESS TEST > SAMPLE VALVE TEST.

2. Select TEST FIRST FAILURE to start the test.

The analyzer rotates the sample valve from sensor position 1, 2, then 3. "COMPLETE" shows when the test is completed.

- **LOOP COUNT** —Shows the number of loops the sample ball valve is rotated for each adjustment point for each sensor position during the test (default: 2).
- **CURRENTLY TESTING** —Shows the adjustment points (the time delay implemented by the software) for each sensor during the test. The adjustment points are from 0 to 15 with 1 point increments.
- **FIRST FAILURE POINT** —Shows the adjustment point at which the analyzer does not detect the position of the valve.

3. Select ADJUST SAMPLE VALVE to set the sample valve stop position to align the sample ball valve with the sample valve ports. Follow the instructions on the display.

The analyzer shows the position of the valve (e.g., SENS 1) when the adjustment values are entered.

If a 17_SMPL VALVE NOT SYNC fault occurs, refer to the information sheets *T018. BioTector Sample Valve Not Synchronized Fault Troubleshooting after Valve Replacement* and *TT002. BioTector Sample Valve Not Sync Fault Quick Troubleshooting*.

Note: *When the sample valve is replaced, refer to the information sheet M046. Sample Valve Adjustment and Sample Tube Positioning Guidelines.*

3.7 Do a base wash test

Do a base wash test to examine the base wash and tubing wash cycles. The base wash and tubing wash cycles clean the sample tubing with the base reagent.

1. Select MAINTENANCE > DIAGNOSTICS > PROCESS TEST > BASE WASH TEST.
2. Select an option.

Option	Description
VALVE	Sets the sample or manual/calibration port used for the base wash and tubing wash cycles.
START TEST	Starts the base wash or tubing wash test.
STOP TEST	Stops the base wash or tubing wash test.

3.8 Do simulations

Do simulations to identify if a component (e.g., pumps, valves and mass flow controller) operation is correct.

Note: *Each time a component is activated, the analyzer will stop the operation of other devices as necessary to prevent damage to the analyzer.*

When the back key is pushed to exit the menu, the analyzer does a pump synchronization process.

1. Select MAINTENANCE > DIAGNOSTICS > SIMULATE.

   The status of the analyzer components show.
2. Select an option.

   When a component is on, an asterisk (*) shows before the component name on the display.

   Note: *Changes made to settings in this menu are not saved.*

Option	Description
MFC	Sets the mass flow controller (MFC) flow (e.g., 40 L/h). Set the flow. Push ✔ to start the mass flow controller (MFC). The measured flow shows at the top of the display. ***Note:*** *If the flow shown is 0.0 L/h, the MFC is off.*
OZONE GENERATOR	Sets the ozone generator to on or off. ***Note:*** *For safety, before the ozone generator is set to on, a pressure test is done. If a gas leak is found, the ozone generator is not set to on.*
ACID PUMP	Sets the acid pump to on or off. Sets the number of pulses (½ revolution). When the pump is in operation, the actual pulse time (external brackets) and the set pulse time (internal brackets) show.
ACID VALVE	Sets the acid valve to on or off.

Option	Description
BASE PUMP	Sets the base pump to on or off. Sets the number of pulses (½ revolution). When the pump is in operation, the actual pulse time (external brackets) and the set pulse time (internal brackets) show.
PH ADJUST VALVE	Sets the pH adjust valve to on or off.
BASE VALVE	Sets the base valve to on or off.
SAMPLE VALVE	Sets the sample (ARS) valve to the selected position. Options: SEN1 (sample pump to bypass), SEN2 (sample pump to reactor) or SEN3 (acid or base to reactor).
SAMPLE PUMP	Sets the sample pump to the selected operation mode. Options: FWD (forward), REV (reverse), P-FWD (pulse control forward) or P-REV (pulse control reverse). If P-FWD or P-REV is selected, set the number of pulses (½ revolution of the pump roller). When the pump is in operation, the actual pulse time (external brackets) and the set pulse time (internal brackets) show.
INJECTION VALVE	Sets the injection valve to on or off.
REACTOR MOTOR	Sets the mixer reactor motor to on or off.
SAMPLE OUT VALVE	Sets the sample out valve to on or off.
EXHAUST VALVE	Sets the exhaust valve to on or off.
CALIBRATION VALVE (optional)	Sets the zero or span calibration valve to on or off. Options: ZERO, SPAN or OFF.
STREAM VALVE	Sets a sample stream valve to on or off. Select the number of the stream valve. Only one stream valve can be set to on at one time. ***Note:*** *The stream valves can be controlled from the programmable relays or from the stream expansion (auxiliary) board.*
MANUAL VALVE	Sets a manual valve to on or off. Select the manual valve. Only one manual valve can be set to on at one time.
COOLER	Sets the cooler to on, off or automatic to identify if the cooler relay operation is correct.
LEAK DETECTOR	The LEAK DETECTOR option cannot be selected. The condition of the Liquid Leak Detector alarm input shows on the display.
FAN	Sets the fan to on, off or automatic to identify if the fan relay operation is correct. The analyzer temperature shows on the display. When FAN is set to AUTO, the analyzer sets the fan to off when the analyzer temperature is less than 25 °C. The fan operates continuously when the analyzer temperature is more than 25 °C.
TEMP SWITCH	Sets the temperature switch to on, off or automatic to identify if the temperature switch operation is correct. When TEMP SWITCH is set to AUTO, the analyzer sets the temperature switch to on when the analyzer temperature is 25 °C (default) or higher. The temperature switch stays on until the analyzer temperature is less than 25 °C.
SAMPLER FILL	Sets the signal to fill the sampler to on or off. The signal stays on until set to off.
SAMPLER EMPTY	Sets the signal to make the sampler empty to on or off. The signal stays on for 5 seconds.

Option	Description
SAMPLER ERROR	Sets the signal for a sampler error to on or off. The sampler error signal is normally sent from the sampler when there is an error in the sampler.
SAMPLE SENSOR	The SAMPLE SENSOR option cannot be selected. The condition of the sample sensor shows on the display.
REACTOR PURGE	Starts the reactor purge operation.
RUN REAGENTS PURGE	Starts the reagent prime operation, which fills the reagent tubing with reagent.
INPUT/OUTPUT STATUS	Goes to the MAINTENANCE > DIAGNOSTICS > INPUT/OUTPUT STATUS menu. The INPUT/OUTPUT STATUS menu shows the conditions of the digital inputs, digital outputs, analog inputs and analog outputs.

3.9 Do a relay or 4–20 mA output test

Do a signal simulation to identify if the relay and 4–20 mA output operation is correct.

1. Select MAINTENANCE > DIAGNOSTICS > SIGNAL SIMULATE.
2. Select an option.

Option	Description
ALARM 1 to 6	Sets the ALARM relay to on if configured.
CHANNEL 1 to 6	Sets a 4–20 mA output (e.g., CHANNEL 1) to a selected 4–20 mA signal.
CO2 ALARM 1 to 6	Sets the CO2 ALARM relay to on if configured.
STM ALARM 1 to 6	Sets a STM ALARM relay to on if configured.
SAMPLE FAULT 1 to 6	Sets the SAMPLE FAULT relay to on for a specified stream if configured.
SYNC RELAY	Sets the SYNC relay to on if configured.
SAMPLE STATUS 1 to 6	Sets the SAMPLE STATUS relay to on for a specified stream if configured.
CAL SIGNAL	Sets the CAL SIGNAL relay to on if configured.
MAINT SIGNAL	Sets the MAINT SIGNAL relay to on if configured.
REMOTE STANDBY	Sets the REMOTE STANDBY relay to on if configured.
STOP	Sets the STOP relay to on if configured.
FAULT	Sets the FAULT relay to on if configured.
FAULT OR WARN	Sets the FAULT OR WARN relay to on if configured.
WARNING	Sets the WARNING relay to on if configured.
NOTE	Sets the NOTE relay to on if configured.
MAN MODE TRIG	Sets the MAN MODE TRIG relay to on if configured.
4-20mA CHNG	Sets the 4-20mA CHNG relay to on if configured.
4-20mA CHNG 1 to 6	Sets a 4-20mA CHNG1 to 6 relay to on for a specified stream if configured.

Option	Description
4-20mA READ	Sets the 4-20mA READ relay to on if configured.
INPUT/OUTPUT STATUS	Goes to the MAINTENANCE > DIAGNOSTICS > INPUT/OUTPUT STATUS menu. The INPUT/OUTPUT STATUS menu shows the conditions of the digital inputs, digital outputs, analog inputs and analog outputs.

3.10 Show the input and output status

Show the signals at the digital inputs, digital outputs, analog inputs and analog outputs to examine their operation.

1. Select MAINTENANCE > DIAGNOSTICS > INPUT/OUTPUT STATUS.
2. Select an option.

Option	Description
DIGITAL INPUT	Shows the digital signal at the digital inputs (1 = active, 0 = not active). "DI" followed by two digits identifies the digital inputs. For example, DI09 is Digital Input 9. The digital input number is followed by the digital signal at the input and then the function. "[PROGRAMMABLE]" identifies the configurable digital inputs. ***Note:*** *DI09 is the enter key. Push and hold down the enter key to change the digital signal at DI09 to 1.*
DIGITAL OUTPUT	Shows the digital signal at the digital outputs (1 = active, 0 = not active). "DO" followed by two digits identifies the digital outputs. For example, DO21 is Digital Output 21. The digital output number is followed by the digital signal at the output and then the function. "[PROGRAMMABLE]" identifies the configurable digital outputs. ***Note:*** *When the analyzer is set to on, all of the digital outputs are set to 0.* ***Note:*** *DO21 has a digital signal of 1 when the cooler is on and 0 when the cooler is off. The cooler operates for approximately 3 seconds and then is off for 7 seconds.*
ANALOG INPUT	Shows the ADC converter digital value, input voltage and function of each analog input. The analyzer uses a 12-bit ADC, so the range of the digital value is 0 to 4095. The input voltage range is 0 to 5.00 V.
ANALOG OUTPUT	Shows the DAC converter digital value, output voltage and function of each analog output. The analyzer uses a 12-bit DAC, so the range of the digital value is 0 to 4095. The output voltage range is 0 to 10.00 V.

3.11 Show the oxygen controller status

Show the system air supply, oxygen supply, gas flow, pressure and temperature parameters.

1. Select MAINTENANCE > DIAGNOSTICS.
2. Select O2-CTRL STATUS.

   The oxygen concentrator is set to on. The information that follows shows on the display:

   - **IDENTIFICATION** —The identification number for the oxygen controller board.
   - **VERSION** —The software version of the oxygen controller board.
   - **MODE** —Sets the mode of the oxygen controller board. The modes follow:
     MFC: The oxygen controller board operates the mass flow controller.

     O2: The oxygen controller board operates the oxygen concentrator.

MFC AND O2: The oxygen controller board operates the MFC and oxygen concentrator.

- **TEMPERATURE SENSOR** —The first value is the temperature of the analyzer at the oxygen controller board. The second value is the voltage reading from the temperature sensor.
- **AIR PRESS SENSOR** —The first value is the air inlet pressure for the oxygen concentrator. The second value is the voltage reading from the air pressure sensor.
- **O2 PRESS SENSOR** — The first value is the oxygen inlet pressure for the MFC (normally 400 mbar (±10 mbar) at 20 L/h MFC setpoint. The second value is the voltage reading from the oxygen pressure sensor.
- **VALVE1, 2, 3**—The oxygen controller valve outputs for Valves 1, 2 and 3 (1 = on, 0 = off). Valve 1 is the air isolation valve. Valve 2 and 3 are reserved.
- **ROTARY VALVE** —The operation of the rotary valve (FORWARD, REVERSE or STOP).

  Note: *Approximately September 2022, the rotary valve was removed from the analyzer.*
- **ROTARY VALVE SENSOR** —The sensor position of the rotary valve (1 = rotary valve is on the sensor, 0 = the valve is not on the sensor).

  Note: *Approximately September 2022, the rotary valve sensor was removed from the analyzer.*
- **MFC SETPOINT** —Sets the setpoint for the mass flow controller. Push enter (checkmark icon), select the setpoint, then push enter again. The MFC flow shows at the top of the display. The MFC is off when the flow is 0.0 L/h.
- **MFC FLOW** —The first value is the MFC flow. The second value is the voltage reading from the MFC. When the analyzer is stopped or in remote standby, the MFC setpoint is 1 L/h.

3.12 Show the Modbus status

1. Select MAINTENANCE > DIAGNOSTICS > MODBUS STATUS.
2. Select an option.

Option	Description
MODE	Shows the Modbus operating mode, which is BIOTECTOR.
DEVICE BUS ADDRESS	Shows the Modbus address of the instrument.
BUS MESSAGE COUNT	Shows the number of Modbus messages that were correctly received and were sent to the Modbus address of the instrument. ***Note:*** *When the count is 65,535, the subsequent message received sets the count to 1.*
BUS COM ERROR COUNT	Shows the number of corrupted or not fully received Modbus messages that the Modbus received. ***Note:*** *When the count is 65,535, the subsequent message received sets the count to 1.*
MANUFACTURE ID	Shows the manufacturer ID for the instrument (e.g., 1 for Hach).
DEVICE ID	Shows the class or family of the instrument, if entered (default: 1234).
SERIAL NUMBER	Shows the serial number of the instrument.
LOCATION TAG	Shows the location of the instrument.

Option	Description
FIRMWARE REV	Shows the firmware revision installed on the instrument.
REGISTERS MAP REV	Shows the Modbus register map version used by the instrument. Refer to the Modbus register maps in the Advanced Configuration Manual.

After the menu options, the first 17 bytes of the last received (RX) and transmitted (TX) Modbus message show.

3.13 Modbus troubleshooting

1. Make sure that the device bus address is correct. Refer to the *Configure the Modbus settings* in the Installation and Operations Manual.
2. Make sure that the register address (5-digit code) is correct.
3. Select MAINTENANCE > DIAGNOSTICS > MODBUS STATUS > BUS COM ERROR COUNT. Look at the bus transmission error count.

   The bus error count should increase each time the analyzer reads an invalid or not fully received Modbus message.

   Note: *Valid messages that are not addressed to the instrument do not increase the counter.*
4. For the Modbus RTU option, make sure that the wire connected to terminal D+ is positively biased compared to the wire connected to terminal D– when the bus is in an idle condition.
5. Make sure that there is a jumper installed on J15 of the motherboard at the end of the bus to terminate the bus. The motherboard is in the electronic enclosure on the door behind the stainless steel cover.
6. For the Modbus TCP option, open the web interface. Refer to *Configure the Modbus TCP/IP module* in the Installation and Operation Manual. If the web interface does not open, do the steps that follow:

   a. Make sure that the network settings are correct.
   b. Make sure that the Ethernet cable connectors are fully installed in the Ethernet ports.
   c. Make sure that the LED for the Modbus TCP/IP (RJ45) connector is green.

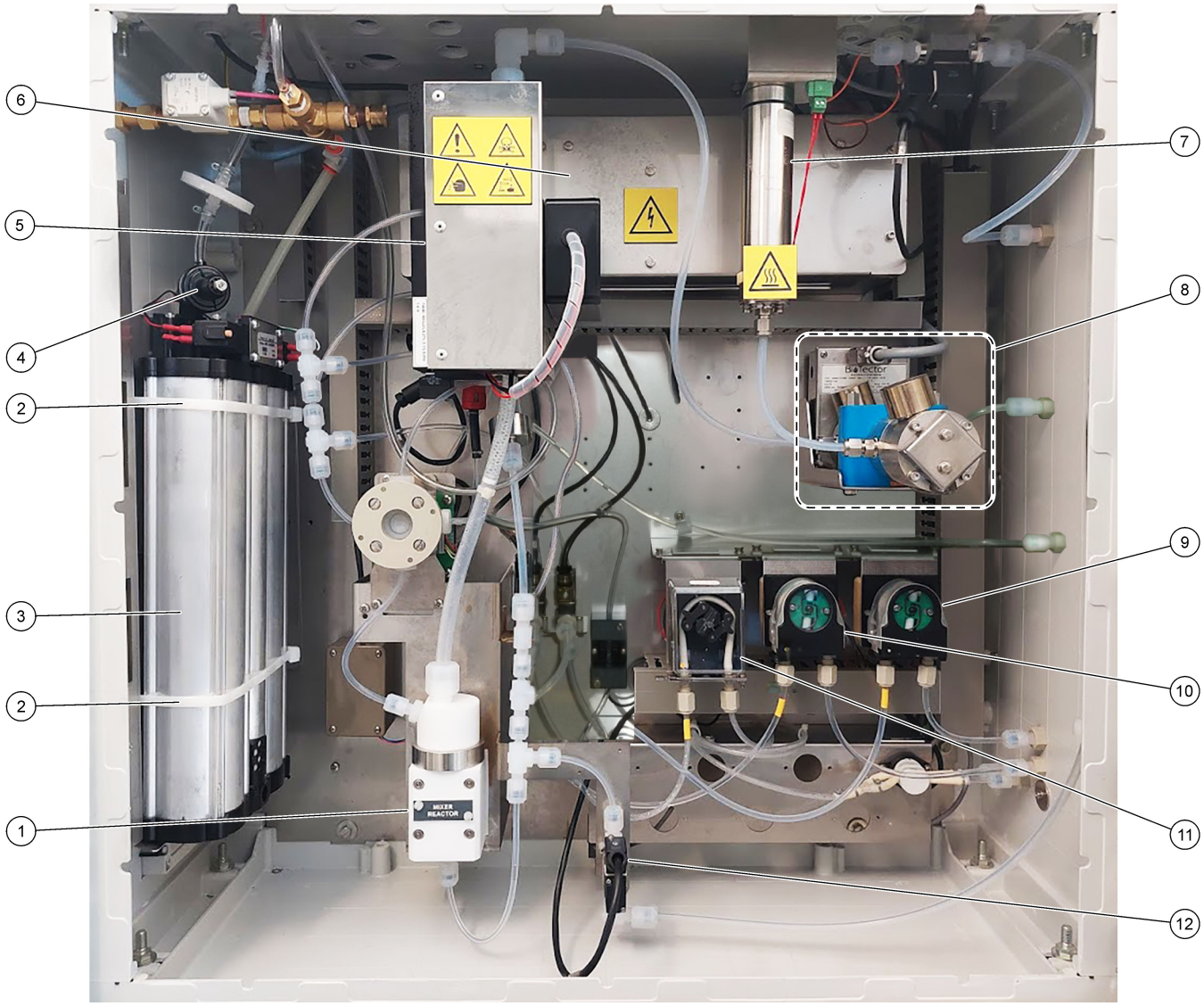
Section 4 Analysis enclosure

Approximately September 2022, the oxygen concentrator parts changed.

Figure 2 shows the pumps and components in the analysis enclosure after the change.
Figure 3 shows the valves in the analysis enclosure after the change.

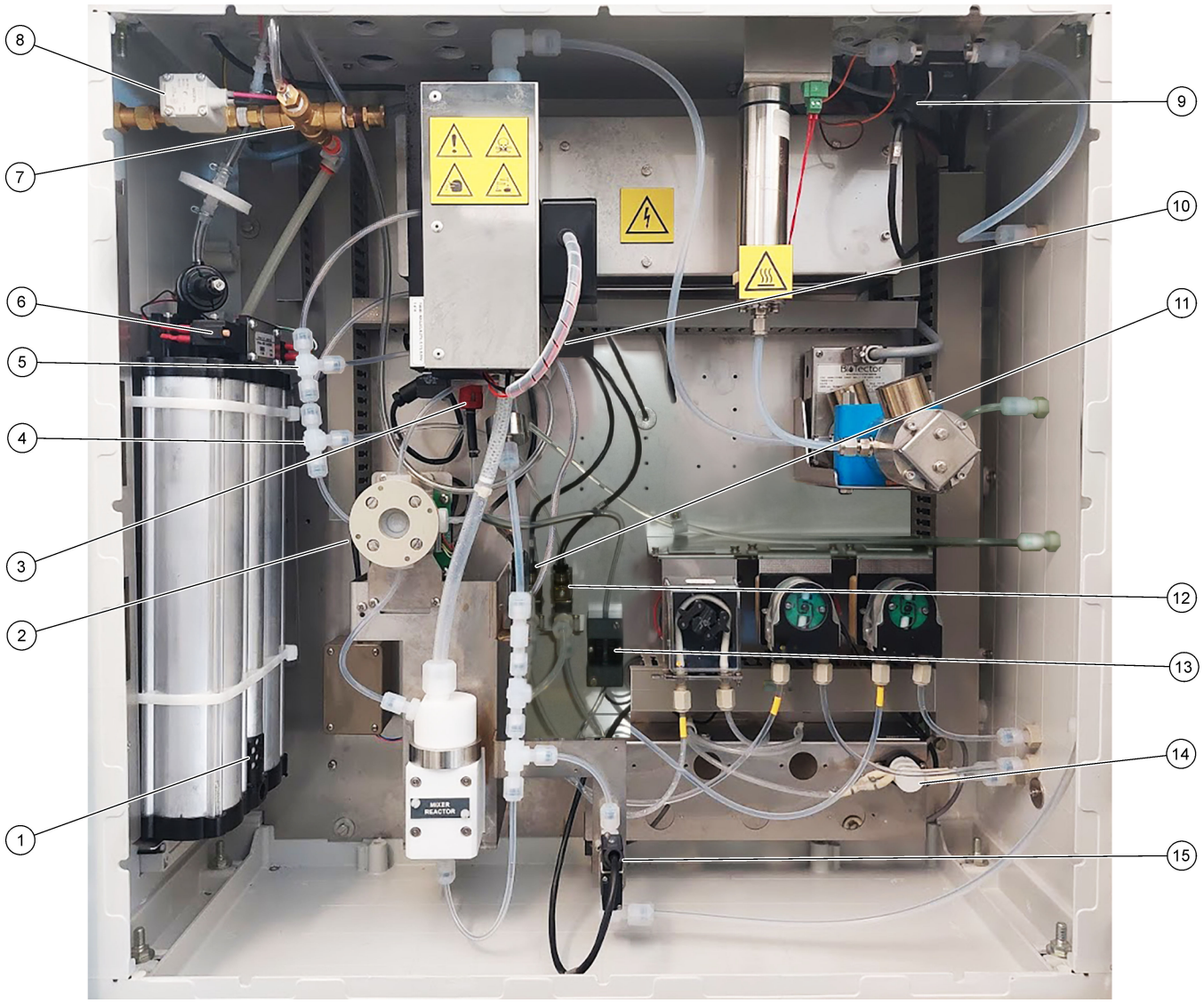
Figure 4 shows the pumps and components in the analysis enclosure before the change.
Figure 5 shows the valves in the analysis enclosure before the change.

Figure 2 Analysis enclosure—Pumps and components



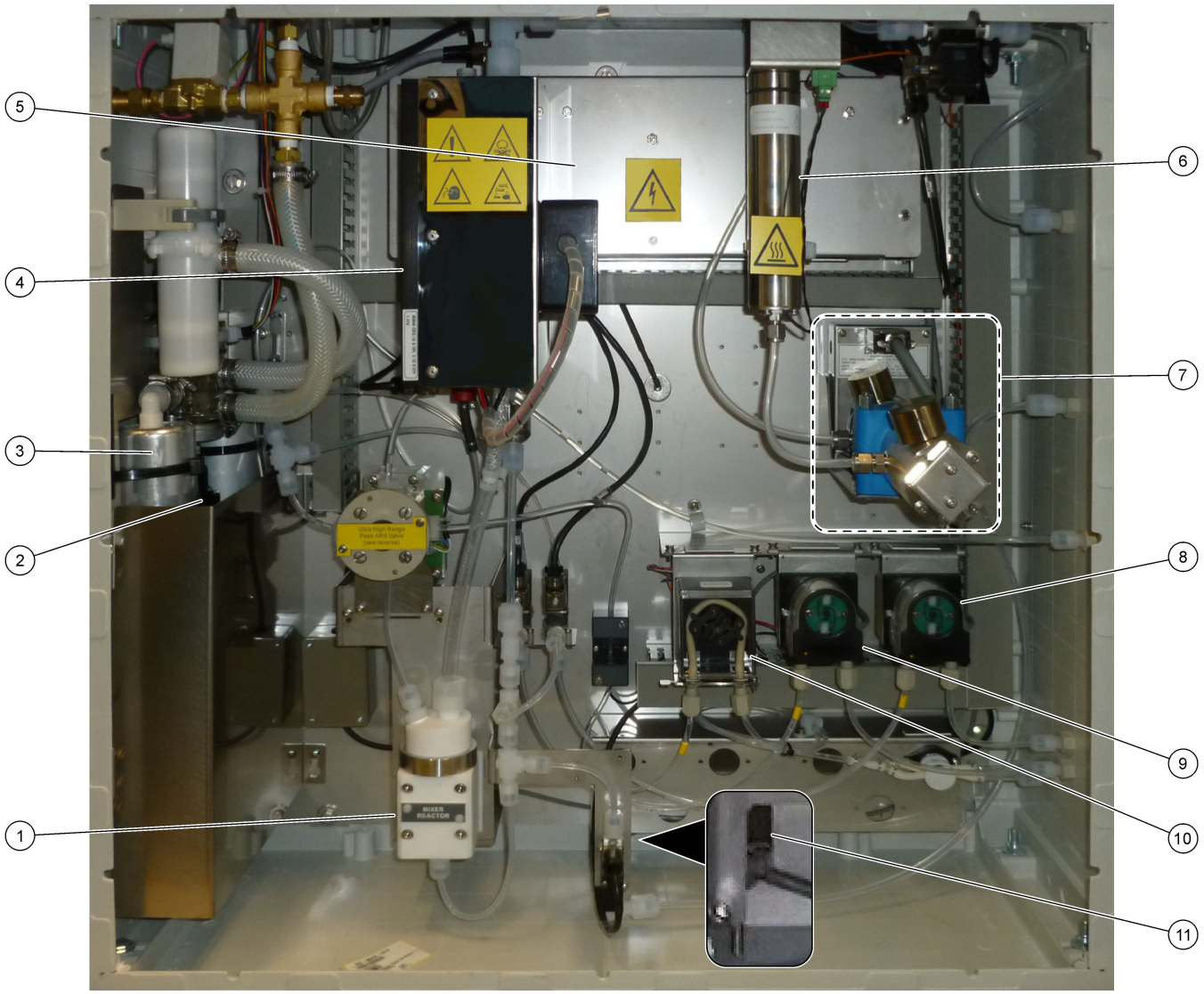
1 Mixer reactor	**7** Ozone destructor
2 Cable ties (2x)	**8** CO_2 analyzer
3 Molecular sieve bed	**9** Base pump, P4
4 Oxygen pressure regulator	**10** Acid pump, P3
5 Cooler	**11** Sample pump, P1
6 Ozone generator	**12** Liquid leak detector

Figure 3 Analysis enclosure—Valves



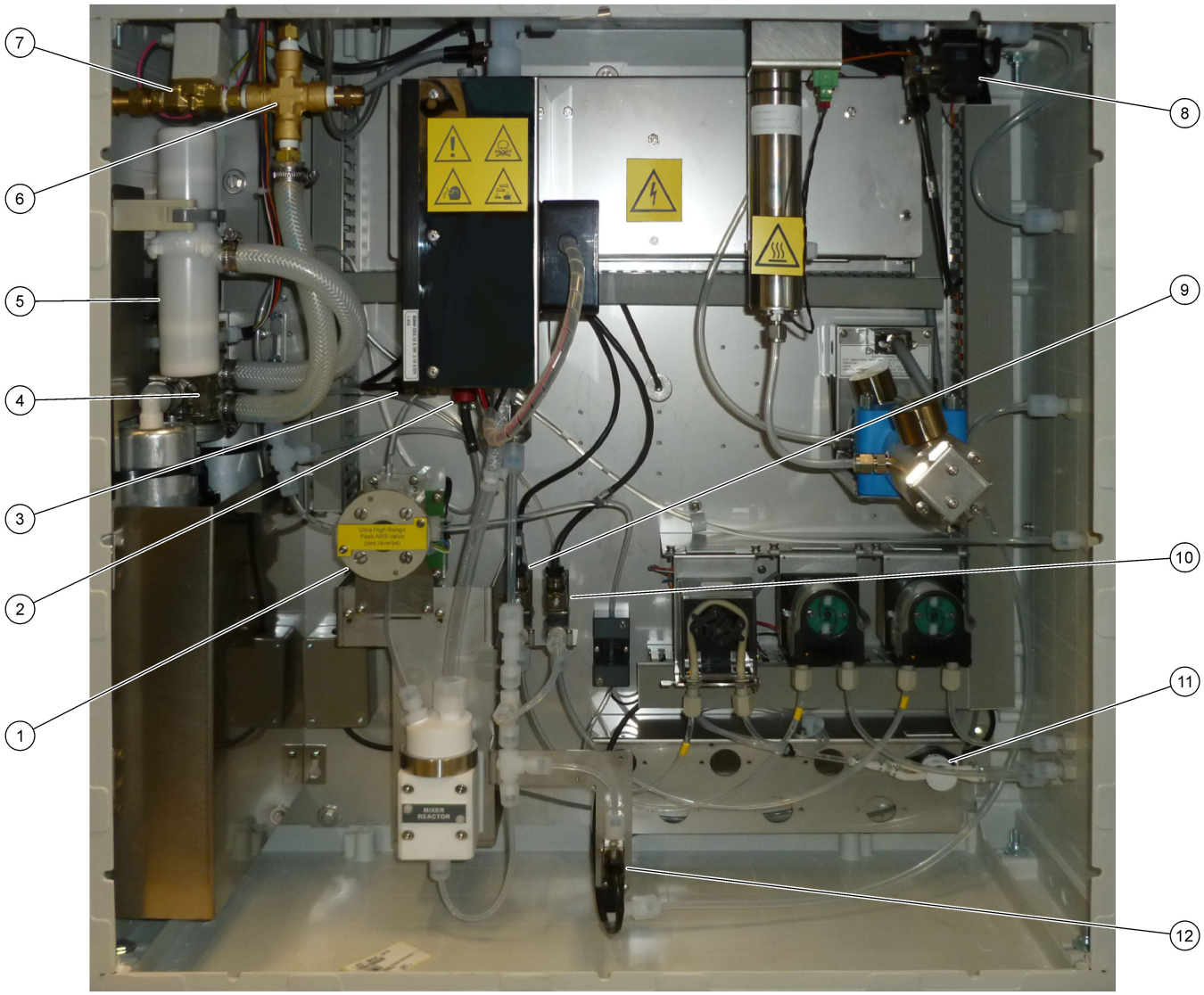
1 Exhaust filter	**9** Exhaust valve, MV1
2 Sample (ARS) valve, MV4	**10** Injection valve, MV7
3 Non-return valve (check valve)	**11** Acid valve, MV6
4 Base Tee junction	**12** Base valve
5 Acid Tee junction	**13** Bubble detector (optional)
6 Valves for the oxygen concentrator	**14** Manual/Calibration valve (span calibration valve), MV9
7 Pressure relief valve, OV1	**15** Sample out valve, MV5
8 Air isolation valve, OV1	

Figure 4 Analysis enclosure—Pumps and components (before September 2022)



1 Mixer reactor	**7** CO_2 analyzer
2 Oxygen pressure regulator	**8** Base pump, P4
3 Molecular sieve bed	**9** Acid pump, P3
4 Cooler	**10** Sample pump, P1
5 Ozone generator	**11** Liquid leak detector
6 Ozone destructor	

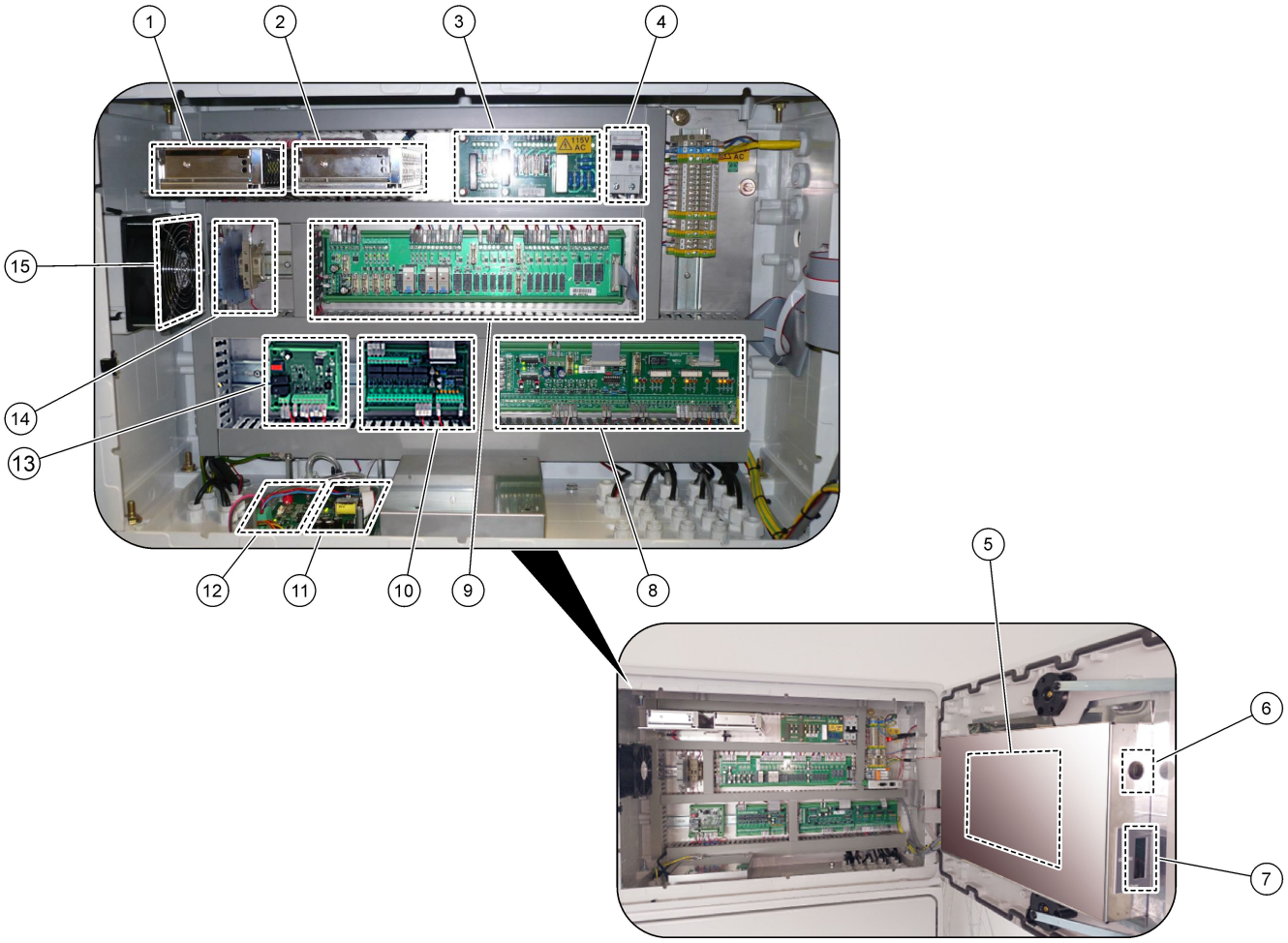
Figure 5 Analysis enclosure—Valves (before September 2022)



1 Sample (ARS) valve, MV4	**7** Air isolation valve, OV1
2 Non-return valve (check valve)	**8** Exhaust valve, MV1
3 Injection valve, MV7	**9** Acid valve, MV6
4 Rotary valve, OV2	**10** Base valve
5 Exhaust filter	**11** Manual/Calibration valve (span calibration valve), MV9
6 Pressure relief valve, OV1	**12** Sample out valve, MV5

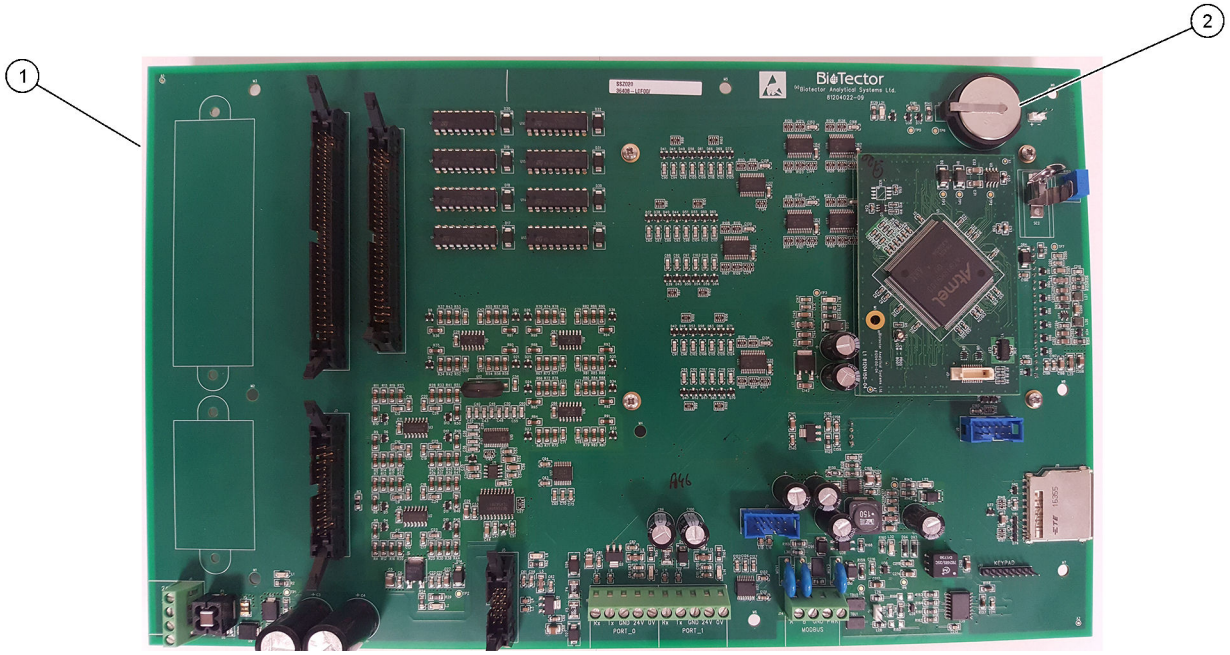
Section 5 Control enclosure components

Figure 6 Control enclosure components



1 Power supply, for main board/motherboard	**9** Relay PCB
2 Power supply, for pumps and valves	**10** Auxiliary/stream expansion PCB (optional)
3 Mains power PCB (printed circuit board)	**11** Mass flow controller
4 Main power switch	**12** Oxygen Controller Board
5 Motherboard	**13** Safety board for ozone generator
6 LCD screen brightness access hole	**14** 4-20 mA isolators
7 SD/MMC card slot	**15** Fan
8 Signal PCB	

Figure 7 Motherboard components



1 Motherboard	**2** Battery (Varta, CR2430, Lithium, 3V, 285mAh)

Section 6 Replacement parts and accessories

⚠WARNING

Personal injury hazard. Use of non-approved parts may cause personal injury, damage to the instrument or equipment malfunction. The replacement parts in this section are approved by the manufacturer.

Note: *Product and Article numbers may vary for some selling regions. Contact the appropriate distributor or refer to the company website for contact information.*

Consumables

Description	Quantity	Item no.
Acid reagent, 1.8 N Sulfuric Acid containing 80mg/L Manganese Sulfate Monohydrate	20 L (5.2 gallons)	25255061
Base reagent, 1.2 N Sodium Hydroxide	20 L (5.2 gallons)	2985562
Deionized water	4 L (1 gallon)	27256
TOC standard, 50.0 mg/L	4 L	5847200
TOC standard, 100 mg/L	1 L	LCW843
TOC standard, 200 mg/L	1 L	LCW845
TOC standard, 250 mg/L	1 L	LCW848
TOC standard, 500 mg/L	1 L	LCW846
TOC standard, 500 mg/L	4 L	5847300
TOC standard, 1000 mg/L	4 L	5846900
TOC standard, 5000 mg/L	4 L	5847400

Oxygen concentrator replacement parts

Refer to Figure 2 on page 31 and Figure 3 on page 32 to identify the oxygen concentrator parts.

Description	Quantity to stock	Item no.
Oxygen concentrator, pressure relief valve	0	10-NOR-025
Oxygen concentrator, pressure regulator	0	10-DVB-012
Oxygen concentrator, full assembly, includes: Sieve beds, valves and fittings	1	10-NID-001

Oxygen concentrator replacement parts (before September 2022)

Refer to Figure 4 on page 33 and Figure 5 on page 34 to identify the oxygen concentrator parts.

Description	Quantity to stock	Item no.
Exhaust filter/muffler	1	10-DVB-005
Oxygen concentrator, molecular sieve beds (2)	1	12-DVB-013
Oxygen concentrator, pressure relief valve	0	10-DVB-024
Oxygen concentrator, pressure regulator	0	10-DVB-012
Oxygen concentrator, rotary valve	1	20-B5C-011

Replacement parts and accessories

Replacement parts

Description[2]	Quantity to stock	Item no.
6-month maintenance kit, B7000i Dairy TOC analyzer	1	19-KIT-132
Air isolation valve, N/C	0	19-B5C-012
Acid pump or base pump, SR25	0	19-ASF-004
ARM main board, Rev 9, includes: processor and LCD	0	19-PCB-053
CO_2 analyzer, Hastelloy, 0–15000 ppm	0	20-CO2-011
Cooler , B4M with glass bead filter	0	19-BAS-018
Instrument air filter pack, B5C	0	10-SMC-001
Filter pack elements for air supply, B5C	1[3]	12-SMC-001
Isolation amplifier	1	10-KNK-001
Mass flow controller (MFC)	0	12-PCP-001
Mixer reactor motor, B4M, 24 VDC, complete with leak detection	1	19-BAS-015
Mixer reactor, B4M, PTFE, complete with 24 VDC motor	0	19-BAS-016
Mixer reactor, B4M, PTFE	0	19-BAS-017
Ozone destructor heater	0	10-HAW-001
Ozone generator module B7000i	0	20-OZN-003
Ozone tube subassembly (with PCBA)	0	20-OZN-002
Ozone tube subassembly (without PCBA)	0	20-OZN-006
Ozone PCBA	0	ZBA81204326
Oxygen control board, complete	0	20-PCB-136
Power board, 115 VAC analyzer, B7000	1	19-PCB-160
Power board, 230 VAC analyzer, B7000	1	19-PCB-250
PTFE diaphragm for mixer reactor	1	10-KNF-038
PTFE ferrule and PEEK locking ring set, 1 x 3/16-in.	5	10-EMT-136
PTFE ferrule and PEEK locking ring set, 1 x 1/4-in.	5	10-EMT-114
Sample pump, WMM60, with Norprene chemical tubing	1[3]	19-MAX-010
Safety board holder assembly	0	20-OZN-001
Tubing, PFA, 3/16-in. OD x 1/8-inch ID, 1 m length	5 m length	10-SCA-002
Tubing, PFA, 1/4-in. OD x 4 mm ID, 1 m length	5 m length	10-SCA-003
Tubing, PFA, 1/4-in. OD x 1/8-in. ID (6.35-mm OD x 3.18-mm ID), 1 m length	5 m length	10-SCA-006
Tubing, PFA, 3/16-in. OD x 1/16-inch ID, 1 m length	1 m length	10-SCA-007
Tubing, EMPP 562, 6.4 mm OD x 3.2 mm ID, 1 m length	2 m length	10-REH-002
Tubing, EMPP, 5.6 mm OD x 2.4 mm ID, 1 m length	1 m length	10-REH-003

[2] Consumables/wearing parts: EMPP tubing, Y tube fittings, filters for the fan and vent, FPM/FKM tubing in the ozone generator, catalyst in the ozone destructor, CO_2 filter for the base reagent container, 24 V relay on the ozone board, 24 V plug-in relays in the relay board (81204001), sample out valve, exhaust valve, acid valve, diaphragm in the mixer reactor and the wetted parts of the sample valve (ARS valve).

[3] Normally replaced at 24 month intervals.

Replacement parts (continued)

Description[2]	Quantity to stock	Item no.
Tubing, sample pump, WMM60, Norprene, 1/4-in. OD x 1/8-in. ID (6.4-mm OD x 3.2-mm ID), 2 x 156.5 mm	1[3]	12-CPR-006
Valve, N/C with plug, Type 6606 Burkert	1	19-EMC-001
Valve, N/O with plug, Type 6606 Burkert	1	19-EMC-002
Valve, C/O with plug, Type 6606 Burkert	1	19-EMC-003
Valve, non-return (check valve), 1 psi	1	10-SMR-001
Valve, pinch, B4M, C/O, complete	0	12-BIO-001
Valve, sample, PEEK ARS, 2.5 mm with integrated fittings	1[3]	10-EMT-090

[2] Consumables/wearing parts: EMPP tubing, Y tube fittings, filters for the fan and vent, FPM/FKM tubing in the ozone generator, catalyst in the ozone destructor, CO_2 filter for the base reagent container, 24 V relay on the ozone board, 24 V plug-in relays in the relay board (81204001), sample out valve, exhaust valve, acid valve, diaphragm in the mixer reactor and the wetted parts of the sample valve (ARS valve).

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