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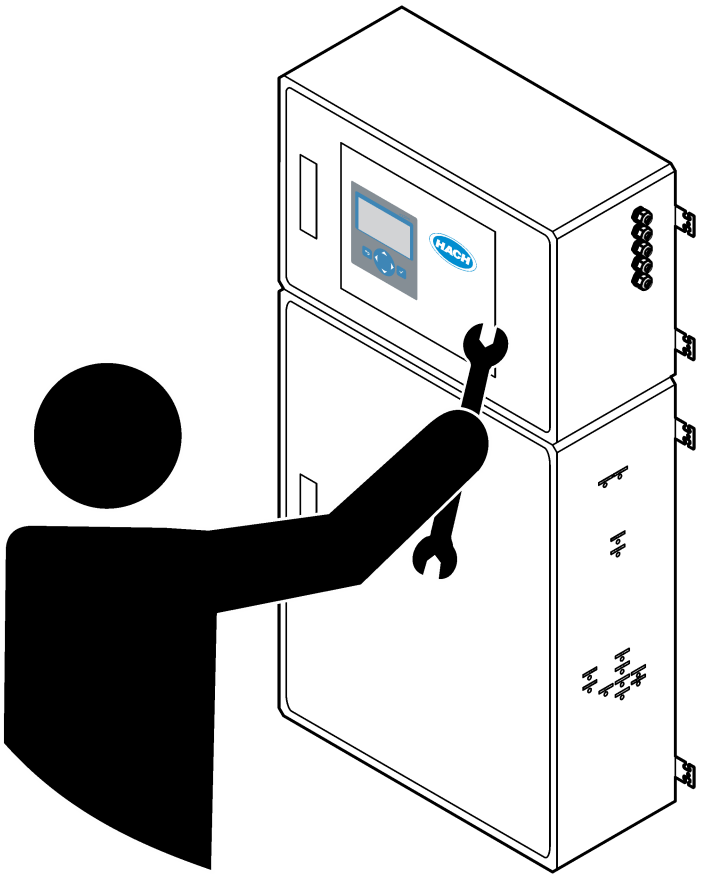
BioTector B7000 Online TOC TN Analyzer

Maintenance and Troubleshooting

07/2026, Edition 6



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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 that respiratory personal protectve equipment (PPE) is required when there is powder or dust in the enclosure.
	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 required 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.

1.1.5 Zeolite precautions

⚠CAUTION

Inhalation hazard. The molecular sieve material used in the oxygen concentrator is classified as an irritant substance. Molecular sieve material can be released in a fault condition. Exposure to dust or particles from this material may pose serious health risks, including respiratory irritation and long-term effects.

Immediate or short-term effects

- Respiratory irritation: Coughing, throat irritation, and difficulty breathing are common initial symptoms due to dust exposure. Chest discomfort or pain: Some individuals report chest pain shortly after exposure.

Chronic or long-term risks

- Pulmonary fibrosis: Scarring and thickening of lung tissue, leading to chronic shortness of breath and persistent cough.

Precautions

- Always wear appropriate personal protective equipment (PPE) when handling or servicing components containing molecular sieve material.
- PPE must include chemical-resistant gloves, protective eyewear, and a NIOSH-MSHA face mask or respirator rated for fine particulate filtration. Refer to the applicable safety data sheet (SDS).
- Avoid creating dust or aerosolised particles during maintenance.
- Handle the material in a well-ventilated area or under a fume hood, if available.
- Dispose of any waste material in accordance with local hazardous waste regulations.

Failure to follow these precautions may result in serious injury or long-term health effects.

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 and 12-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 6	X			
6-month maintenance[1]		X		
12-month maintenance[1]			X	
NF300 circulation pump maintenance[1]		X	X	
Fill or replace the reagents on page 7				X
Replace a fuse on page 8				X
Shutdown procedure on page 10				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 oxygen pressure supplied to the analyzer is correct. • Oxygen concentrator plumbed to filtered instrument air— 200 L/h at less than 0.6 bar (8.7 psi). Instrument air pressure: 2.1 bar (30.5 psi, 90 L/minute). The maximum air pressure is 2.3 bar (33.35 psi). • Oxygen concentrator with integrated air compressor—200 L/h at less than 0.6 bar (8.7 psi) • Oxygen cylinder, 50 L (welding grade)—1.0 bar (14.5 psi)	
Select MAINTENANCE > DIAGNOSTICS > SIMULATE > OXIDATION PHASE SIM. 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 regulator shows 350 mbar at 20 L/h. Refer to Analysis enclosure on page 33 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 7.	
Make sure that there are no leaks at the reagent pumps. Refer to Analysis enclosure on page 33 for the location.	
Make sure that there are no leaks at the circulation pump. Make sure that liquid moves in the tubing when the circulation pump is in operation. Refer to Analysis enclosure on page 33 for the location.	
Make sure that there are no leaks at the sample pump.	
Make sure that the oxidized sample catch-pot has no leaks.	
Make sure that there are no leaks at the valves in the analyzer. Refer to Analysis enclosure on page 33 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.	

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

Task	Initial
Make sure that there is sufficient sample flow to the oxidized sample catch-pot or the sample tubing for a fresh sample for each analysis cycle.	
Make sure that there are no blockages or damage to the DRAIN fitting. Refer to Analysis enclosure on page 33 for the location.	
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.

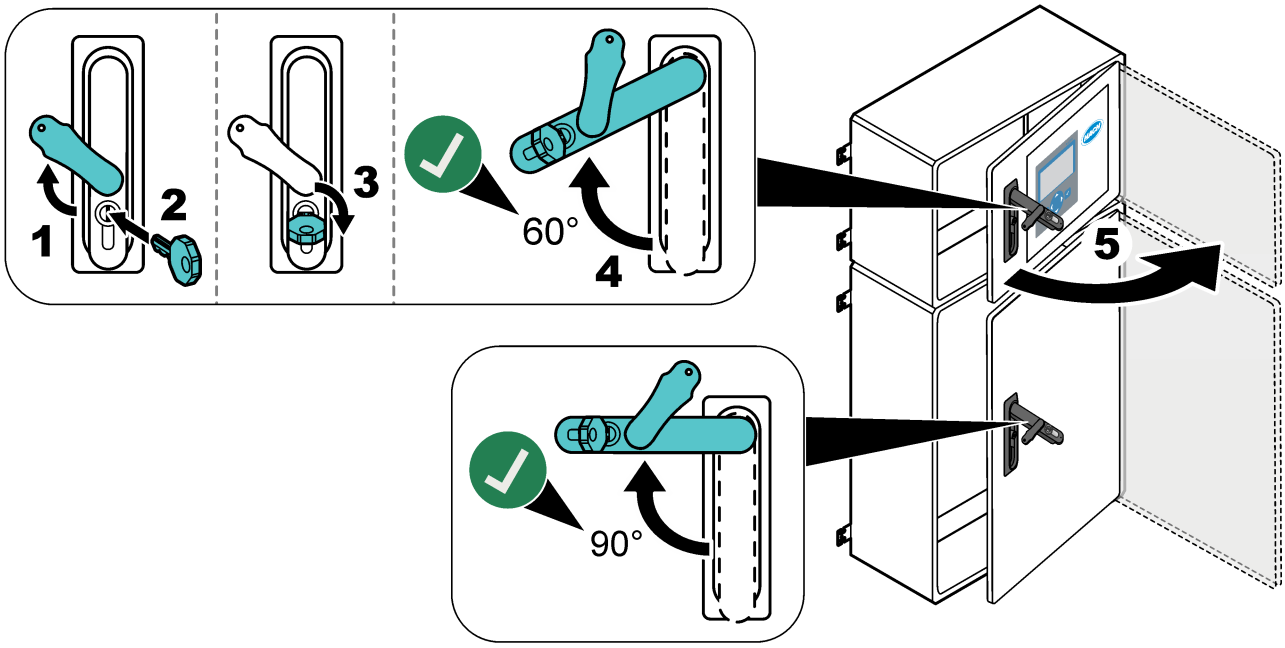
Fill or replace the acid and base reagent containers as necessary when the analyzer is stopped.

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 Open the doors

NOTICE

Make sure that the door handles are fully turned before the doors are opened or damage to the door seals can occur. If the door seals have damage, dust and liquid can enter the enclosures.



1.6 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

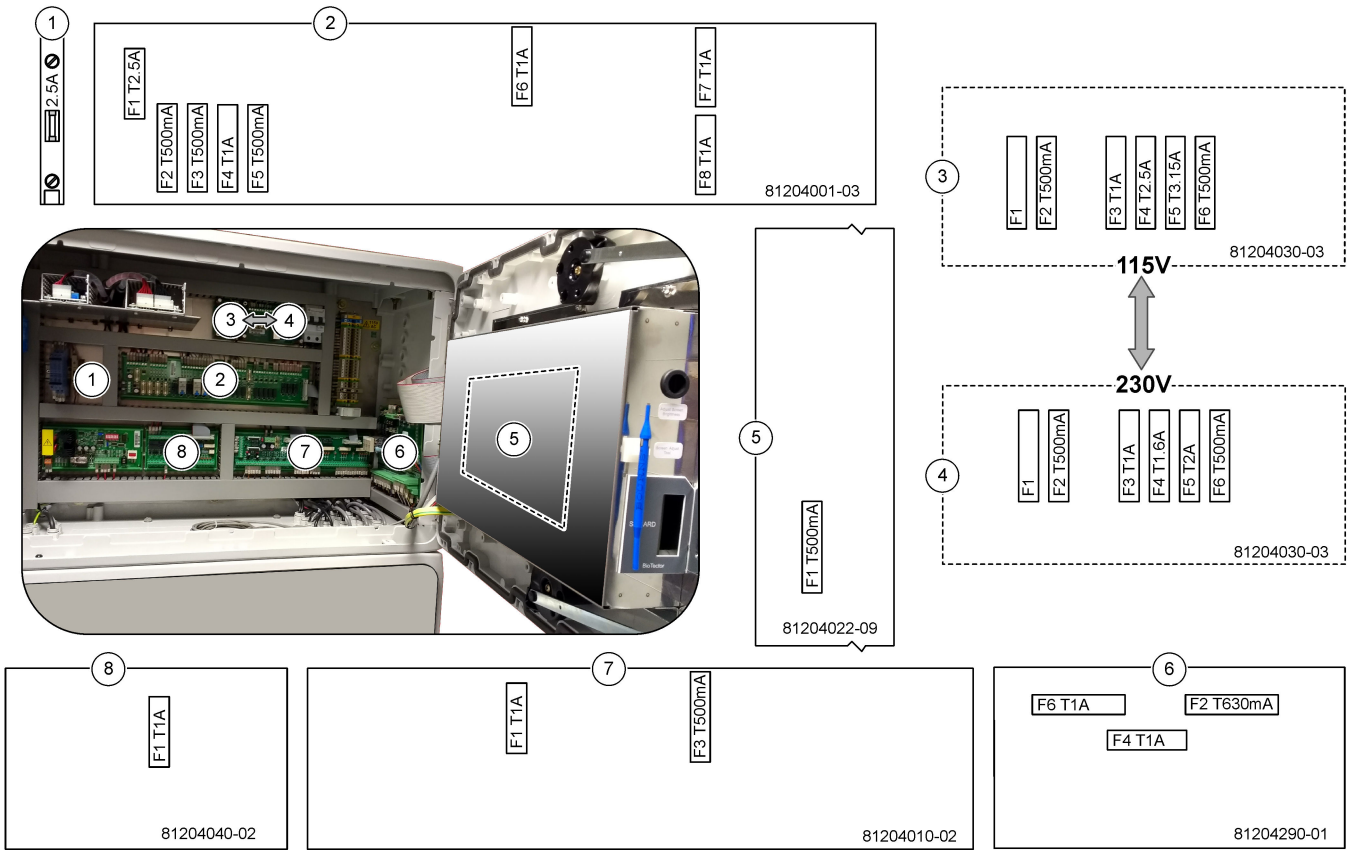


Table 2 Fuse specifications

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
3	115 VAC Power PCB (Mains PCB)	81204030-03	Miniature 5 x 20 mm	Ceramic	F1	—	Blank
					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

Table 2 Fuse specifications (continued)

Item	Name	Number	Size	Material	Number	Current	Type
4	230 VAC Power PCB (Mains PCB)	81204030-03	Miniature 5 x 20 mm	Ceramic	F1	—	Blank
					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	NP I/O PCB (TNTP board)	81204290-01	Miniature 5 x 20 mm	Glass	F2	630 mA	T 630mA H250V
					F4	1.0 A	T 1A H250V
					F6	1.0 A	T 1A H250V
7	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
8	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

1.7 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 11.	
Disconnect the SAMPLE fittings from the sample sources. Connect the SAMPLE fittings to an open drain or empty plastic container.	

Task	Initial
Do the steps that follow: 1. Select MAINTENANCE > DIAGNOSTICS > SIMULATE > OXIDATION PHASE SIM > CLEANING VALVE. Select ON to open the cleaning valve. 2. Make sure that all of the stream, manual and calibration valves are closed. 3. Select SAMPLE PUMP, then select REV to set the pump to operate in reverse. Operate the sample pump in reverse until the sample lines and the oxidized sample catch-pot are empty.	
Remove power to the analyzer.	

1.7.1 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, BASE and HCL WATER ports on the side of the analyzer.
3. Plumb the ACID, BASE and HCL WATER 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 (Relay 20) is set to on.

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 cylinder is empty • Oxygen supply problem • 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 23.
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 cylinder is empty • Oxygen supply problem • 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 23.
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 pressure is too high • Oxygen supply problem
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 circulation pump is incorrect.

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 circulation pump for leaks.
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.
10_N/P PCB FAULT	The operation of the 24V PSU is not correct. The nitrogen phosphorus input/output board (NP I/O board 81204290) has a blown fuse F2, F4 or F6.	Examine the 24V DC input power to the NP I/O board (81204290). Refer to Control enclosure components on page 35 for the location. Examine fuses F2, F4 and F6 on the NP I/O board. LED L1, L4 and L6 are set to off when the fault is corrected.
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 > OXIDATION PHASE SIM. If the CO_2 value on the display is more than 250 to 300 ppm, examine the oxygen purity. Examine the oxygen gas input and oxygen concentrator if applicable. 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.

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 and 3.	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. 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	Sample Valve Sensor 1, 2 or 3 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. Refer to Control enclosure components on page 35 for the board location. 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.
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.
19_DCP LIQ LEAK DET	The liquid leak detector for the DCP (dual cell photometer) is active.	Look for a liquid leak in the dual cell photometer. Examine the operation of the liquid leak detector for the dual cell photometer.
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 7.

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 (Relay 20) 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 cylinder is empty • Oxygen supply problem • 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 23.
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 cylinder is empty • Oxygen supply problem • 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 23.
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 circulation pump for leaks. Do a pressure test. Refer to Do a pressure test on page 23.
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.
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.	

Table 4 System warnings (continued)

Message	Description	Cause and solution
36_TN SPAN CAL FAIL	The result of the TN span calibration is not within the TN BAND setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > SPAN PROGRAM > TN 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.
39_TN SPAN CHCK FAIL	The result of the TN span check is not within the TN BAND setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > SPAN PROGRAM > TN BAND.	
44_TN ZERO CAL FAIL	The result of the TN zero calibration is not within the specified TN BAND setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > ZERO PROGRAM > TN BAND.	Make sure that deionized water is connected to the ZERO WATER fitting on the right side of the analyzer. Examine the stability of the zero reactions and the quality of the reagents used. Make sure that the settings in the MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > ZERO PROGRAM are correct. Examine the operation of the analyzer. Do a zero calibration again. Select CALIBRATION > ZERO CALIBRATION > RUN ZERO CALIBRATION.
47_TN ZERO CHCK FAIL	The result of the TN zero check is not within the TN BAND setting. Refer to MAINTENANCE > SYSTEM CONFIGURATION > SEQUENCE PROGRAM > ZERO PROGRAM > TN 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
68_N PUMP STOP ON	The nitrogen pump stopped with its rotation sensor on or the operation of the rotation sensor is incorrect (continuously on). ON = LED 8 is on (NP I/O board)	Examine the rotation of the nitrogen (N) pump. Replace Relay 1 on the NP I/O board. Examine the pump sensor signal. Look at LED 8 on the NP I/O board and DI33 in the DIGITAL INPUT menu. Refer to MAINTENANCE > DIAGNOSTICS > INPUT/OUTPUT STATUS > DIGITAL INPUT. Replace the pump.
69_N PUMP STOP OFF	The nitrogen pump stopped with its rotation sensor off or the operation of the rotation sensor is incorrect (no rotation sensed). OFF = LED 8 is off (NP I/O board)	
76_DCP WARN	The analyzer cannot communicate with the DCP (dual cell photometer).	Examine the power on the dual cell photometer. Make sure that the LEDs on DCP board are set to on. Examine the connections of the DCP data cable.
77_DCP N SIG WARN 78_DCP N REF WARN	The nitrogen SIGNAL/REFERENCE channel readings on TN DI water are not within the factory band.	Make sure that the TN DI water is not dirty. Examine the operation of xenon lamp. Clean the TN measuring cell. Examine the coaxial cables on the dual cell photometer. Start a READ DIW REF TEST to examine the SIGNAL/REFERENCE readings. Refer to MAINTENANCE > DIAGNOSTICS > PROCESS TEST > READ DIW REF TEST.
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 (180 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.
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.
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 7. 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 180 days (default). RESET SERVICE COUNTER was selected.	This notification is automatically acknowledged. No action is necessary.
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.

Option	Description
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: 80 L/hr).
MFC FLOW	Shows the flow from the MFC. If there is no blockage, the flow is approximately 80 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 72 L/hr (default). **WARNING**—The flow from the MFC at the end of the test is less than 72 L/hr but more than 40 L/hr (default). **FAIL**—The flow from the MFC at the end of the test is less than 40 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 and the oxidized sample catch-pot/cleaning vessel 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 liquid phase test

Do a liquid phase test to identify if each step of the liquid phase analysis is done correctly.

1. Select MAINTENANCE > DIAGNOSTICS > PROCESS TEST.

2. Scroll down to LIQUID PHASE PROCESS TEST.

3. Select an option.

Option	Description
PURGE CELLS TEST	Starts the cell purge step of the liquid phase analysis. The test removes the contents of the oxidized sample catch-pot and the TN measuring cell. ***Note:*** *At the end of the test, the measuring cell is not filled with deionized water.*
CLEAN CELLS TEST	Starts the cell cleaning step of the liquid phase analysis. The test removes the contents of the oxidized sample catch-pot and the TN measuring cell. Then, the TN cleaning liquid enters the TN measuring cell. The cleaning vessels are cleaned. At the end of the test, the measuring cell and the sample lines are flushed with deionized water.

Option	Description
READ DIW REF TEST	Starts the reference reading cycle on deionized water. The test removes the contents of the TN measuring cell. Then deionized water enters the TN measuring cell. The deionized water in the TN measuring cell is measured in the dual cell photometer (DCP) module. The measurement is done with the same procedure as a normal reaction. At the end of the test, the items that follow show on the display: **N SIG** —The intensity of the nitrogen reading at the signal wavelength (217 nm) and the percent (%) intensity value[2]. **N REF** —The intensity of the nitrogen reading at the reference wavelength (265 nm) and the percent (%) intensity value. **S/R RATIO** —Signal to reference ratio for nitrogen When the measurements are done, the analyzer removes the contents of the TN measuring cell. ***Note:*** *The % intensity values should be within the fault threshold (normally more than 50% and less than 150%).*
READ TN SMPL TEST	Before this option is selected, select OPERATION > START,STOP > FINISH & STOP. Make sure that the oxidized sample catch-pot is full of liquid. Starts the TN sample reading cycle. The test removes the contents of the measuring cell. Then the sample in the oxidized sample catch-pot (OSCP) goes into the TN measuring cell and is measured in the dual cell photometer module. The measurement is done with the same procedure as a normal reaction. At the end of the test, the items that follow show on the display: **N SIG** —The intensity of the nitrogen reading at the signal wavelength (217 nm) **N REF** —The intensity of the nitrogen reading at the reference wavelength (265 nm) **S/R RATIO** —Signal to reference ratio for nitrogen ***Note:*** *A % intensity value is not calculated (0% shows).* When the measurements are done, the analyzer removes the contents of the TN measuring cell.

3.7 Do oxidation analysis simulations

Do oxidation analysis 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 > OXIDATION PHASE SIM.
   The status of the analyzer components show.
2. Select an option.

[2] The % intensity value is calculated from the test reading and the factory reading.

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.
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.
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.
CIRCULATION PUMP	Sets the circulation pump 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.
CLEANING VALVE	Sets the cleaning 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.

Option	Description
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.
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.
SAMPLE SENSOR	The SAMPLE SENSOR option cannot be selected. The condition of the sample sensor shows on the display.
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.

3.8 Do liquid analysis simulations

Do liquid step simulations to identify if the operation of a component (e.g., pump, valve and lamp) 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.*

1. Select MAINTENANCE > DIAGNOSTICS > SIMULATE > LIQUID PHASE SIM.

   The status of the analyzer components show. In addition, the signal (S) intensity and reference (R) intensity readings for nitrogen and the signal to reference (S/R) ratio for nitrogen show on the display.

   Note: *New intensity and ratio readings only show on the display when the detectors in the dual cell photometer are used.*

2. Select an option.

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

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

Option	Description
XENON LAMP	Sets the xenon lamp to on or off.
NP SAMPLE VALVE	Sets the NP sample valve to on or off.
DI WATER VALVE	Sets the DI water valve to on or off.
TN CLEANING VALVE	Sets the TN cleaning valve to on or off.
N PUMP	Sets the nitrogen (N) pump to the selected operation mode. Options: P-FWD (pulse control forward) and P-REV (pulse control reverse). Sets the number of pulses (½ revolutions of the pump roller).
DCP LEAK DETECTOR	The DCP LEAK DETECTOR option cannot be selected. The condition of the DCP leak detector alarm input for the dual photometer shows on the display. **ON**—There is a liquid leak in the dual cell photometer. **OFF**—There is no leak.
CLEANING VALVE	Sets the cleaning valve to on or off.

Option	Description
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 revolutions of the pump roller). When the pump is in operation, the actual pulse time (external brackets) and the set pulse time (internal brackets) show.
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
COMMON FAULT	Sets the FAULT relay to on. ***Note:*** *Refer to the COMMON FAULT setting in Configure the relays in the Installation and Operation Manual to identify if the fault relay is set to normally energized (closed) or normally de-energized (open).*
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.
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.
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 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.*

Option	Description
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.
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.

3.12 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.

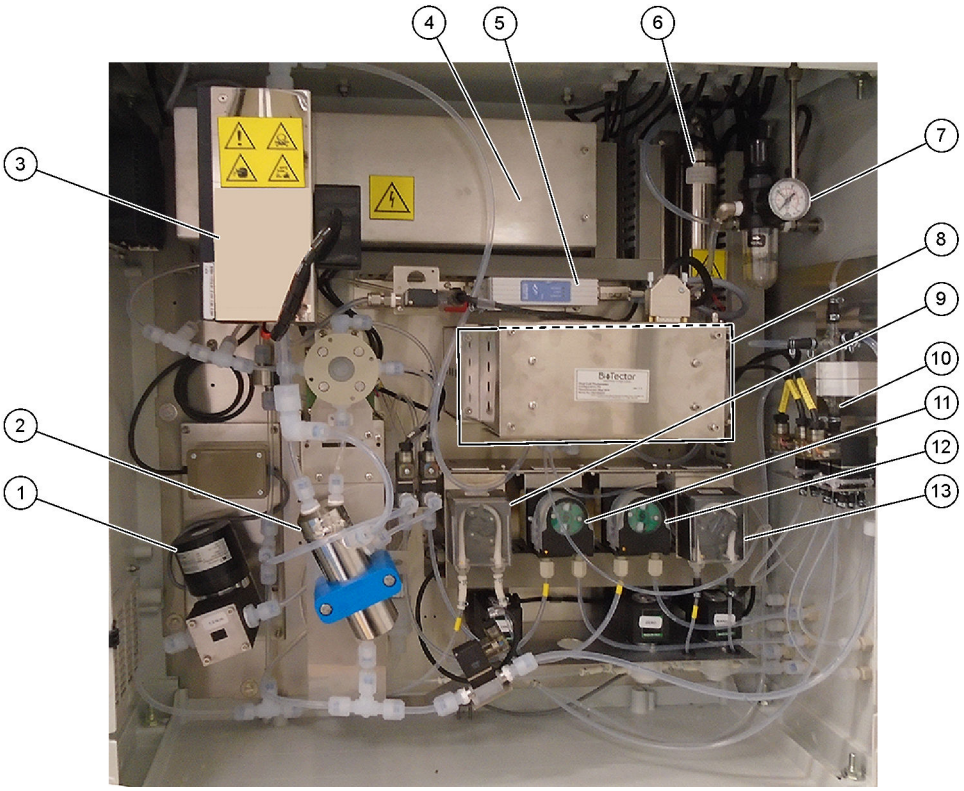
   Note: *Valid messages that are not addressed to the instrument do not increase the counter.*
4. For the Modbus RTU option, make sure that the wire connected to terminal D+ is positively biased compared to the wire connected to terminal D– when the bus is in an idle condition.
5. Make sure that there 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

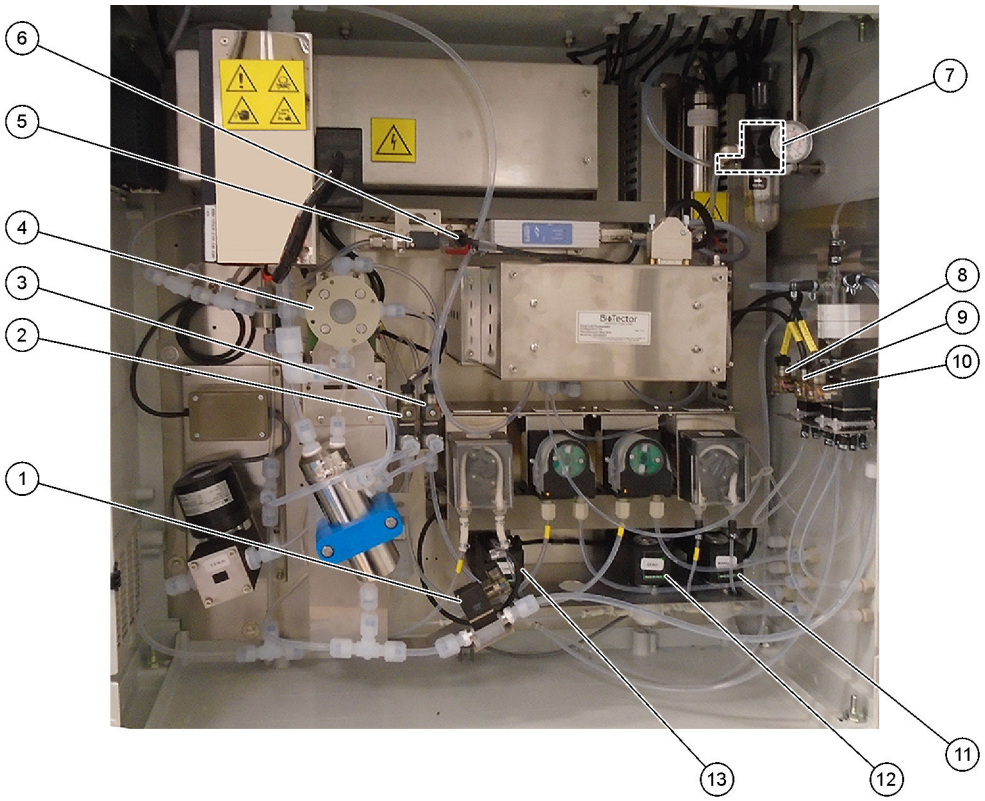
Figure 2 shows the pumps and components in the analysis enclosure. Figure 3 shows the valves in the analysis enclosure.

Figure 2 Analysis enclosure—Pumps and components



1 NF300 circulation pump, P2	**8** CO_2 analyzer
2 Reactor	**9** Sample pump
3 Cooler	**10** Oxidized sample catch pot/cleaning vessel
4 Ozone generator	**11** Acid pump
5 Mass flow controller (MFC)	**12** Base pump
6 Ozone destructor	**13** Nitrogen (N) pump, LP1
7 Oxygen regulator	

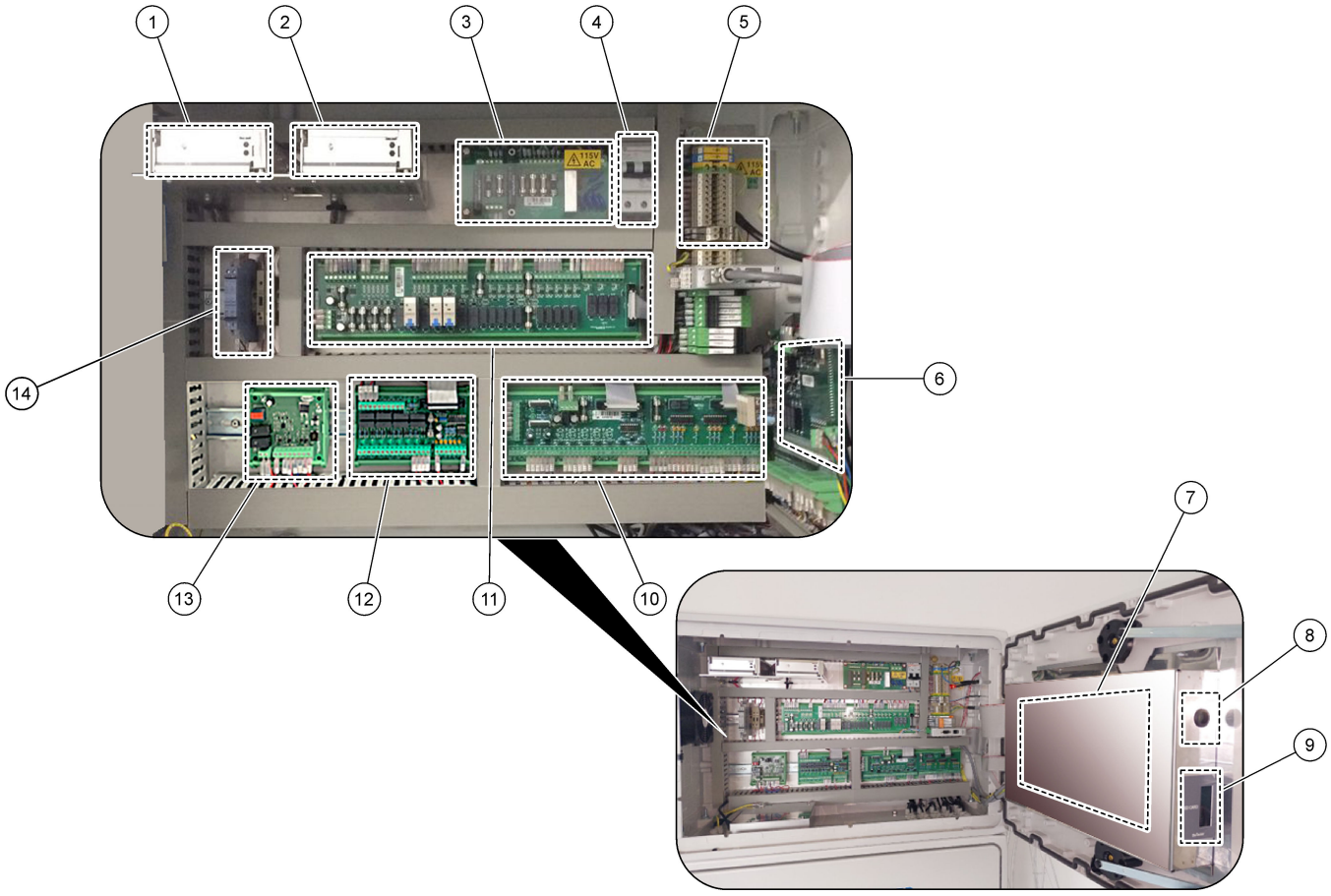
Figure 3 Analysis enclosure—Valves



1 Sample out valve, MV5	**8** NP sample valve, LV3
2 Acid valve, MV6	**9** DI water valve, LV2
3 Base valve (optional)	**10** TN cleaning valve, LV1
4 Sample (ARS) valve, MV4	**11** Manual valve (Span Calibration valve), MV9
5 Injection valve, MV7	**12** Zero water valve (Zero Calibration valve), MV15
6 Non-return valve (check valve)	**13** Cleaning valve
7 Exhaust valve, MV1	

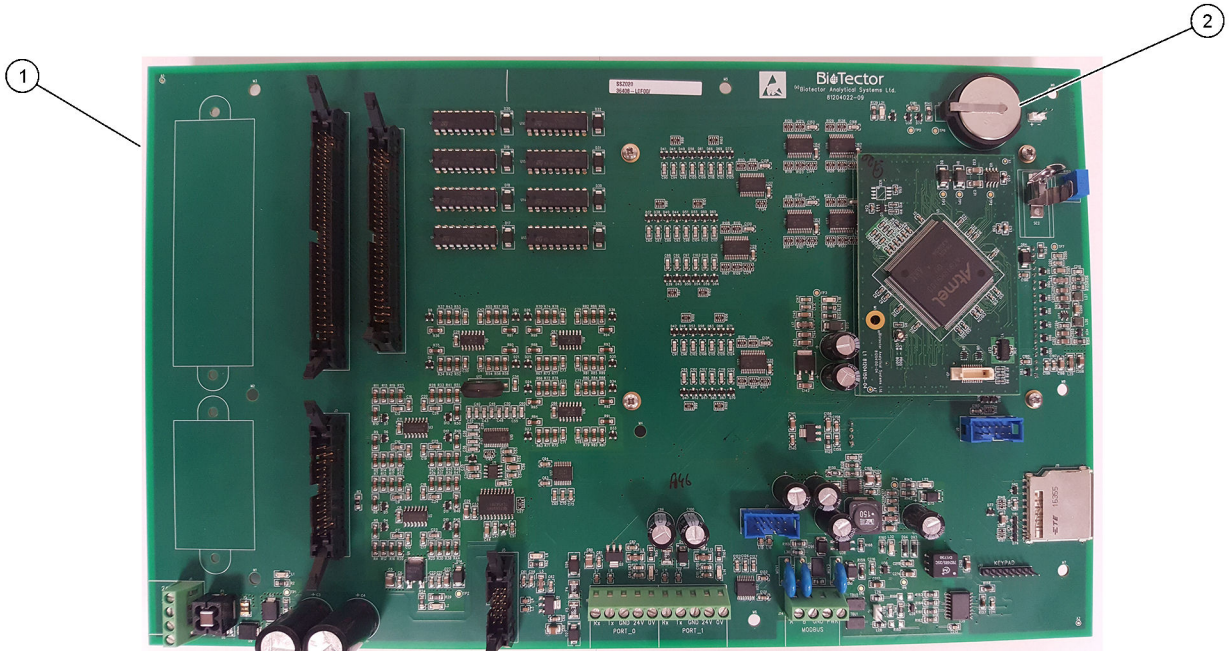
Section 5 Control enclosure components

Figure 4 Control enclosure components



1 Power supply, for main board/motherboard	**8** LCD screen brightness access hole
2 Power supply, for pumps and valves	**9** SD/MMC card slot
3 Mains power PCB (printed circuit board)	**10** Signal PCB
4 Main power switch	**11** Relay PCB
5 Terminals for customer connections	**12** Auxiliary/stream expansion PCB (optional)
6 NP I/O PCB (Nitrogen Phosphorus Input/Output PCB)	**13** Safety Relay PCB
7 Motherboard	**14** 4-20 mA isolators

Figure 5 Motherboard components



1 Motherboard	**2** Battery (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	20 L (5.2 gallons)	2985462
Base reagent	20 L (5.2 gallons)	2985562
TN cleaning solution	20 L (5.2 gallons)	2985662
Deionized water	20 L (5.2 gallons)	27362[3]

Replacement parts

Description	Quantity to stock	Item no.
6-month maintenance kit, B7000 TOC TN analyzer	1	19-KIT-117
12-month maintenance kit, B7000 TOC TN analyzer	1	19-KIT-118
6-month maintenance kit, NF300 circulation pump with PTFE coated diaphragm	1	19-KIT-110
24-month maintenance kit, NF300 circulation pump	1	19-KIT-146
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, 0–10000 ppm	0	19-CO2-007
Cooler	0	19-PCS-002
Isolation amplifier	1	10-KNK-001
Mass flow controller (MFC)	0	12-PCP-001
Ozone destructor heater	0	10-HAW-001
Oxidized sample catch-pot (OSCP), cleaning vessel, glassware, 50 mm	1	10-KBS-019
Oxygen regulator, relieving, 0 to 700 mbar	1	10-MAC-001
Power board, 115 VAC analyzer, B7000	1	19-PCB-160
Power board, 230 VAC analyzer, B7000	1	19-PCB-250
PTFE ferrule and PEEK locking ring set, 1 x 1/8-in.	1	10-EMT-118
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	1[4]	19-MAX-004

[3] Not available in the EU. As an alternative, use 27256 (4 L).
[4] Normally replaced at 24 month intervals.

Replacement parts (continued)

Description	Quantity to stock	Item no.
Gearbox for WMM60 pump, Spur Gearhead GS3860	0[5]	19-MAX-005
Tubing, PFA, 1/8-in. OD x 1/16-in. ID, 1 m length	5 m length	10-SCA-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, EMPP, 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
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, sample, PEEK ARS	1[4]	10-EMT-004
B4M C/O pinch valve	0	12-BIO-001
Valve, Type 6606 Burkert C/O with tube connectors and plug	1	19-EMC-009
Dual cell photometer module[6], includes: measuring cell and xenon lamp light	1	19-TND-001
Measuring cell, TN, 45 x 0.5 mm	0	10-OPT-001
Measuring cell, TN, 45 x 1 mm	0	10-OPT-002
Measuring cell, TN, 45 x 2 mm	0	10-OPT-003
Measuring cell, TN, 45 x 5 mm	0	10-OPT-004
Measuring cell, TN, 45 x 10 mm	0	10-OPT-005
Nitrogen (N) pump, WMM60	1[4]	19-MAX-004
NP I/O board (81204290)	0	17-PCB-031
Tubing, Viton, 9.5 mm OD x 5.5 mm ID, 25 mm length	5	10-JWA-008

[5] For analyzers installed in areas where air purge is necessary (e.g., hazardous areas), replace the WMM60 pump gearbox at 3-month intervals. Keep two replacement gearboxes in stock.

[6] Contact technical support to select the measuring cell.

HACH COMPANY World Headquarters
P.O. Box 389, Loveland, CO 80539-0389 U.S.A.
Tel. (970) 669-3050
(800) 227-4224 (U.S.A. only)
Fax (970) 669-2932
orders@hach.com
www.hach.com

HACH LANGE GMBH
Willstätterstraße 11
D-40549 Düsseldorf, Germany
Tel. +49 (0) 2 11 52 88-320
Fax +49 (0) 2 11 52 88-210
info-de@hach.com
www.de.hach.com

HACH LANGE Sàrl
6, route de Compois
1222 Vésenaz
SWITZERLAND
Tel. +41 22 594 6400
Fax +41 22 594 6499

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