Operator Manual

ANATEL PAT700 TOC ANALYZER

HACH ULTRA™

EXCELLENCE IN PROCESS ANALYTICS

Operator Manual

ANATEL PAT700 TOC ANALYZER

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Chapter 1 Before You Begin

1.1 About this manual

This instruction manual explains how to install and operate the Anatel® PAT700 Total Organic Carbon Analyzer.

- This chapter provides an overview of the PAT700 analyzer; explains your responsibility for reading and following all instructions; explains safety procedures, cautions, and warnings, which must be adhered to at all times; defines terms that are used throughout this manual; and tells you how to contact customer service.
- Chapter 2 explains how to install the analyzer.
- Chapter 3 explains analyzer behavior at startup, how to use the lock and unlock icons to sign on or sign off the analyzer, and how to use the home screen to read Total Organic Carbon (TOC), conductivity, and temperature.
- Chapter 4 explains how to use the software to monitor the TOC analysis cycle.
- Chapter 5 explains how to use the setup dialog box to navigate and change analyzer settings.
- Chapter 6 explains how to use the bottles in the sample cartridge to run calibrations, validations, or system suitability tests; analyze samples from a bottle; install excursion bottles to capture samples when TOC measurements exceed alarm limits; or schedule tests to be run.
- Chapter 7 explains how to read, export, and filter historical sample data.
- Chapter 8 explains how to perform tests on the system to verify it is operating correctly.
- Chapter 9 explains how to enter or change passwords that provide data security for the analyzer.
- Chapter 10 explains troubleshooting and service procedures for the analyzer.
- Appendix A: provides specifications for the analyzer.

1.2 Anatel® PAT700 analyzer overview

The Anatel® PAT700 analyzer provides TOC analysis for pure and ultra-pure water processing.

The PAT700 oxidizes a water sample to determine the TOC in the sample. The analyzer traps a sample in the analysis cell, exposes the sample to ultraviolet (UV) light, and monitors changes in temperature and conductivity until the sample has completely oxidized. Once full oxidation has occurred, the analyzer reports TOC, temperature, conductivity, and the oxidation curve. The PAT700 incorporates the OASIS™ onboard, automated standards introduction system that simplifies analyzer performance testing using standards bottles tagged with RFID technology.

A touch-screen interface provides access to all analyzer functions. The user interface consists of a home screen from which all user operation initiates. The home screen displays the current status of the analyzer, TOC level, and environmental data. The software can display data in a number of user-selected formats, including TOC, compensated and uncompensated conductivity, and temperature in engineering units, with graphical representations of the data. Compliance with 21 CFR Part 11 is ensured with password protection and an audit trail of all user intervention.

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- You can interact with the analyzer remotely, including downloading data records, by querying the analyzer through an RS-232 communications port.
- You can communicate with the analyzer using Modbus® protocol via the Ethernet port. Alternatively, the user may connect a memory stick to the unit and download the contents of the data buffer and bottle analysis reports.
- You can print data on a remote printer via the RS-232 serial port.
- Printing may be done automatically or on demand through an RS-232 port to a serial printer.

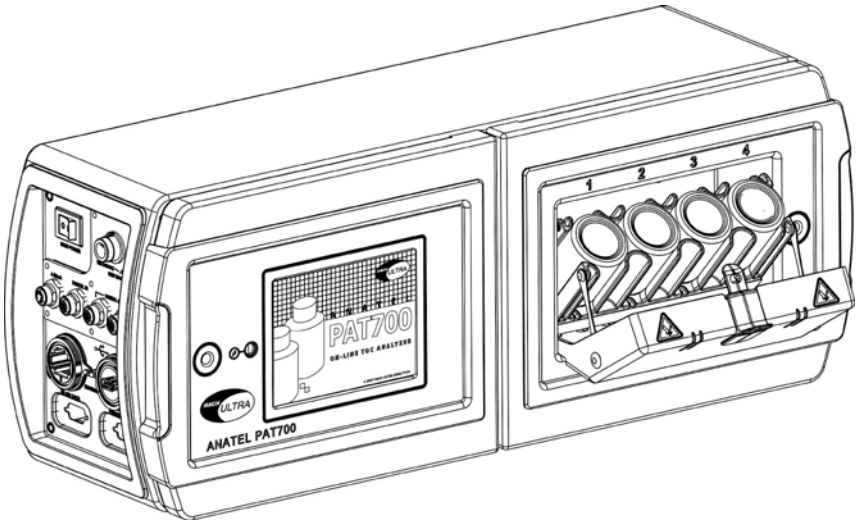

Figure 1-1 PAT700 with bottle bay open

1.3 RFID technology

The Aantel PAT700 on-line TOC analyzer Onboard Automated Standards Introduction System (OASIS™) employs Radio Frequency Identification (RFID) technology, a registered radio frequency device. The RFID system in the PAT700 operates over a very short distance to eliminate any interference with other wireless communications.

The term RFID describes a system that transmits data wirelessly, using radio waves, over a very short distance. An RFID system is comprised of a “tag” and a “reader/writer”. In the PAT700 analyzer, the tag is attached to the standards bottles used in calibrations (conductivity and TOC), validations, and system suitability tests. The RFID tag consists of a microchip attached to a radio antenna mounted on a substrate. The RFID tag is attached to the bottom of the standards bottle. The microchip contains data about the standard contained in the bottle. The PAT700 OASIS system contains four RFID reader/writers permanently mounted inside the analyzer that align with the bottle RFID tags when the bottles are fully loaded in the analyzer. The reader/writer retrieves the data stored on the RFID tags located on the bottom of the standards bottles. The RFID reader/writers have antennas that emit radio waves and receive signals back from the tags on the standards bottles. The information provided from the tag includes the identity of the standard, the standard’s concentration, date of expiration and other pertinent data.

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The reader/writer takes the data received from the tag and passes the information in digital form to the PAT700 processor. The RFID system in the PAT700 can read and write to the RFID tags attached to the standards bottle. The writing feature allows the PAT700 to write data to the bottles showing that the bottle has been used and provides for writing of data for the exclusive excursion sampling feature.

The RFID system in the PAT700 does not require any user intervention to operate. The system operates automatically when bottle tests are performed. The system automatically turns on and off to read and write data only when necessary. When enabled, the radio frequency modulation emitted from the antennas is fixed at 13.56 Mhz. There are no user serviceable parts associated with the RFID system. The RFID reader/writer board assembly should only be serviced by a Hach Ultra certified service representative.

Since the RFID labels on the standards bottles contain the data necessary for each standard, the labels must not be removed from the bottle. Without the label, the RFID reader/writer has no data to read and will not operate as intended.

1.4 Reading and following instructions

You must comply with all instructions while you are installing, operating, or maintaining the analyzer. Failure to comply with the instructions violates standards of design, manufacture, and intended use of the analyzer. Hach Ultra disclaims all liability for the customer's failure to comply with the instructions.

- *Read instructions* — Read all instructions before installing or operating the product.
- *Retain instructions* — Retain the instructions for future reference.
- *Follow instructions* — Follow all installation, operating and maintenance instructions.
- *Heed warnings and cautions* — Adhere to all warnings and caution statements on the product and in these instructions.
- *Parts and accessories* — Install only those replacement parts and accessories that are recommended by Hach Ultra Analytics, Inc. Substitution of parts is hazardous.

1.5 Safety

- Read the *Anatel PAT700 TOC Analyzer Operator Manual* thoroughly before installing or operating the analyzer. Although the analyzer is designed for rugged use, you should care for and maintain it as described in this manual. Following proper safety and handling instructions promotes accident free operation and prolong product life.
- For any questions regarding the analyzer, phone Hach Ultra at 800.866.7889 or +1 541.472.6500.
- All service procedures should be conducted by properly trained service personnel.
- Follow all procedures in Return procedures, page 109 before shipping the analyzer to a service center for repair or recalibration.
- Make sure the analyzer is properly installed and all connections are correctly installed before operating the analyzer. Adhere to all instructions provided in caution and warning statements.
- Any changes or modifications not expressly approved by Hach Ultra Analytics, Inc. could void the user's authority to operate this equipment.

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1.6 Caution and warning statements

This manual contains caution and warning statements with which you *must* comply to prevent inaccurate measurement, property damage, or personal injury.

CAUTION

Caution statements alert you to hazards or unsafe practices that could result in minor personal injury or property damage.

Each caution statement explains what you must do to prevent or avoid the potential result of the specified hazard or unsafe practice.

WARNING

Warning statements alert you to hazards or unsafe practices that could result in severe property damage or personal injury due to electrical shock, fire, or explosion.

Each warning statement explains what you must do to prevent or avoid the potential result of the specified hazard or unsafe practice.

Caution and warning statements comply with American Institute of Standards Z535.1-2002 through Z535.5-2002, which set forth voluntary practices regarding the content and appearance of safety signs, symbols, and labels.

Each caution or warning statement explains:

1) The specific hazard that you must prevent or unsafe practice that you must avoid,
2) The potential result of your failure to prevent the specified hazard or avoid the unsafe practice, and
3) What you must do to prevent the specified hazardous result.

1.7 FCC conformance

The PAT700 contains a registered Radio Frequency device (RFID)
FCC ID: VICPAT700TOC
IC: 6149A-PT700TOC

Japan
MIC、この設備は自分自身で証明されます。
MIC証明Number はAC-_ _ _ _です

Frequency: 13.56 Mhz - +/- 7Khz
RF Output power <180mW

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This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you should try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or authorized service person for help.

Any changes or modifications not expressly approved by Hach Ultra Analytics, Inc. could void the user's authority to operate the equipment.

1.8 Definitions of terms

The following terms are used throughout this manual:

Conductivity. A measure of the ability to conduct current through water. Conductivity, very low with high-purity deionized water, is the reciprocal of resistivity and is measured in microsiemens per centimeter (µS/cm).

Megohm (M). A measurement of 1,000,000 ohms.

Microsiemens (µS). A unit of conductance in the metric system equivalent to one millionth of an ampere per volt (1 µS = 1 x 10^{-6} A/V).

Normalize. To make conform to a standard. In this case, the user performs calculations on the raw data to produce a result in a standard unit of measure.

Organic. Organic chemicals, including carbon atoms in complex molecules, but not including carbonate (CO_2, HCO_3, CO_3) or cyanide (CN) related compounds. Oxygen is very common in organics, and they almost always include hydrogen.

Oxidation. The loss of electrons by a chemical species, typically with oxygen. Organic carbon, for example, oxidizes to carbon dioxide and water.

Parts per billion (ppb). A term used to report trace chemical analyses. It refers to the concentration of the element or compound present within one billion parts of water. One microgram per liter (µg/L) is equal to 1 ppb).

Resistivity. Resistance, measured in megohmcentimeters (M-cm), to the flow of electrical current through high-purity water. Resistivity is a means of continuously measuring the purity of the water and is the reciprocal of conductivity.

Temperature compensation. Conductivity and resistivity measurements normalized to 25 °C (77 °F) for reporting purposes. Normalized conductivity and resistivity measurements reflect the values that would be reported at a sample temperature of 25 °C (77 °F) using a model based on sodium chloride in water. Conductivity and resistivity of electric current in water depend on the temperature of the water. The lower the temperature, the lower the conductivity and the higher the resistivity.

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Total organic carbon (TOC). A measurement of the organics present in water based on its carbon content. High-purity water measures TOC in parts per billion (ppb). Total organic carbon is used interchangeably with total oxidizable carbon.

VGA. Video Graphics Adapter.

1.9 Customer service

For customer service:

- Voice: US: 1.970.663.9760 or 1.800.373.0531
  EU: 41.22.594.6400
- FAX: US: 1.970.663.9761
  EU: 41.22.594.6488
- Support hot line: US: 1.877.4 ANATEL (1.877.426.2835)
- Email: www.hachultra.com

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Chapter 2 Installation

2.1 Installation requirements

Install the analyzer in a dry, dust-free environment. The analyzer has a splash-resistant NEMA 12-compliant water resistant IP56 enclosure surrounding the electronics portion of the analyzer. All components in the hydraulics portion of the analyzer are rated IP56.

- Install the analyzer in a properly ventilated location where ambient air temperature does not exceed 35 °C (95 °F).
- The analyzer has 3/4-inch NPT conduit fittings or quick-connect fittings for wiring.

See Figure 2-1, page 8 for mounting dimensions. The analyzer weighs 27 lb (12.25 kg).

The analyzer ship kit includes the following parts:

- This instruction manual
- 5-foot (1.5 meter) PFA inlet tubing
- 10-foot (3 meter) polypropylene outlet tubing
- Allen wrench
- Stylus
- Instrument screwdriver
- RFID tagged excursion sample bottle

For units with quick connect I/O fittings the following items are also included:

- Quick connect power cord
- Male 8-pin quick connect cord fitting
- Three male 5-pin quick connect cord fitting

2.2 Orientation and mounting

CAUTION

Failure to mount the analyzer in an upright position can cause measurement error.

To ensure proper operation of the measurement cell between analysis cycles, mount the analyzer in an upright position. See Figure 2-2.

- Secure the analyzer using the factory-supplied mounting bracket (see Figure 2-3, page 10). Use the mounting holes in the bracket to mount it to a flat, stable surface.
- Hook the analyzer onto the mounting bracket and latch it into place using the twist latches.
- An optional handle, attached to the analyzer, enables it to be moved from place to place.

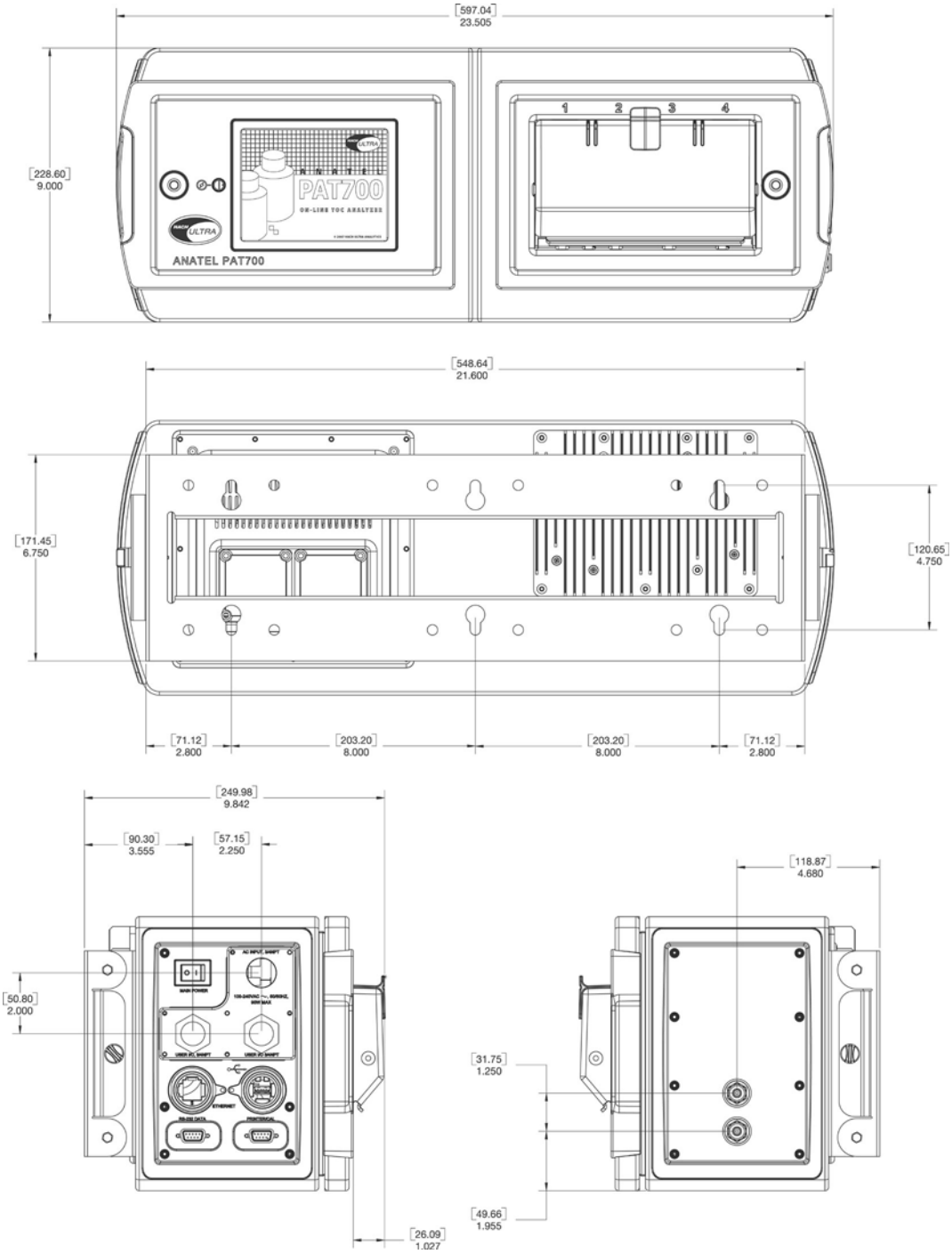

Figure 2-1 PAT700 mounting dimensions

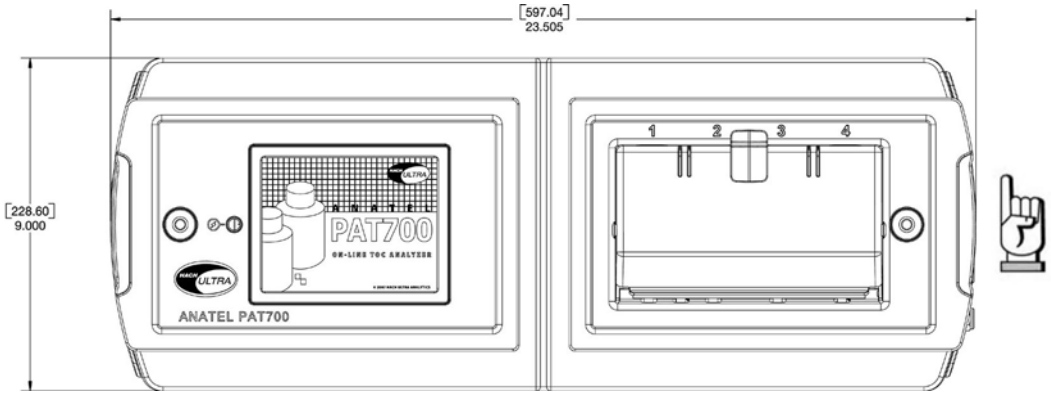

Figure 2-2 PAT700 analyzer orientation

Mounting general considerations

Follow these guidelines when installing the analyzer:

- Locate the analyzer where it is accessible for operation, service and calibration.
- Minimize the distance between the water system sample point and the analyzer to allow for representative sampling.
- Locate the analyzer where the ambient temperature remains between 15 and 35 °C (59 and 95 °F).
- The transmitter mounting bracket is installed independently from the analyzer. Once mounted, the analyzer hooks on the mounting bracket and locks into place with twist latches.
- Mount the transmitter mounting bracket to a stable, flat surface or dual instrument poles.
- The front of the analyzer requires 12 inches (30.48 cm) of clearance to allow the doors to open completely.
- The analyzer is available with ¾-inch conduit openings or quick-connect fittings for power and I/O wiring. If conduit is used, install fittings that ensure a complete seal with the openings and are properly sealed to keep the analyzer electronics compartment watertight.

Mounting to a wall

Follow these guidelines and refer to Figure 2-1 and Figure 2-3 to mount the transmitter to a wall or other flat, rigid surface:

- Use 5/16-inch (8 mm) diameter screws or bolts and nuts to mount the analyzer to a wall or other flat, rigid surface. Use hardware that can withstand the process environment. Hach Ultra does not supply hardware.
- To minimize stress on the analyzer mounting bracket, secure all mounting bolts to the same structure, which should be flat and should not vibrate or move excessively. Do not secure bolts to separate girders, beams, or wall studs, which can move independently.

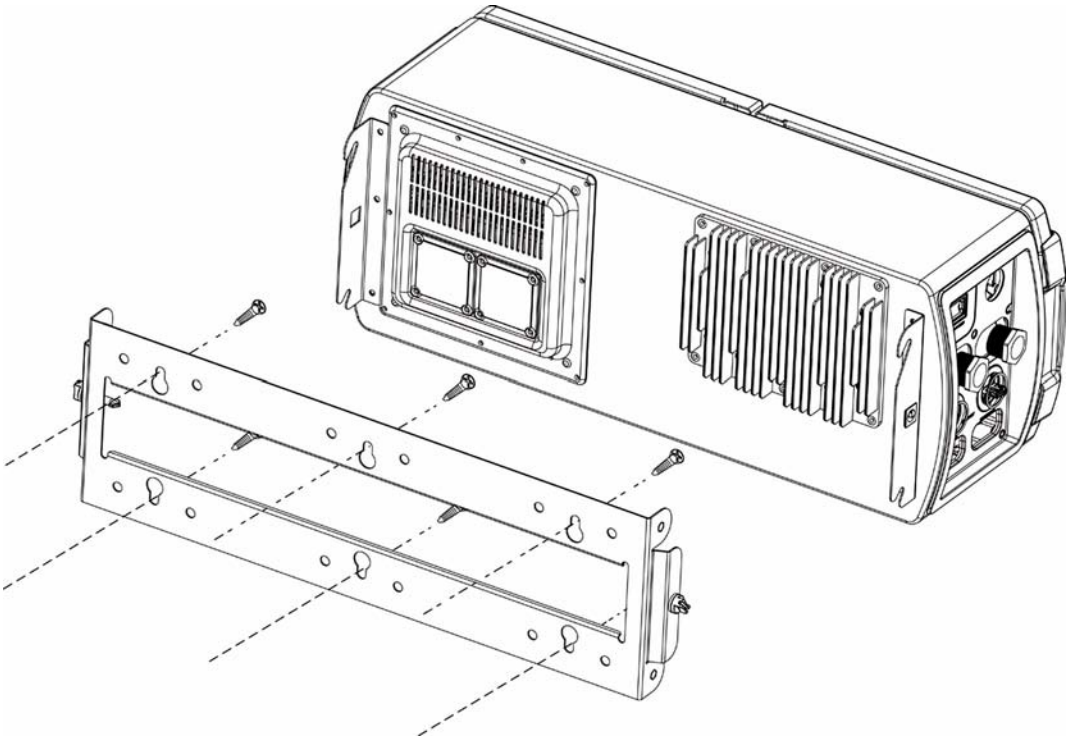

Figure 2-3 PAT700 wall mount

Mounting to dual instrument poles

Follow these guidelines and refer to Figure 2-1 and Figure 2-4 to mount the transmitter to instrument poles:

- Mount the analyzer mounting bracket to two instrument poles that are attached to a common surface. Do not secure to two instrument poles that could move independently.
- Use four 5/16-inch U-bolts, two for each 2-inch pipe, and eight matching nuts, to mount the analyzer mounting bracket to two rigid instrument poles. Use U-bolts and nuts that can withstand the process environment. Hach Ultra does not supply U-bolts or nuts.
- The instrument poles should extend at least 10 inches (254 mm) from a common rigid base and should be no larger than 2 inches (50.8 mm) in diameter.

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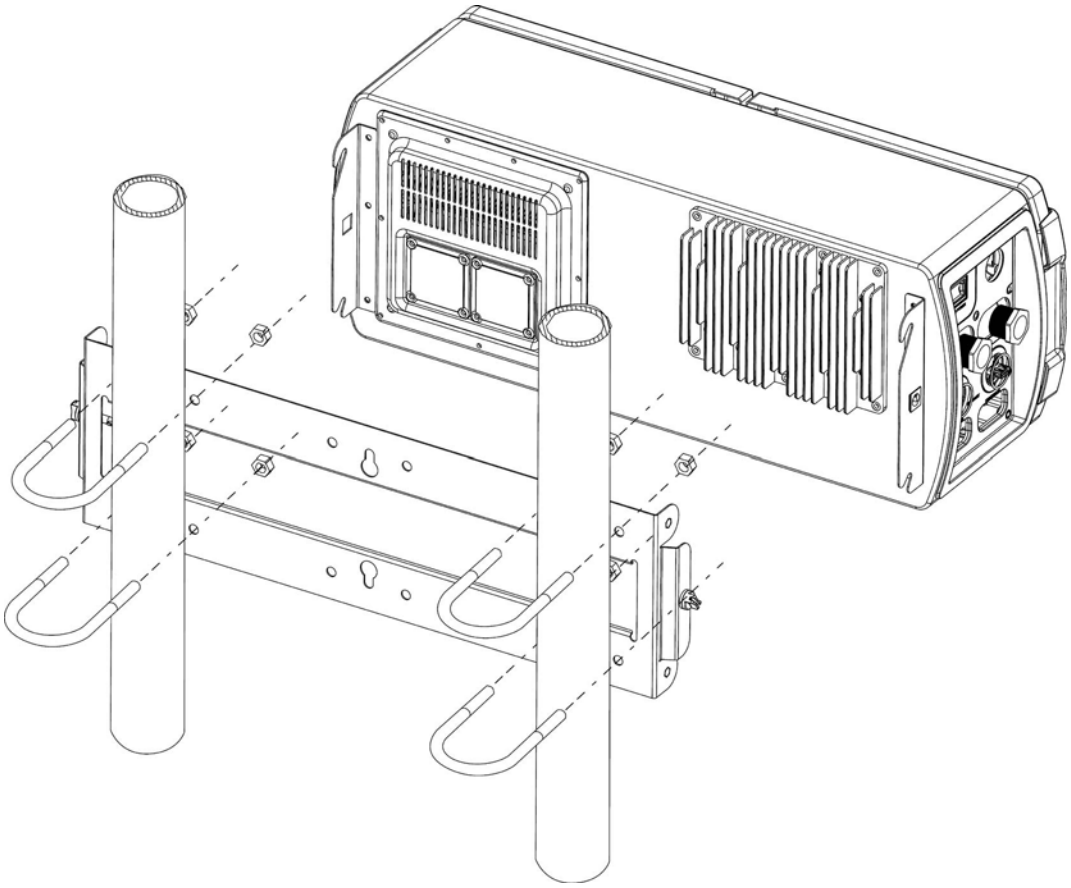

Figure 2-4 PAT700 instrument-pole mount

2.3 Plumbing connections

CAUTION

Improper plumbing connections to the analyzer can cause improper flow through the analyzer, resulting in measurement error.

To avoid measurement error due to improper flow if temperature and pressure exceed the limits listed in Table 2-1, page 12*, install high grade 1/4" (OD) PTFE, FEP, PVDF, or 316 stainless steel tubing. Otherwise, install the factory-supplied 1/4" PFA (perfluoroalkoxy resin) sample tubing and 1/4" OD polypropylene drain tubing. Hach Ultra supplies 5 feet (1.5 meters) of PFA tubing and 10 feet (3 meters) of polypropylene tubing with the analyzer.*

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Isolation valve

To enable manual isolation of the analyzer from input flow, connect the analyzer to the sample supply through a customer-supplied upstream isolation valve. See Figure 2-5.

Table 2-1 Maximum temperature and pressure limits for PFA tubing

Maximum water temperature	Maximum pressure
75 °C (167 °F)	90 psig (620 kPa)
85 °C (185 °F)	80 psig (550 kPa)
90 °C (194 °F)	70 psig (480 kPa)

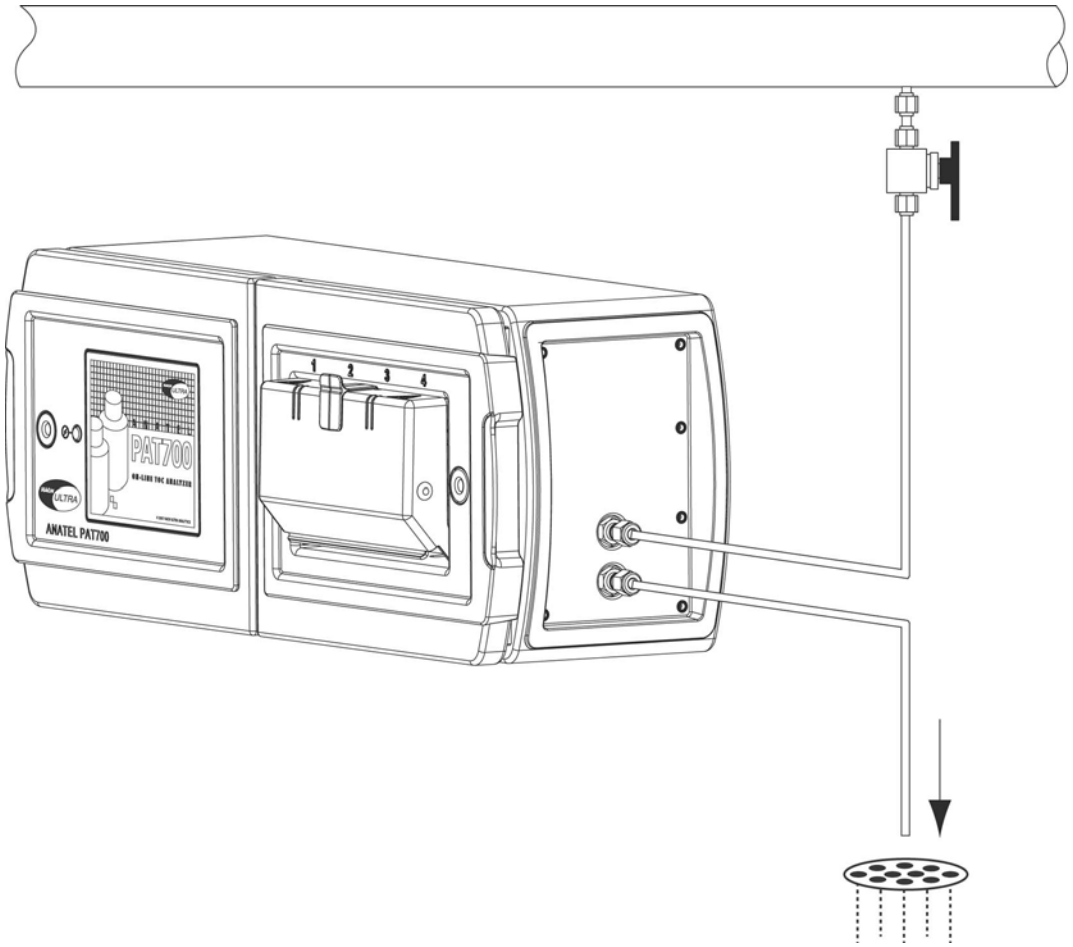
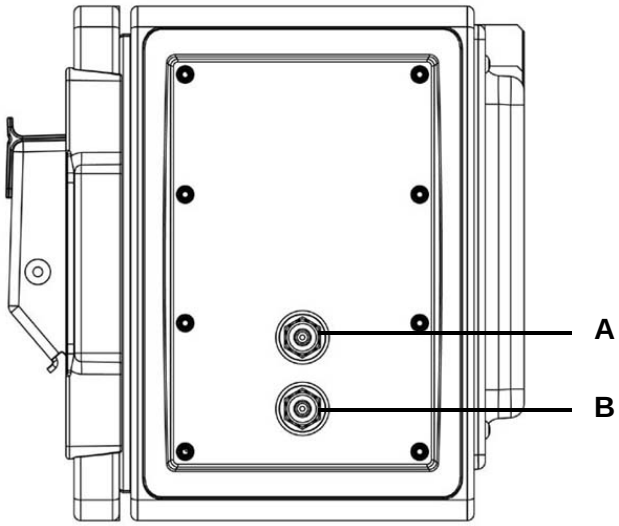


Figure 2-5 PAT700 connection to isolation valve

Water inlet and outlet

Tubing connects to the 1/4” inlet (WATER IN) and outlet (WATER OUT) 316 stainless steel compression fittings on the analyzer. See Figure 2-6. Installation requires a 7/16” wrench.



A Water inlet
B Water outlet

Figure 2-6 PAT700 water inlet and outlet connections

To connect plumbing to the 1/4” inlet (WATER IN) port, follow these steps:

1) To avoid introducing debris through the inlet plumbing, flush the isolation valve by opening and closing it fully several times.
2) Taking care not to crimp or damage the tubing, push one end of the inlet tubing into the water inlet port until it cannot be inserted any farther.
3) Taking care not to pull on the tubing, hand-tighten the compression nut.
4) Mark both the compression nut and the WATER IN connector as a reference for tightening the nut.
5) Tighten the compression nut 1-1/4 turns to secure the connection.

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CAUTION

Over tightening fittings can damage the ferules, causing leaks that can result in measurement error or property damage.

After tightening a ferule 1-1/4 turns, do not tighten it more than another 1/4 turn to seal the connection.

To connect plumbing to the 1/4” outlet (WATER OUT) port, follow these steps:

1) Noting the flow direction, attach the 10-foot long, 1/4” OD polypropylene drain tubing to the WATER OUT port of the analyzer.
2) Taking care not to crimp or damage the tubing, push one end of the tubing into the water outlet port until it cannot be inserted any farther.
3) Taking care not to pull on the tubing, hand-tighten the compression nut.
4) Mark both the compression nut and the WATER OUT connector as a reference for tightening the nut.
5) Tighten the compression nut 1-1/4 turns to secure the connection.
6) Leak test the connections by slowly opening the upstream isolation valve to introduce water into the analyzer. Pulse the valve several times by opening and closing it, then recheck the fittings.
7) If necessary, slowly tighten the compression fittings to stop any leaks.

2.4 Wiring connections for PAT700 with conduit openings

Refer to this section if the PAT700 has three 3/4-inch female NPT conduit openings.

- One opening accommodates power supply wiring.
- The other two openings accommodate 4-20 mA or discrete I/O wiring.
- Power supply and I/O wiring connects to terminals in the compartment behind the analyzer’s display unit. Figure 2-8 illustrates power supply and I/O wiring terminals. To access the terminals:

1) Use the factory-supplied Allen wrench to unlatch the door that contains the display.
2) Unlatch the door and swing it open on its hinges.

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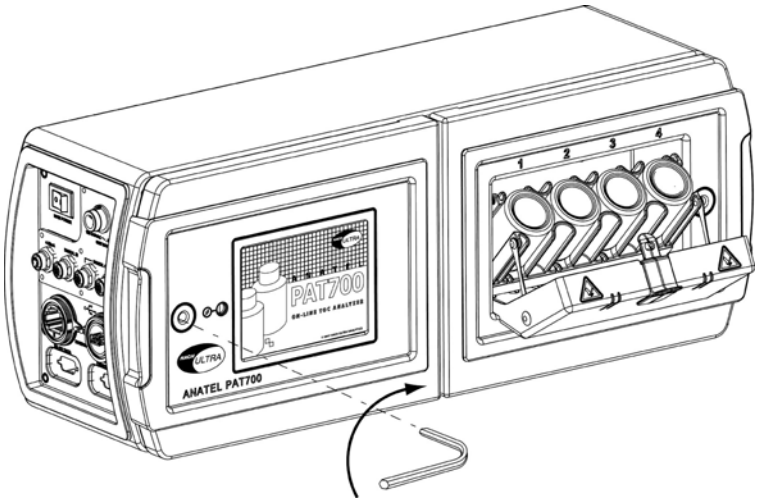
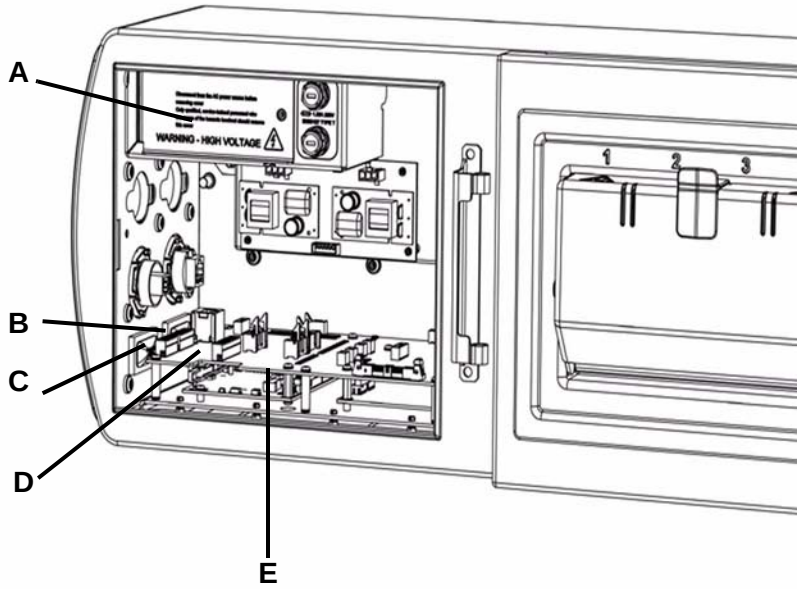


Figure 2-7 Using Allen wrench to access wiring connections



A Power supply wiring compartment (terminals are behind door)
B 4-20 mA output wiring terminals (connector block **J17**)
C Discrete input wiring terminals (connector block **J24**)
D Discrete output wiring terminals (connector block **J22**)
E I/O circuit board

Figure 2-8 PAT700 power supply and I/O wiring terminals

Power supply wiring

WARNING

Improper grounding can cause property damage or personal injury.

• Adhere to ground network requirements for the facility.

• Maintain all exposed conductors at earth ground.

Figure 2-9 illustrates power supply wiring terminals.
Table 2-2 lists specifications for power supply wiring.

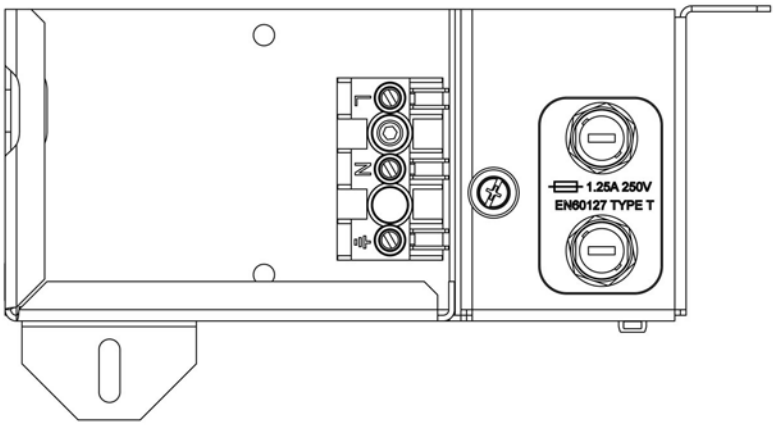


Figure 2-9 PAT700 power supply wiring terminals

Table 2-2 Power supply wiring specifications

Description	Specification
Voltage input	100 to 240 VAC universal
Frequency	50 to 60 Hz
Power	900 Watts maximum, 1.25 A @ 250 VAC

I/O wiring

The analyzer has three 4-20 mA outputs, two discrete inputs, and four discrete outputs. Connect wiring to the Y-shaped connector blocks located on the I/O circuit board.

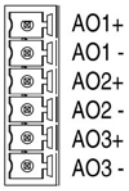
- The connector blocks are a 2-part assembly.
- The terminal block connector can be unplugged from the analyzer for easier installation of wiring.
- Install twisted-pair unshielded wiring, 18 to 14 AWG (1.0 to 2.5 mm^2).

4-20 mA outputs

The analyzer has three 4-20 mA outputs. Wiring connects to terminals on connector block J17, as listed in Table 2-3.

- Analog output 1 represents TOC (total organic carbon).
- Analog output 2 represents conductivity or resistivity (user selected).
- Analog output 3 represents temperature in °F or °C (user selected).

Table 2-3 J17 connector block: 4-20 mA output wiring terminal designations

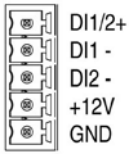
J17 Block	Terminal	Description	Variable	Designation
	1	4-20 mA source output for analog output 1 (+)	TOC	AO1+
	2	4-20 mA sink output for analog output 1 (–)	TOC	AO1-
	3	4-20 mA source output for analog output 2 (+)	Conductivity or resistivity	AO2+
	4	4-20 mA sink output for analog output 2 (–)	Conductivity or resistivity	AO2-
	5	4-20 mA source output for analog output 3 (+)	Temperature	AO3+
	6	4-20 mA sink output for analog output 3 (–)	Temperature	AO3-

Discrete inputs

The analyzer has two discrete inputs. Wiring connects to terminals on connector block J24, as listed in Table 2-4.

- Discrete input 1 initiates TOC analysis. When the output state switches from high to low, the analyzer stops the current operation and runs a single TOC analysis. After the analysis is complete, the analyzer returns to the mode defined by digital input 2. During the TOC analysis, the analyzer ignores all subsequent trigger values.
- Discrete input 2 switches the analyzer modes. If digital output 2 is in high state, the analyzer is in TOC mode. If digital output 2 is in low state, the analyzer runs in flow with conductivity mode.

Table 2-4 J24 connector block: Discrete input wiring terminal designations

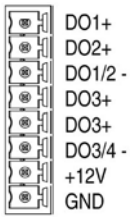
J24 Block	Terminal	Description	Variable	Designation
	1	Common connection for external sourcing (+)	Common	DI1/2+
	2	Digital input 1 voltage source return input (–)	Initiates TOC analysis	DI1–
	3	Digital input 2 voltage source return input (–)	Analyzer mode	DI2–
	4	• 12 VDC power supply + • Connect only if output device requires power supply	Output power supply	+12V
	5	• 12 VDC power supply – • Connect only if output device requires power supply	Output power supply	GND

Discrete outputs

The analyzer has four discrete outputs. Wiring connects to terminals on connector block J22, as listed in Table 2-5.

- Discrete output 1 is a TOC alarm. The output reports the TOC level as above (low state) or below (high state) the user-specified alarm limit.
- Discrete output 2 is an uncompensated conductivity alarm. A low state indicates the conductivity level is above the alarm limit. A high state indicates the conductivity level is below the alarm limit.
- Discrete output 3 reports a warning or failure condition. A low state indicates an error condition exists. A high state indicates no error conditions exist.
- Discrete output 4 reports a TOC analysis start (by indicating the state of the sample inlet valve). A low state indicates the sample valve is closed. A high state indicates the sample valve is open.

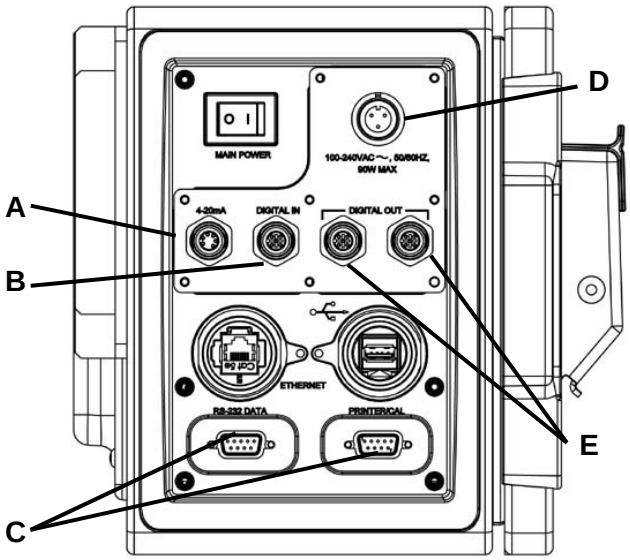
Table 2-5 J22 connector block: Discrete output wiring terminal designations

J22 Block	Terminal	Description	Variable	Designation
	1	Digital output 1 (+)	TOC alarm	DO1+
	2	Digital output 2 (+)	Uncompensated conductivity alarm	DO2+
	3	Common return for discrete outputs 1 and 2 (+)	TOC alarm, uncompensated conductivity alarm	DO1/2
	4	Digital output 3 (+)	Warning or failure	DO3+
	5	Digital output 4 (+)	TOC analysis start	DO4+
	6	Common return for discrete outputs 3 and 4 (+)	Warning or failure, TOC analysis start	DO3/4
	7	• 12 VDC power supply + • Connect only if input device requires power supply	Input power supply	+12V
	8	• 12 VDC power supply – • Connect only if input device requires power supply	Input power supply	GND

2.5 Wiring connections for PAT700 with quick-connect fittings

Refer to this section if the PAT700 has five quick-connect fittings, as illustrated in Figure 2-10.

- One connector accommodates power supply wiring.
- The other four connectors accommodate 4-20 mA or discrete I/O wiring.
- The comes with factory-supplied mating connectors and a plug-in cord for power supply wiring.



A 4-20 mA output wiring connector
B Digital input wiring connector
C Serial communications wiring connectors (see page 22)
D Power supply wiring connectors
E Digital output wiring connectors

Figure 2-10 PAT700 power supply and I/O wiring terminals

Power supply wiring

WARNING

Improper grounding can cause property damage or personal injury.

• Adhere to ground network requirements for the facility.

• Maintain all exposed conductors at earth ground.

Table 2-6 lists specifications for power supply wiring.

Table 2-6 Power supply wiring specifications

Description	Specification
Voltage input	100 to 240 VAC universal
Frequency	50 to 60 Hz
Power	900 Watts maximum, 1.25 A @ 250 VAC

I/O wiring

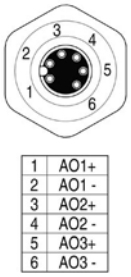
The analyzer has three 4-20 mA outputs, two discrete inputs, and four discrete outputs.

4-20 mA outputs

The analyzer has three 4-20 mA outputs, as listed in Table 2-7.

- Analog output 1 represents TOC (total organic carbon).
- Analog output 2 represents conductivity or resistivity (user selected).
- Analog output 3 represents temperature in °F or °C (user selected).

Table 2-7 4-20 mA output wiring terminal designations

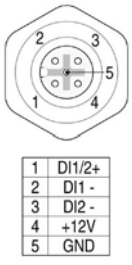
Wiring connector	Terminal	Description	Variable	Designation
	1	4-20 mA source output for analog output 1 (+)	TOC	AO1+
	2	4-20 mA sink output for analog output 1 (–)	TOC	AO1–
	3	4-20 mA source output for analog output 2 (+)	Conductivity or resistivity	AO2+
	4	4-20 mA sink output for analog output 2 (–)	Conductivity or resistivity	AO2–
	5	4-20 mA source output for analog output 3 (+)	Temperature	AO3+
	6	4-20 mA sink output for analog output 3 (–)	Temperature	AO3–

Discrete inputs

The analyzer has two discrete inputs, as listed in Table 2-8.

- Discrete input 1 initiates TOC analysis. When the output state switches from high to low, the analyzer stops the current operation and runs a single TOC analysis. After the analysis is complete, the analyzer returns to the mode defined by digital input 2. During the TOC analysis, the analyzer ignores all subsequent trigger values.
- Discrete input 2 switches the analyzer modes. If digital output 2 is in high state, the analyzer is in TOC mode. If digital output 2 is in low state, the analyzer runs in flow with conductivity mode.

Table 2-8 Discrete input wiring terminal designations

Wiring connector	Terminal	Description	Variable	Designation
	1	Common connection for external sourcing (+)	Common	DI1/2+
	2	Digital input 1 voltage source return input (–)	Initiates TOC analysis	DI1–
	3	Digital input 2 voltage source return input (–)	Analyzer mode	DI2–
	4	• 12 VDC power supply + • Connect only if output device requires power supply	Output power supply	+12V
	5	• 12 VDC power supply – • Connect only if output device requires power supply	Output power supply	GND

Discrete outputs

The analyzer has four discrete outputs, as listed in Table 2-9 and Table 2-10.

- Discrete output 1 is a TOC alarm. The output reports the TOC level as above (low state) or below (high state) the user-specified alarm limit.
- Discrete output 2 is an uncompensated conductivity alarm. A low state indicates the conductivity level is above the alarm limit. A high state indicates the conductivity level is below the alarm limit.
- Discrete output 3 reports a warning or failure condition. A low state indicates an error condition exists. A high state indicates no error conditions exist.
- Discrete output 4 reports a TOC analysis start (by indicating the state of the sample inlet valve). A low state indicates the sample valve is closed. A high state indicates the sample valve is open.

Table 2-9 Discrete outputs 1 and 2 wiring terminal designations

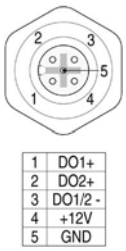
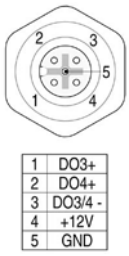
Wiring connector	Terminal	Description	Variable	Designation
	1	Digital output 1 (+)	TOC alarm	DO1+
	2	Digital output 2 (+)	Uncompensated conductivity alarm	DO2+
	3	Common return for discrete outputs 1 and 2 (–)	TOC alarm, uncompensated conductivity alarm	DO1/2–
	4	• 12 VDC power supply + • Connect only if input device requires power supply	Input power supply	+12V
	5	• 12 VDC power supply – • Connect only if input device requires power supply	Input power supply	GND

Table 2-10 Discrete outputs 3 and 4 wiring terminal designations

Wiring connector	Terminal	Description	Variable	Designation
	1	Digital output 3 (+)	Warning or failure	DO3+
	2	Digital output 4 (+)	TOC analysis start	DO4+
	3	Common return for discrete outputs 3 and 4 (–)	Warning or failure, TOC analysis start	DO3/4–
	4	• 12 VDC power supply + • Connect only if input device requires power supply	Input power supply	+12V
	5	• 12 VDC power supply – • Connect only if input device requires power supply	Input power supply	GND

2.6 Serial communication

The analyzer has the following serial ports:

- A female RS-232 serial port for data acquisition and control via a host computer.
- A male RS-232 serial port for connection to an external printer (1200 baud, 8 data bits, 1 stop bit, no parity).
- A USB port for data transfer via a FAT drive.
- An Ethernet® 10/100 base-T interface port for communication via Modbus® protocol. For information about using Modbus protocol, see the instruction manual entitled *Using Modbus Protocol with the Anatel PAT700 TOC Analyzer*.
- All serial ports are internally wired. Table 2-11 lists specifications for serial communication.

Table 2-11 RS-232 serial communication specifications

Description	Specification
RS-232 interface ports	ASCII, 8 data bits, no parity, 1 stop bit, 1200 baud
USB host	Output to FAT memory stick
Ethernet® interface	• 10/100 base-T, Modbus® TPC • 1 start bit, 8 data bits, 2 stop bits, no parity

Serial interface commands consist of mode set, parameter set, data read, data logger and data history functions. The commands consist of 2-character ASCII text mnemonics. Some commands also require one or more arguments, each delimited by at least one space (ASCII 32; 20 Hex), followed by the command mnemonic. Each command string is terminated with a carriage return (ASCII 13; 0D Hex).

The analyzer responds to uppercase or lowercase commands.

The analyzer responds with an OK> prompt after the command has been accepted. In addition, Data read and parameter set commands elicit a reply that consists of one or more numeric or text values, each delimited by at least one space, and terminated by a carriage return, line feed pair (ASCII 13,10; 0D,0A$_{hex}$).

Both commands and replies use a free field format, so the number of delimiting spaces and length of each argument or data field may vary. If a command is rejected due to invalid syntax, for instance, refusal is indicated by a question mark (ASCII63; 3F$_{hex}$) reply preceding the “OK>” prompt.

The notations used to represent command arguments below are as follows:

hh:mm:ss	hours:minutes:seconds
n	decimal number (such as “1.234”)
i	integer (such as “1”)
s	text string (such as “SENSOR_NAME”)
b	binary flag (“1” or “0”)

Mode set commands

The mode set commands are used to determine the instrument's operational mode.

Table 2-12 Mode set commands

Command	Function	Comment
MC	Self-clean mode	Valve open, lamp on
MD	Auto TOC mode	Continuous TOC analyses
ME	Clear code log	Erases codes from memory
MO i	Start TOC analysis	• One or more TOC analyses, then goes to idle state • Default is one analysis cycle if an argument ("i") is not specified
MP	Purge mode	• Valve open, lamp off • Shows resistivity/conductivity and temperature
MZ	Idle state	Places analyzer in idle state (if present)

Parameter set commands

Issuance of the "HR" command displays or sets the user-defined parameters. When issued without arguments, the analyzer's current settings are displayed. Issued with arguments, the specified parameters are changed for the analyzer and a printout is generated documenting the modification. If an "out of bounds" value is sent, the entire command is ignored.

Issuing the "HR" command without specifying arguments displays the current parameter settings. Read-only values cannot be modified.

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Table 2-13 Parameter set commands

Command	Function
HR t t i i . . .	Sample time (hh:mm:ss)
	Cycle time (hh:mm:ss)
	Absolute TOC alarm limit (ppb)
	Reserved (always “0”)
	Reserved (always “0”)
	Analyzer channel ID number (1 through 8)
	Analyzer name (1 through 13 characters)
	Cycle modes (0 = TOC and idle, 1 = TOC and purge)
	Sampling mode (0 = Water saver, 1 = Continuous)
	Diagnostic port function (0 = Normal, 1 = External module)
	Conductivity/resistivity units of measure: 0 = MΩ-cm 1 = µS/cm 2 = MΩ-cm uncompensated 3 = µS/cm uncompensated
	20 mA output during TOC calibration (0 = Inactive, 1 = Active)
	TOC mode print strategy (0 = Continuous, 1 = Paper saver)
	Purge mode print strategy (0 = Continuous, 1 = Paper saver)
	Active alarm type (0 = Absolute ppb, 2 = Absolute ppb and uncompensated conductivity alarm)
	Analog output type (0 = 4 to 20 mA, 1 = 0 to 20 mA)
	20mA output on alarm (0 = minimum value, 1 = unchanged, 2 = maximum value)
	TOC mode paper saver percentage change (1 through 99)
	Purge mode paper saver percentage change (1 through 99)
	Purge Mode Interval Between Printouts (hh:mm:ss)
	Zero-scale TOC range (ppb)
	Full-scale TOC range (ppb)
	User TOC calibration slope (read-only)
	Digital control (0 = disabled, 1 = enabled)
	Log (0 = Data and audit, 1 = Audit only)
	User conductivity calibration slope (read-only) Example: "HR 00:01:00 00:00:00 500 0 0 1 SENSOR_NAME 0 0 0 0 0 0 0 0 0 0 1 1 00:01:00 0 1000 1.0 0 20 5 95 0 1.0 <“
SY	Set time (MM:DD:YY:hh:mm:ss format) Example: "SY 03 04 1993 12 33 00 <cr>"

Data read commands

The data read functions return multiple values, the string terminated with a <cr><lf>.

If the analyzer is in an operational mode that does not generate a TOC result (modes 6 through 12), the TOC, TOC alarm percentage, TOC trend, profile (curve) type, and oxidation time are not returned.

Data normally are returned only in response to issuance of the RD or RE commands. When collecting data with a serial communications program such as Windows 95 Hyperterminal, however, it is more convenient to have the data displayed automatically. This can be done using the SA command, which then displays data whenever they are reported.

Table 2-14 Data read commands

Command	Function	Comment
RD	Read analyzer data	RD Read analyzer data returns one line of time stamped data from when the unit began oxidation: mm/dd/yyyy, hh:mm, mode, state, TOC in ppb, alarm percentage, trend in ppb/hr, resistivity in MΩ-cm, temperature in °C, curve (profile) type and oxidation time in seconds. The mode is: 1 = Auto TOC 2 = Single TOC 3 = Digital TOC 4 = Sample Manual 5 = Manual 6 = Clean Mode 7 = Purge Mode 8 = Digital Purge 9 = Temperature Test 10 = Self-Calibrate 11 = Idle Mode 12 = Failure Mode The state is: 1 = Idle 2 = Sample 3 = Oxidize 4 = Self-Calibrate 5 = Repurge
RE	Read analyzer codes	Returns time stamped alarms, if any, since the last power-up or ME command issued, one code per line: hh:mm:ss (time of first occurrence), alarm code, number of occurrences and alarm description.

Log commands

Log functions return information on the analyzer's internal log.

Table 2-15 Log commands

Command	Function	Comment
LP	Display log	Displays the contents of the internal log. If any third character is appended to the command (such as "LPx"), the display is aborted.
LU	Report log usage	Displays what percentage (0 to 100) of the internal log has been used.

Data history commands

Data history commands return the results of the most recent calibration and validation procedures performed on the analyzer.

Table 2-16 Data history commands

Command	Function	Comment
PC	Conductivity calibration history	Up to five calibrations are displayed
PT	TOC calibration history	Up to five calibrations are displayed
PS	System suitability calibration history	Up to five tests are displayed
PV	TOC validation history	Up to five tests are displayed

Chapter 3 Startup

3.1 Startup sequence

The analyzer goes through the following sequence on power up:

1) **Splash window:** The splash window appears at startup while the system checks for the FAT driver, copies files, and launches the application.
2) **Verify lamp monitor:** After the system has initialized, it verifies that the lamp monitor works by turning on the main lamp and ensuring a voltage is returned. The analyzer needs to enable the lamp to warm up for a few seconds to ensure a valid result.
3) **Sample bottle check:** The system checks to see if the bottles loaded in the sample cartridge match the last known configuration. If the bottles contain RFID tags, the analyzer reads the tags and compare them against the information stored in the settings. If the RFID tag doesn't match what's stored in the settings, the settings is updated with the new information and a warning is generated. If the settings list a non-RFID tagged bottle in one of the bottle positions and an RFID tag cannot be detected in that position, the analyzer assumes the bottle is still present.
4) **Start sampling:** If the analyzer is configured to one of the Auto TOC modes, it starts sampling after it has powered up.
5) **Print header:** After the system has started up, it prints a header that tells when the system was rebooted, and its condition. It prints the column header for the normal operation mode.

3.2 Logging on and off the analyzer

Lock and unlock icons

The lock and unlock icons enable you to sign on or sign off the analyzer.

If you are signed on to the system, touching the lock icon signs you off and changes the icon to the unlock icon.

If no one is signed on to the system, touching the unlock icon displays the sign on dialog box.

- If you are signed on remotely, you cannot be signed off locally.
- If you are signed on locally, you cannot be signed off by a remote user.

Upon successfully signing on to the system locally, the icon changes to the sign off icon. Upon successfully signing on to the system remotely, the icon changes to indicate that someone is logged on remotely.

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Auto logoff

The analyzer logs the current user off after the user-defined period of time.

- If the analyzer is currently displaying the home screen, the lock or unlock icon in the sliding toolbar changes to the sign on icon.
- If the analyzer is currently displaying any dialog box other than the home screen, the sign on dialog box is displayed, forcing you to sign back on.
- Only the previously signed on user or the administrator may unlock the system.

3.3 Home screen

The home screen enables you to navigate through the menu system. The home screen consists of a sliding toolbar for navigation; a data section to view the last data readings, view a log of past data readings, or a graph of past data readings; a display of the current date and time; a display of the current sampling mode; and a process animation. See Figure 3-1.

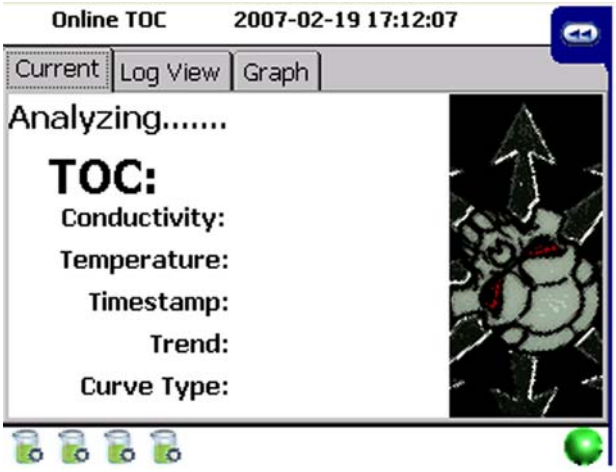

Figure 3-1 Home screen

Sliding toolbar

The sliding toolbar consists of icons that enable you to navigate through the analyzer menu structure or to access a single function. The toolbar is hidden off the home screen most of the time. You may access the toolbar by touching the toolbar's tab to slide it out onto the right edge of the home screen. Selecting one of the icons, touching somewhere else on the home screen, or touching the toolbar's tab hides the toolbar again.

Toolbar icons

Run mode icon enables you to change the operating mode of the analyzer. Touching the icon takes you to the run mode dialog box without interrupting the current sample.

Setup icon enables you to modify the settings of the analyzer. Touching the icon takes you to the setup dialog box, which contains navigation icons, without interrupting the current sample.

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Bottle mode icon enables you to enter bottle mode. Touching the icon takes you to the bottle mode dialog box without interrupting the current sample.

Alarm acknowledge icon enables you to review and acknowledge current or unacknowledged alarms. If no alarms are present, the icon is gray. Touching the icon takes you to the alarm review dialog box and displays all unacknowledged alarms without interrupting the current sample.

Diagnostics icon enables you to check the health of the analyzer. Touching the icon takes you to the diagnostics dialog box without interrupting the current sample. The icon changes states to display warning conditions.

Data review icon enables you to view the information from the log file. Touching the icon takes you to the data review dialog box without interrupting the current sample.

Sign on/off icon enables you to sign onto the analyzer to modify or change the operation, or sign off of the analyzer to prevent changes, without interrupting the current sample. If no user is signed on, the sign on icon is present. Touching the icon when no one is signed on takes you to the sign on dialog box, where you may enter your user ID and password. If you are already signed on, the sign off icon is present. Touching the icon when you are signed on signs you off. While you are logged off, you have view-only access to all dialog boxes except user security, factory setup, and audit trail. but you can issue print commands.

Home screen data views

Home screen data views consist of a display with current, log view, and graph tabs. You may switch from tab to tab without interrupting the current sample. See Figure 3-2.

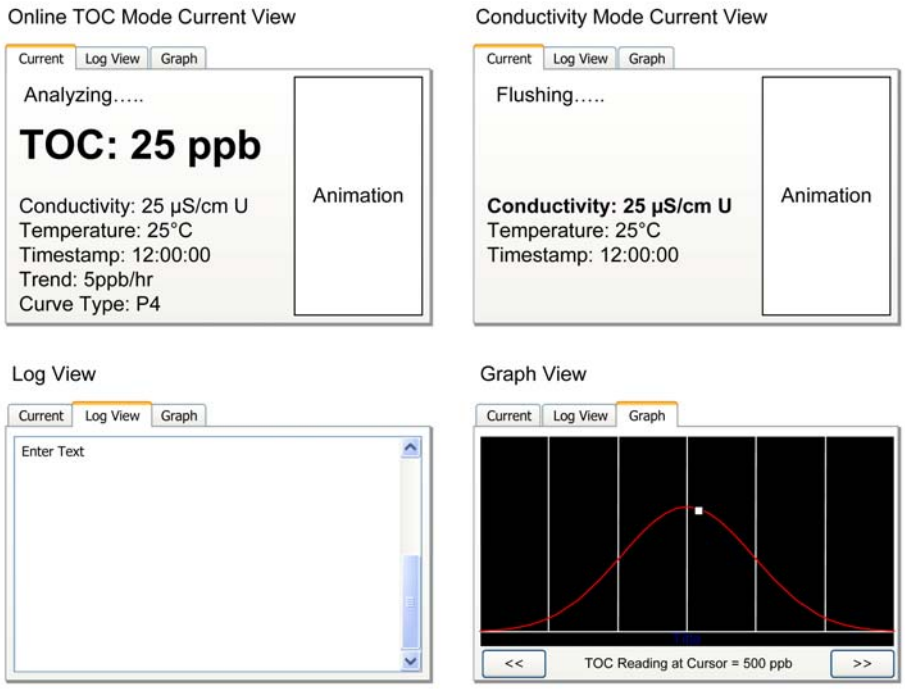

Figure 3-2 Home screen data views

Date and time displays the current date and time in ISO format. Depending on the current time format setting, the date and time is in 24-hour format (yyyy-mm-dd hh:mm:ss) or 12-hour format (yyyy-mm-dd hh:mm:ss AM/PM). The date and time are set in the setup dialog box.

Bottle displays the current state of the bottles in the sample cartridge. There are three states for this indicator (no bottles loaded, bottles loaded, or bottles empty). Touching this graphic takes you to the bottle mode dialog box.

Status indicator displays the current alarm status.

- Green indicates the analyzer is operating properly.
- Yellow indicates the analyzer has experienced a warning condition.
- Red indicates the analyzer has experienced an error or alarm condition.
- Flashing red indicates the analyzer has experienced a fatal error.

Current tab

The home screen displays the last reading for TOC or conductivity, depending on the selected analysis mode. In all modes except standby, conductivity and clean, the current tab displays the last readings for TOC, conductivity, temperature, curve type, and the time of the last reading. It displays the current analysis state and trend for TOC readings. See Figure 3-3.

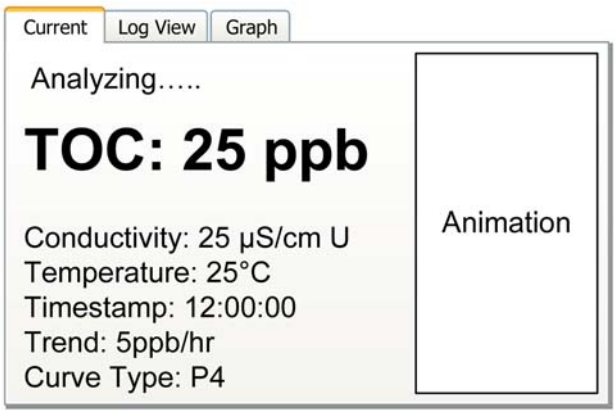

Figure 3-3 Home screen current tab

Process animation displays the current state of the analysis as an animated graphic. There are four possible states: idle, flushing, analyzing, reporting, and error conditions. Analysis results are displayed until a new analysis is complete. It displays the last readings for conductivity, temperature, and the time of the last reading. It displays the current state as flushing.

Operation mode displays the selected mode of the analyzer. The choices for operation mode are online TOC, conductivity, standby, offline, and online manual TOC in upper left corner of home screen.

Analysis state displays the current state (idle, flushing, analyzing, or reporting) in text.

TOC displays the last TOC reading as “TOC: X.X ppb”. The range of this value is 0.5 to 2000 ppb. If the value exceeds 2000, “Over limit” is displayed.

Conductivity displays the last conductivity reading as “Conductivity: X.XX µS/cm” for compensated conductivity and “Conductivity: X.XX µS/cm U” for uncompensated conductivity. If resistivity is selected, it is displayed as “Resistivity: X.XX M-cm” for compensated resistivity. The home screen displays conductivity or resistivity, depending on the current setting of the display units set in the setup dialog box.

Temperature displays the last temperature reading in “Temperature: X.X °C” or “Temperature: X.X °F”, depending on the current setting of the temperature units set in the setup dialog box.

Timestamp displays the time of the last reading as “Timestamp: hh:mm:ss” in 24-hour format.

Trend displays the TOC trend over the last hour as “Trend: +/-X ppb/hr”.

Curve type displays the curve type for the last TOC reading as “Curve Type: X” where X can be one of four types (P1, P2, or P3).

Log view tab

The log view tab displays all analysis readings or events as they would appear on the printout. The log view displays all data since the analyzer was powered on up to the last 72 hours. See Figure 3-4.

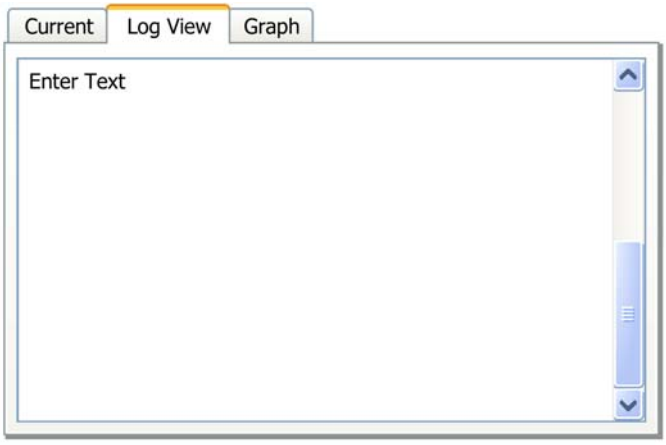

Figure 3-4 Home screen log view tab

Graph tab

The graph tab displays past data values. In all modes except conductivity, the graph displays TOC values. In conductivity mode, the graph displays averaged conductivity values. These values is averaged over the last 30 minutes. See Figure 3-5.

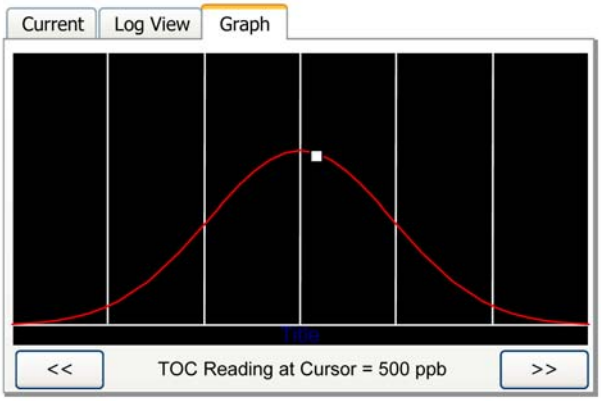

Figure 3-5 Home screen graph tab

Scroll icons move the graph cursor one point to the left or right.

Data values text label displays the TOC value, conductivity, temperature, timestamp, trend, and curve type for the current cursor position.

Chapter 4 Run modes

4.1 The analysis cycle

An analysis cycle is comprised of a flush of the analysis cell, oxidation, and idle time (if the cycle time is greater than the combined flush and oxidation time).

Oxidation time varies based on the amount of total organic carbon in the sample. Flush time is fixed and idle time varies to allow for varying analysis cycle time. See Figure 4-1.

Idle time occurs only after an online TOC analysis has been completed and only if the elapsed time has not exceeded the value for cycle time.

- If conductivity was selected during idle, the analyzer reports conductivity during the idle time.
- If no conductivity was selected, the analyzer verifies the lamp is off and opens the bypass valve.

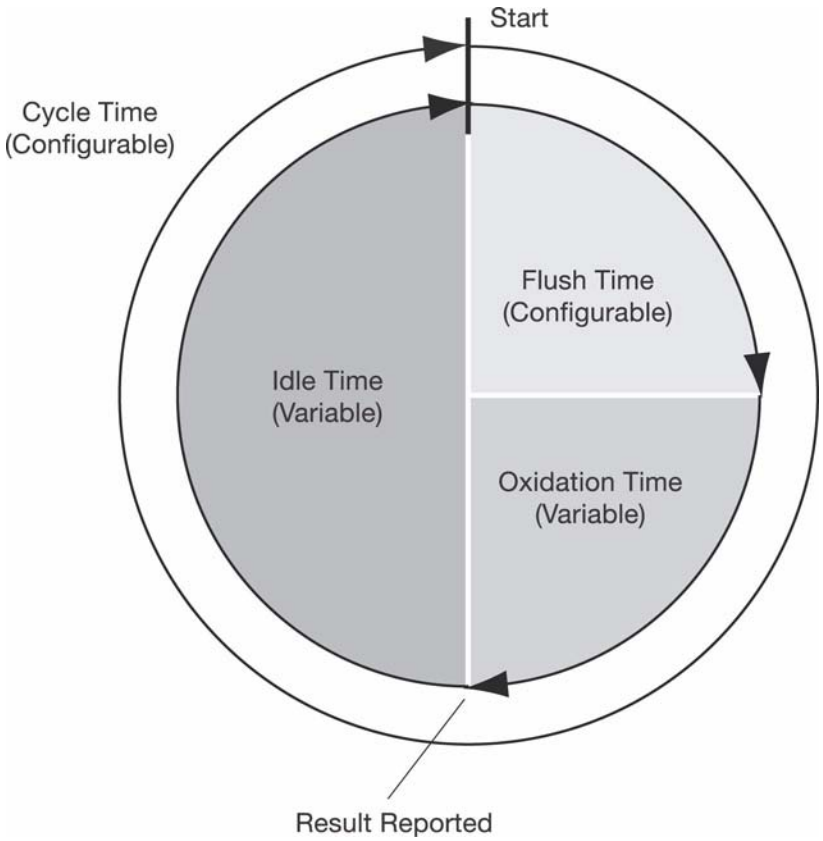

Figure 4-1 The TOC analysis cycle

CAUTION

Using the sample pump on a pressurized system could damage the pump.

Do not use the pump on a pressurized system.

In online TOC mode, the cell valve opens to flush the cell.

- If you are sampling from a zero pressure system, you need to enable the pump option to draw water into the cell. In this case, the pump valve must be opened and the pump started for every action that requires drawing water through the cell. The analyzer continues to flush until the elapsed time is equal to the time value that has been set in the setup dialog box. The cell valve is then closed to capture the sample.
- The analysis is started and conductivity and temperature readings are fed into the TOC algorithm. Conductivity is monitored until oxidation is complete.
- When oxidation is complete, the analyzer reports the results to the home screen and the printer if connected. It then checks to see if the elapsed time is greater than or equal to the value for cycle time in settings. If it is, the next online TOC analysis is started. Otherwise, it enters the idle mode.

4.2 Conductivity mode

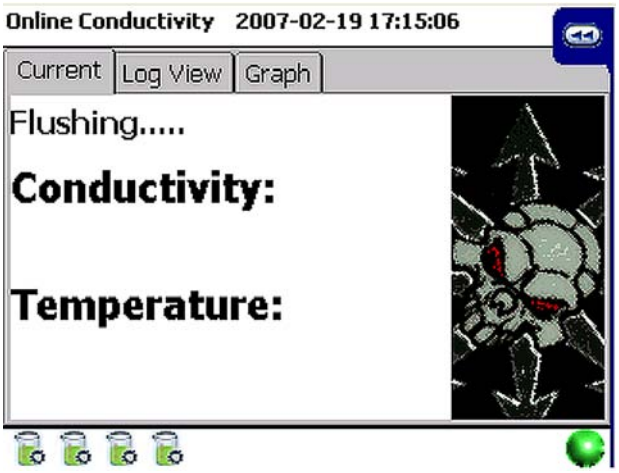

Figure 4-2 Conductivity mode

In conductivity mode, the analyzer starts by verifying the lamp is off and the cell valve is open to flush the cell. The analyzer reports the current readings for conductivity and temperature to the main display every time a new value is available. The reported value is an average of the data for over the last two seconds. The average reading will also be sent to the printer, based on the printout settings, and the data log.

Standby

In standby, the analyzer verifies the lamp is off and all the valves are open. Standby mode must be terminated by switching to another mode.

Offline

In offline mode, the analyzer verifies the lamp is off and the valves are closed.

4.3 Clean

Figure 4-3 Clean mode

In clean mode, the analyzer starts by setting the elapsed time to 0, opening the cell valve to flush the cell, and turning the lamp on. If timed operation was selected for this mode, the analyzer will display a countdown timer on the dialog box. Otherwise, the elapsed time is displayed. A stop icon will also be displayed on this dialog box to enable you to terminate the operation. The analyzer will remain in this state until the countdown timer reaches 0, you manually stops the operation, or the analyzer is switched to another mode by schedule or by digital control. Touching the stop icon immediately returns you to the home screen and starts operating in its normal mode.

Chapter 5 Setup

5.1 Setup dialog box

The setup dialog box enables you to navigate and change analyzer settings. Accessing this dialog box does not interrupt the current operation. See Figure 5-1.

Figure 5-1 Setup dialog box

5.2 TOC

The TOC icon enables you to modify the settings for the TOC operating mode. Any changes are stored in the settings file and become the defaults.

General

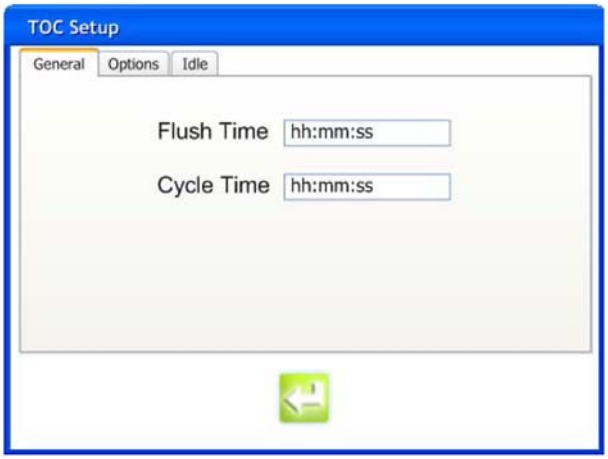

Figure 5-2 TOC setup dialog box, general

Flush time text box enables you to specify the amount of time to flush the cell prior to beginning a TOC analysis. You may specify a time in hh:mm:ss format between 00:00:00 and 23:59:59. The default value is 00:01:00.

Cycle time text box enables you to specify the minimum amount of time to between automatic TOC analyses. Any value less than the actual elapsed time causes the next analysis to begin immediately. You may specify a time in hh:mm:ss format between 00:00:00 and 23:59:59. The default value is 00:00:00.]

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail. All changes take effect on the next change of state.

Options

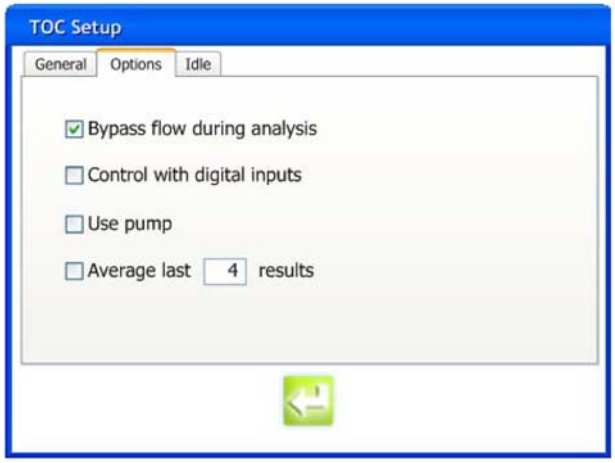

Figure 5-3 TOC dialog box, options

Bypass flow during analysis checkbox enables you to enable or disable bypass flow. If enabled, the bypass flow valve opens at the beginning of the flush. If disabled, this valve remains closed. The default setting is enabled.

Control with digital inputs checkbox enables you to control the mode of the analyzer through the use of two digital inputs. The default setting is disabled. If enabled, the analyzer enters the mode defined by digital2.

- If digital2 is high, the analyzer enters online TOC analysis mode. If digital2 is low, the analyzer enters conductivity mode.
- A high to low state transition on digital1 aborts the current operation and immediately run a single TOC analysis. The analysis runs to completion regardless of whether subsequent trigger values are received. Once the analysis is complete, the analyzer return to the mode defined by digital2.

Use pump checkbox determines whether or not to use the pump for online sampling. You may enable or disable this option. If enabled, the analyzer turns the pump on any time water needs to be drawn from the online water source to the cell. If disabled, the analyzer does not use the pump for this action. Due to the potential risk of damage to the pump by using it with a positive touchure water source, enabling this option displays a message asking you to confirm this choice. The default setting for this option is disabled.

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Average results checkbox averages the last X TOC analyses. The averaged value is displayed on dialog box and logged to the data log. The default value is disabled.

Number of values to average text box enables you to specify the number of values to use in the average. You may enter a value between 2 and 50. The default value is 4.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail. All changes take effect on the next change of state.

Idle

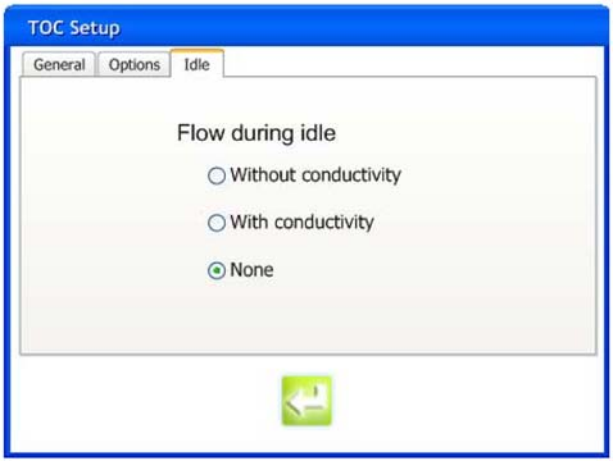

Figure 5-4 TOC dialog box, idle

Flow during idle option icons enables you to select what state the analyzer should enter while waiting for the next analysis to begin. You may select without conductivity, with conductivity, or none (default). If without conductivity is selected, the analyzer closes all valves except the cell valve and does not report conductivity. If with conductivity is selected, the analyzer closes all valves except the cell valve and reports conductivity and temperature once per minute. If none is selected, the analyzer closes all valves and does not report conductivity or temperature.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail. All changes take effect on the next change of state.

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5.3 System

The system icon enables you to modify system settings for the analyzer.

General

Figure 5-5 System dialog box, general

Analyzer name text box enables you to specify the analyzer name used in the system. You may enter between 1 and 13 alphanumeric or symbol characters. The default value is “Sensor”.

Language drop down list box enables you to select the language to use for all you interfaces. You may select from English, French, German, Italian, or Spanish.

- Selecting a different language changes the operating system setting in the registry. When the system is rebooted, the new setting takes effect. The default selection is English.
- For Japanese and Chinese translations, this control is disabled. In these cases, the appropriate operating system must be loaded, which loads the appropriate user interfaces.

Restore factory defaults icon enables you to reset all the system options back to their factory defaults.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail. All changes take effect on the next change of state.

Display

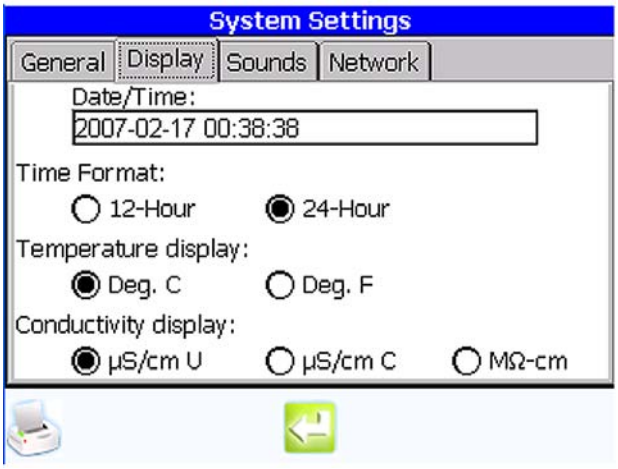

Figure 5-6 System dialog box, display

Date text box enables you to specify the date to be used in the system. You may enter any valid date in “yyyy-mm-dd” format. The default value is 2007-01-01.

Time text box enables you to specify the time to be used in the system. You may enter any valid time in “hh:mm:ss” or “hh:mm:ss tt” format. The format used is based on the selected time format. The default value is 12:00:00.

Time format text box enables you to select the time format to be used in the system. You may select from 12 or 24-hour format. Selecting one of the formats changes the value displayed in the time box. The default selection is 24-hour format.

Temperature display drop down list box enables you to select the format for displaying temperature values. You may select °C and °F. The default value is °C.

Conductivity display drop down list box enables you to select the format for displaying conductivity values. You may select conductivity uncompensated µS/cm, conductivity compensated µS/cm, or resistivity M-cm. The default value is conductivity uncompensated. If the conductivity alarm option has been selected, this control is disabled.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail. All changes take effect on the next change of state.

Sounds

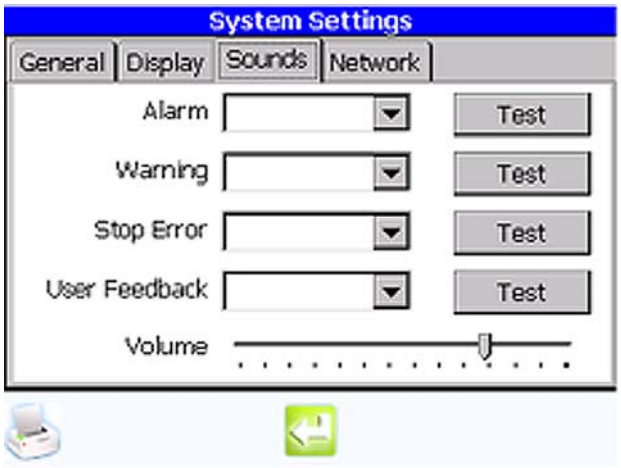

Figure 5-7 System dialog box, sounds

Sound selection drop down list box enables you to select one of the system sounds to be associated with a certain alarm type. The default sounds are determined during development.

Test icon plays the selected sound for the corresponding alarm.

Volume slider controls the level of the volume. Moving the slider to the right increases the volume and moving it to the left decreases the volume. The default setting is determined during development.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail. All changes take effect on the next change of state.

Network

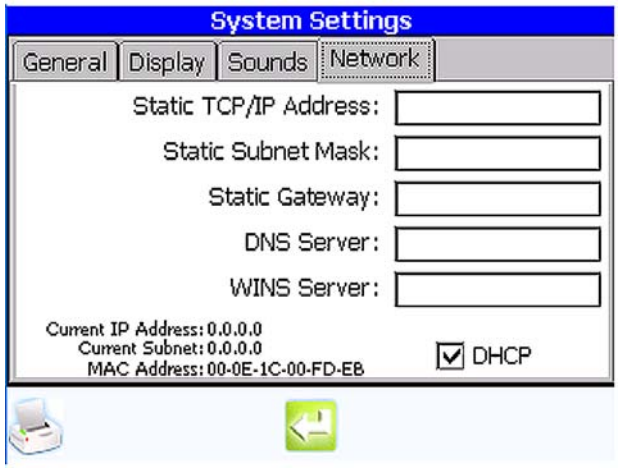

Figure 5-8 System dialog box, network

TCP/IP address text box sets the TCP/IP address for the analyzer. You may specify a value between 0 and 255 for each octet. The default value is 192.168.0.1.

Subnet mask text box sets the subnet mask for the analyzer. You may specify a value between 0 and 255 for each octet. The default value is 255.255.255.0.

Default gateway text box sets the default gateway for the analyzer. You may specify a value between 0 and 255 for each octet. The default value is blank.

DNS server text box sets the DNS server address for the analyzer. You may specify a value between 0 and 255 for each octet. The default value is blank.

WINS server text box sets the WINS server address for the analyzer. You may specify a value between 0 and 255 for each octet. The default value is blank.

DHCP check box enables you to enable or disable DHCP. When enabled, the TCP/IP address, subnet mask, and default gateway entries are disabled. The default setting is enabled.

MAC address label displays the MAC address for the analyzer.

Print icon enables you to print the current system settings. Touching this icon sends a formatted report to the serial printer.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail. All changes take effect immediately.

5.4 Alarms

The alarms icon enables you to enable or disable TOC and conductivity alarms on the system.

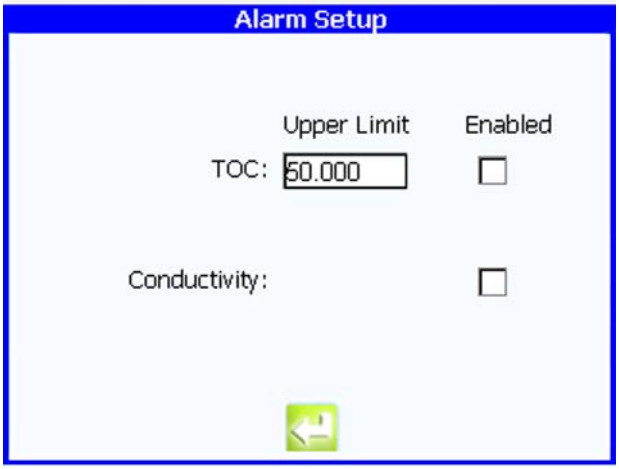

Figure 5-9 Alarm dialog box

TOC alarm limit text box enables you to set the alarm limit for the TOC measurement. You may enter a value between 0 and 3000. The default value is 50.

TOC enabled checkbox enables you to enable or disable the TOC alarm. If enabled, any TOC reading that exceeds the value in the alarm limit box triggers a TOC alarm. If disabled, no TOC alarms are triggered. The default setting is disabled.

Conductivity enabled checkbox enables you to enable or disable the conductivity alarm. If enabled, any conductivity reading that exceeds the value in Table 2 Conductivity Alarm Limits2 for the current temperature triggers a conductivity alarm. If disabled, no conductivity alarms are triggered. The default setting is disabled. If you enable this alarm but do not have uncompensated conductivity selected for conductivity display, refer to section Conductivity display. A warning message is displayed asking if you want to change this value. Selecting yes changes the conductivity display value and disable it, and enable the conductivity alarm. Selecting no leaves the conductivity alarm checkbox unchecked.

Table 5-1 Conductivity alarm limits

Temperature (°C)	Uncompensated Conductivity (µS/cm)	Temperature (°C)	Uncompensated Conductivity (µS/cm)
0	0.6	55	2.1
5	0.8	60	2.2
10	0.9	65	2.4
15	1.0	70	2.5
20	1.1	75	2.7
25	1.3	80	2.7
30	1.4	85	2.7
35	1.5	90	2.7
40	1.7	95	2.9
45	1.8	100	3.1
50	1.9		

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail.

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5.5 Printer

The printer icon enables you to configure the printer settings for the analyzer.

TOC

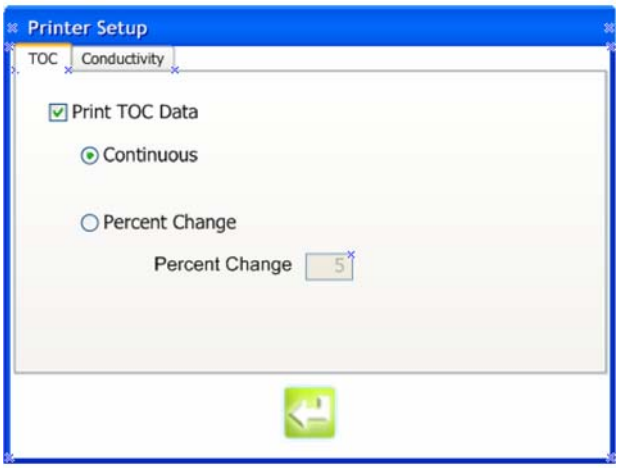

Figure 5-10 Printer dialog box, TOC

Print TOC checkbox enables or disables the automatic printing of TOC data. The default setting is enabled. If disabled, all other settings are also disabled.

TOC frequency radio buttons determine how frequently to print a TOC value. You may select continuous or percent change. Selecting continuous generates a TOC printout at the end of each analysis. This selection disables the percent change text box. Selecting percent change generates a TOC printout only when the change in TOC level between successive analyses exceeds the value in the percent change box. This selection enables the percent change text box. The default setting is continuous.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail.

Conductivity

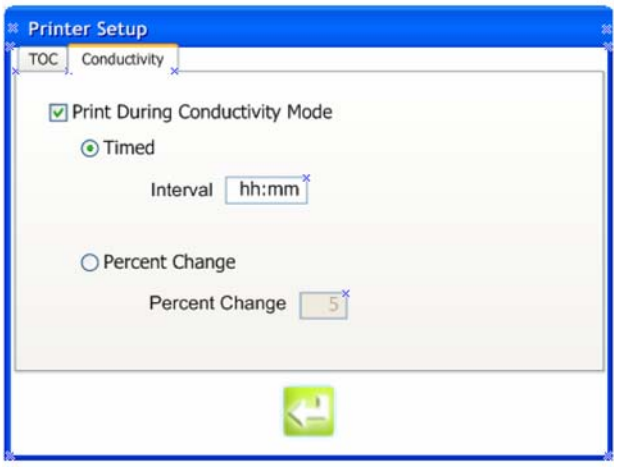

Figure 5-11 Printer dialog box, conductivity

Print during conductivity mode checkbox enables or disables the automatic printing of data during conductivity mode. The default setting is enabled. If disabled, all other settings are disabled.

Percent change text box appears on both the TOC and conductivity tabs but maintains the same functionality. You may enter a value between 1 and 100%. The default value is 1.

Interval text box determines how often a printout occurs when in timed mode. You may enter a value between 1 minute and 24 hours. The default value is 1 minute.

Conductivity frequency radio buttons determine how often to print a data during conductivity mode. You may select timed or percent change. Selecting timed generates a printout at the interval specified in the interval text box. This selection disables the percent change text box. Selecting percent change generates a printout only when the change in conductivity between successive analyses exceeds the value in the percent change box. This selection disables the Interval text box. The default setting is percent change.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail.

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5.6 Security

The security icon enables you to modify the security settings for the system.

General

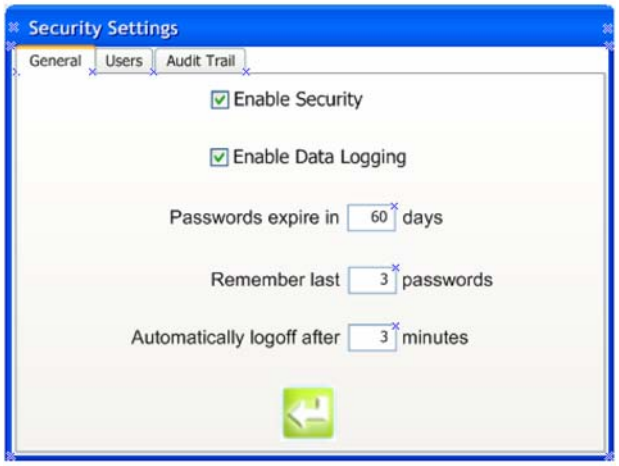

Figure 5-12 Security settings dialog box, general

Enable security checkbox enables you to enable or disable the analyzer's security system. When enabled, you are required to sign on prior to making changes in the analyzer. When disabled, you are not required to sign on. Disabling the analyzer's security system disables the audit trail and all controls on this dialog box except the enable data logging checkbox. The default setting is disabled.

Enable data logging checkbox enables you to enable or disable data logging. When enabled, all data are automatically stored to the analyzer's internal data buffer. When disabled, no data are saved. The default setting is enabled.

Password expiration text box enables you to set the number of days a user's password may be used before it must be changed. You may enter a value between 30 and 365 or 0. Entering a 0 disables this feature. The default value is 60.

Password history text box enables you to set the number of passwords to keep in memory to prevent a user from using an old password. You may enter a value between 0 and 5. The default value is 3.

Automatic logoff text box enables you to set the number of minutes of inactivity before auto logoff. You may enter a value between 0 and 60 minutes. A setting of 0 disables this feature. The default value is 1.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail.

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Users

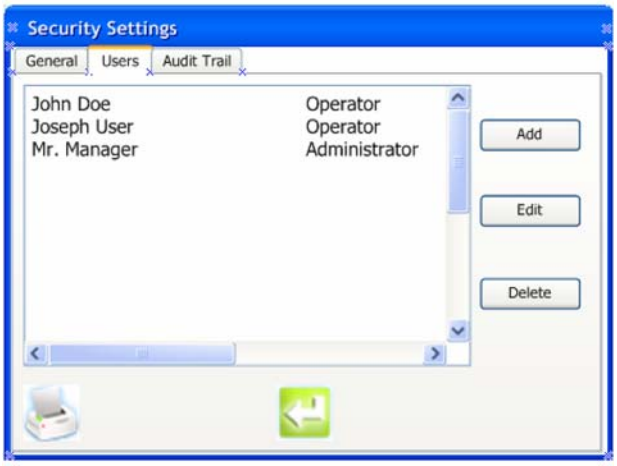

Figure 5-13 Security settings dialog box, users

User rights. There are four different user types who can access the system: guest, operator, administrator, and factory. Only operator users may be added or deleted from the system.

- **Guest.** This user type is any user who is not logged on to the system. This user may access most areas and view information but is not allowed to modify any settings or initiate any operations. Guests have no access to the security settings dialog box.
- **Operator.** This user type has full access to most dialog boxes. Operators have no access to the security settings dialog box and read-only access to the factory dialog box.
- **Administrator.** This user type has full access to most dialog boxes. Administrators have read-only access to the factory dialog box.
- **Factory.** This user type has full access to all dialog boxes.

User list list box lists all users configured to use this analyzer. By default, two users appear in the list (the administrator and the factory users). The default administrator entry has a user name of “Administrator”, a user ID of “Admin”, and a password of “123456”. The default factory entry has a user name of “Factory User”, a user ID of “Factory”, and a password of “DIAMOND”. You may add up to 10 additional users to this list.

Add user icon enables you to add a user to the system. Touching this icon opens the edit user dialog box.

Edit user icon enables you to edit an existing user in the system. You must first select a user from the list. If no user is selected when this icon is touched, an error message appears. Otherwise, the edit user dialog box appears. See Figure 5-14.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail.

Edit user

Figure 5-14 Edit user dialog box

User full name text box enables you to type up to 15 alphanumeric or symbol characters. The default value is blank.

Password enables you to type up to 15 alphanumeric or symbol characters. The default value is blank.

- If the entered user ID and password match existing entries in the user's list, you are signed on and returned to the home screen.
- If the entered user ID and password don't match existing entries in the user's list, an error message is displayed and you may try again.

Retype password text box enables you to verify the new password. This box is normally disabled. You may enter a value between 5 and 15 alphanumeric or symbol characters. This field is case sensitive. The default value is blank. When you enter a character, only the * symbol appears for each key touch.

Change password checkbox forces you to change your password the next time you log on. The default setting for this option is unchecked. Any time the password entry is modified, this option is automatically checked.

OK icon returns you to the security settings dialog box and saves the changes. You ID and user name must be unique. Any changes are noted in the audit trail.

- If a change was made to the password, both passwords in the password and confirm password boxes must match. The new password may not be the same as any of the passwords in the password history list.
- A changed password triggers an entry in the audit trail but does not list the old or new password. The new password is converted to an MD5 hash. The new password and date are added to the password history list.

Cancel icon returns you to the security settings dialog box. All changes are discarded and no entries are made in the audit trail.

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Audit trail

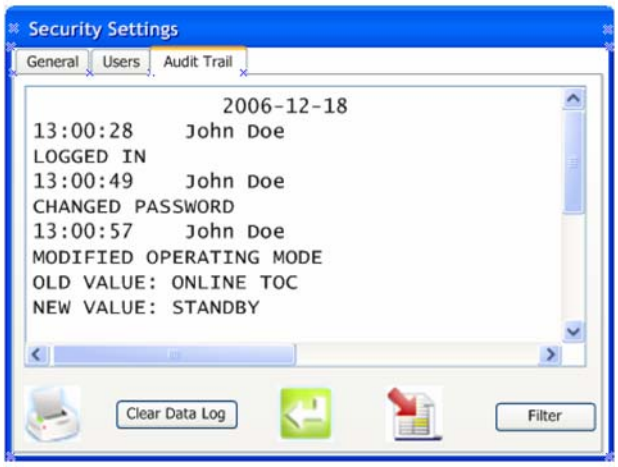

Figure 5-15 Security settings dialog box, audit trail

Delete user icon enables you to delete an existing user from the system. You must first select a user from the list. If no user is selected when this icon is touched, an error message appears. Touching this icon with a user selected displays an “are you sure?” message. If you selects “yes”, the selected user is deleted and an entry is made in the audit trail. If you touches “no”, you are returned to the security settings dialog box. The administrator and factory users may not be deleted.

Print security settings icon prints the security settings and user accounts. The factory user cannot be printed on this report.

Audit trail display list box lists the filtered audit trail data. The list box uses a fixed width font and must be capable of displaying up to 40 characters on a line. See Figure 5-16.

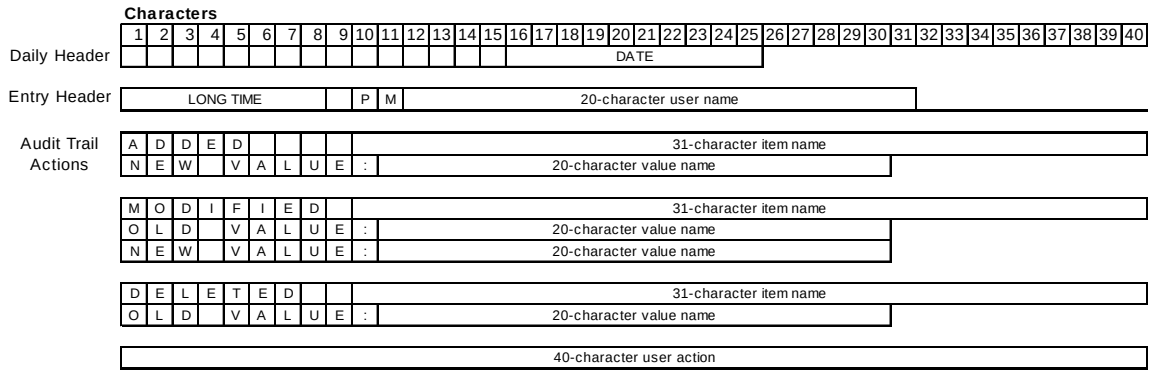

Figure 5-16 Audit trail display

- **Daily header** is displayed once per day preceding the first entry and at the change from one day to the next. The header is center justified. A blank line follows each daily header.
- **Entry header** is displayed at the beginning of each audit trail entry. It consists of the time of the entry in long format (hh:mm:ss) and you name of the person associated with the entry. If the analyzer time is configured for 24-hour format, the AM/PM entry is blank.
- **Audit trail actions** follow the entry header. There are four types of entries possible for this section (data added, data modified, data deleted, or user action).
  - For the data added type, the keyword “Added” is displayed followed by four spaces and the item name. The next line contains the keyword “New Value:” followed by the value name. A blank line follows this section.
  - For the data modified type, the keyword “Modified” is displayed followed by one space and the item name. The next line contains the keyword “Old Value:” followed by the value name. The next line contains the keyword “New Value:” followed by the value name. A blank line follows this section.
  - For the data deleted type, the keyword “Deleted” is displayed followed by two spaces and the item name. The next line contains the keyword “Old Value:” followed by the value name. A blank line follows this section.
  - For you action type, your action is displayed. A blank line follows this section.

Print icon sends the filtered audit trail data to the printer.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail.

Export

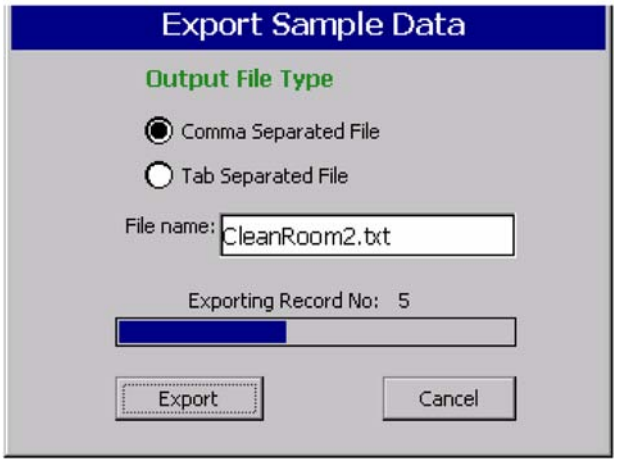

Figure 5-17 Export sample data

Output file type radio buttons enable you to specify the separator to be used between the data values that will be exported to a USB memory stick (“thumb drive”). You may select comma separated or tab separated. When the file is exported, the selected separator is placed between data values. The default selection is tab separated.

File name text box enables you to specify the file name to use when saving the data. You may specify a 20-character file name including the extension. The default file name is the analyzer name with the .txt extension. If you has not specified an analyzer name, “AU643PATExport_AuditTrail.txt” is used.

Progress bar displays the progress of the export.

Export icon starts the export. Before the export may begin, the analyzer must verify there is data to export, you has entered a valid file name, and a USB memory stick is available. The file is written to the root folder of the memory stick. If the file already exists on the memory stick, you are asked if you want to overwrite this file.

Close icon returns you to the audit trail dialog box.

Clear data log icon clears the entire data log. Touching this icon causes a message to appear asking you to confirm this choice.

Filter data

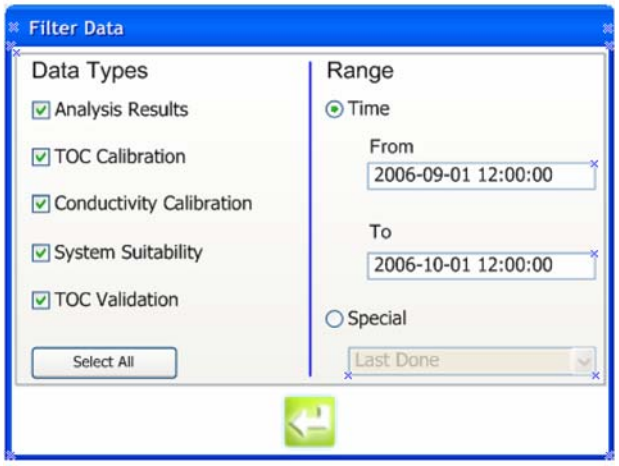

Figure 5-18 Filter data dialog box

From/to date and time range text box. Only audit trail entries that fall between the from and to date and time ranges are displayed in the audit trail display. Any valid date and time may be entered. The from date and time must be earlier than the to date and time. The default entries for these controls are the last 24 hours. These settings are not be retained once you exit the security dialog box.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail.

5.7 Calibration

The calibration icon enables you to enter the cell and thermistor coefficients for the analyzer and view the TOC and conductivity calibration factors.

Cell

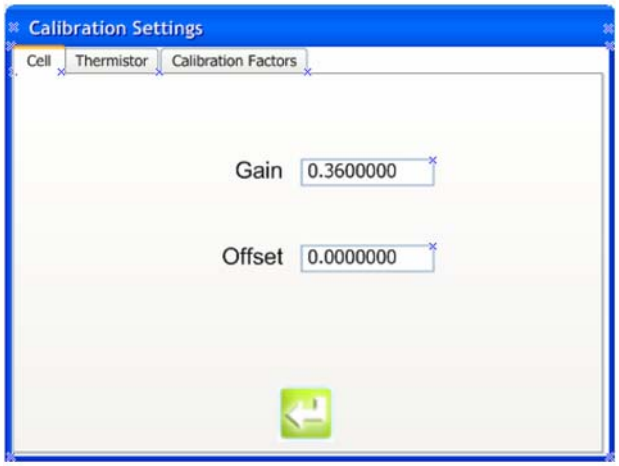

Figure 5-19 Calibration dialog box, cell

Gain text box enables you to enter the cell gain. You may enter a value between 0.0000000 and 1.0000000. The default value is 0.3600000.

Offset text box enables you to enter the cell offset. You may enter a value of –0.5000000 to 0.5000000. The default value is 0.0000000.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail.

Thermistor

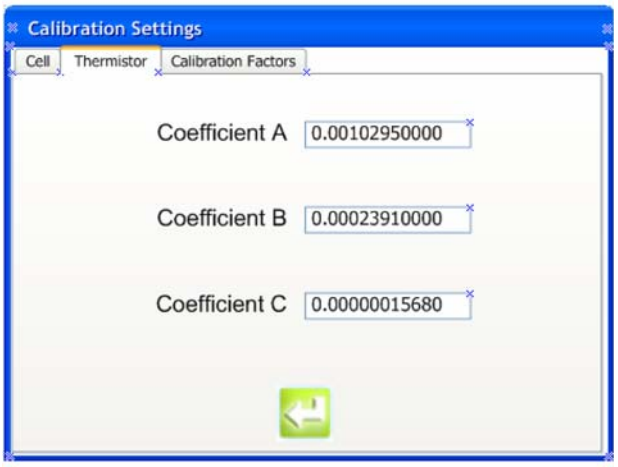

Figure 5-20 Calibration dialog box, thermistor

Coefficient A text box enables you to enter the thermistor A coefficient. You may enter a value between 0.00000000000 and 1.00000000000. The default value is 0.00102950000.

Coefficient B text box enables you to enter the thermistor B coefficient. You may enter a value between 0.00000000000 and 1.00000000000. The default value is 0.00023910000.

Coefficient C text box enables you to enter the thermistor C coefficient. You may enter a value between 0.00000000000 and 1.00000000000. The default value is 0.00000015680.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail.

Calibration factors

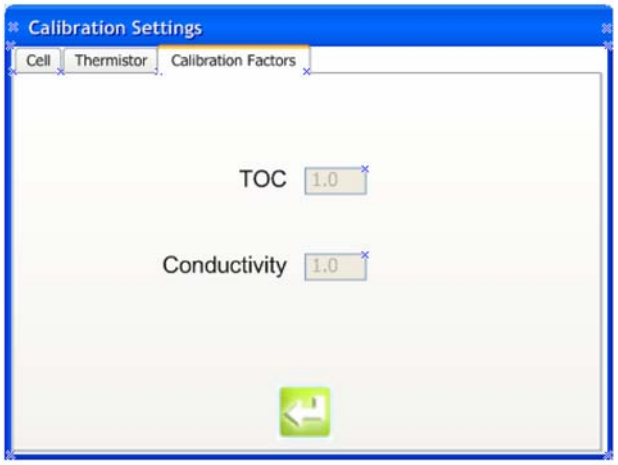

Figure 5-21 Calibration dialog box, factors

TOC calibration factor text box (read only) enables you to view the TOC calibration factor. This value is updated after performing a TOC calibration. The default value is 1.0.

Conductivity calibration factor text box (read only) enables you to view the conductivity calibration factor. This value is updated after performing a conductivity calibration. The default value is 1.0.

OK icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail.

Cancel icon returns you to the setup dialog box but does not save the changes. All values revert back to the values stored in the settings file.

Return icon returns you to the setup dialog box and saves the changes. Any changes are noted in the audit trail.

5.8 Analogs

The analogs icon enables you to configure analog outputs for the system.

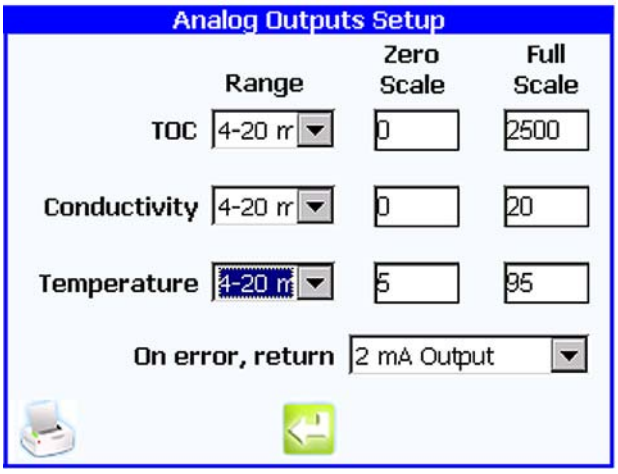

Figure 5-22 Analog outputs setup dialog box

Range drop down list box. All three outputs have the same choices for this setting. This setting enables you to set the minimum and maximum current levels for the output. You may select 0-20 mA or 4-20 mA (default).

TOC zero scale text box sets the TOC reading that corresponds to the lowest output for the selected range. You may enter a value between 0 (default) and 2499 ppb. The zero scale value must be lower than the full-scale value.

TOC full scale text box sets the TOC reading that corresponds to the highest output for the selected range. You may enter a value between 1 and 2500 ppb (default). The full-scale value must be higher than the zero scale value.

Conductivity zero scale text box sets the conductivity reading that corresponds to the lowest output for the selected range. You may enter a value between 0 (default) and 19 µS/cm. The zero scale value must be lower than the full-scale value.

Conductivity full scale text box sets the conductivity reading that corresponds to the highest output for the selected range. You may enter a value between 1 and 20 µS/cm (default). The full-scale value must be higher than the zero scale value.

Temperature zero scale text box sets the temperature reading that corresponds to the lowest output for the selected range. You may enter a value between 5 (default) and 94 °C. The zero scale value must be lower than the full-scale value.

Temperature full scale text box sets the temperature reading that corresponds to the highest output for the selected range. You may enter a value between 6 and 95 °C (default). The full-scale value must be higher than the zero scale value.

On error setting drop down list box determines what value the analyzer outputs when an error condition is encountered. You may select from 2 mA Output (default), Last Output, or 22 mA Output.

Print icon enables you to print the current system settings.

Return icon returns you to the setup dialog box and saves any changes. Any changes are noted in the audit trail.

5.9 Bottle

The bottle icon enables you to configure auto acceptance and test completion criteria for scheduled bottle mode operations.

TOC calibration

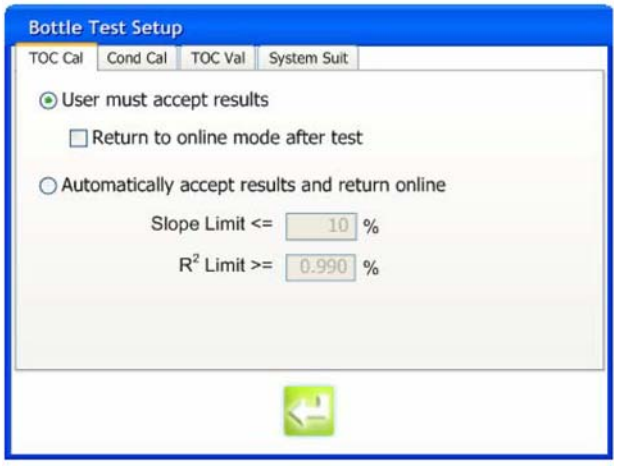

Figure 5-23 Bottle text setup dialog box, TOC calibration

Auto accept results radio buttons determine whether the outcome of the test should be manually or auto accepted. You may select manual (default) or auto acceptance.

- When manual acceptance is selected, the results of the calibration will not be used until you accepts them. The return online function will be enabled. All other options will be disabled.
- When auto acceptance is selected, the results of the calibration will be accepted or rejected based on the slope and R^2 limit options. The slope and R^2 limit options will be enabled. All other options will be disabled. If the calibration is accepted, the new calibration factors will be used.

Return online checkbox tells the analyzer to return to online mode following the TOC calibration. You may enable or disable (default) this option. When enabled, the analyzer will return to online mode following the TOC calibration. When disabled, the analyzer will remain in the selected idle mode.

Slope limit text box enables you to specify the acceptable limit of the slope for the calibration to pass. You may enter a value between 1 and 15%. The default value is 10%.

R2 limit text box enables you to specify the acceptable limit of the correlation coefficient for the calibration to pass. You may enter a value between 0.9000 and 0.9999. The default value is 0.9900.

Return icon returns you to the setup dialog box and saves any changes. Any changes are noted in the audit trail.

Conductivity calibration

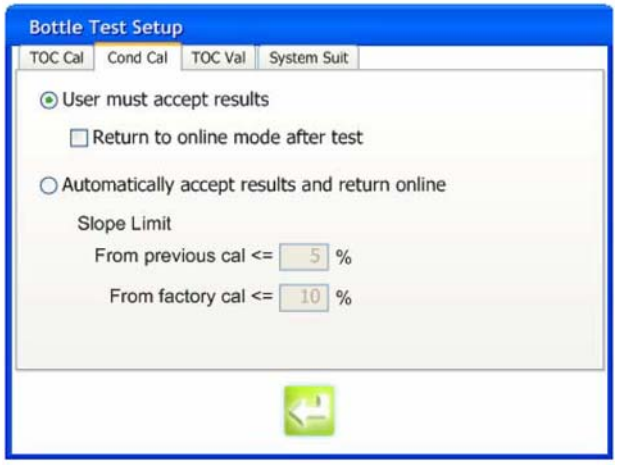

Figure 5-24 Bottle text setup dialog box, conductivity calibration

Auto accept results radio buttons determine whether the outcome of the test should be manually or auto accepted. You may select manual (default) or auto acceptance.

- When manual acceptance is selected, the results of the calibration will not be used until you accept them. The return online function will be enabled. All other options will be disabled.
- When auto acceptance is selected, the results of the calibration will be accepted or rejected based on the slope limit options. The slope limit options will be enabled. All other options will be disabled. If the calibration is auto accepted, the new calibration factors will be used.

Return online checkbox tells the analyzer to return to online mode following the calibration. You may enable or disable (default) this option. When enabled, the analyzer will return to online mode following the calibration. When disabled, the analyzer will remain in the selected idle mode.

Previous cal slope limit text box enables you to specify the acceptable percent difference between the resulting gain factor and the current value for the calibration to pass. You may enter a value between 1 and 5% (default).

Factory cal slope limit text box enables you to specify the acceptable percent difference between the resulting gain factor and the factory value for the calibration to pass. You may enter a value between 1 and 10% (default).

Return icon returns you to the setup dialog box and saves any changes. Any changes are noted in the audit trail.

TOC validation

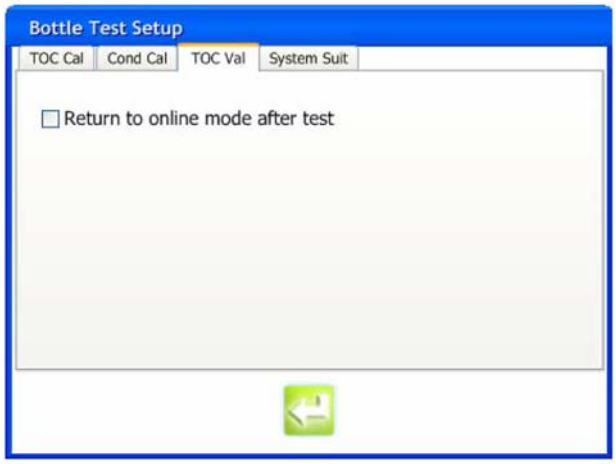

Figure 5-25 Bottle text setup dialog box, TOC validation

Return online checkbox returns you to the online mode following the validation. You may enable or disable (default) this option. When enabled, the analyzer will return to online mode following the validation. When disabled, the analyzer will remain in the selected idle mode.

Return icon returns you to the setup dialog box and saves any changes. Any changes are noted in the audit trail.

System suitability

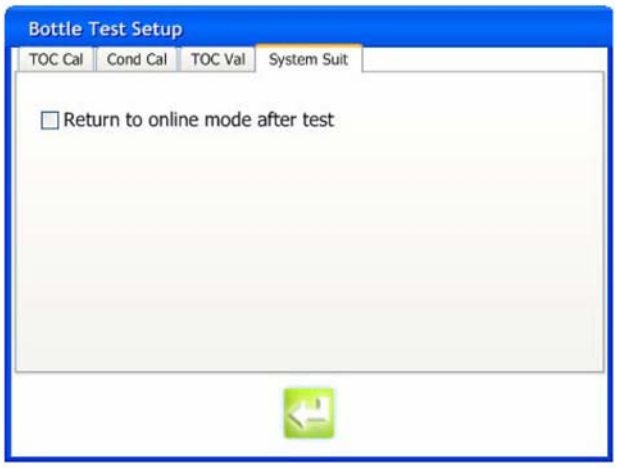

Figure 5-26 Bottle text setup dialog box, system suitability

Return online checkbox returns you to the online mode following the system suitability. You may enable or disable (default) this option. When enabled, the analyzer will return to online mode following the system suitability. When disabled, the analyzer will remain in the selected idle mode.

Return button returns you to the setup dialog box and saves any changes. Any changes will be noted in the audit trail.

5.10 Factory

The factory icon enables factory personnel to enter information that may not be changed by other users.

General

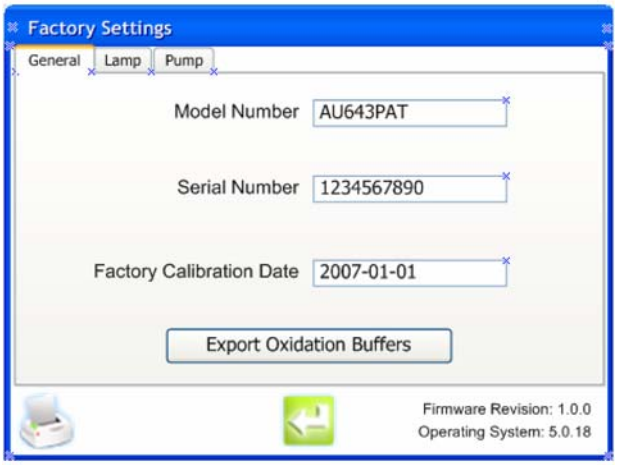

Figure 5-27 Factory dialog box, general

Model number text box enables you to enter between 1 and 10 alphanumeric or symbol characters. The default value is “PAT700”. This value is locked after initial entry.

Serial number text box enables you to enter a numeric value up to 4 characters in length. The default value is 0. This value is locked after initial entry.

Factory calibration date text box enables you to enter any valid date in ISO format, “yyyy-mm-dd”. The default value is the current system date the first time you enters this dialog box. After that, the date is retrieved from the settings file.

Export oxidation buffers icon copies all oxidation buffers (up to five) to your USB memory stick. The files are copied to a folder named Model Number + “Data” on the root of the USB memory stick. If the memory stick is not available, you are notified. If the files already exist, you are asked if you want to overwrite the files.

Return icon returns you to the setup dialog box and saves any changes. Any changes are noted in the audit trail.

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Lamp

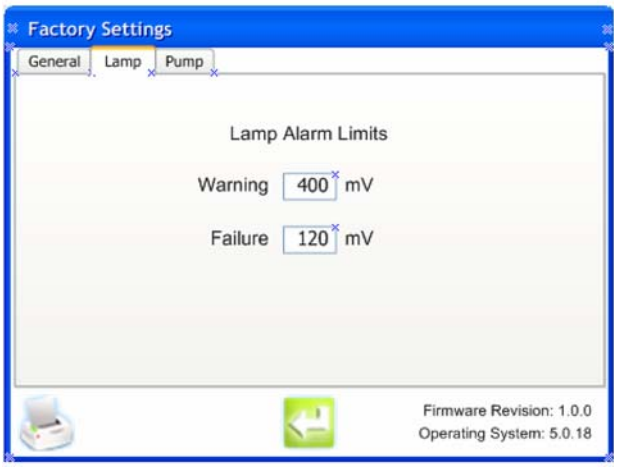

Figure 5-28 Factory dialog box, lamps

Lamp warning limit text box specifies the minimum voltage level a lamp may be measured at before it is marked as marginal. You may enter a numeric value between 0 and 1000. The default value is 400. This value may not be less than the Lamp Failure value.

Lamp failure limit text box specifies the minimum voltage level a lamp may be measured at before it is marked as failed. You may enter a numeric value between 0 and 1000. The default value is 120. This value may not be greater than the Lamp Warning value.

Return icon returns you to the setup dialog box and saves any changes. Any changes are noted in the audit trail.

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Pump

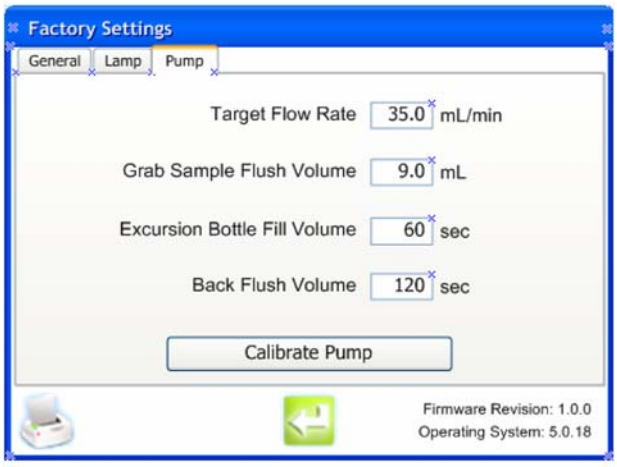

Figure 5-29 Factory dialog box, pumps

Target flow rate text box enables you to enter a numeric value between 0 and 50. The default value is 35 mL/min. Entering a value calculates the corresponding duty cycle based on the duty cycle range of 50 to 99.

Return icon returns you to the setup dialog box and saves any changes. Any changes are noted in the audit trail.

Chapter 6 Bottle mode

6.1 Introduction to bottle mode

The PAT700 Onboard Automated Standards Introduction System (OASIS™) is used for performing standards tests, grab sampling, and excursion sampling. Through the bottle mode, various bottle test functions can be selected. The OASIS is automated through the use of RFID technology (see RFID technology, page 2). When standards bottles with RFID tags are installed in the system, the analyzer uses RFID technology to read and transmit data about the standards to the analyzer. This system eliminates the need for manual data entry.

Although equipped to perform automatically using RFID tagged standards, you may also use bottles without RFID tags by manually entering the standards data when prompted by the analyzer.

Four functions are available under bottle mode: run standards, grab sample, excursion mode, and unload bottles.

6.2 Bottle mode dialog box

The bottle mode dialog box enables you to perform actions using the bottles in the sample cartridge. You may run calibrations, validations, or system suitability tests, analyze samples from a bottle, install an excursion bottle to capture a sample when a TOC measurement exceeds an alarm limit, or schedule tests to be run. See Figure 6-1.

Figure 6-1 Bottle mode dialog box

6.3 Run standards

The run standards dialog box enables you to select a set of standards to run. See Figure 6-2.

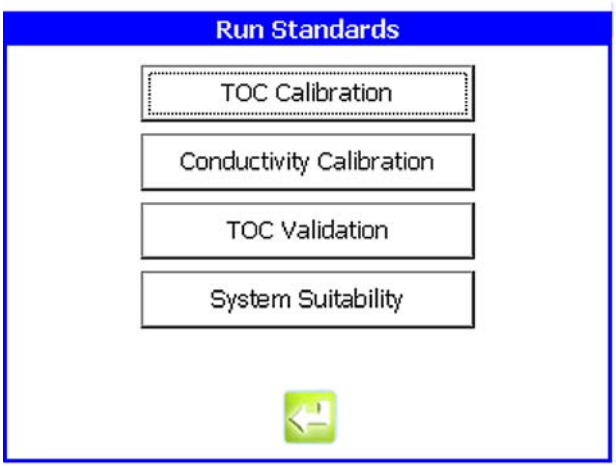

Figure 6-2 Run standards dialog box

TOC calibration icon takes you to the TOC calibration dialog box.
Conductivity calibration icon takes you to the conductivity calibration dialog box.
TOC validation icon takes you to the TOC validation dialog box.
Return icon returns you to the bottle mode dialog box.

TOC calibration setup

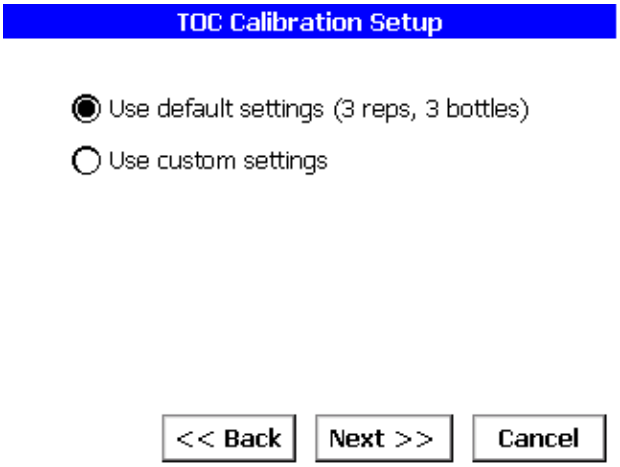

Figure 6-3 TOC calibration setup dialog box

Settings radio buttons enable you to select default settings or custom settings. The default selection is to use the default settings.

Back icon takes you back to the previous dialog box. All changes made to this dialog box are retained.

Next icon takes you to the next dialog box. If you selected default settings, you are taken to the load bottles dialog box. Otherwise, you are taken to the custom settings dialog box. All changes made to this dialog box are retained.

Cancel icon takes you to the main bottle mode dialog box. All changes made in any of the dialog boxes are lost.

Custom setup

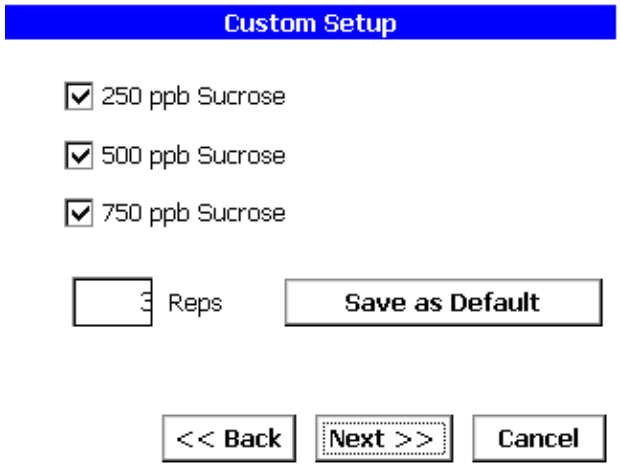

Figure 6-4 Custom setup dialog box

Bottle selection enables you to enable or disable the bottles to use in the test. The default setting for TOC calibration is all three bottles checked.

Reps enables you to specify the number of repetitions to perform on each bottle. You may enter a value between 1 and 3. The default setting for TOC calibration is 3.

Save as default icon will save the bottle selection and reps as the default setting.

Back icon returns you to the previous dialog box. All changes made to this dialog box are retained.

Next icon takes you to the load bottles dialog box. All changes made to this dialog box are retained.

Cancel icon takes you to the main bottle mode dialog box. All changes made in any of the dialog boxes are lost.

Load bottles

Figure 6-5 Load bottles dialog box

Entry. Upon entering this dialog box, the analyzer will energize the bottle door lock for 3 seconds, enabling you to open the door.

Bottle positions graphics show you the order in which to install the bottles. The bottles used in the test may vary based on your selections but the positions will always remain the same. For TOC calibration, position 1 = blank, position 2 = 250 ppb sucrose, position 3 = 500 ppb sucrose, and position 4 = 750 ppb sucrose. If a position is to be left empty, the empty graphic will appear in the place of the bottle graphic.

Unlock icon energizes the bottle door lock for 3 seconds, allowing you to open the door.

Back icon takes you to the previous dialog box.

Next icon takes you to the review test options dialog box.

Cancel icon takes you to the unload bottles dialog box. All changes made in any of the dialog boxes are lost.

Exit dialog box. The analyzer will check the RFID tags for each bottle to verify the correct bottles were loaded, they were loaded in the proper positions, and the bottles are valid. If any of the bottles are missing, you are given the option of returning to the load bottles dialog box or manually entering the bottle information.

Review test setup

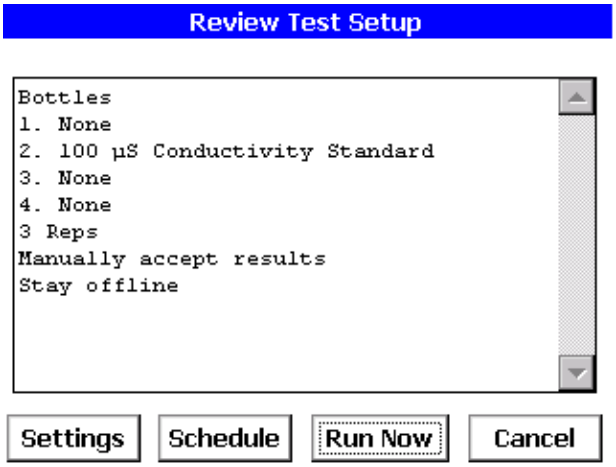

Figure 6-6 Review test setup dialog box

Test setup list box lists the bottles that are loaded, test completion actions, acceptance criteria, and schedule if applicable.

Change settings icon takes you to the bottle test settings dialog box where you can change the acceptance limits and completion actions for each test. If you are not signed on as an administrator, you are prompted to enter the administrator user ID and password. Successfully entering this information will display the dialog box. The admin logon will only be valid while you are in that dialog box. An unsuccessful logon will display an error.

Schedule icon takes you to the schedule test dialog box. All changes made in this dialog box are retained.

Run now icon takes you to the run test dialog box. All changes made in this dialog box are retained.

Cancel icon takes you to the unload bottles dialog box. All changes made in any of the dialog boxes are lost.

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Schedule test

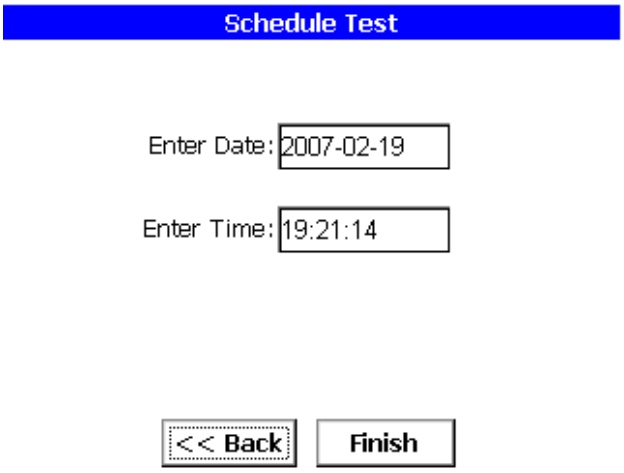

Figure 6-7 Schedule test dialog box

Date text box enables you to enter the date the test will run. The default value is tomorrow's date. You may enter any valid date from today forward.

Time text box enables you to enter the time the test will run. The default time is the current time. You may enter any valid time.

Back icon takes you to the previous dialog box. All changes made in this dialog box are retained.

Finish icon takes you back to the home screen. All changes made in any of the dialog boxes are retained and the test is scheduled to run. Prior to exiting this dialog box, the analyzer will validate the scheduled date and time is within 3 days of the current date and time. It will also validate that none of the bottles will expire prior to the scheduled date.

Run test

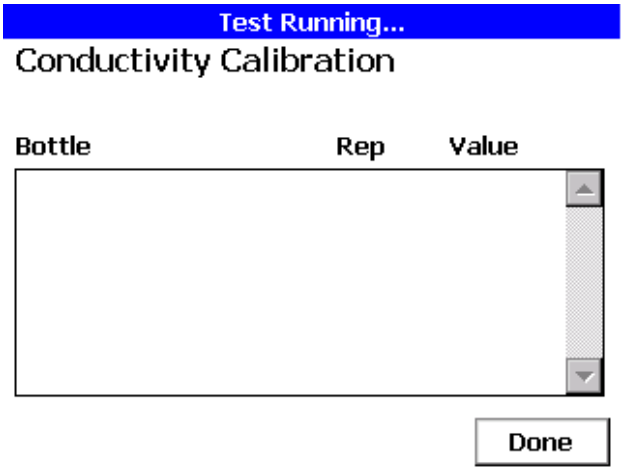

Figure 6-8 Run test dialog box

Entry. Upon entering this dialog box, the analyzer begins running the test.

Test details. The analyzer will first turn off the pump and lamp and close all the valves. It will then check the cell temperature. The cell temperature must less than or equal to 30 °C for the test to continue. The analyzer will check the cell temperature once per minute. During the cool down period, the test status label will indicate the cell is cooling down.

- After the cool down period, the analyzer will open the pump valve and the bottle 1 valve. The pump is turned on and pull XX mL plus the bottle flush volume. The pump will then be turned off and the both valves are closed. The volume information is updated on the RFID tag (if appropriate) and the bottle is marked as used. A standard TOC analysis is run on the sample.
- After the analysis is complete, the analyzer will repeat the process on the same bottle for the number of times specified in the repetitions parameter. For subsequent reps on the same bottle, the analyzer will only pull XX mL. After all the repetitions are complete, the analyzer will repeat the process for the rest of the bottles.
- Once all the bottles have been analyzed, the analyzer will compare the current results to the factory calibration. If the change in slope is greater than +/-15%, the results are automatically rejected. The analyzer will automatically move to the test summary dialog box.

Test status label displays the current status of the test.

Test results list box lists the results of each repetition and bottle as it is running.

Cancel icon displays a message asking you to confirm your choice. If they decide to return to the test, the test will continue without interruption. If they decide to end the test, the analyzer will turn off the pump and UV lamp, close all valves, and take you to the unload bottles dialog box.

Exit dialog box. Before exiting this dialog box, any bottles marked as used are back flushed with the amount of fluid specified for the back flush volume. During this operation, the test status label is updated to indicate the current operation.

Test summary

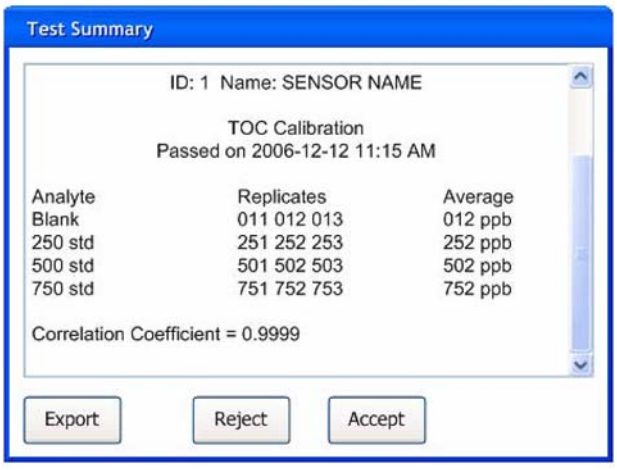

Figure 6-9 Test summary dialog box

Summary list box lists the results of the test. The results are displayed as they would appear on the printed report.

Reject icon will reject the results of the test. For the TOC calibration, the existing correlation coefficient will continue to be used. A rejection message for the test is sent to the printer and stored in the data log. You will then be taken to the run again dialog box.

Accept icon will accept the results of the test. For the TOC calibration, the new correlation coefficient will replace the existing value. An acceptance message for the test is sent to the printer and stored in the data log. You will then be taken to the unload bottles dialog box.

Export icon will take you to the export dialog box where you can save the results of the test to a USB memory stick.

Auto print. Upon entering this dialog box, the summary information is sent to the printer.

Auto exit. If you has selected to auto accept the results and return online, the results are accepted and the analyzer will return to the home screen. If you has selected manually accept the results and return online, this dialog box is displayed for 60 seconds and the analyzer will then return to the home screen. If you has selected to manually accept the results and remain offline, this dialog box is displayed until you touches one of the icons.

Run again

Figure 6-10 Run again dialog box

Yes icon takes you back to the beginning of the test. For the TOC calibration, the analyzer will return to the TOC calibration setup dialog box. All previous data are discarded.

No icon takes you to the unload bottles dialog box.

Unload bottles

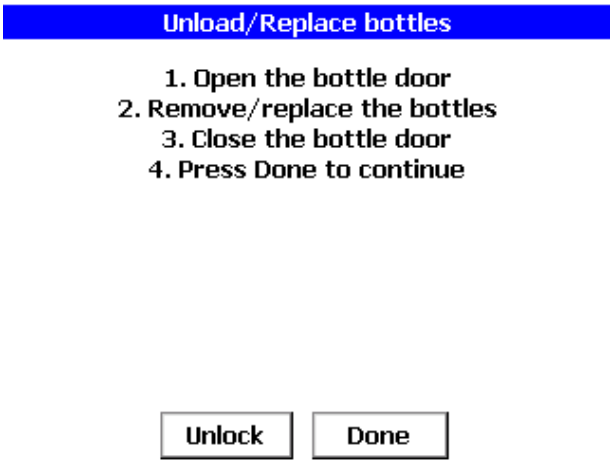

Figure 6-11 Unload bottles dialog box

For future implementation?

6.4 Conductivity calibration

The conductivity calibration dialog box enables you to perform a conductivity calibration. See Figure 6-12.

Figure 6-12 Conductivity calibration dialog box

Load bottles. See Load bottles, page 66.

Bottle positions for conductivity calibration, position 1 = Empty, position 2 = 100 µS potassium chloride, position 3 = Empty, and position 4 = Empty.

Review test options. See Review test setup, page 67.

Schedule test. Upon entering this dialog box, the finish icon is disabled until the calibration resistor has been detected. See Schedule test, page 68.

Instructions label instructs you to install the calibration resistor.

Conductivity meter test

The conductivity meter test dialog box prompts you to install a verification resistor to validate the meter's accuracy. If the calibration is being performed on a schedule, the dialog box will not be displayed and all operation will occur automatically. By default, the next icon is disabled until the analyzer passes the conductivity meter test. The start test icon will also be disabled until the verification resistor is detected. See Figure 6-13.

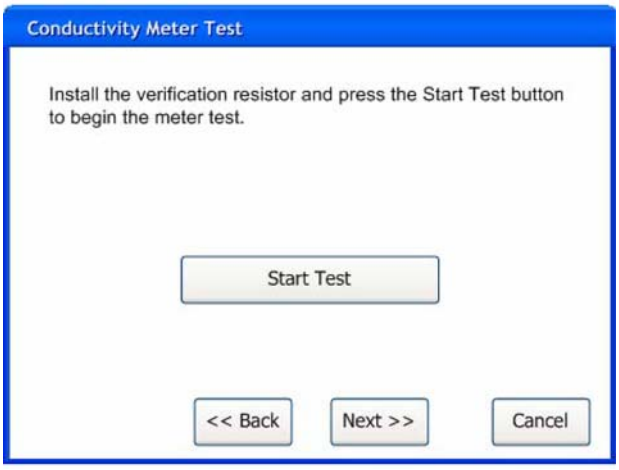

Figure 6-13 Conductivity meter test dialog box

Instructions label instructs you to install the resistor and touch the start test icon.

Start test icon reads the value of the resistor. The analyzer must latch the measurement circuit relays to read the verification resistor. Once the analyzer has read the resistor value, the relays must be unlatched to prevent damage to the circuit. The analyzer then converts this value to conductivity by taking the inverse of the resistance and multiplying it by the cell constant. This value is then compared to the expected value, assuming a 61.9 Kohm resistor. If the measured value is less than or equal to ±0.1 µS/cm of the expected value, the test passes and the next icon is enabled. Otherwise, you are notified and must cancel the calibration.

Back icon takes you to the previous dialog box.

Next icon takes you to the run test dialog box.

Cancel icon takes you to the unload bottles dialog box. All changes made in any of the dialog boxes are lost.

Run test. See Run test, page 68.

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Test details. The analyzer will first turn off the pump and lamp and close all the valves. It will then check the cell temperature. The cell temperature must less than or equal to 30 °C for the test to continue. The analyzer will check the cell temperature once per minute. During the cool down period, the test status label will indicate the cell is cooling down.

- After the cool down period, the analyzer will open the pump valve and the bottle 2 valve. The pump is turned on and pull XX mL plus the bottle flush volume. The pump will then be turned off and the both valves are closed. The volume information is updated on the RFID tag (if appropriate) and the bottle is marked as used. A standard TOC analysis is run on the sample.
- After the analysis is complete, the analyzer will repeat the process 2 more times. For subsequent reps on the same bottle, the analyzer will only pull XX mL. Once all the reps have been completed, the analyzer will automatically move to the test summary dialog box.

Test summary. See Test summary, page 69.

Reject. For the conductivity calibration, the existing gain factor will continue to be used. A rejection message for the test is sent to the printer and stored in the data log. You will then be taken to the run again dialog box.

Accept. For the conductivity calibration, the new gain factor will replace the existing value. An acceptance message for the test is sent to the printer and stored in the data log. You will then be taken to the unload bottles dialog box.

Run again. See Run test, page 68.

Yes. For the conductivity calibration, the analyzer will return to the load bottles dialog box.

Unload bottles. See Unload bottles, page 71.

TOC validation setup

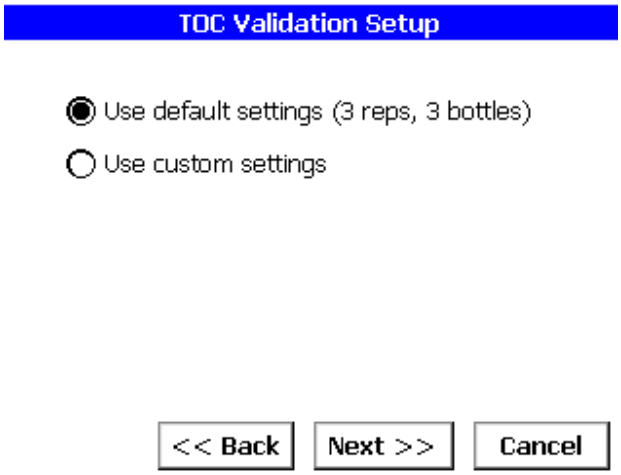

Figure 6-14 TOC validation dialog box

TOC calibration setup. See TOC calibration setup, page 64.

Custom setup. See Custom setup, page 65.

Bottle selection. The default setting for TOC validation is only the 500 ppb Sucrose choice selected.

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Reps. The default setting for TOC validation is 3.

Load bottles. See Load bottles, page 66.

Bottle positions for the TOC validation, position 1 = Blank, position 2 = 250 ppb Sucrose, position 3 = 500 ppb Sucrose, and position 4 = 750 ppb Sucrose.

Review test options. See Review test setup, page 67.

Schedule test. See Schedule test, page 68.

Run test. See Run test, page 68.

Test details. The analyzer will first turn off the pump and lamp and close all the valves. It will then check the cell temperature. The cell temperature must less than or equal to 30 °C for the test to continue. The analyzer will check the cell temperature once per minute. During the cool down period, the test status label will indicate the cell is cooling down.

- After the cool down period, the analyzer will open the pump valve and the bottle 1 valve. The pump is turned on and pull XX mL plus the bottle flush volume. The pump will then be turned off and the both valves are closed. The volume information is updated on the RFID tag (if appropriate) and the bottle is marked as used. A standard TOC analysis is run on the sample.
- After the analysis is complete, the analyzer will repeat the process on the same bottle for the number of times specified in the repetitions parameter. For subsequent reps on the same bottle, the analyzer will only pull XX mL. After all the repetitions are complete, the analyzer will repeat the process for the rest of the bottles.
- Once all the bottles have been analyzed, the analyzer will calculate the percent deviation for each of the standards by subtracting the average of the blank from the average of each of the standards. If any of the percent deviation values are greater than +/-15%, the results are automatically rejected. The analyzer will automatically move to the test summary dialog box.

Test summary. If the average of each standard is within ±15% of the expected value, the validation is considered acceptable. If any of the averaged values are greater than ±15% of the expected value, the validation is considered unacceptable. See Test summary, page 69.

Reject icon is hidden.

Accept icon is labeled “Next.” If the result of the validation is acceptable, touching this icon takes you to the unload bottles dialog box. If the result of the validation is unacceptable, touching this icon takes you to the run again dialog box.

Run again. See Run test, page 68.

Yes – For TOC validation, the analyzer will return to the select kit dialog box.

Unload bottles. See Unload bottles, page 71.

Load bottles

Figure 6-15 System suitability dialog box

Load bottles. See Load bottles, page 66.

Bottle positions for system suitability, position 1 = Blank, position 2 = Empty, position 3 = 500 ppb Sucrose, position 4 = 500 ppb 1-4 Benzoquinone.

Review test options. See Review test setup, page 67.

Schedule test. See Schedule test, page 68.

Run test. See Run test, page 68.

Test details. The analyzer will first turn off the pump and lamp and close all the valves. The analyzer will then check the cell temperature. The cell temperature must less than or equal to 30 °C for the test to continue. The analyzer will check the cell temperature once per minute. During the cool down period, the test status label will indicate the cell is cooling down.

- After the cool down period, the analyzer will open the pump valve and the bottle 1 valve. The pump is turned on and pull XX mL plus the bottle flush volume. The pump will then be turned off and the both valves are closed. The volume information is updated on the RFID tag (if appropriate) and the bottle is marked as used. A standard TOC analysis is run on the sample.
- After the analysis is complete, the analyzer will repeat the process on the same bottle two more times. For subsequent reps on the same bottle, the analyzer will only pull XX mL. After all the repetitions are complete, the analyzer will repeat the process for the rest of the bottles. All reported values must be normalized to 500 ppb using the following formula.

$$r_n = r_{raw}\left(\frac{500}{Cof\ A\ Value}\right)$$

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- Once all the bottles have been analyzed, the analyzer will compare the average reading of the sucrose standard to the average reading of the 1-4 benzoquinone. If the two values are within ±15% of each other, the test passes. The analyzer will automatically move to the test summary dialog box. The following formulas are used to calculate the response efficiency.

$$r_e = 100 = \left(\frac{SR}{LR}\right)$$

Where:

SR = Suitability Response of the analyzer defined as ($r_{ss} – r_w$).
LR = Limit Response of the analyzer defined as ($r_s – r_w$).
r_w = Average TOC response for the blank.
r_s = Average TOC response for the sucrose standard.
r_{ss} = Average TOC response for the benzoquinone standard.

Test summary. See Test summary, page 69.

Next icon takes you to the unload bottles dialog box.

Unload bottles. See Unload bottles, page 71.

6.5 Grab sample setup

The grab sample setup dialog box enables you to run a grab sample. See Figure 6-16.

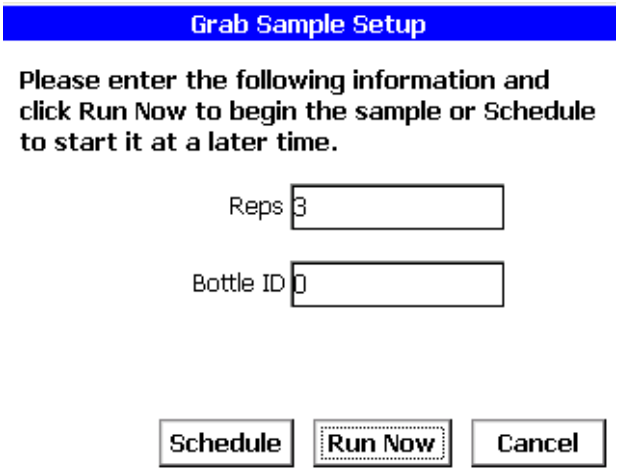

Figure 6-16 Grab sample setup dialog box

Load bottles. See Load bottles, page 66.

Bottle positions for the grab sample, position 1 = Empty, position 2 = sample bottle, position 3 = Empty, and position 4 = Empty.

Enter sample information. Enables you to enter sample information, such as the bottle identifier and the number of repetitions. See Figure 6-16.

Repetitions text box enables you to specify the number of repetitions to perform on the sample bottle. You may enter a value between 1 and 3. The default setting is 3.

Bottle ID text box enables you to specify an identifier to be used in the data buffer and in reports. You may specify a four-digit number. The default setting is 0.

Schedule icon takes you to the schedule test dialog box. All changes made in this dialog box are retained.

Run now icon takes you to the run test dialog box. All changes made in this dialog box are retained.

Cancel icon takes you to the unload bottles dialog box. All changes made in any of the dialog boxes are lost.

Schedule test. See Schedule test, page 68.

Run grab sample

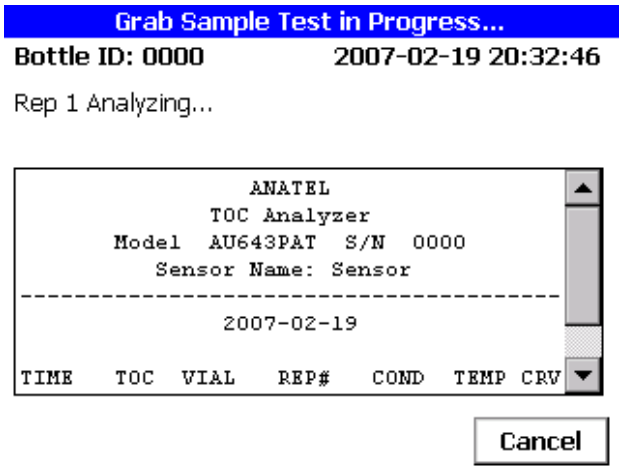

Figure 6-17 Grab sample test in progress dialog box

Test details. The analyzer will first turn off the pump and lamp and close all the valves. It will then check the cell temperature. The cell temperature must less than or equal to 30 °C for the test to continue. The analyzer will check the cell temperature once per minute. During the cool down period, the test status label will indicate the cell is cooling down.

- After the cool down period, the analyzer will open the pump valve and the bottle 2 valve. The pump is turned on and pull XX mL plus the bottle flush volume. The pump will then be turned off and the both valves are closed. A standard TOC analysis is run on the sample.
- After the analysis is complete, the analyzer will repeat the process on the same bottle for the number of times specified in the repetitions parameter. For subsequent reps on the same bottle, the analyzer will only pull XX mL.
- Once the analysis is complete, the analyzer will automatically move to the sample summary dialog box.

Bottle ID label displays the bottle ID that you entered in the grab sample setup dialog box.

Date/time label displays the current date and time.

Test status label displays the current status of the test.

Test results list box lists the results of each repetition as it is running.

Cancel icon displays a message asking you to confirm your choice. If you decide to return to the test, the test will continue without interruption. If you decide to end the test, the analyzer will turn off the pump and UV lamp, close all valves, and take you to the unload bottles dialog box.

Grab sample summary

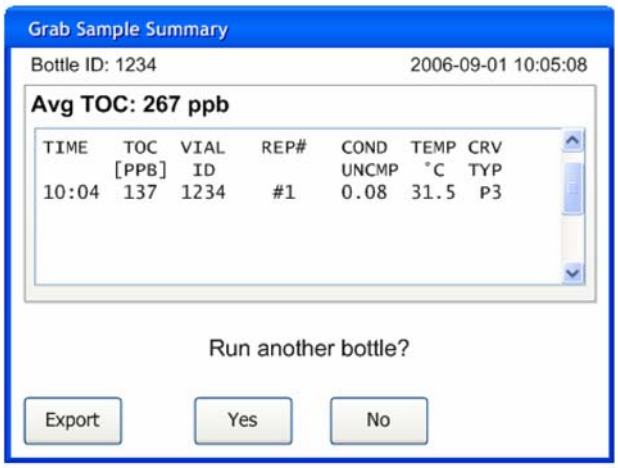

Figure 6-18 Sample summary dialog box

Summary list box lists the results of the test. The results are displayed as they would appear on the printed report.

Export results icon takes you to the export dialog box where you can save the results of the operation to a USB memory stick.

Yes icon takes you back to the load bottles dialog box.

No icon takes you to the unload bottles dialog box.

Auto print. Upon entering this dialog box, the summary information is sent to the printer.

Unload bottles. See Unload bottles, page 71.

6.6 Excursion mode

The excursion mode dialog box enables you to determine whether or not to run a validation after an excursion. See Figure 6-19.

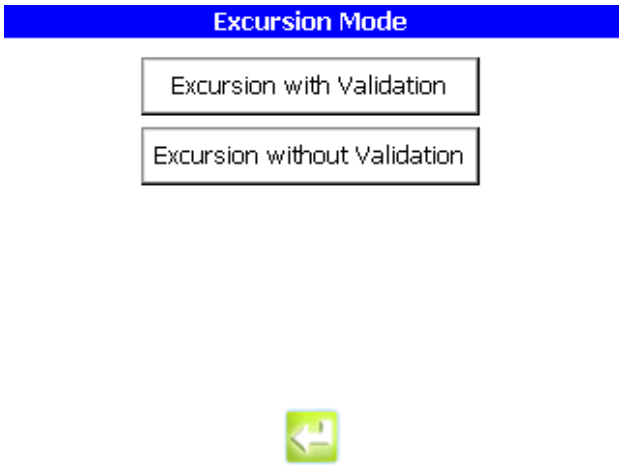

Figure 6-19 Excursion mode dialog box

Excursion mode options. Prompts you to select whether to run a validation following an excursion or not. See Figure 6-19.

Excursion with validation icon tells the analyzer to prompt for validation options and run a validation test following an excursion.

Return icon returns you to the main bottle mode dialog box.

Load bottles. See Load bottles, page 66.

Bottle positions for excursion with validation mode, position 1 = Blank, position 2 = Empty, position 3 = 500 ppb Sucrose, and position 4 = Excursion Bottle. For excursion without validation mode, position 1 = Empty, position 2 = Empty, position 3 = Empty, and position 4 = Excursion Bottle.

Excursion mode setup

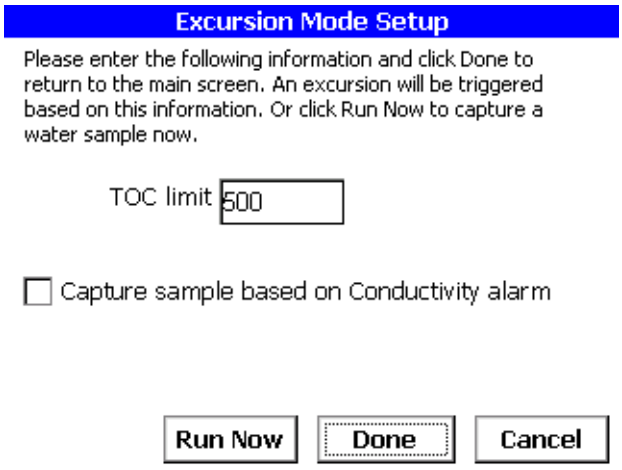

Figure 6-20 Excursion mode setup dialog box

TOC limit text box enables you to enter a limit an online TOC analysis must reach before an excursion sample is captured. You may specify a value between 1 and 2500 ppb. The default setting is 500 ppb.

Conductivity alarm check box enables you to specify whether a conductivity alarm will also trigger an excursion to occur. This option will only be enabled if you has selected to enable conductivity alarming. The default value is unchecked.

Run now icon will open the cell and bottle 4 valves, allowing water to flow from the online source into the excursion bottle. The valves will stay open for the time specified in section, and then close. While the bottle is filling, a dialog box will appear telling you that the bottle is being filled and displaying the progress. An abort icon will also appear on this dialog box enabling you to immediately stop this operation. Once the bottle has been filled, you are taken to the excursion captured dialog box unless excursion with validation was selected.

- If excursion with validation was selected, a validation will immediately follow the excursion operation. The validation will occur as described in section Run test. However, only the 500 ppb sucrose is used and the analyzer will perform three reps. Following this operation, you are taken to the validation summary dialog box.
- Following these operations, the analyzer will write the date, time, TOC value, analyzer serial number, status, oxidation curve filename, conductivity, and temperature information to the RFID tag. If a validation was also performed, the analyzer will also write the TOC, conductivity, temperature, and curve type for each repetition, and the average TOC for each bottle to the RFID tag.

Done icon closes the bottle mode dialog box and returns you to the home screen. When an excursion condition occurs, the analyzer will perform the steps described above. Following the excursion operation, the analyzer will always return to its online mode.

Cancel icon takes you to the unload bottle dialog box.

Validation summary. See Test summary, page 69.

Reject icon is hidden.

Accept icon is labeled “Next.” Touching this icon will take you to the excursion captured dialog box.

Excursion sample captured

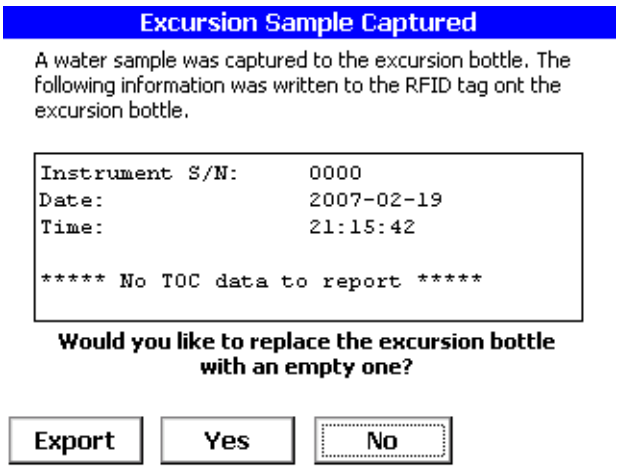

Figure 6-21 Excursion sample captured dialog box

Excursion information text box displays information related to the excursion. The information displayed is the analyzer's serial number, the date and time of the excursion, the TOC value, and the oxidation curve filename.

Export icon takes you to the export dialog box where you can export the oxidation curve file to a USB memory stick.

Yes icon takes you back to the load bottles dialog box.

No icon takes you to the unload bottles dialog box.

Unload bottle. See Unload bottles, page 71.

Chapter 7 Data Review

7.1 Data review dialog box

Figure 7-1 Data review dialog box

Data area list box lists the data in the data log. The data will appear as it would on the printer. The data are filtered based on the settings in the filter dialog box. Data is displayed in chronological order from earliest to most recent. Upon entering this dialog box, the list will scroll to display the earliest data.

Print icon sends the currently displayed filtered data to the printer.

Return icon returns you to the home screen.

7.2 Export sample data

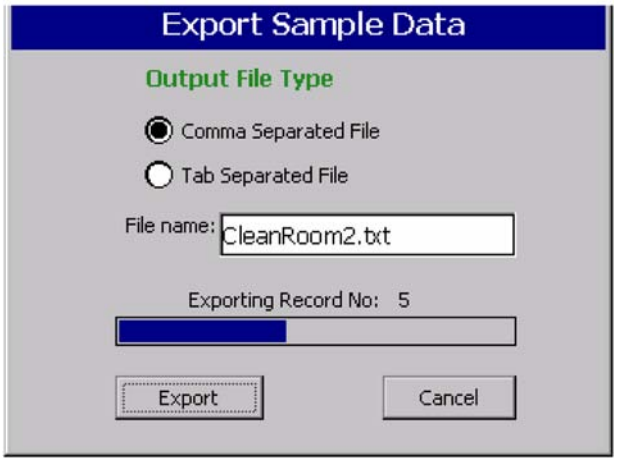

Figure 7-2 Export sample data dialog box

File type radio buttons enable you to specify the separator to be used between the data values. You may select comma separated or tab separated. When the file is exported, the selected separator is placed between each data value. The default selection is tab separated.

File name text box enables you to specify the file name to use when saving the data. You may specify a 20-character file name including the extension. The default file name is the analyzer name with the .txt extension. If you has not specified an analyzer name, “AU643PATExport_Data.txt” is used.

Progress bar displays the progress of the export.

Export icon starts the export. Before the export may begin, the analyzer must verify there is data to export, you has entered a valid file name, and a USB memory stick is available. The file is written to the root folder of the memory stick.

Cancel icon cancels the export if it is in progress.

Close icon returns you to the home screen.

7.3 Filter data

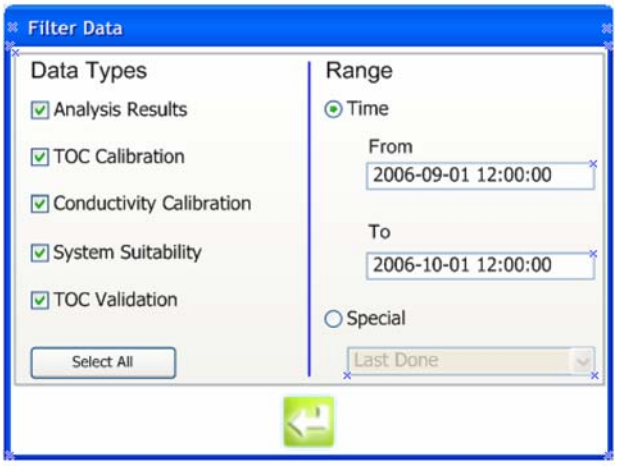

Figure 7-3 Filter data dialog box

Data types checkboxes determine what data are displayed in the data review dialog box. By default, all data types are selected.

Select all icon selects all the data types check boxes.

Range radio buttons enable you to determine how much data are displayed in the data review dialog box. You may select from time or special. Selecting time enables the from and to text boxes and disables the special drop down list box. Selecting special enables the special drop down list box and disables the from and to text boxes. Selecting special will also uncheck the analysis data checkbox. The default selection is time.

From/to date time range text boxes list data between the defined from and to date and time. The default entries are the last 24 hours.

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Special drop down list box filters the data to display the last few entries of a certain type. You may select last accepted, last done, or last five. Selecting last accepted will display only the last accepted tests for the selected data types. Selecting last done will display only the last completed tests for the selected data types. Selecting last five will display only the last five completed tests for the selected data types. If special is selected, the data are sorted by data type first and then by time from most recent to earliest. The data type will prefix each group of data. For example, “System Suitability” will prefix the system suitability group. A blank line will separate each group.

Return icon returns you to the data review dialog box and resets the data area based on the options chosen.

Return icon returns you to the home screen.

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Chapter 8 Diagnostics

8.1 Diagnostics dialog box

The diagnostics dialog box enables you to perform tests on the system to verify it is operating correctly.

8.2 General

The general tab displays the operating status of lamps 1 and 2. See Figure 8-1.

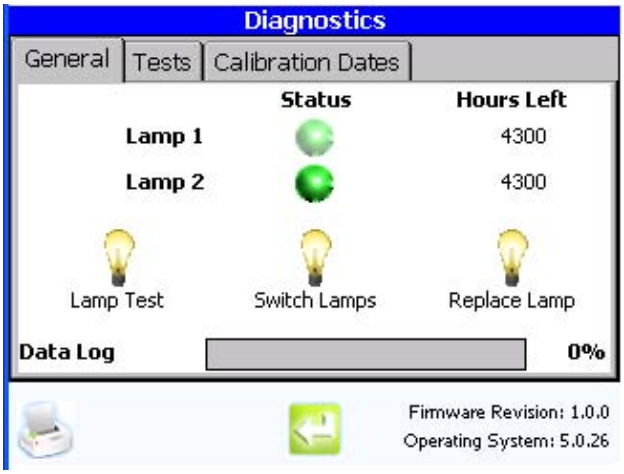


Figure 8-1 Diagnostics dialog box, general

Version information text label displays the firmware and operating system version information.

UV lamp monitor represents the current state of the UV lamps in the analyzer.

Status icon represents the status of each of the lamps. If the lamp is not currently in use, the icon will appear slightly grayed.

- **Good** (green) means the lamp has not reached 0 hours left and has a voltage greater than 0.4V.
- **Marginal** (yellow) means the lamp has either reached 0 hours left or has a voltage less than or equal to 0.4V but greater than 0.12V.
- **Failed** (red) means the lamp has a voltage less than or equal to 0.12V.
- **Not in use** (gray) means the lamp is off.

Hours left text label. All values will appear rounded up. For example, if the lamp has 3:00:24 time left, it is displayed as 4 hours left.

Lamp test

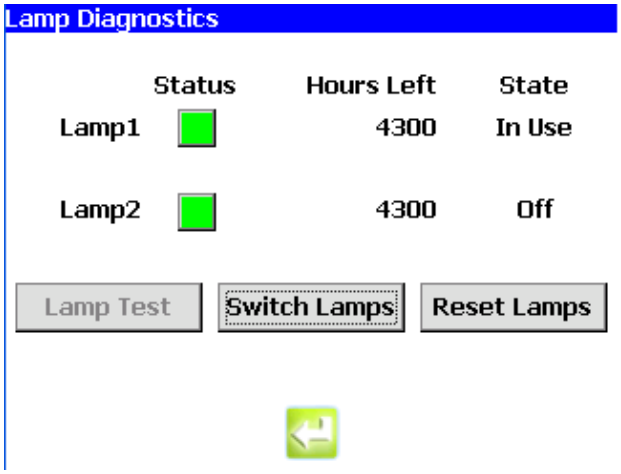


Figure 8-2 Lamp test dialog box

You are first notified that the current sample is stopped and asked if you want to continue. Each lamp is then turned on in sequence for 60 seconds and its voltage measured. During the test, a message is displayed stating which lamp is being tested and how much time is left in the test. A stop icon is also available to abort the test. See Figure 8-3. Once the lamp test is over, the lamp information is updated and the analyzer is returned to its normal mode. Executing a lamp test will trigger an entry in the audit trail.

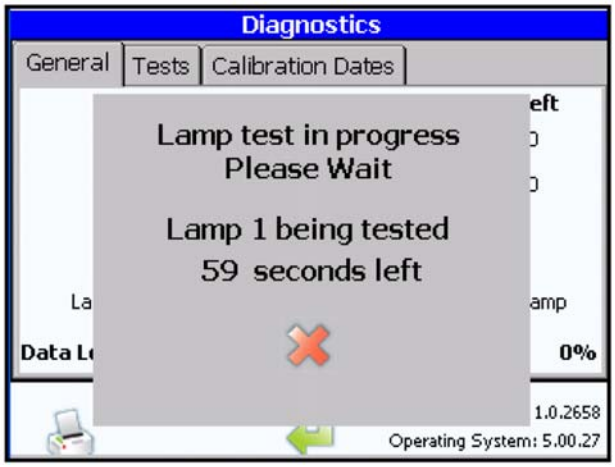


Figure 8-3 Lamp test progress dialog box

Switch lamps icon prompts you to switch from one lamp to the other. You are first notified that the current sample is stopped and asked if you want to continue. The current lamp is turned off and the other lamp turned on for 60 seconds to accurately measure the voltage. The lamp information is then updated and the analyzer returned to its normal mode. Executing this function will trigger an entry in the audit trail.

- You may only switch from a good lamp to another good lamp, or from a marginal lamp to either a good or marginal lamp.
- Using this logic, the switch lamps icon is enabled or disabled based on whether an appropriate lamp is available.

Replace lamp icon will display the UV lamp replacement dialog box. The dialog box will walk you through changing a single UV lamp or the entire UV lamp module. In order to do this, the analyzer must be powered down first. After the analyzer is powered back on, the dialog box will continue with where it left off.

Return icon returns you to the diagnostics dialog box.

PAT700 lamp replacement

To replace the lamp, follow these steps:

1) Touch the replace lamp icon to open the replace lamp dialog box:

Figure 8-4 Replace lamp module dialog box

2) Touch “Replace Single Lamp” to replace a single lamp.

3) Touch “Run Wizard” to run the lamp replacement wizard. The wizard provides step-by-step instructions for replacing the lamp. Read the instructions completely. At the conclusion of the wizard, you will be instructed to power down the analyzer and proceed with lamp replacement.

WARNING

High voltage! Failure to shut off power to the analyzer before you replace the UV lamp can cause a fire, explosion, or electrical shock, resulting in property damage or severe personal injury.

Shut off power to the analyzer before you replace a UV lamp.

WARNING

Improper disposal of the analyzer's UV lamp can cause exposure to mercury vapor, resulting in severe personal injury.

Dispose of the expired lamp in accordance with applicable local regulations.

CAUTION

Leaving fingerprints on the lamp's glass surface can diminish UV output, resulting in measurement error.

- *Do not touch the UV lamp's glass surface during the lamp replacement procedure.*
- *Use isopropyl alcohol and a lint-free cloth to clean the glass.*

4) Touch Enter to proceed.

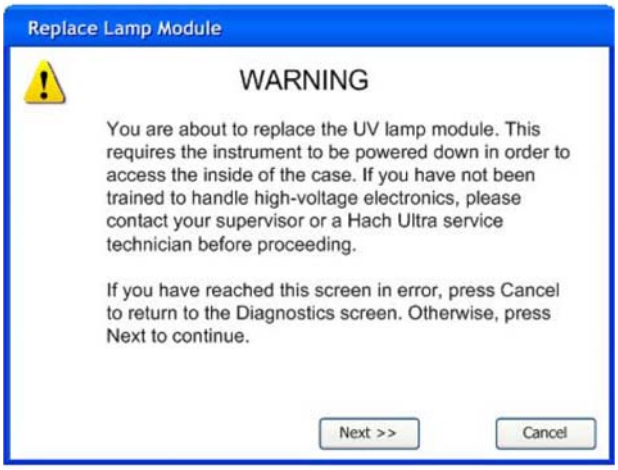


Figure 8-5 Replace lamp module warning dialog box

5) Touch the Next button to proceed.

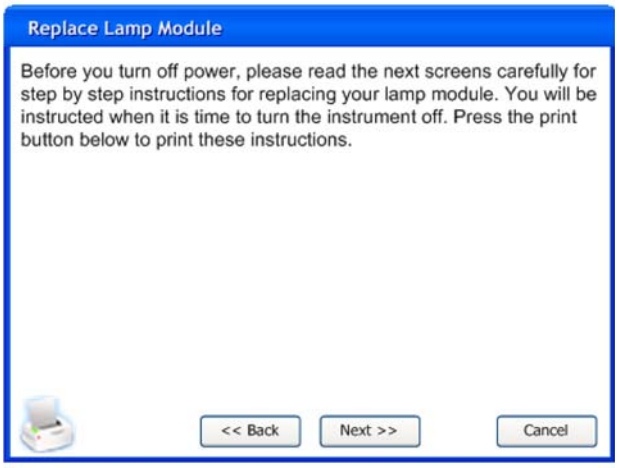


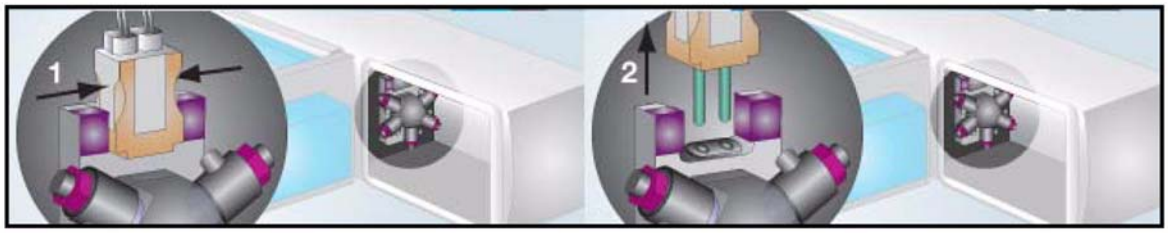
Figure 8-6 Replace lamp module dialog box, instructions

6) Touch the Next button to proceed.

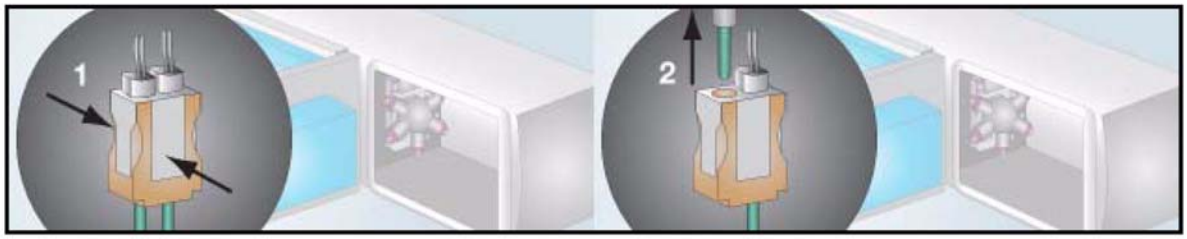
7) Open the right access door using a 5/32-inch hex key. (Show illustration of door opening. Use two frames to show the door opening, but not closing.)

8) Locate the lamp power connectors in the front upper left corner of the compartment. Disconnect the lamp connectors by twisting both locking rings counter-clockwise and carefully unplugging both connectors. (Show illustration of lamp power connector locations and rotation direction to unlock.)

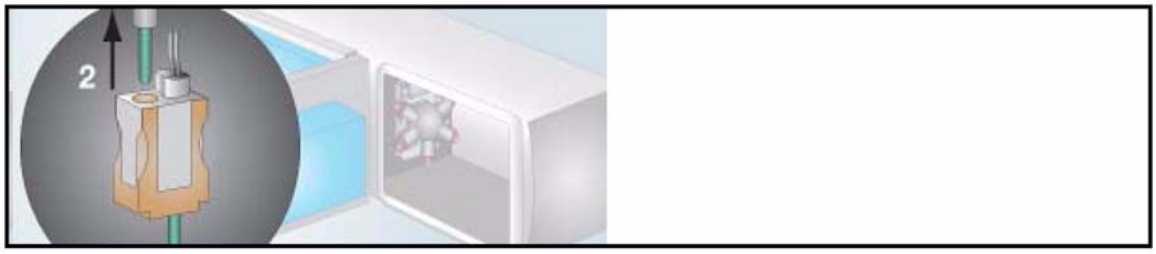
9) Grasp the lamp module on the right and left side and squeeze the module locking clips to release the module from the manifold assembly. Pull straight upward until the lamps clear the manifold.



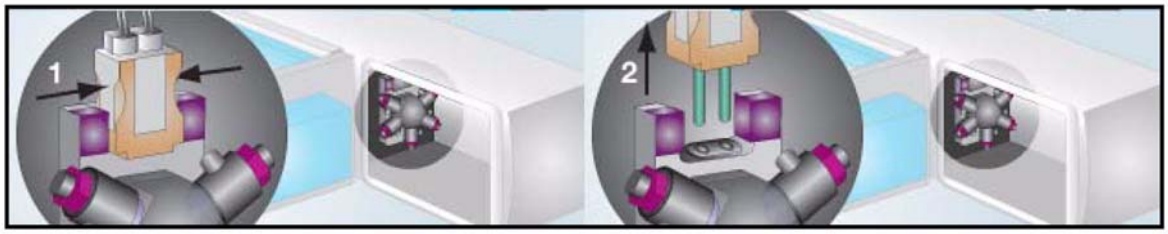
10) Press and hold the lamp retaining clip to release the UV lamp. While pressing the lamp retaining clip, carefully withdraw the lamp from the lamp holder. DO NOT touch the glass surfaces of the lamps.



11) Holding the lamp by its metal sleeve, insert the new lamp into the lamp holder hole and clip into place. The lamp is self-aligning. Ensure that the lamp is locked in place by the lamp retaining clip. (Need new illustration.)

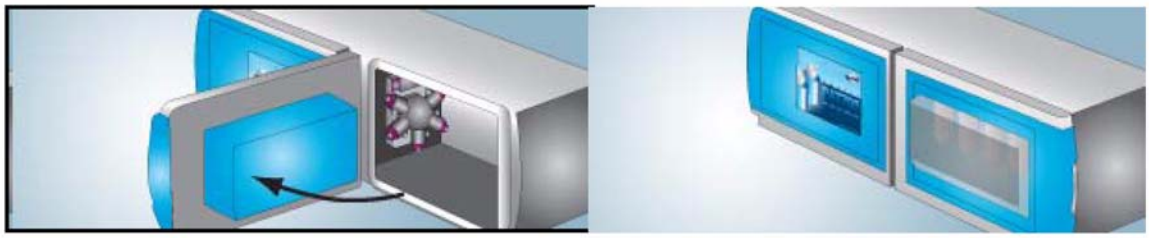


12) Reinsert the lamp module into the instrument by centering it over the manifold assembly and gently sliding the module down to the manifold until it locks into place. (New illustration similar to below.)



13) Reconnect the lamp power connectors by carefully reinserting the connectors and locking them in place by twisting the locking rings clockwise. (Show illustration of lamp power connector locations.)

14) Close and lock the door. (Change illustration to show door closing.)



15) Touch the next button to proceed.

Figure 8-7 Lamp replacement, turn analyzer off

16) Shut off power to the analyzer.

Figure 8-8 Lamp test in progress window

17) At the completion of the lamp test, reset the hour counter for the replaced lamp to the full time.

8.3 Tests

The tests dialog box enables you to test outputs, the printer, plumbing, and pumps. See Figure 8-9.

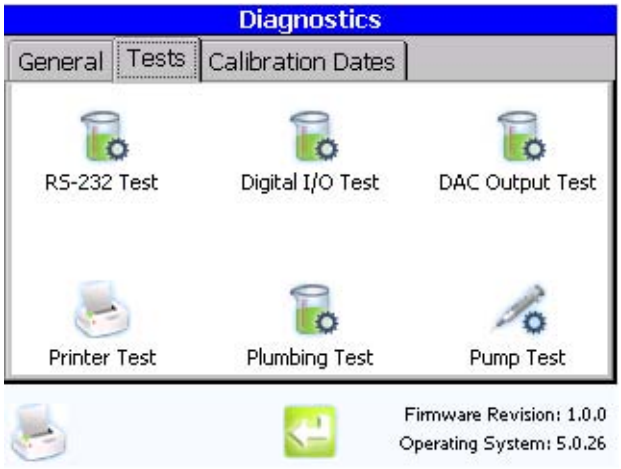


Figure 8-9 Tests dialog box

RS-232 test

The RS-232 test icon enables you to test serial communication through both serial ports. See Figure 8-10. To perform this test, you must connect one serial port to the other.

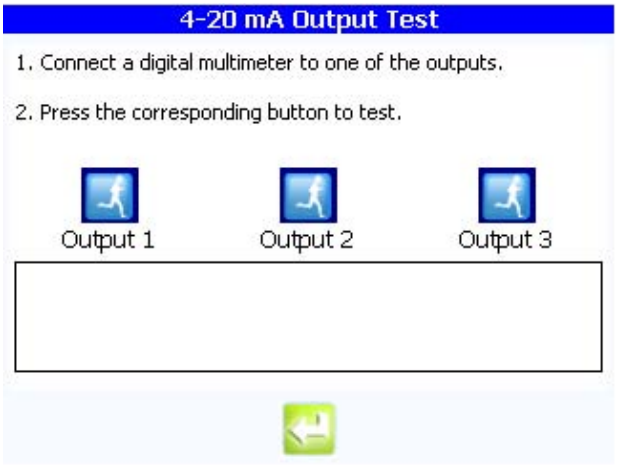


Figure 8-10 RS-232 test dialog box

Start test icon will send serial data out one serial port and read the data on the other. If the read data matches the sent data, the test passes.

Results text label. After the test has been run, pass or fail text will appear here. The default value of this label is blank.

Print icon prints the results of the test. The printout will indicate the date and time of the test, the test results, the number of bytes sent and received, and the actual text sent. This icon is disabled until the test has been run.

Digital I/O test icon tests the digital inputs and outputs of the system. Touching this icon opens the Digital I/O test dialog box. In order to perform this test, you must connect a digital output to a digital input. See Figure 8-11.

Return icon returns you to the diagnostics dialog box.

Digital I/O test

The digital I/O test icon enables you to test digital I/O communication. See Figure 8-11. Before you perform the digital I/O test, make sure I/O wiring is properly connected.

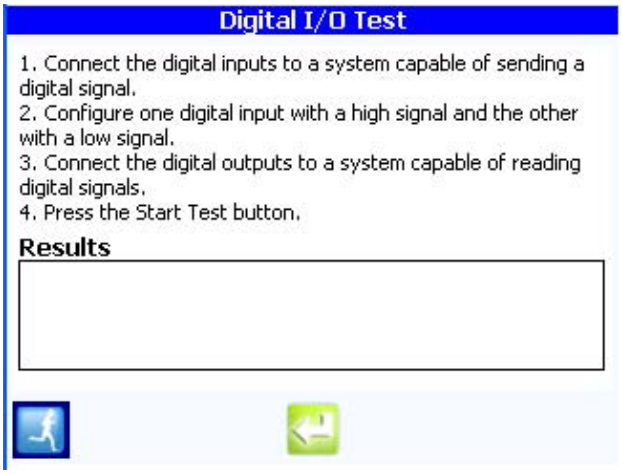


Figure 8-11 Digital I/O test dialog box

Digital test icon for each output. Touching this icon will send a digital signal out the specified digital output port and read the signal on one of the digital input ports. If the read data matches the sent data, the test passes.

Results text label. After the test has been run, pass or fail text will appear here. The default value of this label is blank.

Print icon prints the results of the test. The printout will indicate the date and time of each test and the test results. This icon is disabled until the test has been run.

4-20 mA out test icon tests the 4-20 mA outputs of the system. Touching this icon opens the 4-20 mA output test dialog box. In order to perform this test, you must connect a digital multimeter to the appropriate output to measure the voltage. See Figure 8-12.

Return icon returns you to the diagnostics dialog box.

4-20 mA output test

The 4-20 mA output test icon enables you to test analog outputs. See Figure 8-12.

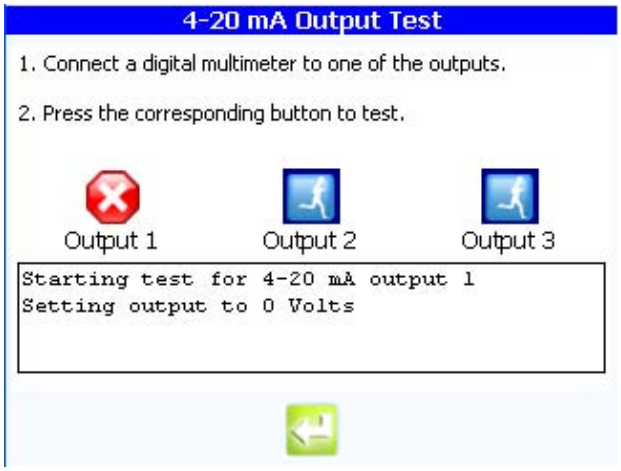


Figure 8-12 4-20 mA output test dialog box

Start test icon for each of three 4-20 mA outputs. The test functionality is the same for each output. Touching this icon will send a 4 mA signal out the appropriate output. The analyzer will then send a 20 mA signal out the same DAC. Each signal is held for 3 seconds.

Status text text label. After the test has been started, a message is displayed on dialog box to indicate what voltage is output or that the test is over. For each voltage output, the following message is displayed “Output X: Outputting X mA”. When the test is over, this message will change to “Output X: Test complete”.

Return icon returns you to the diagnostics dialog box.

8.4 Printer test

Touching the printer test icon sends a test printout to the printer. Before you perform the printer test, make sure the analyzer is properly connected to the printer.

Plumbing test

The plumbing test icon enables you to test plumbing that is connected to the analyzer. See Figure 8-13. Before you perform the plumbing test, make sure plumbing is properly connected to the analyzer.

You are first notified that the current sample is stopped and asked if you want to continue. In this dialog box, you may select from pre-configured valve and pump combinations to test. Entering this dialog box will trigger an entry in the audit trail. See Figure 8-13.

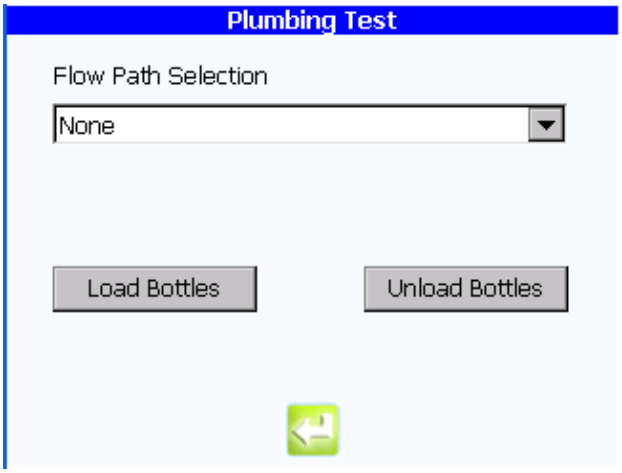


Figure 8-13 Plumbing test dialog box

Flow path drop down list box enables you to select from 12 pre-configured valve and pump combinations. You may select none, bypass line, flow through cell, flow through cell with pump, sample from bottle 1, sample from bottle 2, sample from bottle 3, sample from bottle 4, back flush through bottle 1, back flush through bottle 2, back flush through bottle 3, and back flush through bottle 4. Selecting an option will immediately change to that configuration. The default selection is none.

None. Selecting this option turns off the pump and closes all the valves.

Bypass. Selecting this option opens only the bypass valve.

Flow through cell. Selecting this option opens only the cell valve.

Flow through cell with pump. Selecting this option opens the cell valve, the pump valve, and turns on the pump.

Sample from bottle. Selecting this option opens the selected bottle valve, the pump valve, and turns on the pump.

Back flush through bottle. Selecting this option opens the selected bottle valve and the cell valve.

Return icon returns you to the diagnostics dialog box.

Pump test

The RS-232 test icon enables you to test pumps. See Figure 8-14. To perform this test, you must connect one serial port to the other.

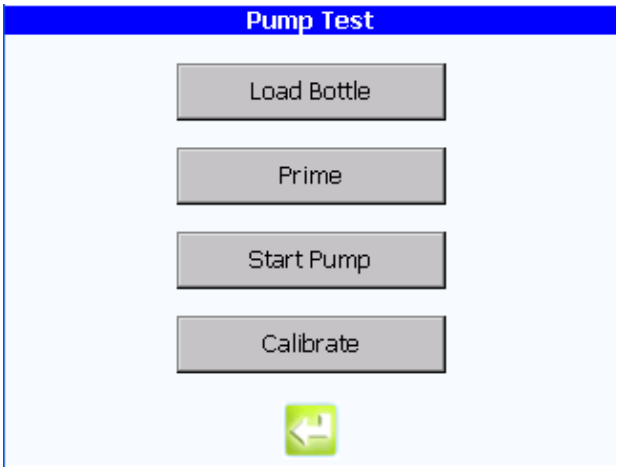


Figure 8-14 Pump test dialog box

Prime icon opens the pump valve and the appropriate input source valve, then starts the pump. The pump will run long enough to pull XX mL and stop. Both valves are then closed.

Load bottle icon opens the grab sample test dialog box (see Grab sample setup, page 76), enabling you to load a bottle into position 2.

Start/stop pump icon opens the pump valve and the grab sample bottle valve then starts the pump. The pump will run indefinitely until you stops it. Both valves are then closed and the pump is stopped. This icon is used to start and stop the pump. The icon text will toggle between “Start Pump” and “Stop Pump”.

Calibrate icon opens the pump calibration dialog box. See Figure 8-15.

Return icon returns you to the diagnostics dialog box.

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Pump calibration

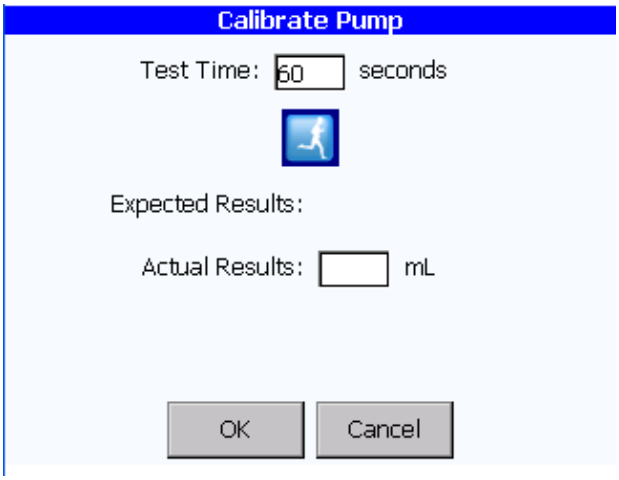

Figure 8-15 Pump calibration dialog box

Test time text box enables you to specify the amount of time in seconds that is used for the test and calibration functions. You may enter a value between 1 and 60.

Start test icon opens the pump valve and the appropriate input source valve then starts the pump. The pump will run for the amount of time specified in the test time box and stop. Both valves are then closed.

Expected result text label displays the calculated amount of water that should have been measured during the test. The formula for calculating this value appears below.

$$V = \frac{\text{Flow rate}}{\text{Test time}}$$

Where:

Flow rate=Target flow rate of the pump as entered in the factory dialog box.

Test time=Value entered in the test time text box.

Actual result text box enables you to enter the actual volume measured during the test. You may enter a value between 0.0 and 100.0. Once you enter a value in this box, the analyzer will determine if the result is close enough or should be tested again. See Figure 8-16.

Return icon returns you to the diagnostics dialog box.

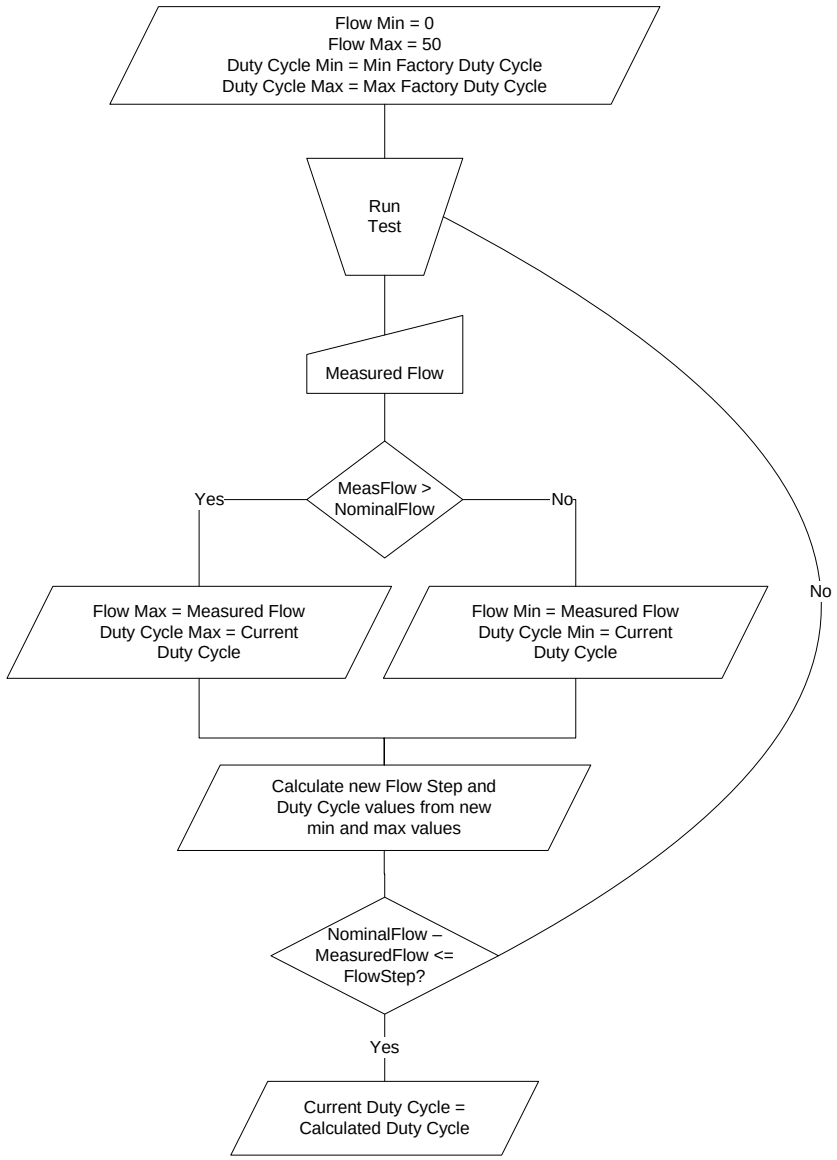

Figure 8-16 Pump calibration flow diagram

Result text text label indicates whether the current duty cycle setting is adequate to meet the factory set nominal flow rate. If it is, the label will indicate that the calibration is complete. If not, the label will indicate that the test should be run again.

OK icon saves the calculated duty cycle to the system settings and returns you to the pump test dialog box.

Cancel icon returns you to the pump test dialog box without saving the new duty cycle.

Return icon returns you to the diagnostics dialog box.

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8.5 Calibration dates

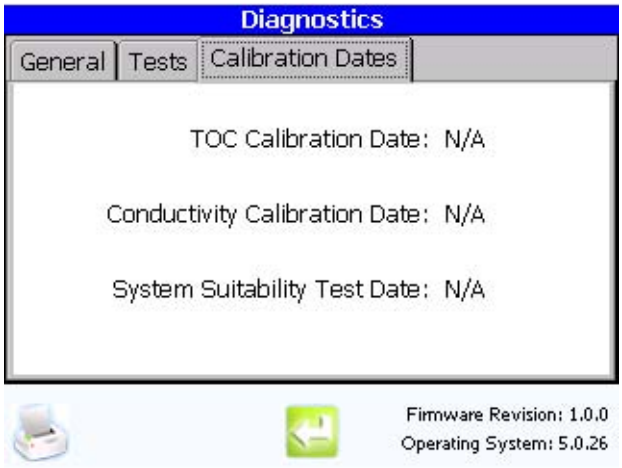

Figure 8-17 Calibration dates dialog box

TOC calibration date text box (read-only) updates when a TOC calibration has been run and accepted. The date will appear in ISO format “yyyy-mm-dd”. The default value is blank.

Conductivity calibration date text box (read-only) updates when a conductivity calibration has been run and accepted. The date will appear in ISO format “yyyy-mm-dd”. The default value is blank.

System suitability test date text box (read-only) updates when a system suitability test has been run and accepted. The date will appear in ISO format “yyyy-mm-dd”. The default value is blank.

Print icon prints the version information and the results of the lamp and voltage tests.

Return icon returns you to the diagnostics dialog box.

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Chapter 9 Security

9.1 Password

Figure 9-1 Password dialog box

User ID enables you to type up to 15 alphanumeric or symbol characters. The default value is blank.

Password enables you to type up to 15 alphanumeric or symbol characters. The default value is blank.

- If the entered user ID and password match existing entries in the user's list, you are signed on and returned to the home screen.
- If the entered user ID and password don't match existing entries in the user's list, an error message is displayed and you may try again.

All attempted sign on actions are logged to the audit trail.

OK icon returns you to the home screen and saves the changes.

Cancel icon returns you to the home screen. No entries are written to the audit trail.

Change password

Figure 9-2 Change password dialog box

Current password enables you to type your current password. You may enter five to 15 alphanumeric or symbol characters.

New password enables you to type your new password. The new password may not be the same as any of the passwords in the password history list.

Confirm password enables you to retype your new password. Passwords in the password and confirm password boxes must match.

- You may enter five to 15 alphanumeric or symbol characters in each text box.
- All three text boxes are case sensitive.
- Their default values are blank.
- When you enter a character, only the “*” symbol appears for each key touch.

OK icon returns you to the sign on dialog box and saves the changes. All changes are noted in the audit trail. None of the passwords appear. The new password is converted to an MD5 hash. The new password and current date are added to the password history list.

Cancel icon returns you to the sign on dialog box. All changes are discarded and no entries are made in the audit trail.

Expired password

Upon successful sign on, the analyzer checks to see if the user’s password has expired. If it has, you are prompted to change your password.

Backdoor password

If administrators or factory personnel forget their passwords, they may gain temporary access by entering the backdoor password. The backdoor password is a hash made from the analyzer’s serial number and current date. Upon successful sign on, the analyzer prompts you to change you password.

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Chapter 10 Troubleshooting and Service

10.1 Alarm acknowledgement

The alarm acknowledge dialog box enables you to view and acknowledge current or past alarms. See Figure 10-1.

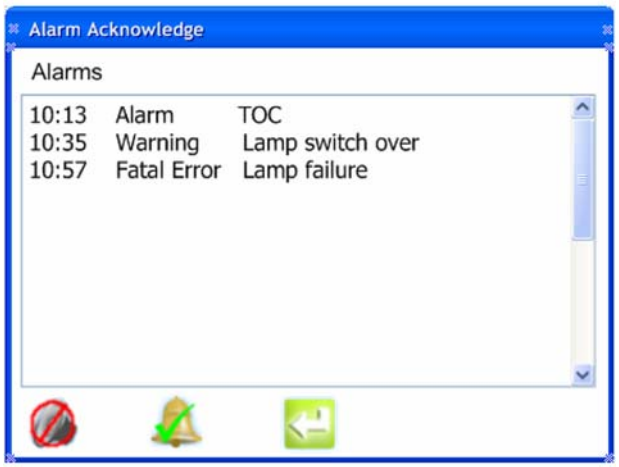

Figure 10-1 Alarm acknowledge dialog box

Alarm list box displays all unacknowledged alarms. This control displays the alarm time, alarm type, and a brief alarm description in chronological order, from earliest to most recent. Upon entering this dialog box, the list scrolls to display the most recent alarm. Any new alarms that occur while this dialog box is displayed cause the list to update.

Silence alarms icon silences the audible alarm. The next time an alarm condition occurs, the audible alarm activates again.

Acknowledge alarms icon acknowledges all alarms in the list and clears the list. The currently signed on user is logged to the audit trail as the user who acknowledged the alarms. If no user is logged on, the sign on dialog box will appear. Successfully entering a user name and password will not sign you on to the system. This information will only be used for the audit trail entry.

Return icon returns you to the home screen.

Alarm indication

The analyzer has two operational modes: on-line and bottle. On-line TOC and conductivity are the two primary on-line modes (although you can also select standby, off-line, manual, or clean). In on-line TOC and conductivity modes, the main display window provides an on-screen animation indicating the general state of water flow through the analyzer. In on-line TOC, conductivity, or manual TOC modes, the animation area also serves as an error condition indicator. If an error occurs in an on-line mode, the following sequence of events occurs:

- At each occurrence of an error, the animation area flashes red and the PAT700 makes a sound (if a sound is programmed).
- If a process variable such as TOC or conductivity caused the error, the displayed value of the process variable turns red.
- The animation area continues to flash red until a user acknowledges the alarm by entering the alarm log window and pressing the acknowledge icon (bell with green check mark).
- If the error alarm has been acknowledged and the user returns to the main display screen, the animation area will remain solid red until the analyzer completes a full cycle without any errors.
- Once a full cycle has occurred without any errors, the normal animation reappears and any red process variables return to black.
- If on the next cycle the same or a new error occurs, the animation area again flashes red and must be acknowledged by the user.
- As long as errors exist in the error log, a user can access the log and view the list of errors.
- At any time, a user can delete the entire error log by pressing the alarm delete icon (bell with red X). Once all errors are deleted from the error log, the alarm log access icon on the main menu dims and the alarm log is inacccessible until a new error occurs.
- All errors are sent to the data log.
- All alarm acknowledgements and error screen deletions are logged to the audit trail.

10.2 Alarm details

Touching one of the alarms in the list displays the alarm details dialog box. See Figure 10-2.

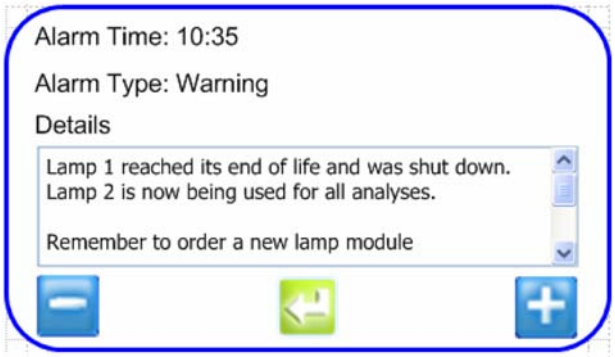

Figure 10-2 Alarm details dialog box

Alarm time text label displays the time of the selected alarm.

Alarm type text label displays the type of the selected alarm.

Details list box lists a full text description for the selected alarm.

Next/previous icons will move to the next or previous alarm in the list. Either icon may be disabled if the displayed alarm is the first or last in the list.

Return icon returns you to the alarm acknowledge dialog box.

Fatal error alarms

A fatal error occurs any time the analyzer cannot function due to an error in the system. The fatal error will appear as a full-screen, flashing message. All operation will cease until the error condition has been corrected. The current sample is aborted. Touch the display to clear the error message. See Table 10-1.

Table 10-1 Fatal error messages

Message	Condition indicated by message
Both lamps failed	Analyzer has detected that both lamps have a status of failed.
Unable to read temperature or conductivity	Analyzer cannot read either the temperature or conductivity from the cell.
Pump fails to run (if detectable)	Internal pump has failed to run.
Sample fluid temperature	Temperature of the fluid in the cell exceeds 95 °C.
Internal temperature	Ambient temperature inside the instrument exceeds 40 °C.

Warning alarms

A warning occurs any time one of the subsystems is not operating at a normal level. When a warning condition is present, a warning indicator will appear on the display. Operation may continue with a warning condition present. When the warning condition has been corrected, the indicator will disappear. See Table 10-2.

Table 10-2 Warning messages

Message	Condition indicated by message
Single lamp failure	Currently used lamp's output has reached the failure limit but the other lamp has not. This condition will trigger the instrument to begin using the other lamp.
Marginal lamp	Currently used lamp's output has reached the marginal limit. • If the other lamp has a status of good, the instrument will begin using the other lamp. • If the other lamp has a status of marginal or failed, this lamp will continue to be used. • If the lamp cannot be switched over, this warning will occur once per day.
Lamp switch over	Analyzer has switched from one lamp to the other.
Lamp life exceeded	Lamp life counter has reached 0. This lamp will be set to a status of marginal and then follow the procedures for a marginal lamp above in section Marginal lamp
Wrong bottle loaded	Scheduled bottle operation only. Operation cannot be performed due to the wrong bottle being detected in one or more positions. Analyzer will abort the operation and return to its normal operating mode.
Not enough fluid	There is not enough fluid in one or more of the bottles to complete the scheduled bottle operation. Analyzer will abort the operation and return to its normal operating mode.
RFID read failure	Scheduled bottle operation only. Analyzer has failed to read the RFID tag on a bottle that should have an RFID tag. Analyzer will abort the operation and return to its normal operating mode.
RFID write failure	Scheduled bottle operation only. Analyzer has failed to write to the RFID tag on a bottle that should have an RFID tag. Analyzer will continue with the operation.
Failed to load settings	Analyzer has failed to load previously saved settings during startup. Analyzer will load the default settings. This action will be noted in the audit trail, if applicable.
Sample bottle mismatch	Analyzer has detected that one or more bottles do not match the last known configuration during startup. Analyzer will continue loading but will not run the scheduled operation until the problem is fixed.

Measurement alarms

A measurement alarm condition occurs any time a data value exceeds a user-defined or system defined alarm limit. When an alarm condition occurs, the corresponding data value will turn RED. If the value drops below the alarm limit, the value will return to its normal color.

Audible alarms

When any of the above three error types occurs, an audible alarm will sound. The audible alarm will repeat until the alarm condition has cleared or the user silences it. Each type of alarm (Stop, Warning, Alarm) will have its own sound. If multiple alarms are present, only the highest-level alarm will sound.

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Lamp failure alarms

Lamp failure occurs when one lamp needs replacement. This warning will occur after each analysis, if the condition is still present. See Table 10-3.

Table 10-3 Lamp failure messages

Warning indicator	Occurrence
Lamp marginal	A UV lamp has a status of marginal. This warning will occur once per day.
Lamp switch-over	One UV lamp has failed and the analyzer is able to switch over to the other lamp.
Lamp life exceeded	Lamp life timer has reached 0. This warning will occur once per day.
Wrong or no bottle loaded	Analyzer needs to sample from or send an excursion sample to a bottle that is missing or incorrect.
Not enough fluid	Not enough fluid in the bottle to perform a grab sample or calibration using the bottles.
RFID read/write failure	Analyzer has failed to read from or write to the RFID tag.
Failed to load settings	Some or all of the settings could not be read from the settings file.
Sample bottle mismatch	One or more sample bottles do not match the last known configuration.

10.3 Return procedures

To return an Anatel PAT700 TOC Analyzer for service, first obtain a return material authorization number (RA#). The RA# is necessary for any analyzer that requires repair or calibration by an authorized service center. Include the RA# on the shipping label when the analyzer is returned.

While the RA# process is described in this section, for the most up-to-date RA# process information, including copies of all required forms, call Hach Ultra at 800.866.7889 or +1 541.472.6500.

To return an analyzer for credit, contact the local sales representative.

WARNING

Failure to dispose of hazardous waste byproducts in accordance with applicable local regulations can cause exposure to poisonous chemicals, resulting in severe environmental and property damage or personal injury.

Adhere to applicable local regulations to ensure proper disposal of hazardous waste byproducts.

WARNING

Improper disposal of the analyzer's lithium battery can cause fire, explosion, or burns, and other severe injuries.

Follow the battery manufacturer's instructions for disposing of the lithium battery. Do not attempt to incinerate, recharge, or disassemble the lithium battery.

WARNING

Failure to adhere to the following procedures before returning the analyzer to Hach Ultra Analytics, Inc. can cause property damage or personal injury.

Before shipping the analyzer:

- *Run a test without attaching a sample vial to purge the unit of all liquid.*
- *Remove all process materials and thoroughly clean the analyzer.*

10.4 Technical support

Technical support engineers can provide high quality advice and recommendations for applications, product operation, measurement specifications, hardware and software, factory and customer site training.

Provide name, company, phone, fax, model number, serial number, and comment or question.

- Voice +1 541.472.6500
- Toll free: 1.800.866.8854 (USA/CA)
- FAX: 1.541.474.7414
  6:00 AM to 5:00 PM Pacific Time Monday through Friday
- Email: TechSupportGP@hachultra.com

Appendix A: Specifications

Performance specifications

The PAT700 TOC Analyzer is specifically designed for use in applications that monitor ultrapure water with a typical conductivity less than 0.2 microsiemens/cm (as high as 5.0 µS/cm for pH neutral waters) compensated to 25 °C.

- The maximum configuration may contain up to eight analyzers in addition to a host computer and associated input/output devices.
- PAT700 Specifications are subject to change without notice.

TOC mode	
Operating range	1 to 1000 ppb as carbon
Resistivity	0.01 to 18.2 M.-cm
Conductivity	0.05 to 150 µS/cm (@ 25 °C)
Display resolution	1 ppb
Online repeatability	±1% or 1 ppb (whichever is greater)[1]
Maximum input conductivity	0.2 µS/cm for all waters 1.0 µS/cm for all neutral waters 5 µS/cm for water with CO_2 as the sole conductive species
Ambient operating temperature	PAT700 analyzer; 15 °C to 40 °C (59 °F to 104 °F)
Sample water temperature	5 °C to 65 °C (41 °F to 149 °F)[2]
Sample inlet flow rate	60 mL/min to 300 mL/min
Sample inlet pressure	10 psi to 100 psi (69 to 690 kPa)

1. Repeatability of reading on an individual analyzer.
2. Sample water temperature specification stated without external heat exchanger. For sample water over 65 °C a CX-20 heat exchanger is highly recommended.

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Conductivity (purge) mode	
Conductivity mode	Temperature compensated to 25 °C or uncompensated
Conductivity range	0.05 to 150 µS/cm (@ 25 °C)
Display resolution	0.01 µS/cm
Resistivity range	0.01 to 18 M.-cm (@ 25 °C)
Display resolution	0.1 to 14.9 M.-cm, 1.0 M.-cm from 15 to 18 M.-cm
Conductivity accuracy	2% over full range (uncompensated)[1]

1. Repeatability of reading from analyzer to analyzer.

TOC	
Up to 4-point calibration	0 ppb C (blank) 250 ppb C 500 ppb C 750 ppb C (all sucrose)
1- to 3-point validation	250 ppb C 500 ppb C 750 ppb C (sucrose)
System suitability	500 ppb C (sucrose) 500 ppb C (1-4, benzoquinone) Reagent Blank
Conductivity	
1-point calibration, cell constant	100 µS/cm solution
1-point validation of meter	61.9 K. resistor

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Physical specifications

Physical	
Installation category	II, IEC 1010
Pollution degree	2, IEC 664
Operating temperature	15 °C to 40 °C (59 °F to 104 °F)
Maximum relative humidity	100% RH (non-condensing)
Maximum altitude	4,000 m (13,125 ft)
Size (including sample vessel assembly)	193 mm H x 489 mm W x 119 mm D (7.6” H x 19.25” W x 4.7” D)
Weight	6.58 kg (14.5 lb)
Analysis cell volume	0.4 mL
Power	100 to 240 VAC ±10%, 50/60 Hz
Power consumption	2 A max. @ 120 VAC 1 A max. @ 230 VAC
Fuse	3 A, 250 VAC fast-blow
Power cord	100 to 120 VAC main, 208 to 230 VAC main
Rating	125 VAC 10 A Foil shield 100% Braid shield 85%
Connectors	IEC 320-C13 and NEMA 5-15P
Rating	250 VAC 10 A Foil shield 100% Braid shield 85%
Connectors	IEC 320-C13 and CEE 7/7or CEI 23-16/VII (or like, depending on country)

I/O connections	
Analog	Opto-isolated 4-20 mA output Non-isolated 12 VDC output @ 1/2 A max.
Digital I/O	Two opto-isolated inputs Two opto-isolated outputs
Serial interfaces	RS485 opto-isolated network RS232 data acquisition RS232 printer RS232 diagnostics

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