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Operations Manual

Electrochemistry Meters



Update Meter Software to Ensure Optimum Performance

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DOMINIQUE DUSCHER SAS

Orion Pro Star PC215 pH/Ion and Conductivity Bench Meter User Manual

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ThermoFisher SCIENTIFIC

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Chapter 1 Introduction

Thank you for purchasing the Thermo Scientific™ Orion™ Pro Star PC215 pH/ion and conductivity bench meter. Orion Pro Star PC215 pH/ion and conductivity bench meters are designed to provide accurate and reliable testing in laboratories that need a modern, easy-to-operate meter with advanced performance and reliable data reporting.

Orion Pro Star PC215 bench meters utilize two channels to offer the following measurements:

- pH, mV, ORP or ion concentration with temperature
- Conductivity, TDS, salinity or resistivity with temperature

First time meter startup is made easy with the meter setup wizard, which guides the user through important meter and measurement settings. Utilize onscreen meter tours and guides for calibration, measurements, meter connections, electrode stand assembly and pH electrode usage to better understand meter operation, warnings and required maintenance. The streamlined, easy to operate user interface includes guided calibrations with step-by-step instructions to help perform calibrations correctly and ensure accurate, reliable and reportable measurements.

Easily view measurements on the large 7-inch color graphic touchscreen display. The responsive touchscreen is operable with gloves and angled to help ensure ergonomic viewing. View measurement channels individually or both simultaneously to meet changing measurement needs. Select the basic, advanced or custom measure display format to view only the information you prefer in the measure mode. Select the graph view to display individual measurements in a graph with temperature for measurement versus time studies.

While taking measurements, easily enter sample identification information into the meter using an optional meter accessory including USB barcode scanner, USB keyboard or USB mouse. Easily and uniformly stir samples using an optional meter-controlled and meter-powered stirrer probe, which eliminates the need for a magnetic stir plate and bars.

Save, display and export up to 20 calibrations per parameter with date and time stamps to support GLP (Good Laboratory Practice) compliance. Filter calibration logs by user and export calibration logs by date range or all at once.

Easily save measurements to the data log for long-term data retention. Save, display and export up to 10,000 data log sets with date and time stamps to support GLP compliance. View individual data log sets with extensive measurement information organized into an easy-to-read onscreen list. Filter data logs by user, date and time or log number and export data logs by date and time range, log number range or all at once.

Output meter data logs, calibration logs and methods to a printer, computer or USB flash drive. Save data to a computer or USB drive as comma separated value (CSV) files for import into programs like Microsoft Excel or save data to a USB drive as report files for printable records. Customize exported

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files to include all data, advanced, intermediate or basic data, depending on the information needed for your record keeping. Utilize bidirectional communication with remote commands to interface the meter with computer programs including LIMS, HyperTerminal, PuTTY and additional data collection software.

Save measurement settings to standardize your analyses and standard operating procedures (SOPs) using meter methods. Save up to 10 methods per parameter. Import methods to and export methods from other Orion Pro Star series meters to standardize your testing across multiple meters. Also save, import and export incremental techniques for ion concentration determination using known addition, known subtraction, analyte addition and analyte subtraction to standardize your analyses.

Activate the secure mode and assign up to 3 administrators and up to 30 users with individual account logins and password protection. Administrators can select from predefined user access levels to meter functions. Control access to date and time settings, instrument settings, data logs, and calibration logs, or customize each user's access level from full access to basic data collection as needed. Administrators can also export the user list and audit trail to help ensure digital data integrity.

Operate the included electrode stand to facilitate secure, smooth movement of electrodes into and out of solutions. The electrode stand's weighted base allows flexible placement of the stand around the meter. Secure a wide range of electrodes using the various electrode holder options. Neatly organize electrode cables in the built-in side channels of the stand.

All Orion Pro Star PC215 meters include an electrode stand, USB flash drive, computer cable and universal 100-240V 50/60 Hz power adapter with wall plugs for US/Japan, Euro, UK/Singapore, Australia/New Zealand and China. View meter accessories at www.thermofisher.com.

1.1 Intended Use

1.1.1 Intended Use

This device is a bench laboratory meter intended for use in a typical, indoor, controlled, laboratory environment. This device should only be used for analytical testing in accordance with these instructions.

1.1.2 Non-Intended Use

This device is not a Medical Device. It is not intended to be used to diagnose, treat, cure, or prevent disease.

1.1.3 Safety



CAUTION: This symbol, in the context of a CAUTION, indicates a potentially hazardous situation which if not avoided could result in minor to moderate injury or damage to the equipment.

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Note: This symbol, in the context of a Note, indicates to follow the manufacturer specified instructions, notes and requirements set out in the manuals.



CAUTION: Before using or maintaining this product, please be sure to read the manual carefully. Failure to follow these instructions may cause the product to malfunction.



CAUTION: Use this product only in the way described in the product literature and in this manual. Before using it, verify that this product is suitable for its intended use. If the product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired.



CAUTION: Do not modify system components. Use only OEM exact replacement equipment or parts. Before use, confirm that the product has not been altered in any way.



Note: Unauthorized repair of your meter will invalidate the warranty. For additional information, contact Technical Support at 1-800-225-1480, +1-978-232-6000 or WLP.TechSupport@thermofisher.com.

1.1.4 Power Connection

See the Universal Power Supply Assembly section for complete instructions on assembling and installing the included meter power supply.



Note: Position the meter so the user can access power connection and unplug power adapter in the event of a fault, so hazard of electrocution can be removed.

1.2 Cleaning Instructions (Meter Only)

Wipe the exterior surfaces (except the display panel) using a lint-free cloth dampened with clean water.

Wipe the display panel with a clean microfiber cloth, taking care to wipe lightly to avoid scratching the meter display.

The meter housing can also be cleaned using a clean microfiber cloth dampened with IPA (isopropyl alcohol) for disinfection purposes.

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Chapter 2
Getting Started

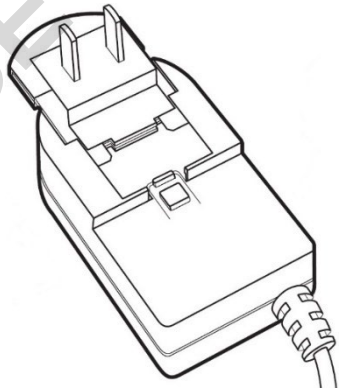
Refer to the 3.10 Information & Help section and Meter Tours to access onscreen tours that explain how to use important meter functions including meter connections, electrode stand assembly, pH electrode preparation, pH electrode storage and pH electrode cleaning.

2.1 Universal Power Supply Assembly

A universal power adapter (catalog number PSTAR-PWR) with US/Japan, Euro, UK/Singapore, Australia/New Zealand and China wall plug plates is included with the meter. This power adapter is specifically designed for use with this meter. The use of other power adapters can damage the meter and will void the meter warranty.

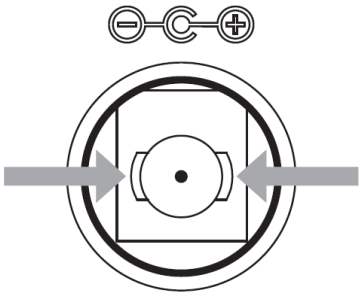
Note: The power adapter plug has 2 prongs that allow it to be securely locked onto the meter input. These 2 prongs must be properly aligned when connecting it to ensure it is fully connected, twisted and locked onto the meter input.

1. Unpack the power supply provided with the meter.
2. Select the appropriate plug plate for the wall power outlet.
3. Slide the appropriate plug plate into the groove on the back of the power adapter.

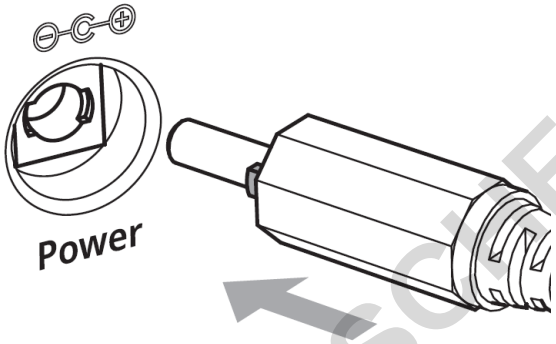


4. Connect the assembled power adapter to the meter input.
    a. Locate the 2 slots on the meter power input.

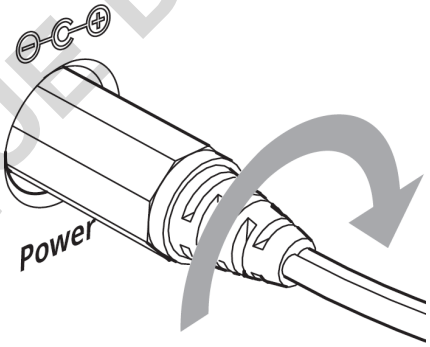
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b. Align the 2 tabs on the power adapter plug with the 2 indents on the meter power input.



c. Insert the power adapter plug into the meter power input and twist clockwise to lock the connection.



5. Connect the assembled power adapter to a power outlet.
6. You are now ready to turn on the meter.

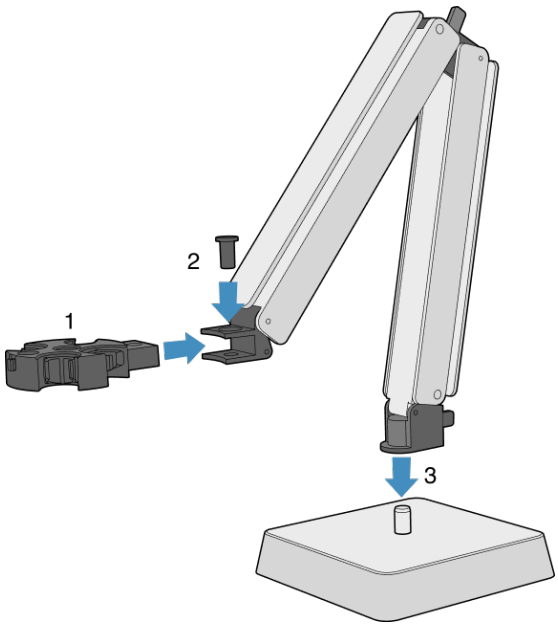
CAUTION: Use of a surge protector or uninterrupted power supply (UPS) is recommended, as an unintended power surge of electricity to the meter may damage the meter and void the warranty.

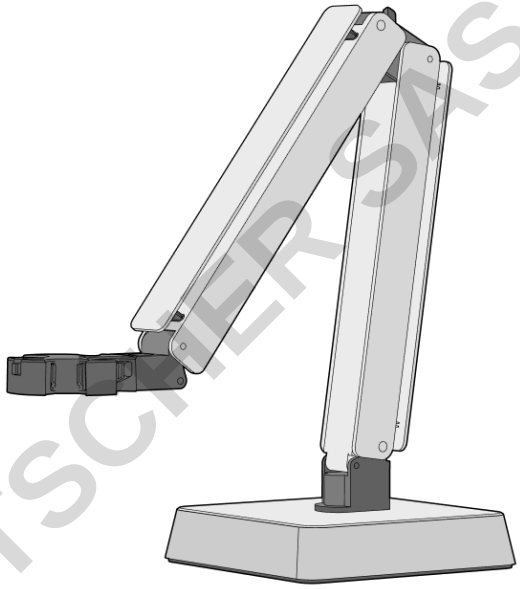
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2.2 Electrode Stand Installation

The included electrode stand (catalog number PSTAR-ARM) facilitates secure, smooth movement of electrodes into and out of solutions. A weighted base provides flexible placement of the stand around the meter. Several electrode holder and clip options accommodate a wide range of electrode types. Built-in side channels allow electrode cables to be neatly organized inside the stand.

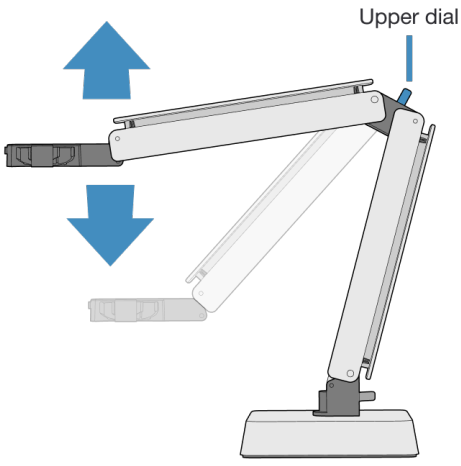
Unpack the electrode stand arm, holder head and base from the meter box.



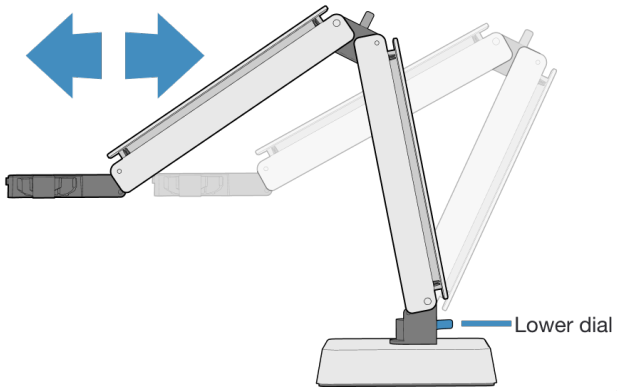


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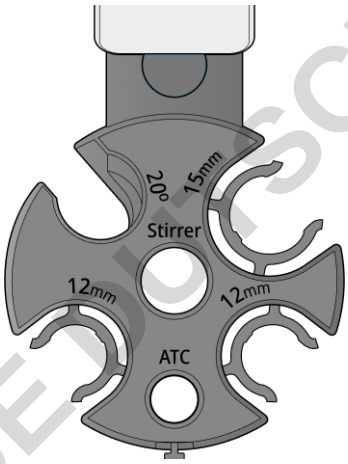
1. Slide the electrode holder head into the U-shaped slot on the arm.
2. Insert the pin into the hole at the top of the U-shaped slot.
3. Lower the electrode arm onto the peg on the base of the stand.
4. Adjust the electrode stand resistance as needed.
    a. The amount of up and down resistance can be adjusted using the upper dial. Dialing left decreases the resistance, making the arm easier to move up and down. Dialing right increases the resistance, making the arm harder to move up and down.



b. The amount of front and back resistance can be adjusted using the lower dial. Dialing left decreases the resistance, making the arm easier to move forward and backward. Dialing right increases the resistance, making the arm harder to move forward and backward.



5. Place the electrodes into the electrode holders. The recommended electrode diameter for each slot is indicated on the holder.



a. The **12mm** clips hold pH electrodes, ORP electrodes, ion selective electrodes (ISEs) and other electrodes with a 12mm electrode body diameter.

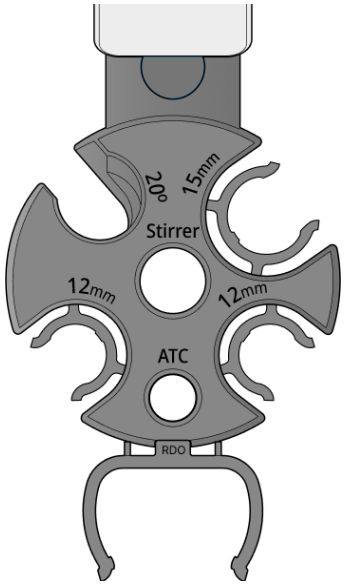
b. The **ATC** holder secures the Orion ATC temperature probe. The height of the ATC probe can be adjusted to match the height of additional electrodes in the holder.

c. The **Stirrer** holder secures the Orion stirrer probe, catalog number 096019-WA. The Orion stirrer is meter-controlled, meter-powered and works seamlessly with this meter.

d. The **15mm** clip holds conductivity electrodes, polarographic dissolved oxygen electrodes and other electrodes with a 15mm diameter.

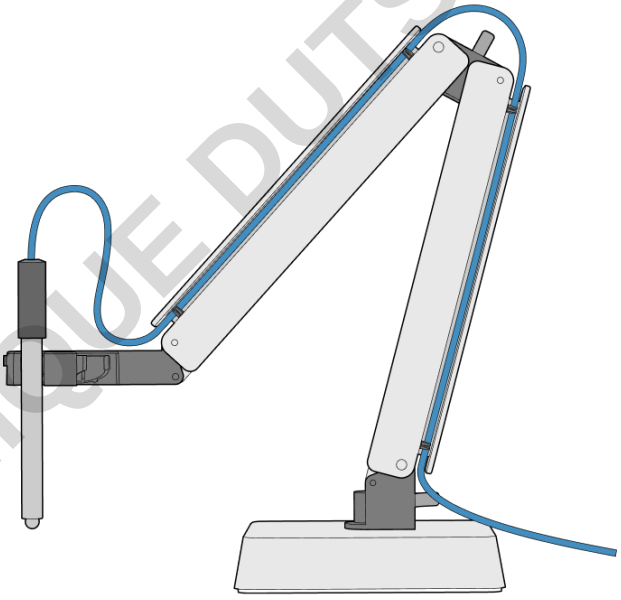
e. The **20°** angled holder secures gas-sensing ion selective electrodes (ISEs) including the ammonia electrode, catalog number 9512BNWP and high performance ammonia electrode, catalog number 9512HPBNWP.

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f. The **RDO** clip holds optical dissolved oxygen electrodes. Attach the RDO clip to the holder head by sliding the clip down on top of the tab on the front of the holder head.

6. Use the side channels built into the electrode arm to organize the electrode cables. Press the electrode cables into the 4 grips inside the arm channels to secure the cables in place.

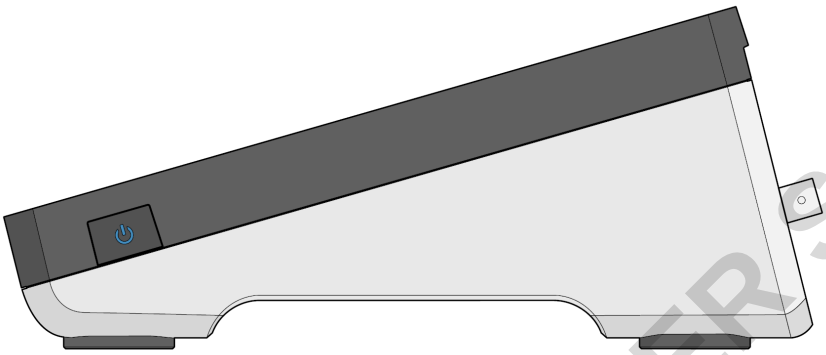


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2.3 Meter Inputs

2.3.1 Power Button

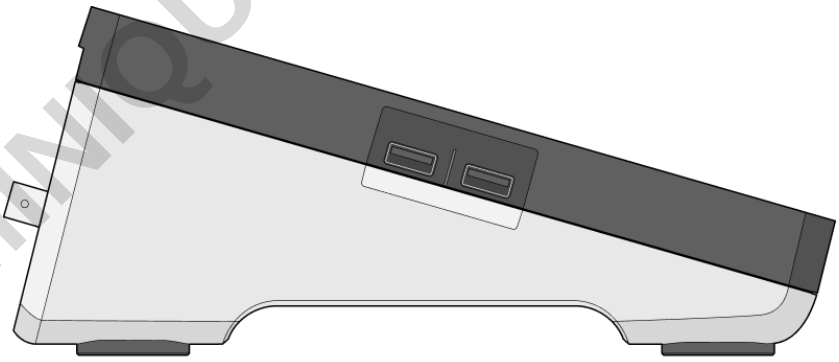
The meter power button is located on the right side of the meter. Press and release the power button to power the meter on or off.



2.3.2 USB Inputs

The USB meter inputs are located on the left side of the meter. Each input has a protective cap that protects the meter from dust and water intrusion. For maximum protection, keep the protective caps securely closed unless the input is in use.

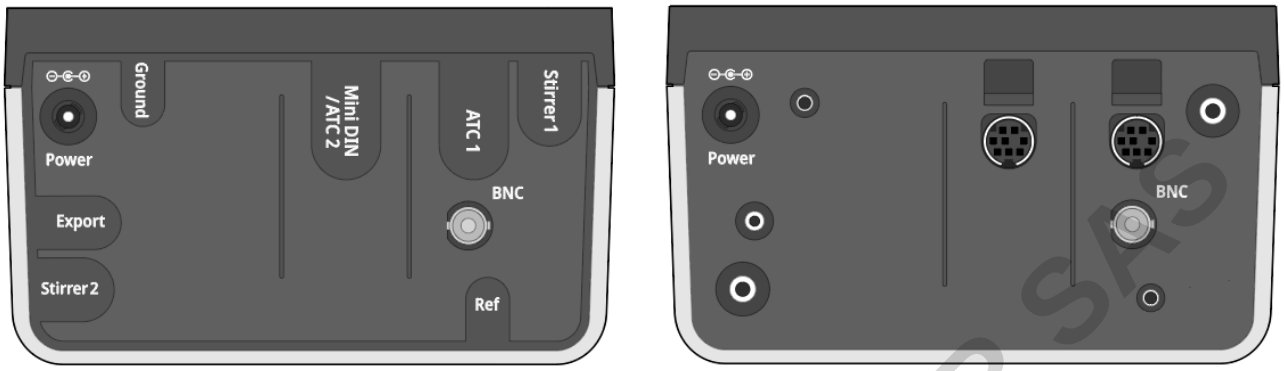
- Connect 1 USB flash drive with a USB-A plug to the meter for data transfer.
- Connect 1 USB accessory (barcode scanner, mouse or keypad) with USB-A plug to the meter for alphanumeric character entry into meter fields including sample ID.



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2.3.3 Back Panel Meter Inputs

Most meter inputs are located on the back panel of the meter. Each input has a protective cap that protects the meter from dust and water intrusion. For maximum protection, keep the protective caps securely closed unless the input is in use.



Power Input: Connect the power adapter, with twist-and-lock plug, to the meter. To ensure a secure connection:

- Align the 2 tabs on the power adapter plug with the 2 indents on the meter power input.
- Insert the power adapter plug into the meter power input and twist clockwise to lock the connection.

Export Input: Connect a computer or printer cable, with 2.5 mm phono jack plug, to the meter to transfer data.

- Lift the protective cap labeled Export.
- To connect a computer, use the included USB computer cable (catalog number PSTAR-USB) to interface the meter with a computer.
- To connect the Orion ink printer (catalog number STARA-106), use the printer cable included with the printer to interface the meter with the printer.

Ground Input: Connect a ground wire to the meter.

- The meter power supply usually provides optimal measurement performance, so the ground connector is not typically needed.
- However, in certain measurement conditions, for example, where other electrical devices are also placed the same sample, connecting the meter to earth ground via the ground input may reduce interference or noise.

Stirrer Inputs: Connect the Orion stirrer probe (catalog number 096019-WA), with 3.5 mm phono jack plug, to the meter.

- Lift the protective cap labeled Stirrer 1 or Stirrer 2.
- Insert the Orion stirrer probe plug fully into the meter input.

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- 1 or 2 Orion stirrer probes can connect with the stirrer inputs on the meter; the user can assign the Stirrer 1 or Stirrer 2 input to each measurement channel in the measurement settings.
- Orion stirrer probes are meter-powered and meter-controlled for easy sample stirring and rinsing.

Conductivity Input: Connect an Orion conductivity electrode, with 8-pin MiniDIN plug, to the meter.

- Lift the protective cap labeled MiniDIN/ATC 2.
- Insert the Orion conductivity electrode plug into the meter input. Ensure the plug is fully inserted and the clip is securely in place.

pH/Ion Inputs:

- Connect a pH, ORP or ion selective electrode; with BNC plug; to the meter.
    - Lift the protective cap (BNC shorting cap) from the BNC input.
    - Insert the electrode BNC plug fully into the meter input and twist to lock it in place.
    - The BNC shorting cap can be used to troubleshoot the meter, retain it for later use.
- Connect an Orion ATC temperature probe, with 8-pin MiniDIN plug, to the meter.
    - Lift the protective cap labeled ATC 1.
    - Insert the Orion ATC probe plug into the meter input. Ensure the plug is fully inserted and the clip is securely in place.
- Connect a reference half-cell electrode, with pin-tip plug, to the meter.
    - This meter input is only needed when using a reference half-cell electrode paired with a sensing half-cell electrode.
    - Lift the protective cap labeled Ref.
    - Insert the reference electrode plug fully into the meter input.

2.4 Meter Startup Sequence

When the meter is powered on, it displays a startup screen and proceeds to the main measure mode.

The first time the meter is powered on, it launches the meter setup wizard. Follow the displayed steps to set critical meter and measurement settings. View detailed information on additional settings in the 3.2 Settings section.

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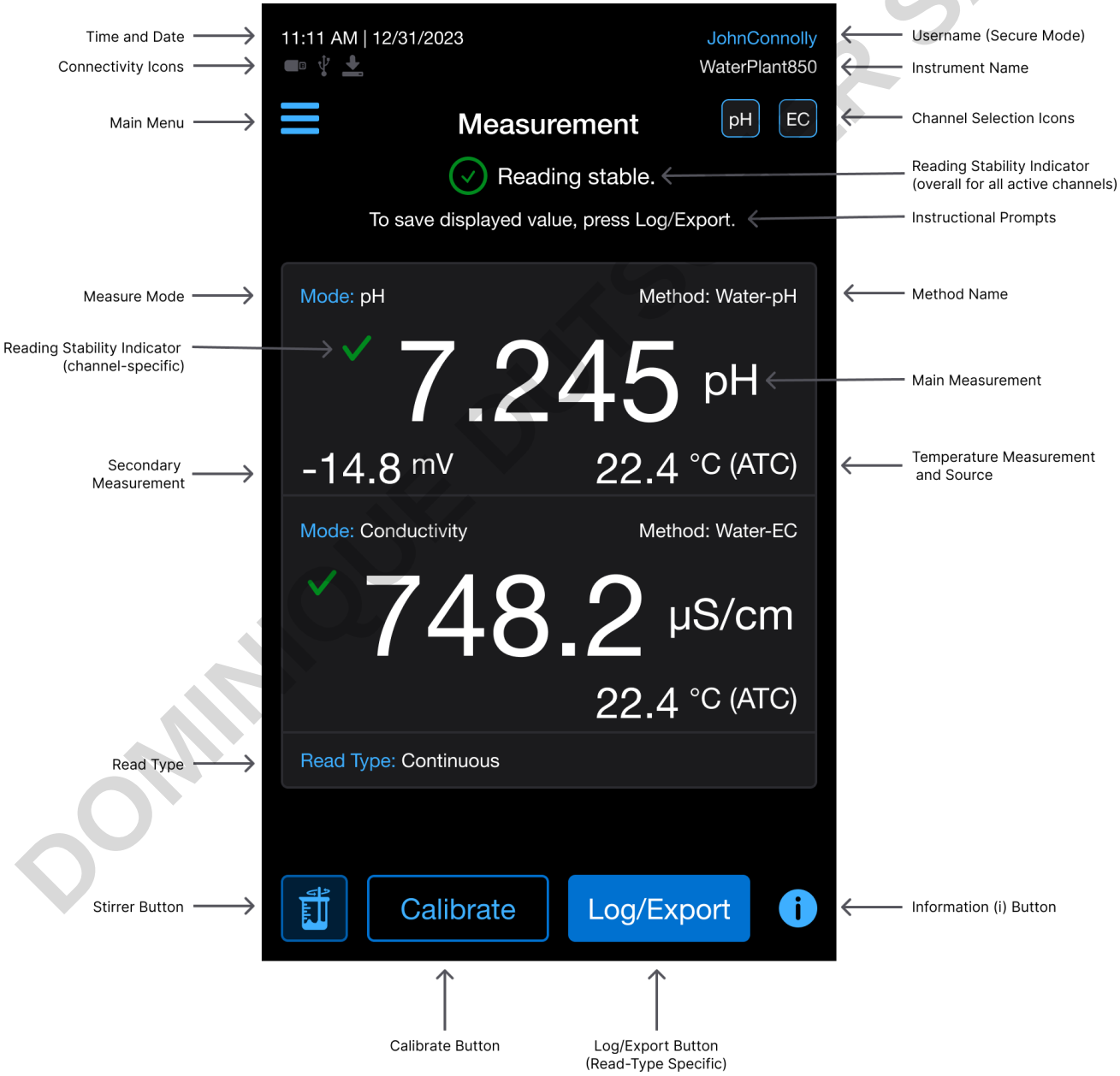
2.5 Touchscreen Functions

Orion Pro Star meters offer a 7” capacitive touchscreen interface that is compatible with most nitrile laboratory gloves.

- Key interaction points on the screen are blue for easy navigation.
- For screens with extended data, easily scroll by touching and sliding the display up and down.

Optionally, a USB mouse can be connected to the meter and used to operate the touchscreen interface if direct contact with the screen is not desirable.

2.5.1 Main Measure Mode



Note: *User-selectable information (i.e. instrument name) will only be shown on the measure mode display if it is entered in the settings menus.*

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Connectivity Icons: Indicate connectivity status of USB devices and export device with the meter.

	USB Flash Drive:	Indicates a USB flash drive is connected and communicating with the meter.
	USB Accessory:	Indicates a USB accessory (USB mouse, USB keyboard or USB barcode scanner) is connected and communicating with the meter.
	Export:	Indicates the meter is set to communicate with a computer or the Orion ink printer (catalog number STARA-106).

Channel Selection Icons: Use to select or deselect the channels that are actively displayed in the measure mode. Tap each icon to display or hide that channel.

- Tap the pH icon to select or deselect the pH, mV, ORP or ion concentration channel.
- Tap the EC icon to select or deselect the conductivity, TDS, salinity or resistivity channel.

Active channels are indicated with white text and hidden channels are indicated with gray text.

	pH and EC channels actively displayed in measure mode.
	pH channel actively displayed in measure mode, EC channel hidden in measure mode.

Read Type: Indicates the active read type for the measure mode.

- **Continuous:** Measurements are continuously updated on the display and measurement stability status is indicated as stabilizing or stable. Tap the Log/Export button to save and export the actively displayed measurement.
- **Auto-Read:** Tap the Measure button to start a measurement. When the measurement is stable, it is frozen/locked on the display until the Measure button is tapped again. When the measurement is stable, it is automatically saved and exported.
- **Timed**: Measurements are continuously updated on the display and measurement stability status is indicated as stabilizing or stable. Measurements are automatically saved and exported at the selected time intervals, from 3 seconds to 2 hours, while in the measure mode.

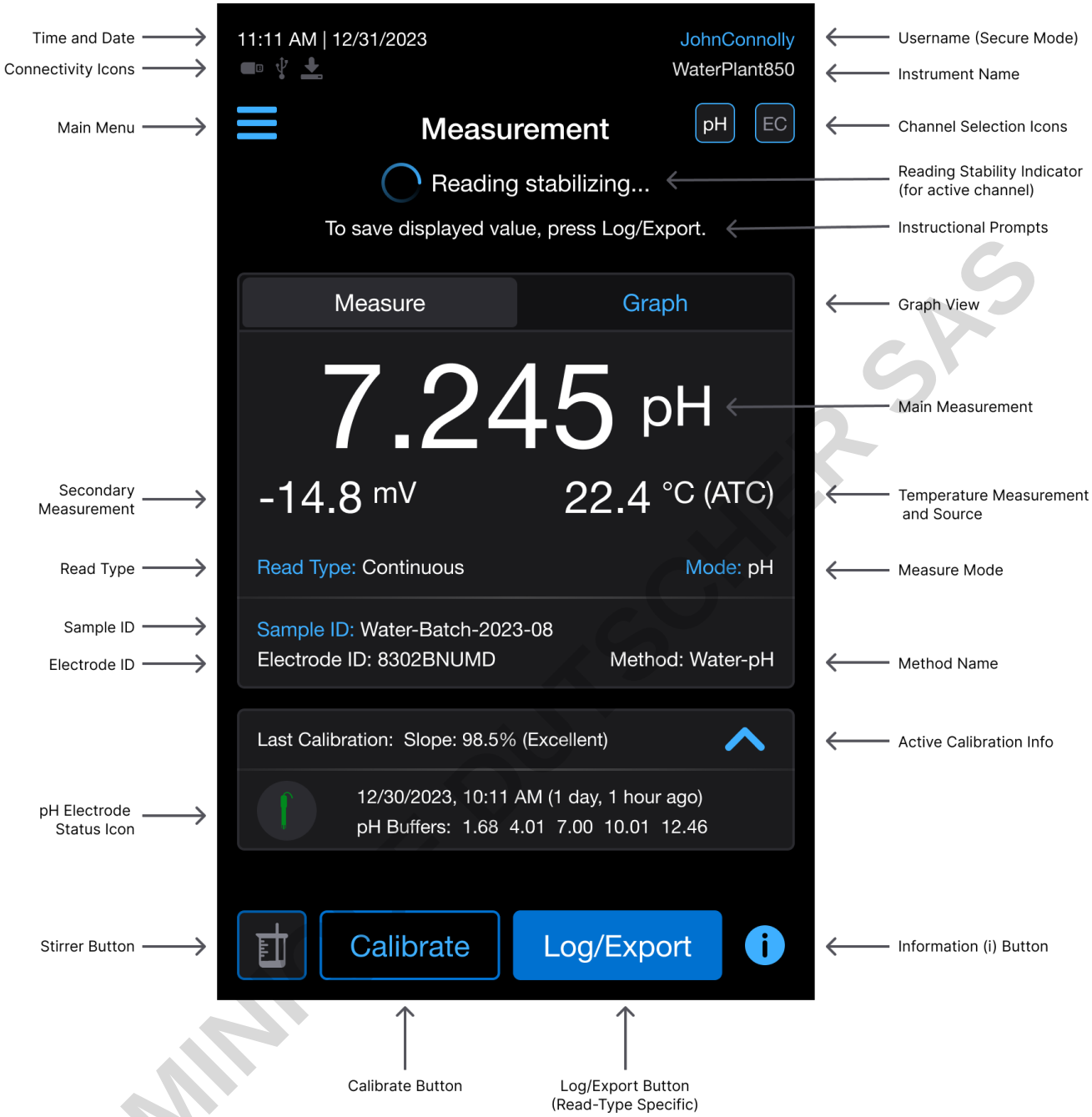
Stirrer Button: Use to activate or deactivate the Orion stirrer probe. Tap and hold the Stirrer button to adjust the stirrer probe speed.

Note: *The Stirrer button is hidden if the stirrer function is turned off for all actively shown channels in the measure mode.*

Information (i) Button: Tap to access helpful information and guidance about meter functions.

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2.5.1.1 Single Measure Mode View



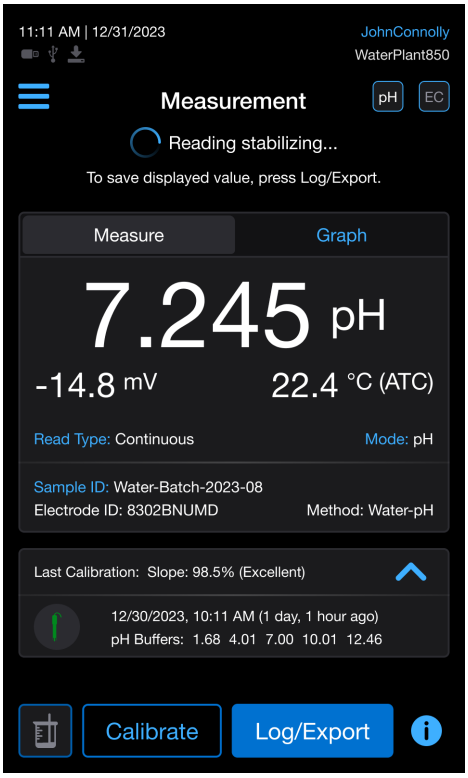
Note: *User-selectable information (i.e. instrument name, sample ID, electrode ID, method) will only be shown on the measure mode display if it is entered in the settings menus.*

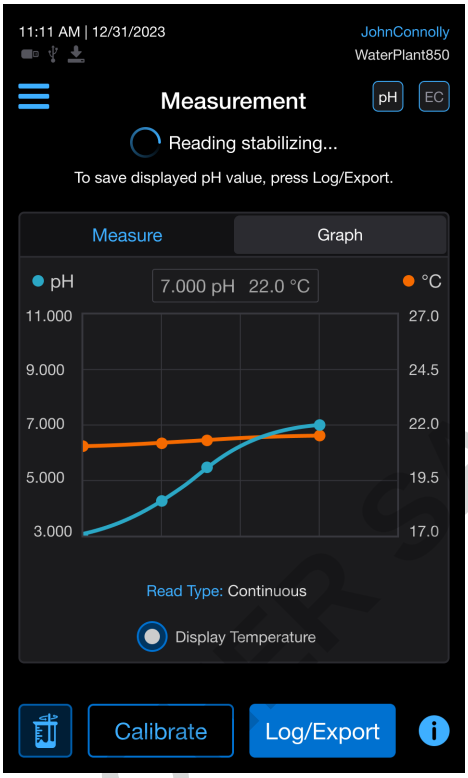
When viewing a single channel in the measure mode, additional information is displayed including the sample ID, electrode ID and most recent calibration information, as well as the option to view the current measurements as a graph.

Graph (Single Channel View Only): Tap the blue Graph text to view the current measurement as a graph with temperature.

- Select the Read Type to change how the graph tracks measurements over time.
- Tap the Display Temperature button to show or hide temperature measurements.

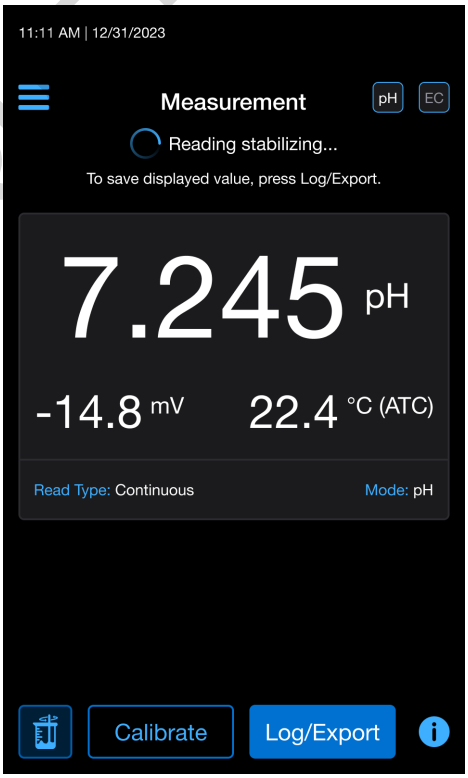
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2.5.1.2 Basic Measure Mode View

Refer to the 3.2.1 Instrument Settings section and Display settings and select Basic as the Custom Measure Layout to view a simplified version of the measure mode. The default meter setting is Advanced as the Custom Measure Layout and all user-selectable information (i.e. instrument name, sample ID, electrode ID, method) will only be shown when it is entered in the settings menus.



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2.6 Electrode Information

The Orion Pro Star PC215 meter is compatible with a pH electrode, ORP (redox) electrode or ion selective electrode (ISE) with BNC connector; ATC temperature probe with 8-pin MiniDIN connector; reference half-cell electrode with pin-tip connector and conductivity electrode with 8-pin MiniDIN connector. The Orion Pro Star PC215 meter is available in a meter only configuration (purchase electrode separately) or in meter kits with electrodes and solutions included for different applications.

Refer to the instructions in the electrode user manual for specific care and maintenance procedures. The following are general recommendations for electrode preparation.

pH, ORP and Ion Selective Electrodes

1. Remove the electrode from its packaging and remove the protective cap/bottle from the electrode and save it for later storage.
2. Rinse any salt deposits off the electrode using distilled or deionized water.
3. If the electrode is refillable, uncover the fill hole and add filling solution to the electrode up to the fill hole. The fill hole should remain open when the electrode is in use.
4. Soak the electrode in storage solution when first preparing it and when it is not in use.
5. Connect the electrode to the meter.

Conductivity Electrodes

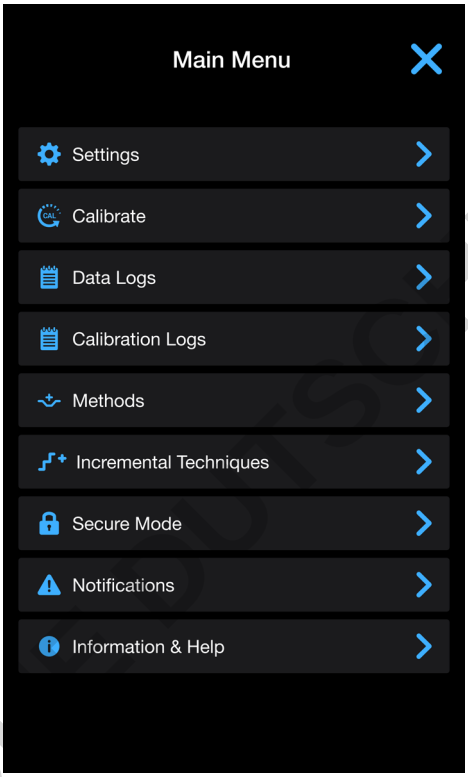
1. Remove the electrode from its packaging.
2. Rinse any dust or debris off the electrode using distilled or deionized water.
3. Connect the electrode to the meter.

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Chapter 3
Main Menu

3.1 Main Menu

Tap the Main Menu icon in the measure mode to access the Main Menu.



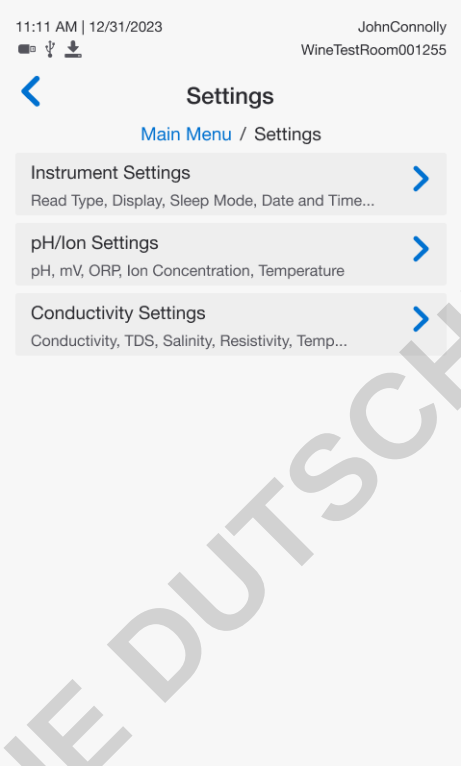
- Settings: View and customize instrument and measurement settings.
- Calibrate: Perform all calibration functions, including temperature and barometer calibrations.
- Data Logs: View, filter and export up to 10,000 data sets with time and date stamps.
- Calibration Logs: View, filter and export up to 20 calibration logs per parameter with time and date stamps.
- Methods: View, create, edit and load up to 10 methods per parameter. Methods allow measurement settings to be saved to standardize the analysis and SOP.
- Incremental Techniques: View, create, edit and run up to 20 incremental techniques for ion concentration determination using known addition, known subtraction, analyte addition and analyte subtraction.
- Secure Mode: Option to activate Secure Mode and assign up to 3 administrators and up to 30 users, each with an individual account login with password protection and custom access levels.

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- Notifications: View a list of the latest warnings, alarms and errors shown on the meter.
- Information & Help: View meter information, user manual and meter tours; perform meter tests and troubleshooting, setup wizard, software updates and meter reset functions.

3.2 Settings

Tap the Settings option in the Main Menu to access the instrument and measurement settings.

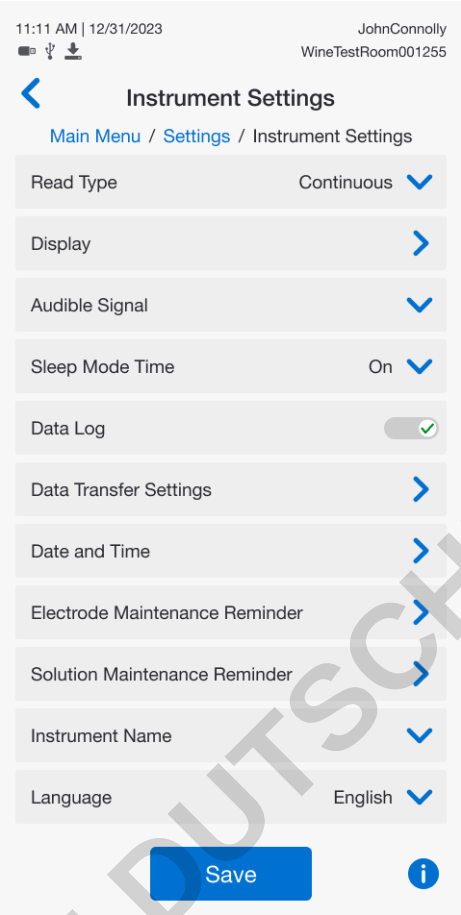


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- Instrument Settings: View and customize instrument settings for the read type, display, audible signal, sleep mode, data log, data transfer, date and time, maintenance reminders and instrument name.
- pH/Ion Settings: View and customize measurement settings for the pH, mV, ORP or ion concentration channel, including temperature, measure mode, sample ID, alarms, resolution, calibration points, electrode type, stability criteria, stirrer, electrode ID, isopotential value, slope type and slope guidance.
- Conductivity Settings: View and customize measurement settings for the conductivity, TDS, salinity or resistivity channel, including temperature, measure mode, sample ID, alarms, nominal cell constant, reference temperature, temperature compensation, calibration points, stability criteria, stirrer, electrode ID and electrode type.

3.2.1 Instrument Settings

Tap the Instrument Settings option in the Settings list to access the instrument settings.



- Read Type: Set the Read Type as Continuous, Auto-Read or Timed to define how measurements are performed, saved and exported. If Timed is selected, set the time interval from 3 seconds (0:00:03) to 2 hours (2:00:00).
    - Continuous: In the Continuous measure mode, measurements are continuously updated on the display and the stabilizing or stable icon indicates the measurement stability status. Tap the Log/Export button to save a measurement to the data log and export to an external device according to the Data Transfer Settings.
    - Auto-Read: In the Auto-Read measure mode, tap the Measure button to start a measurement. When the measurement is stable, the stable icon is shown and the measurement is locked on the display until the Measure button is tapped again. The stable measurement is automatically saved to the data log and exported to an external device according to the Data Transfer Settings.
    - Timed: In the Timed measure mode, tap the Start button to begin taking timed measurements. Measurement values are continuously updated on the display. Measurements are automatically saved at the selected time intervals (3 seconds to 2 hours) to the data log and exported to an external device according to the Data Transfer Settings while the meter remains in the measurement mode. Tap the Stop button or leave the measure mode to stop taking timed measurements.

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- Display: Adjust the Brightness and set the Custom Measure Layout of the display.
    - Brightness: Adjust the display brightness by sliding the icon to the left (dimmer display) or to the right (brighter display).
    - Custom Measure Layout: Select an option to customize information in measure mode:
        - Basic: Only critical information is shown in the measure mode, including primary reading, secondary reading (if applicable), temperature, read type and mode.
        - Advanced: All information is shown in the measure mode.
        - Custom: Select or deselect the components to show in the measure mode.
- Audible Signal: Turn the audible signal on or off for notifications and alarms and stable reading (Auto-Read only).
- Sleep Mode Time: Set the amount of time the meter will remain idle before powering off to 5, 10, 20, 30 or 60 minutes or turn off sleep mode so the meter will not power off automatically.
- Data Log: Turn the data log function on or off. When on, measurements are saved to the data log according to the selected Read Type setting. When off, no measurements are saved.
- Data Transfer Settings: Set the Export Destination, Export Baud Rate (when applicable), Custom Data Log Export and Custom Calibration Log Export settings.
    - Export Destination: Select 1 external device for data to be exported from the meter.
        - USB Drive: Data is exported to a USB flash drive when it is connected to the USB port on the side of the meter. Methods and software updates can also be imported from the USB flash drive to the meter.
        - Computer: Data is exported to a computer when a computer is connected to the Export port on the back of the meter.
        - Printer: Data is exported to the Orion ink printer (catalog number STARA-106) when it is connected to the Export port on the back of the meter.
        - Off: No data is exported to an external device.
    - Export Output Format: Set the format of exported files when USB Drive or Computer is selected as the Export Destination.
        - CSV (Comma Separated Values): Plain text file with data delimited by commas, useful for importing into LIMS, Microsoft Excel and similar programs.
        - Report: Formatted file with data organized in separate rows, useful for easily viewing data outside the meter and creating hardcopy records.
    - Export Baud Rate: Set the baud rate the meter will use to export data. Use 115200 for exporting to most computers. Use 9600 for exporting to the Orion ink printer.
    - Custom Data Log Export: Select an option to customize the amount of information exported from the data log. *Select All Data when exporting data to LIMS software.*
        - Basic: Only critical data is exported from the data log including date, time, primary reading and temperature.

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        - Intermediate: Moderate data is exported from the data log including basic data plus log #, username, measure mode, secondary reading (if applicable) and short calibration log summary.
        - Advanced: Significant data is exported from the data log including intermediate data plus read type, read time, sample ID, method, electrode ID, full calibration log summary and instrument ID.
        - All Data: All data is exported from the data log including advanced data plus meter model, serial number, software revision, export date and export time.
    - Custom Calibration Log Export: Select an option to customize the amount of information exported from the calibration log. *Note: Select All Data when exporting data to LIMS software.*
        - Basic: Only critical data is exported from the calibration log including date, time, calibration points (reading with temperature) and calibration results.
        - Intermediate: Moderate data is exported from the calibration log including basic data plus log #, username and calibration points (secondary reading).
        - Advanced: Significant data is exported from the calibration log including intermediate data plus calibration mode, electrode ID, method, calibration points (read time and entry type) and instrument ID.
        - All Data: All data is exported from the calibration log including advanced data plus meter model, serial number, software revision, export date and export time.
- Date and Time: Set the date format (MM/DD/YYYY, DD/MM/YYYY or DD-MMM-YYYY), enter date values, set the time format (12 hour or 24 hour) and enter time values.
- Electrode Maintenance Reminder: Set up to 5 reminders for electrode maintenance. Each reminder time interval can be set to 3 months, 6 months, 1 year or a custom value from 1 day to 24 months. Each reminder also has a note field to enter information related to the reminder such as “Refill”, “Clean” or “Replace”.
- Solution Maintenance Reminder: Set up to 5 reminders for solution maintenance. Each reminder time interval can be set to 1 week, 1 month, 3 months, 6 months or a custom value from 1 day to 12 months. Each reminder also has a note field to enter information related to the reminder such as “Pour Fresh”, “Reorder”, “Expires” or “Replace”.
- Instrument Name: Enter up to 20 alphanumeric characters to identify the meter on the display, in the data log, in the calibration log and on exported records.

Note: Tap the Save button once all changes are made.

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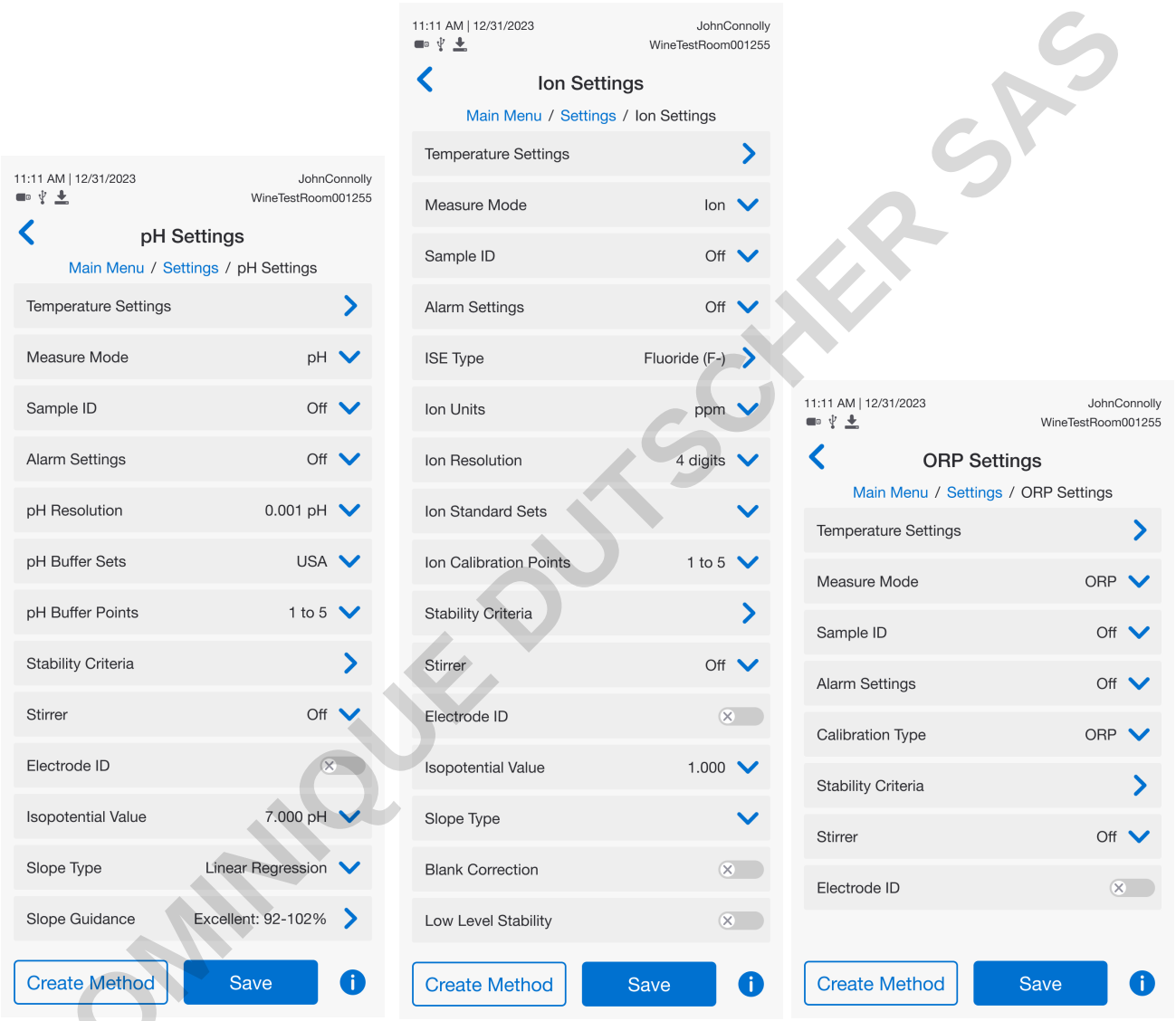
3.2.2 pH/Ion Settings

Tap the pH/Ion Settings option in the Settings list to access the measurement settings for the pH, mV, ORP or ion concentration channel.

The list will update dynamically with setting changes.

The temperature settings apply to all measure modes for this channel.

Example pH/Ion Settings:



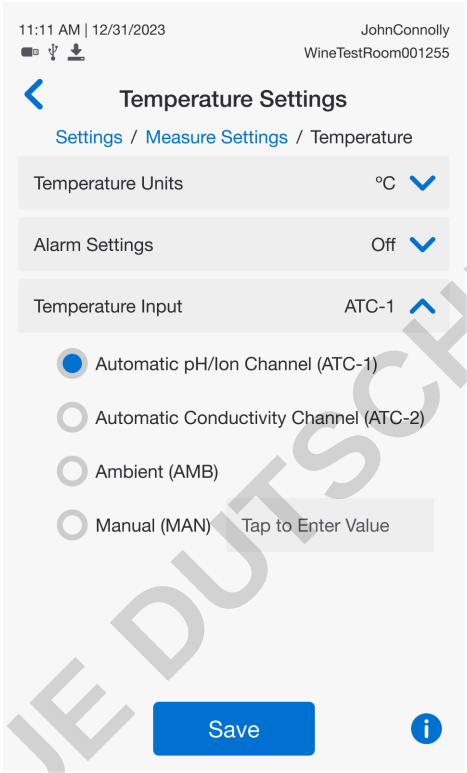
Temperature Settings: Select the temperature settings to be applied to the active channel, regardless of the selected measure mode.

- Temperature Units: Set temperature units as °C (Celsius) or °F (Fahrenheit).
- Alarm Settings: Set alarm settings for high and/or low temperature values and calibration due reminder as needed.
- Temperature Input: Select the source of temperature readings from the list.
  - Automatic: When ATC sensors are connected to the meter, all available sensors

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are shown in the list. The meter will default to ATC sensor connected to the active channel and the ATC sensor from the other channel can be selected.

- Ambient: The meter's built-in sensor is used to measure ambient air temperature. While not as accurate as an ATC sensor in sample solution, it is more accurate than not reporting temperature.
- Manual: When no ATC temperature sensor is connected to the meter, the meter will default to MAN as the temperature input. Use the manual temperature input field to enter the sample temperature value, from -30.0°C to 130.0°C.



- Measure Mode: Set the main measure mode to pH, mV, ORP (relative mV) or ion concentration.
- Sample ID: Set to Auto-incremental, Manual or Off.
    - Auto-incremental: Enter up to 20 alphanumeric characters or select from the list of previously entered sample IDs. The meter will add "00001" to the end of the first sample ID and then automatically increase the sample ID by 1 for subsequent sample IDs.
    - Manual: Enter up to 25 alphanumeric characters or select from the list of previously entered sample IDs.
    - Off: No sample ID is shown for measurements, logs or exported records.
- Alarm Settings: Enable the Set Value Alarm and Calibration Reminder Alarm functions.
    - Set Value Alarm: Set a high value and an alarm will trigger if the measured value goes above the set high value. Set a low value and an alarm will trigger if the measured value goes below the set low value.
    - Calibration Reminder Alarm: Set an alarm interval of 8 hours, 1 day, 7 days or custom

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time from 1 hour to 30 days. If a calibration is not performed within the set interval, an alarm is shown on the meter.

- pH Resolution (pH mode): Set displayed pH resolution as 0.1, 0.01 or 0.001 pH units.
- pH Buffer Sets (pH mode): Select the pH buffer values used for automatic buffer recognition during pH calibrations. If Custom is selected, enter up to 5 values that are at least ±1 pH unit apart. *Note: During a pH calibration, values can also be manually entered for each point.*
    - USA: 1.68, 4.01, 7.00, 10.01, 12.46
    - DIN: 1.68, 4.01, 6.86, 9.18, 12.46
    - STD: 1.00, 3.00, 6.00, 8.00, 10.00, 13.00
    - Pure Water: 4.10, 6.97, 9.15
    - Custom: Up to 5 custom buffer values
- pH Buffer Points (pH mode) or Ion Calibration Points (ion mode): Set the required number of calibration points for calibrations.
    - 1 to 5: Calibrations can be performed using 1 to 5 calibration points. The user can proceed to the next calibration point or end the calibration after each calibration point.
    - 4: User must perform calibrations using 4 calibration points only.
    - 3: User must perform calibrations using 3 calibration points only.
    - 2: User must perform calibrations using 2 calibration points only.
    - 1: User must perform calibrations using 1 calibration point only.
- Calibration Type (ORP mode): Set the type of calibration as ORP or E_H.
    - ORP: User must manually enter the ORP standard value during calibration.
    - E_H: The meter will automatically recognize the Orion ORP standard value and adjust the calibration value related to the standard hydrogen electrode (E_H) value at the measured temperature during calibration. User may also manually enter the ORP standard value.
- Ion Type (ion mode): Set the type of ion selective electrode to be used for calibration and measurements. This setting is critical for the meter to correctly evaluate the calibration slope.
- Ion Units (ion mode): Set the displayed ion units as ppt, ppm, ppb, mg/L, M, mM, %, none (no units shown) or custom (enter up to 5 alphanumeric characters).
- Ion Resolution (ion mode): Set the displayed ion concentration resolution as 5 digits, 4 digits, 3 digits, 2 digits or 1 digit.
- Ion Standard Sets (ion mode): Select the standard set for automatic recognition during the ion concentration calibration. If Custom is selected, enter up to 5 values that are at least 1 decade apart (i.e. 1.000 and 10.000). *Note: During an ion calibration, values can also be manually entered for each point.*
    - 1.000, 10.00, 100.0, 1000, 10000
    - Custom: Up to 5 custom standard values

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- Stability Criteria: Select the Measurement Stability and Measurement Averaging functions.
    - Measurement Stability: Select Automatic, Fast, Medium or Slow Stability for measurements. The meter will use specific resolution criteria to determine the wait time before indicating measurements are stable.
    - Measurement Averaging: Select Automatic or Off for averaging measurements. When Automatic is selected, the meter will analyze the measurement and stabilize faster when measurements are fluctuating around an averageable value.
- Stirrer: Assign 1 of the 2 stirrer probe inputs on the back of the meter to the measurement channel and set the speed for that stirrer probe.
- Electrode ID: Enter up to 20 alphanumeric characters or select from the list of previous electrode IDs; electrode ID is shown on the display, data log, calibration log and exported records.
- Isopotential Value: Set the isopotential value for measurements.
    - Based on the Nernst equation, the isopotential point is the point at which the electrode slope does not change with temperature. It is 7.000 for most pH electrodes. It must be published or experimentally determined for ion selective electrodes.
- Slope Type: Select Segmented (point-to-point slope) or Linear Regression (single best fit slope) as the slope type to be used to calculate calibration results.
    - Segmented slope provides the most accurate measurements.
    - Linear regression uses an average slope, so it is not as accurate as using a segmented slope but may be helpful if measurements change significantly over a large range.
- Slope Guidance (pH mode): Set the range for Excellent, Fair and Bad slope values.
    - Excellent: Default slope range is 92.0 to 102.0%. Adjust from 90.0% to 105.0%.
    - Fair: Default slope range is 80.0 to 91.9% and 102.1 to 105.0%. Adjust from 80.0 to 95.0% and 100.1 to 110.0%.
    - Bad : Default slope range is below 80.0% and above 105.0%. Adjust to below 80.0% and above 110.0%.
- Blank Correction (ion mode): Turn blank correction function on or off.
    - When blank correction is enabled, an algorithm is used to compensate for the non-linearity of an ion selective electrode in low level standards and samples when at least 3 standards are used for calibration.
- Low Level Stability (ion mode): Turn low level stability function on or off.
    - When low level stability is enabled, the stability time is increased for calibration points to improve the accuracy of low level calibration standards and measurements.

Note: *Tap the Save button once all changes are made to preserve the changes or tap the Create method button to save the current channel parameters as a new method.*

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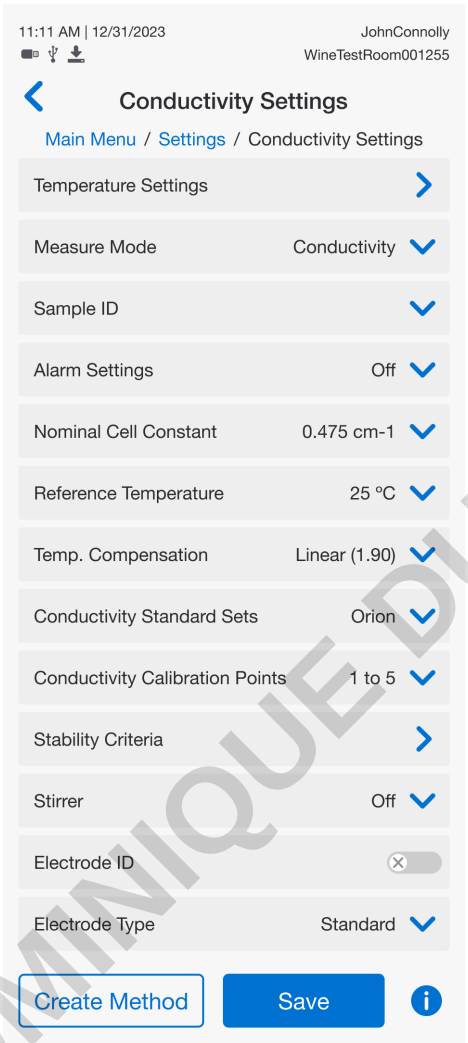
3.2.3 Conductivity Settings

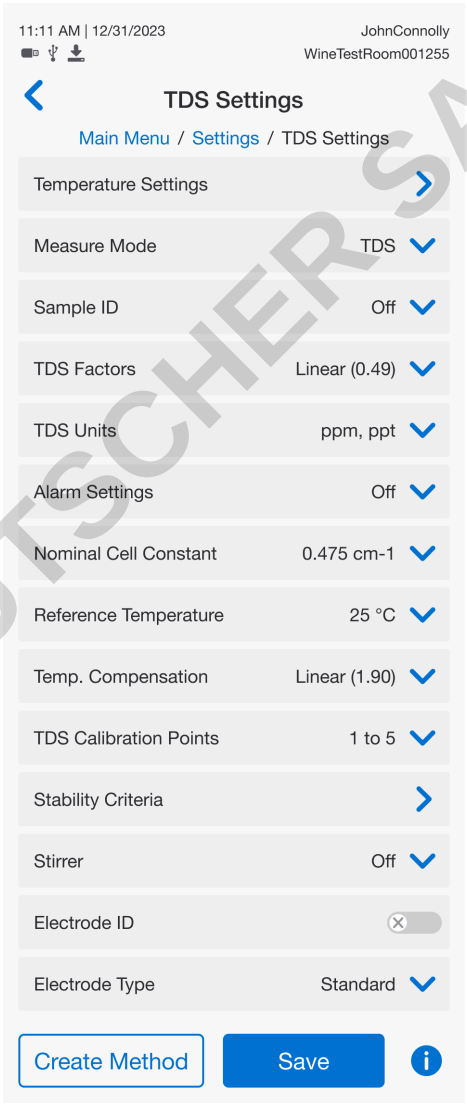
Tap the Conductivity Settings option in the Settings list to access the measurement settings for the conductivity, TDS, salinity or resistivity channel.

The list will update dynamically with setting changes.

The temperature settings apply to all measure types for this channel.

Example Conductivity Settings:





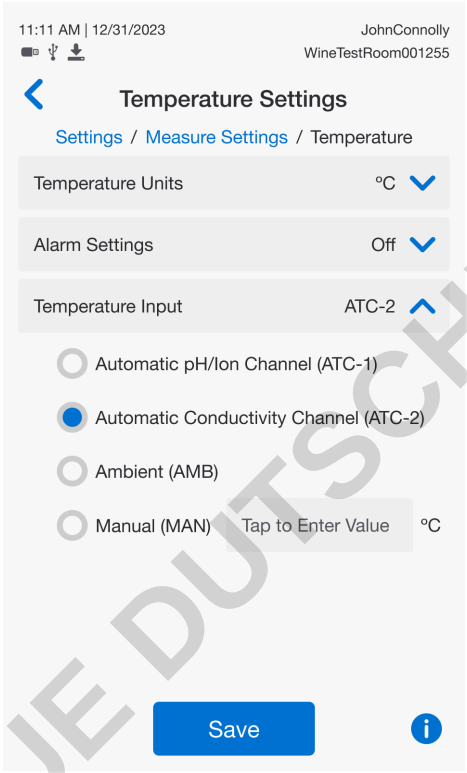
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Temperature Settings: Set temperature settings to be applied to the active channel, regardless of the selected measure mode.

- Temperature Units: Set temperature units as °C (Celsius) or °F (Fahrenheit).
- Alarm Settings: Set alarm settings for high and/or low temperature values and calibration due reminder as needed.
- Temperature Input: Select the source of temperature readings from the list.
  - Automatic: When ATC sensors are connected to the meter, all available sensors

are shown in the list. The meter will default to ATC sensor connected to the active channel and ATC sensors from other channels can be selected.

- Ambient: The meter's built-in sensor is used to measure ambient air temperature. While not as accurate as an ATC sensor in sample solution, it is more accurate than not reporting temperature.
- Manual: When no ATC temperature sensor is connected to the meter, the meter will default to MAN as the temperature input. Use the manual temperature input field to enter the sample temperature value, from -30.0°C to 130.0°C.



- Measure Mode: Set the main measure mode to conductivity, TDS, salinity or resistivity.
- Sample ID: Set to Auto-incremental, Manual or Off.
    - Auto-incremental: Enter up to 20 alphanumeric characters or select from the list of previously entered sample IDs. The meter will add "00001" to the end of the first sample ID and then automatically increase the sample ID by 1 for subsequent sample IDs.
    - Manual: Enter up to 25 alphanumeric characters or select from the list of previously entered sample IDs.
    - Off: No sample ID is shown for measurements, logs or exported records.
- TDS Factor (TDS mode): Set the TDS factor for TDS measurements as Linear, ISO/EN27888, 442 or NaCl. If Linear is set, enter the coefficient value in the range of 0.00 to 10.00.
    - Linear: Meter applies the entered factor to all measurements.
        - The standard method to determine a TDS factor is to evaporate the sample to dryness at 180°C and weigh the residue, the TDS factor is calculated by taking

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the residue weight and dividing it by the sample conductivity.

  - ISO/EN27888: Meter applies a linear TDS factor of 0.67 and a default temperature compensation type of nLFn.
  - 442: Meter applies a custom algorithm for the TDS factor and a temperature compensation type of nLFn.
  - NaCl: Meter applies a custom algorithm for the TDS factor and a temperature compensation type of linear 2.00 %/°C.

- TDS Units (TDS mode): Set the TDS units for TDS measurements as ppm, ppt or mg/L, g/L.
- Salinity Type: Set the salinity type for salinity measurements as Practical Salinity (PSU), Natural Seawater (ppt) or NaCl (%NaCl).
  - Practical Salinity (PSU): Meter applies a PSS-78 algorithm to all measurements, reference temperature of 15°C and temperature compensation type for PSS-78.
  - Natural Seawater (ppt): Meter applies a UNESCO-66 algorithm to all measurements, reference temperature of 15°C and temperature compensation type for UNESCO-66.
  - NaCl (%NaCl): Meter applies a custom algorithm to all measurement and default temperature compensation type of linear 2.00 %/°C.
- Alarm Settings: Enable the Set Value Alarm and Calibration Reminder Alarm functions.
  - Set Value Alarm: Set a high value and an alarm will trigger if the measured value goes above the set high value. Set a low value and an alarm will trigger if the measured value goes below the set low value.
  - Calibration Reminder Alarm: Set an alarm interval of 8 hours, 1 day, 7 days or custom time from 1 hour to 30 days. If a calibration is not performed within the set interval, an alarm is shown on the meter.
- Nominal Cell Constant: Set the cell constant value for the conductivity electrode to be used for calibration and measurements. This setting is critical for the meter to correctly evaluate the calibration readings.
- Reference Temperature: Select the reference temperature to be used for temperature compensated measurements as 5, 10, 15, 20, 25 or 30°C.
- Temperature Compensation: Set the temperature compensation type for measurements as Linear, nLFn (non-linear natural waters), nLFu (non-linear ultra-pure waters) , EP/USP or Off. If Linear is set, enter the coefficient value in the range of 0.00 to 10.00 %/°C.
  - Linear: Meter applies the entered coefficient value as a constant percent correction factor to every degree change in temperature.

Solution (25-50°C)	Coefficient (%/°C)
Sugar Syrup	5.64
Ultra-Pure Water	4.55

Solution (25-50°C)	Coefficient (%/°C)
Dilute Ammonia	1.88
5% NaOH	1.72

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Solution (25-50°C)	Coefficient (%/°C)
98% Sulfuric Acid	2.84
Salt (NaCl)	2.12
KCl	1.90

Solution (25-50°C)	Coefficient (%/°C)
10% HCl	1.32
5% Sulfuric Acid	0.96

  - nLFn: For non-linear natural waters, meter applies a non-constant correction factor to natural water samples that have a varying response to changes in temperature. Recommended for low conductivity waters in equilibrium with air and natural waters like natural ground, well or surface waters.
  - nLFu: For non-linear ultra-pure waters, meter applies a non-constant correction factor to pure water samples that have a varying response to changes in temperature. Recommended for ultra-pure waters that contains no air and no carbon dioxide (18 megohms resistance or higher) directly from the source and without aeration.
  - EP/USP: Meter will not apply temperature compensation to correct measurements and a warning is shown if the measured conductivity value is over the EP requirement for pure water at the measured sample temperature.
  - Off: Meter will not apply temperature compensation to correct measurements and the actual conductivity value (conductance) is shown at the measured sample temperature.
- Conductivity Standard Sets (conductivity mode): Select the standard set for automatic recognition during conductivity calibrations. If Custom is selected, enter up to 4 values, 1 per conductivity range (20.00 to 300.0 µs/cm, 300.0 to 9999 µs/cm, 10.00 to 99.99 mS/cm and 100.0 to 3000 mS/cm). *Note: During a conductivity calibration, values can also be manually entered for each point.*
  - Orion: 100 µS/cm, 1413 µS/cm, 12.9 mS/cm, 111.9 mS/cm
  - Custom: Up to 4 custom standard values
- Conductivity Calibration Points (conductivity mode) or TDS Calibration Points (TDS mode): Set the required number of calibration points for calibrations.
  - 1 to 5: Calibrations can be performed using 1, 2, 3, 4 or 5 calibration points. The user has the option to proceed to the next calibration point or end the calibration after each calibration point.
  - 4: User must perform calibrations using 4 calibration points only.
  - 3: User must perform calibrations using 3 calibration points only.
  - 2: User must perform calibrations using 2 calibration points only.
  - 1: User must perform calibrations using 1 calibration point only.
- Stability Criteria: Select the Measurement Stability and Measurement Averaging functions.
  - Measurement Stability: Select Automatic, Fast, Medium or Slow Stability for measurements. The meter will use specific resolution criteria to determine the wait time before indicating measurements are stable.

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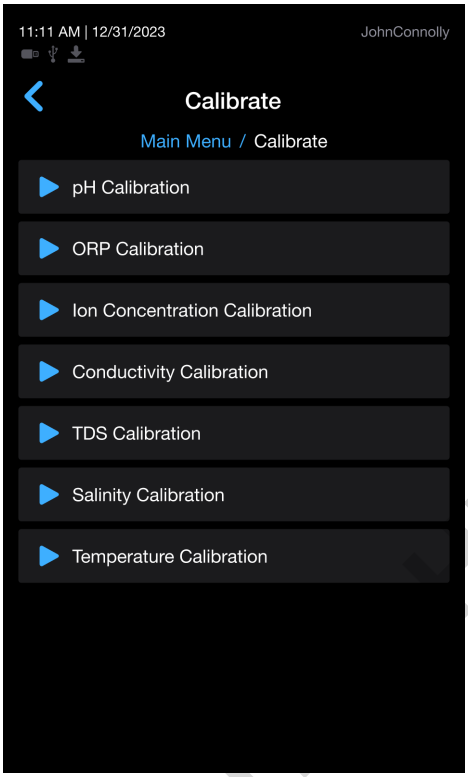
    - Measurement Averaging: Select Automatic or Off for averaging measurements. When Automatic is selected, the meter will analyze the measurement and stabilize faster when measurements are fluctuating around an averageable value.
- Stirrer: Assign 1 of the 2 stirrer probe inputs on the back of the meter to the measurement channel and set the speed for that stirrer probe.
- Electrode ID: Enter up to 20 alphanumeric characters or select from the list of previous electrode IDs; electrode ID is shown on the display, data log, calibration log and exported records.
- Electrode Type: Set the type of conductivity electrode to be used for calibration and measurements as Standard (most conductivity electrodes) or USP Pure Water (Orion 2-cell ultra-pure water conductivity electrode, Cat. No. 013016MD).

Note: *Tap the Save button once all changes are made to preserve the changes or tap the Create method button to save the current channel parameters as a new method.*

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3.3 Calibrate

Tap the Calibrate option in the Main Menu to access the complete list of calibrations available.



The Orion Pro Star PC215 pH/ion and conductivity bench meter is capable of performing:

- 1 to 5 point pH calibration
- 1 point ORP calibration
- 1 to 5 point ion concentration calibration
- 1 to 5 point conductivity calibration
- 1 to 5 point TDS calibration
- 1 point salinity calibration
- 1 to 2 point temperature calibration

Refer to the Chapter 4 Calibration for detailed instructions for each type of calibration.

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3.4 Data Logs

Tap the Data Logs option in the Main Menu to access the data logs.

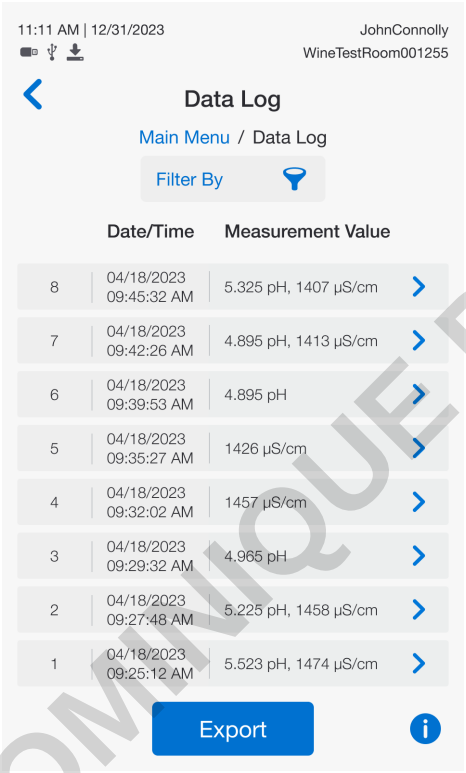
The meter's data log will store up to 10000 data logs with time and date stamps. Each data log includes measurements from the active channels when the data log was saved as well as settings, measurement information and meter details.

- Use the Instrument Settings / Data Log setting to turn on the data log functionality.
- Use the Instrument Settings / Read Type setting to set how measurements are saved to the data log in the measure mode.

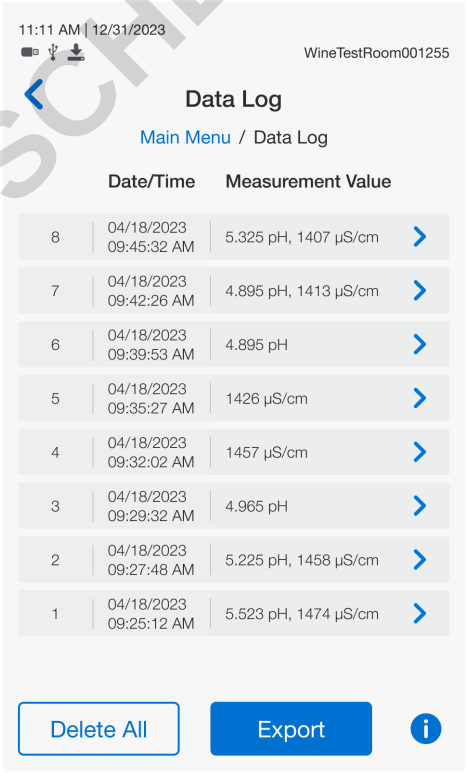
From the data log list, filter the list, view individual data logs, export the data log and delete the data log (Open Mode only).

Example Data Log List:

Secure Mode Example



Open Mode Example



When in Open Mode, the meter will save up to 10000 data logs and then automatically overwrite the oldest data log with the newest data log when the limit is reached. Alternatively, tap the Delete button to permanently delete all data logs.

When in Secure Mode, the meter will save up to 10000 data logs and then prompt the Administrator and Level 1 user accounts to export and delete data logs when the limit is reached. When the data log becomes full, data logs must be exported before they can be deleted.

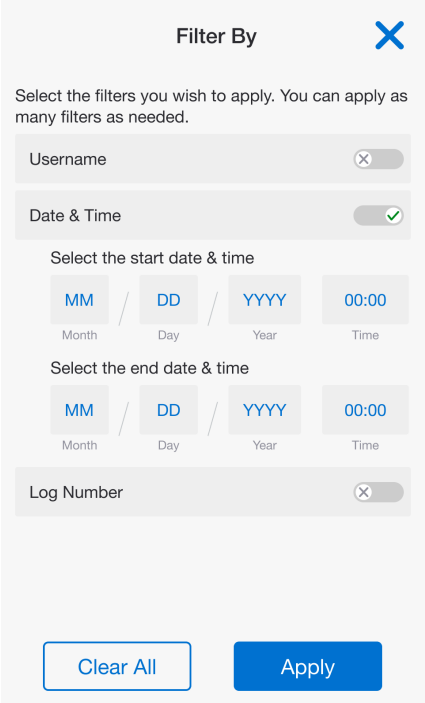
Note: *Once data logs are deleted, the action cannot be undone. Create backup records of the data logs as needed before deleting data logs.*

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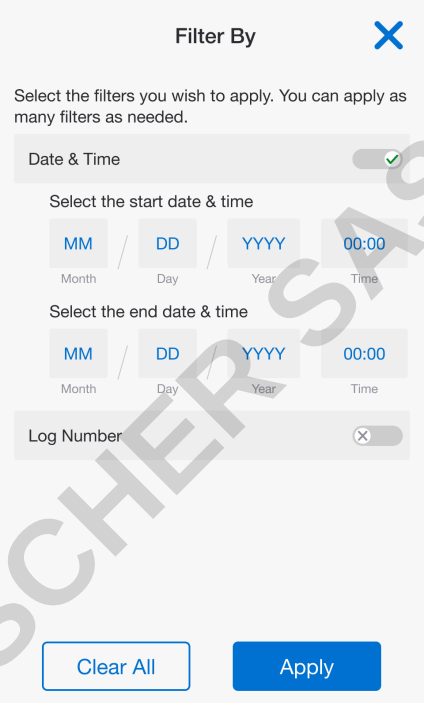
3.4.1 Filter the Data Log

Tap the Filter By field to select and set parameters for Username (Secure Mode only), Date & Time and Log Number to filter the data log list.

Secure Mode Example

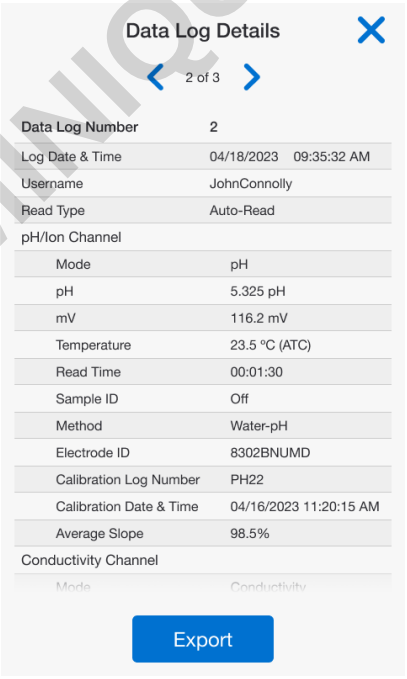


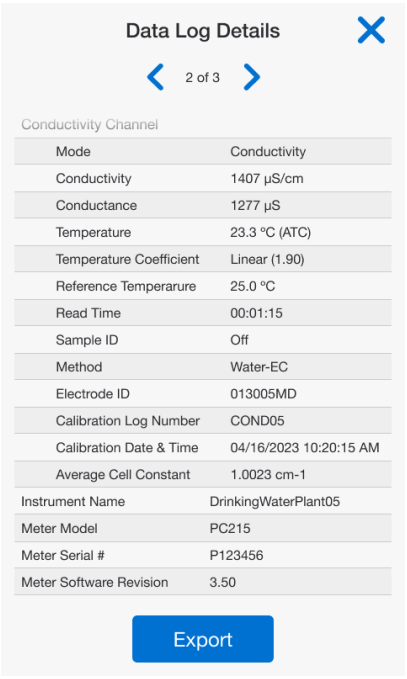
Open Mode Example



3.4.2 View Individual Data Logs

Tap a log on the list to view the individual data log details. You may need to scroll down to view all the included information. Tap the blue arrows to scroll up or down through the individual data logs. Tap the Export button to export the individual data log.





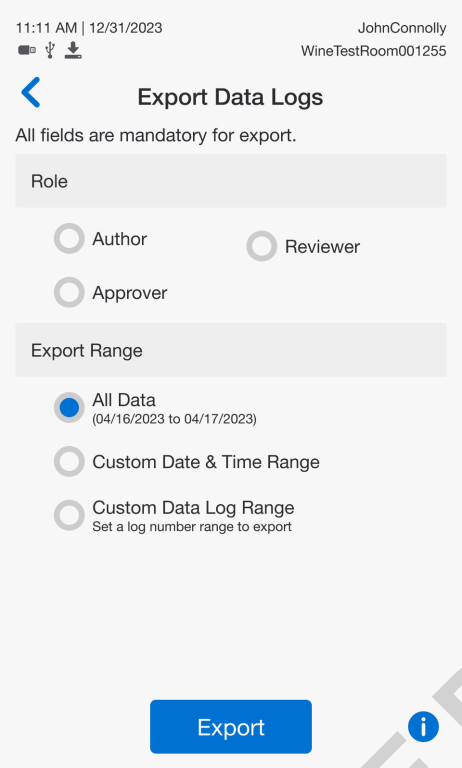
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3.4.3 Export the Data Log

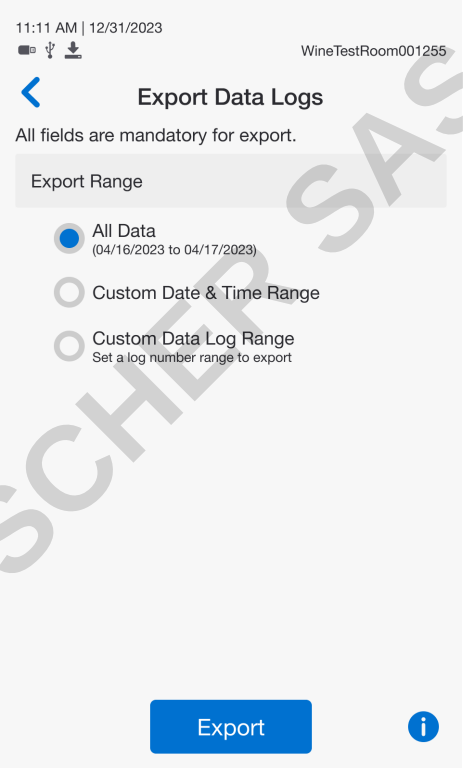
Tap the Export button to export the data log to a USB flash drive, computer or printer.

- Use the Instrument Settings / Data Transfer Settings to view and modify the Export Destination, Output Format, Baud Rate (when applicable) and Custom Data Log Export settings.

Secure Mode Example



Open Mode Example



When in Secure Mode, if an Administrator or Level 1 user account is active, that account will have the option to delete the data log after it is exported. When the data log becomes full, it must be exported and then deleted before new data logs can be saved.

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3.5 Calibration Logs

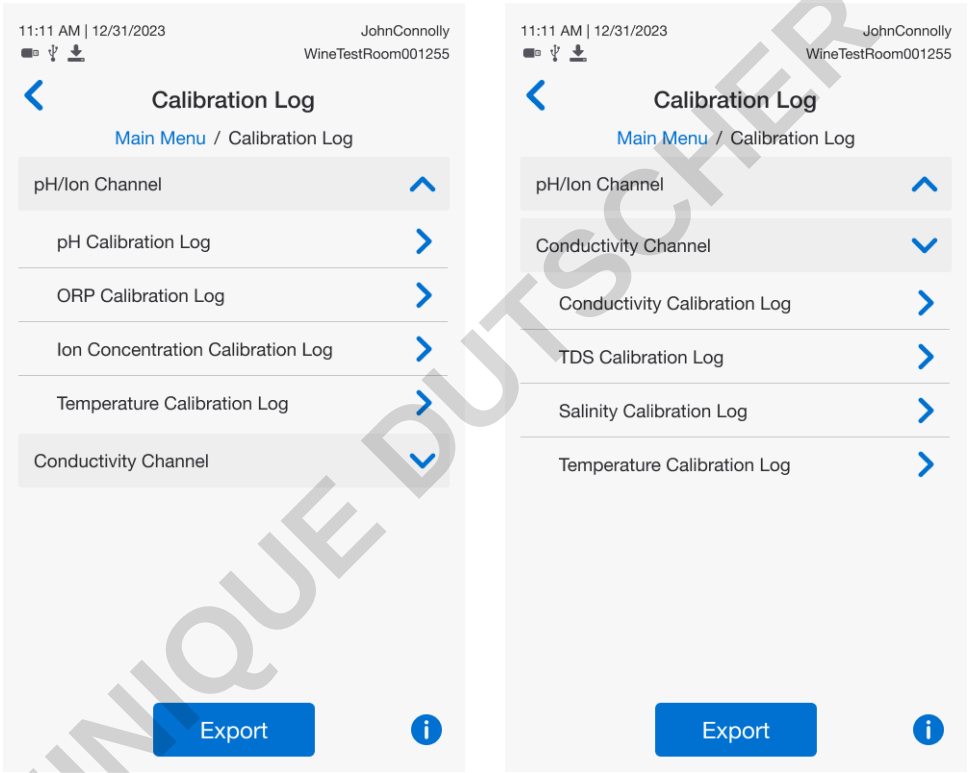
Tap the Calibration logs option in the Main Menu to access the calibration logs.

The meter will store up to 20 calibration logs per parameter with time and date stamps. Each calibration log includes calibration data with calculated results.

The parameter list for calibration logs is grouped by channel.

- Expand the pH/Ion Channel to view the pH Calibration Log, ORP Calibration Log, Ion Concentration Calibration Log and Temperature Calibration Log for the pH/ion channel.
- Expand the Conductivity Channel to view the Conductivity Calibration Log, TDS Calibration Log, Salinity Calibration Log and Temperature Calibration Log for the conductivity channel.

Example Calibration Log Parameter List:



Tap to select a parameter to view the calibration log list for that parameter.

Note: *In Secure Mode, when the calibration log becomes full, the calibration log must be exported before it can be cleared.*

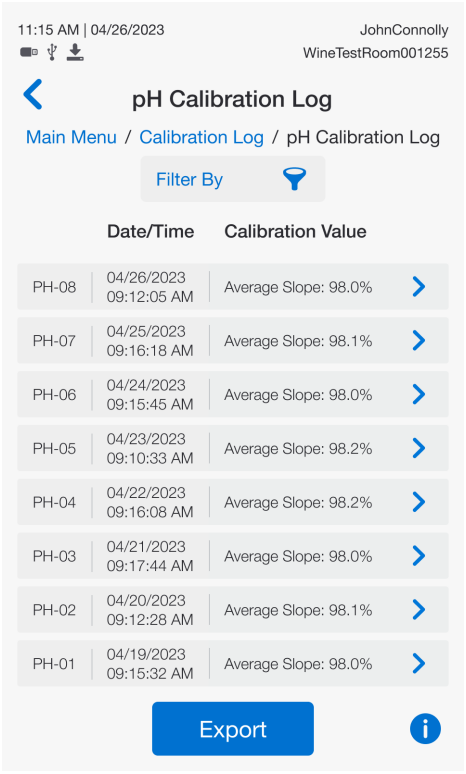
3.5.1 Filter the Calibration Log

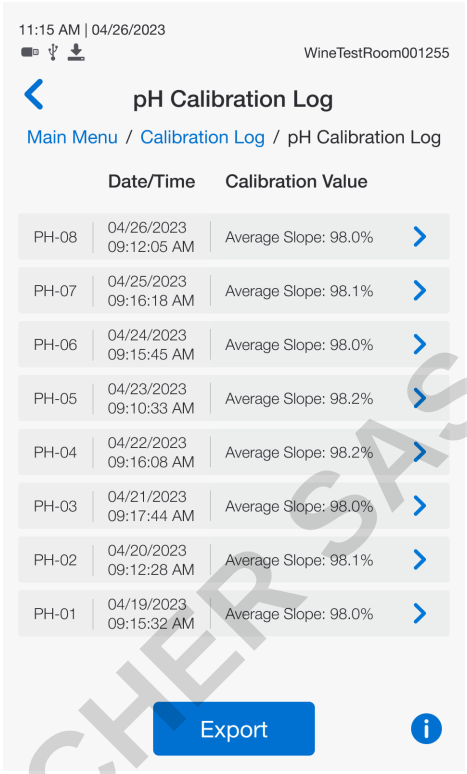
From the parameter-specific calibration log list, filter the list (Secure Mode only), view individual calibration logs and export the calibration log.

Secure Mode Example

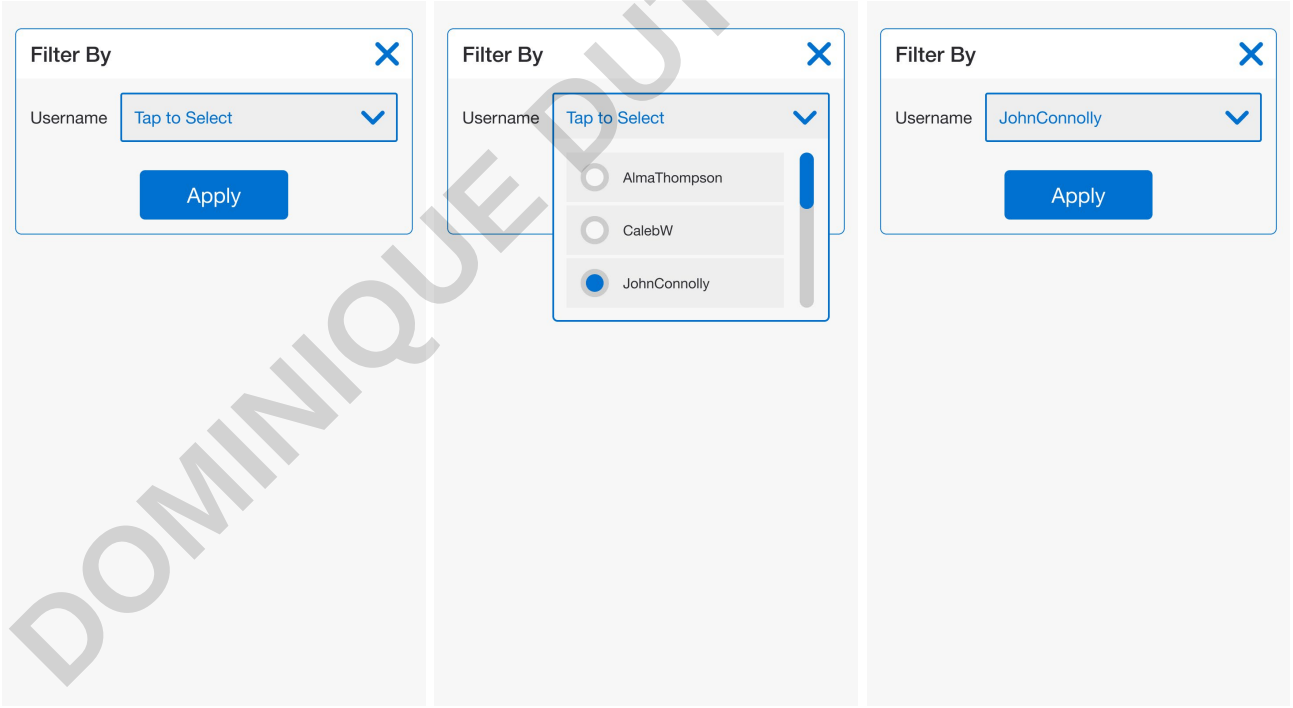
Open Mode Example

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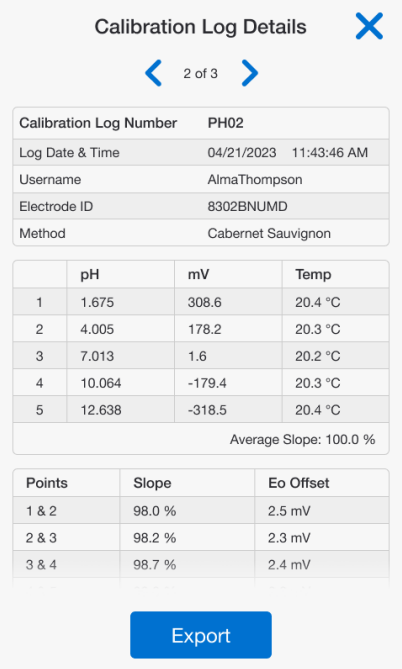
Tap the Filter By field to set parameters for Username (Secure Mode only) to filter the calibration log list.

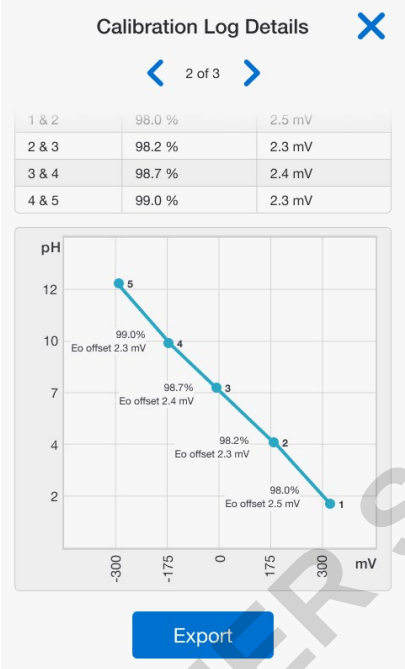


3.5.2 View Individual Calibration Logs

Tap a log on the list to view the individual calibration log details. You may need to scroll down to see all included information. Tap the blue arrows to scroll up or down through the individual calibration logs. Tap the Export button to export the individual calibration log.

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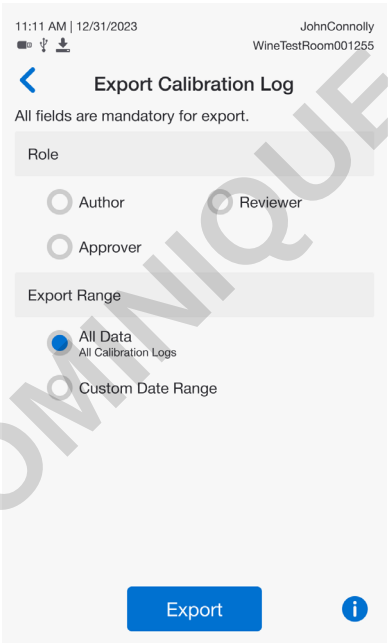


3.5.3 Export the Calibration Log

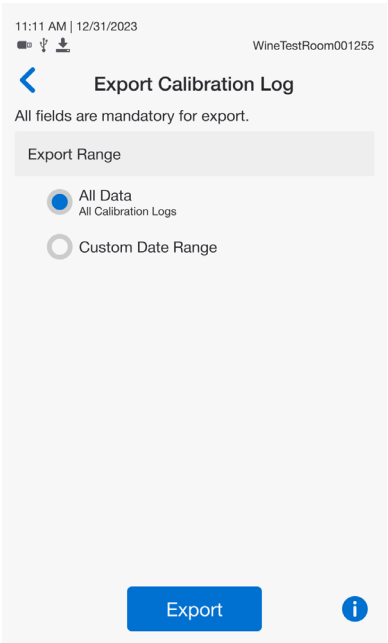
Tap the Export button to export the calibration log to a USB flash drive, computer or printer.

- Use the Instrument Settings / Data Transfer Settings to view and modify the Export Destination, Output Format, Baud Rate (when applicable) and Custom Calibration log Export settings.

Secure Mode Example



Open Mode Example



When in Secure Mode, if an Administrator or Level 1 user account is active, that account will have the option to delete the calibration log after it is exported. When the calibration log becomes full, it must be exported and then deleted before new calibration logs can be saved.

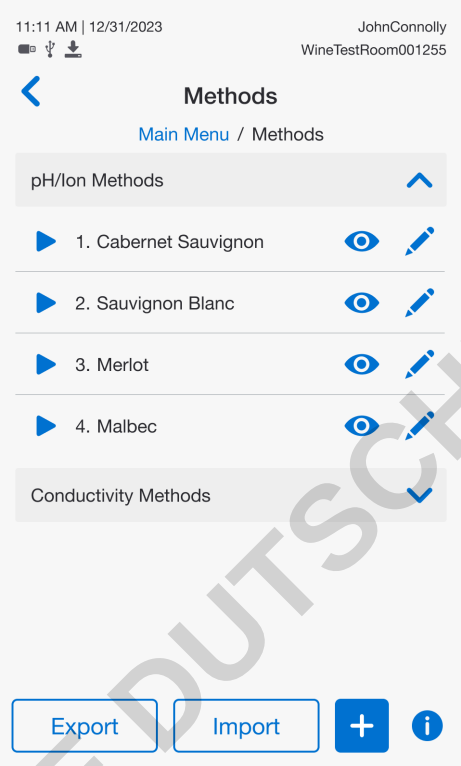
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3.6 Methods

Tap the Methods option in the Main Menu to access the methods list.

Methods offer the option to save measurement settings to standardize analyses and SOPs.

From the methods list, create new methods; load, view and edit existing methods; export existing methods to a USB flash drive and import methods from a USB flash drive.



3.6.1 Create a New Method

Create up to 10 methods per channel.

1. From the methods list, tap the + icon to create a new method.
2. Select the pH/Ion Channel or Conductivity Channel to create the new method and then tap the Continue button.
3. Set the desired settings for the selected channel.
4. Tap the Save button to save the settings to the new method.
5. Use the alphanumeric keypad to enter the method name using up to 20 characters and then tap the Save button.
6. The new method will be added to the list of methods for the selected channel.

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3.6.2 View and Load an Existing Method

1. From the methods list, tap the load (triangle) icon or view (eye) icon to view the method summary information for an existing method on the list.
2. From the method summary screen, perform one of the following actions:
    a. Tap the Load button to load the method to the measure mode. The meter will use the settings from the loaded method for all subsequent measurements.
    b. Tap the back arrow to return to the methods list without loading the method.

3.6.3 Edit an Existing Method

1. From the methods list, tap the edit (pencil) icon to edit an existing method on the list.
2. Update all desired settings for the selected method.
3. Tap the Save button to save the changes made to the method.
4. Use the alphanumeric keyboard to make any desired changes to the method name and then tap the Save button.
5. From the method summary screen, perform one of the following actions:
    a. Tap the Load button to load the method to the measure mode. The meter will use the settings from the loaded method for all subsequent measurements.
    b. Tap the back arrow to return to the methods list without loading the method.

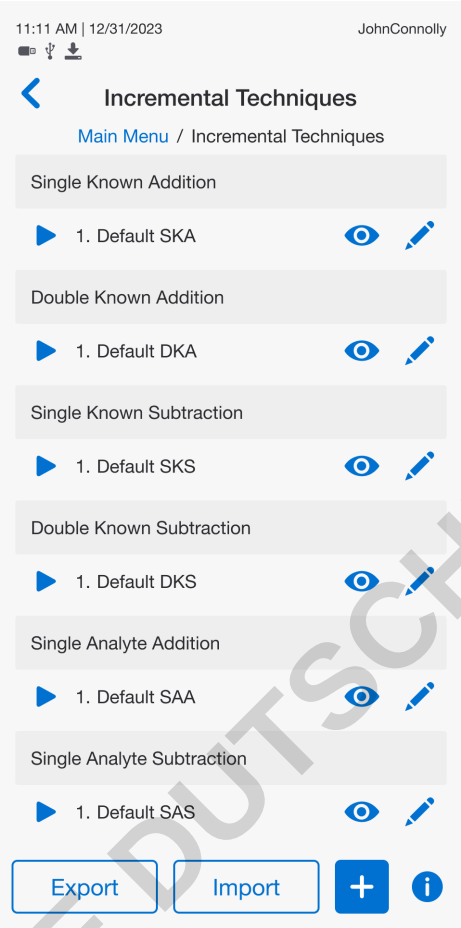
3.6.4 Delete an Existing Method

1. From the methods list, tap the edit (pencil) icon to delete an existing method on the list.
2. Tap the Delete button to delete the selected method.
3. Confirm you want to delete the method by tapping the Delete button again.
4. The meter will return to the methods list and the selected method will be removed.

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3.7 Incremental Techniques

Tap the Incremental Techniques option in the Main Menu to access the incremental techniques list.



From the incremental techniques list, create new incremental techniques; run, view and edit existing incremental techniques; export existing incremental techniques to a USB flash drive and import incremental techniques from a USB flash drive. Create up to 20 incremental techniques total.

3.7.1 Incremental Techniques Overview

When an ion selective electrode (ISE) is used to measure the concentration of a specific ion in a sample, there are two main analysis techniques: direct measurement and incremental techniques.

- Direct Measurements: A calibration curve is created using a set of standards with known concentrations in the calibration mode and then the calibration data is used to determine the concentrations of samples in the measure mode.
- Incremental Techniques: In the incremental technique mode, the user inputs key data and then performs a series of analysis steps where a sample is spiked with a standard or a standard is spiked with a sample and the data from the analysis is used to determine the concentration of the sample. When double known addition or double known subtraction is performed, the slope is also determined with the sample concentration.

For certain samples, incremental techniques for ion concentration analysis may offer significant benefits

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for accuracy, precision, compensation for matrix effects and preparation simplicity. There is no need to prepare multiple calibration standards, create a calibration curve or perform periodic recalibration. Available incremental techniques are single known addition, double known addition, single known subtraction, double known subtraction, single analyte addition and single analyte subtraction.

- Single Known Addition (SKA): A standard with a known concentration is added to a sample with an unknown concentration. Sample concentration Sample concentration should be known within a factor of 3x and the total concentration should approximately double upon addition of the standard. One aliquot of standard is added to the sample and the electrode slope must be entered to calculate the sample concentration.

SKA Standard Volume to Be Added Per 100 mL of Sample	SKA Standard Concentration Compared to Expected Sample Concentration
1 mL	100 times more concentrated
5 mL	20 times more concentrated
10 mL	10 times more concentrated

- Double Known Addition (DKA): A standard with a known concentration is added to a sample with an unknown concentration. Sample concentration should be known within a factor of 3x and the total concentration should approximately double upon the addition of the second aliquot of standard. Two aliquots of standard are added to the sample, so the electrode slope is calculated in addition to the sample concentration.

DKA Recommendations
The sample volume should be 100 mL.
The concentration of the standard should be 100 times the expected sample concentration.
The standard volume additions should be 1 mL (1st addition) and 10 mL (2nd addition).

- Single Known Subtraction (SKS): The addition of a standard subtracts a known increment of the ion of interest in the sample. Sample concentration should be known within a factor of 3x and the total sample concentration should be approximately halved upon addition of the standard. **The reaction ratio of the measured ion to the added standard ion must be entered.** One aliquot of sample is added to the standard and the electrode slope must be entered to calculate the sample concentration.

SKS Standard Volume to Be Added Per 100 mL of Sample	SKS Standard Concentration Compared to Expected Sample Concentration
1 mL	50 times more concentrated
5 mL	10 times more concentrated
10 mL	5 times more concentrated

- Double Known Subtraction (DKS): Each addition of standard subtracts a known increment of the ion of interest in the sample. Sample concentration should be known within a factor of 3x and the total sample concentration should be approximately halved upon addition of the second aliquot of standard. **The reaction ratio of the measured ion to the added standard ion must be entered.** Two aliquots of sample are added to the standard, so the electrode slope is calculated

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in addition to the sample concentration.

DKS Recommendations
The subtraction ability of the chosen standard concentration and standard volume must not exceed the concentration of the sample.
The sample volume should be 100 mL.
The concentration of the standard (in Molarity or Normality) should be 50 times the expected sample concentration when the reaction ratio is 1.
Calculate the volume of standard required to halve the initial sample concentration and divide by 6. The volume of the 1st addition should be 5/6 the total standard mL and the volume of the 2nd addition should be 1/6 the total standard mL.

- Single Analyte Addition (SAA): The first measurement is a known standard solution containing the same type of ion of interest as the unknown sample. The second measurement follows the addition of the unknown sample, and the concentration of the unknown sample is calculated. The electrode slope must be entered to calculate the sample concentration.

SAA Sample Volume to Be Added Per 100 mL of Standard	SAA Standard Concentration Compared to Expected Sample Concentration
1 mL	100 times more concentrated
5 mL	20 times more concentrated
10 mL	10 times more concentrated

- Single Analyte Subtraction (SAS): The first measurement is a known standard solution containing an ion that will complex the ion of interest in the unknown sample. The second measurement follows the addition of the unknown sample, which reduces the concentration of the ions in the solution, and the concentration of the unknown sample is calculated. **The reaction ratio of the standard ion to ion of interest must be entered.** The electrode slope must be entered to calculate the sample concentration.

SAS Recommendations
The subtraction ability of the chosen sample concentration and standard volume must not exceed the concentration of the standard.
The sample volume should be 100 mL.
The sample must be added by volume only. A volume of 1 mL is recommended.
The standard concentration must be approximately 1/50 the expected sample concentration.

3.7.1.1 Incremental Technique Tips

The sample concentration should be known within a factor of 3x so the increment may be correctly chosen. The first addition should double the concentration. The first subtraction should half the concentration. The mV change after the addition or subtraction should be 18 mV or more for a monovalent ion selective electrode and 9 mV or more for a divalent ion selective electrode.

The sample and standard must be volumetrically measured with pipets and graduated cylinders. The total volume of additions made should not exceed 10% of the starting sample volume.

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Any complexing agent must be present in excess (at least 50 to 100 times) or not at all. The ratio of free to complexed ions must remain constant over the analysis. An indication that a complexing agent is present, but not in sufficient quantity to maintain a constant free ion to complexed ion ratio, is an abnormally high or low slope. If this is a suspected problem, add an excess amount of complexing or de-complexing agent to the original solution in the beaker.

Sample concentrations should be within the linear range of the ion selective electrode. If low level samples are measured, some modifications to the incremental technique may be made.

Electrode interferences must be at a minimum, since the effect of the interference might change as the concentration of the ion of interest changes. This situation may also result in high or low electrode slope. Consult the electrode user manual for information on reducing or eliminating some electrode interferences.

Known addition is a useful method for measuring dilute samples, occasional samples or samples that contain an excess of complexing agent. Known addition can also be used to verify the results of a direct measurement.

Known subtraction is useful when measuring ions for which stable standards do not exist. Known subtraction can also be used as a quick version of a titration. When performing a known subtraction, it is necessary to know the stoichiometric ratio (reaction ratio) between the standard and sample.

Double incremental techniques calculate the electrode slope and sample concentration simultaneously. The electrode slope is determined directly in the sample, which results in greater accuracy for samples with complex matrices.

Analyte addition is useful for measuring concentrated, viscous, or non-ambient temperature samples, because the samples will be diluted by the standard during analysis.

3.7.2 Create a New Incremental Technique

1. From the incremental technique list, tap the + icon to create a new incremental technique.
2. Select the type of incremental technique and then tap the Next button.
3. Enter the required information to perform the selected incremental technique and then tap the Save button. See the following tables for details on the required information. This data is critical for the analysis to accurately determine the sample concentration.
4. Use the alphanumeric keypad to enter the incremental technique name using 3-20 characters and then tap the Save button.
5. A summary of the incremental technique will be shown. Tap the back arrow to return to the list of incremental techniques, tap the Start button to begin performing the incremental technique or tap the Edit button to make changes to the incremental technique.
6. The new incremental technique will be added to the incremental techniques list.

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Parameters for Known Addition and Known Subtraction Analysis	SKA	DKA	SKS	DKS
Technique Type: Type of incremental technique to be performed.	•	•	•	•
Sample ID (optional): Identification for the sample to be measured.	•	•	•	•
Electrode ID (optional): Identification for the electrode to be used.	•	•	•	•
Stirrer: Stirrer probe input and speed settings when using an Orion meter-powered stirrer probe, catalog number 096019-WA.	•	•	•	•
ISE Type: Type of ion selective electrode (ISE) used for analysis.	•	•	•	•
Ion Units: Units used to calculate the concentration results.	•	•	•	•
Slope Value: Determined slope value for ISE used for analysis.	•		•	
Sample Volume: Volume of the sample to be analyzed.	•	•	•	•
Total Volume: Volume of the sample plus volume of the ISA added to the sample.	•	•	•	•
Standard Concentration: Concentration of the standard to be added to the sample (must be entered in the same units as the Ion Units setting).	•	•	•	•
Standard Volume 1st Addition: Volume of the first aliquot of standard that will be added to the sample.	•	•	•	•
Standard Volume 2nd Addition: Volume of the second aliquot of standard that will be added to the sample.		•		•
Reaction Ratio: Ratio of sample ion to added standard ion. If a sulfide sample will be subtracted by the addition of a silver standard, 1 sulfide ion needs 2 silver ions to subtract it and the reaction ratio is 1/2 = 0.5.			•	•
Name: Unique name to identify the programmed settings.	•	•	•	•

Parameters for Analyte Addition and Subtraction Analysis	SAA	SAS
Technique Type: Type of incremental technique to be performed.	•	•
Sample ID (optional): Identification for the sample to be measured.	•	•
Electrode ID (optional): Identification for the electrode to be used.	•	•
Stirrer: Stirrer probe input and speed settings when using an Orion meter-powered stirrer probe, catalog number 096019-WA.	•	•
ISE Type: Type of ion selective electrode (ISE) used for analysis.	•	•
Ion Units: Units used to calculate the concentration results.	•	•
Slope Value: Determined slope value for ISE used for analysis.	•	•
Standard Volume: Volume of the standard the sample will be added to.	•	•
Total Volume: Volume of the standard plus volume of the ISA added to the standard.	•	•
Standard Concentration: Concentration of the standard the sample will be added to (must be entered in the same units as the Ion Units setting).	•	•
Sample Volume Addition: Volume of the sample that will be added to the standard.	•	•
Reaction Ratio: Ratio of standard ion to added sample ion. If a silver standard will be subtracted by the addition of a sulfide sample, 2 silver ions need 1 sulfide ion to subtract them and the reaction ratio is 2/1 = 2.		•
Name: Unique name to identify the programmed settings	•	•

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3.7.3 View and Run an Existing Incremental Technique

1. From the incremental technique list, tap the run (triangle) icon or view (eye) icon to view the incremental technique summary information for an existing incremental technique on the list.
2. From the incremental technique summary screen, perform one of the following actions:
    a. Tap the back arrow to return to the incremental techniques list without running the incremental technique.
    b. Tap the Start button to start running the selected incremental technique.
        i. The meter will provide step-by-step instructions for performing the selected incremental technique. Carefully follow all instructions and text prompts.
        ii. Once the analysis is complete, a summary will be shown and saved to the data log and/or exported to an external device according to the Data Log and Data Transfer Settings in the Instrument Settings menu.
        iii. Tap the Repeat button to run the same incremental technique on a new sample or tap the Measure button to return to the measure mode.

3.7.4 Edit an Existing Incremental Technique

1. From the incremental technique list, tap the edit (pencil) icon to edit an existing incremental technique on the list.
2. Update all desired settings for the selected incremental technique.
3. Tap the Save button to save the changes made to the incremental technique.
4. Use the alphanumeric keyboard to make any desired changes to the incremental technique name and then tap the Save button.
5. From the incremental technique summary screen, perform one of the following actions:
    a. Tap the back arrow to return to the incremental techniques list without loading the incremental technique.
    b. Tap the Start button to start running the selected incremental technique.
        i. The meter will provide step-by-step instructions for performing the selected incremental technique. Carefully follow all instructions and text prompts.
        ii. For the best accuracy and reproducibility, allow time for very stable mV readings, especially the first mV reading.
        iii. Once the analysis is complete, a summary will be shown and saved to the data log and/or exported to an external device according to the Data Log and Data Transfer Settings in the Instrument Settings menu.
        iv. Tap the Repeat button to run the same incremental technique on a new sample or tap the Measure button to return to the measure mode.

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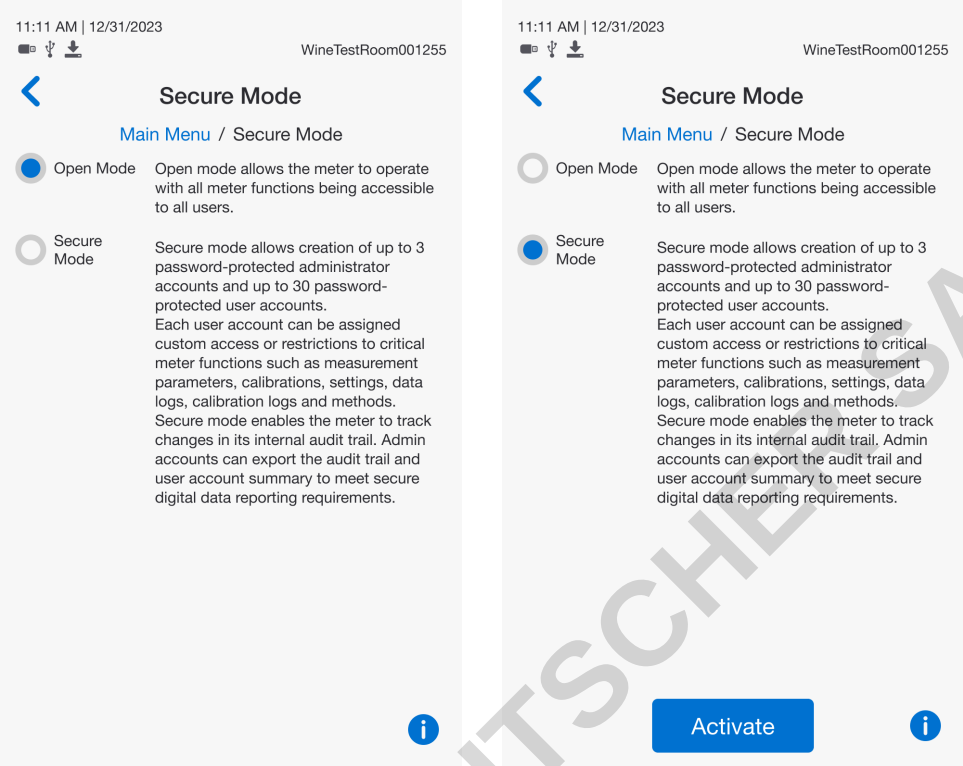
3.7.5 Delete an Existing Incremental Technique

1. From the incremental technique list, tap the edit (pencil) icon to delete an existing incremental technique on the list.
2. Tap the Delete button to delete the selected incremental technique.
3. Confirm you want to delete the incremental technique by tapping the Delete button again.
4. The meter will return to the incremental techniques list and the selected incremental technique will be removed.

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3.8 Secure Mode

Tap the Secure Mode option in the Main Menu to access the secure mode function.



Select the Secure Mode option and tap the Activate button to initiate the Secure Mode.

Once the Secure Mode is activated, create up to 3 administrator and 30 user accounts, each with unique username, password and customized meter access. User permissions are customizable to control each user's access to critical meter settings and functions including date and time settings, instrument settings, methods, calibrations, measurements, data logs and calibration logs. This helps prevent accidental changes by inexperienced or unauthorized users. Administrators can also export the user list and audit trail to ensure data integrity.

3.8.1 Administrator Account Functions

Only admin accounts can create new accounts, edit other user accounts, export the user list, view and export the audit trail, set the password expiration time, deactivate secure mode, set the sleep mode in instrument settings, set the date and time in instrument settings, perform a meter reset and perform a software update.

3.8.1.1 Create First Admin Account

Once the secure mode is activated, an admin account must be created next.

1. Follow all onscreen prompts to enter the first name, last name, username, email, password and 3 security questions for the first admin account.
    a. The password must contain at least 1 number, 1 uppercase letter, 1 lowercase letter, and 1 special character and must be 6-12 characters long.

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2. Tap the Save button.
3. Login to the meter using the created username and password.
4. Create new admin or user accounts, set the password expiration time, set the sleep mode in instrument settings and verify the date and time in instrument settings.

3.8.1.2 Create New Account (Admin Only)

Create up to 2 additional admin accounts and up to 30 user accounts.

1. Tap the Secure Mode option in the Main Menu to access the secure mode list for admins.
2. Tap the User Accounts option.
3. Tap the Add User button.
4. Follow all onscreen prompts to enter the first name, last name, username, email, password and access level for the account. Account access levels are shown in the table below:

Meter Function	Admin	1	2	3	Custom
Help & Information					
Meter Reset	•	---	---	---	---
Meter Software Update	•	---	---	---	---
Meter Tests & Troubleshooting	•	•	•	---	admin set
Settings					
Instrument Settings	•	•	---	---	admin set
Sleep Mode, Date and Time	•	---	---	---	---
pH/Ion Settings	•	•	---	---	admin set
Conductivity Settings	•	•	---	---	admin set
Data Log					
Data Log Delete	•	•	---	---	admin set
Data Log Export	•	•	---	---	admin set
Data Log View	•	•	•	---	admin set
Calibration Log					
Calibration Log Delete	•	•	---	---	admin set
Calibration Log Export	•	•	---	---	admin set
Calibration Log View	•	•	•	---	admin set
Methods					
Create Method	•	•	---	---	admin set
Edit Method	•	•	---	---	admin set
Import Method	•	•	---	---	admin set
Load Method	•	•	•	---	admin set
Calibration					
Calibrate	•	•	•	---	admin set
Measure					
Incremental Techniques	•	•	•	---	admin set
Channel Display	•	•	•	---	admin set
Graph	•	•	•	---	admin set
Ready Type	•	•	•	---	admin set
Mode	•	•	•	---	admin set
Sample ID	•	•	•	---	admin set
Obtain Measurements	•	•	•	•	•

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5. Record the username and temporary password.
    a. The first time the user logs into their account, they will need to enter the temporary password and then create their own password.
    b. The first time a new admin logs into their account, they will also need to create 3 security questions.
6. Tap the Save button.

3.8.1.3 Edit Existing Account (Admin Only)

Admins can modify the first name, last name, email and access level of active accounts as well as reset the password.

1. Tap the Secure Mode option in the Main Menu to access the secure mode list for admins.
2. Tap the User Accounts option.
3. Tap the username of the account to be edited.
4. Make any required changes to the account.
    a. If making changes to an admin account, the 3 security questions can also be modified.
    b. If making changes to another account, the password can be reset to a temporary password and the user of that account will need to enter the temporary password and then select a new password the next time they login to the meter.
    c. If making changes to your own account, the password can be updated permanently.
5. Tap the Save button.

3.8.1.4 Audit Trail (Admin Only)

Admin accounts can view, export and delete the audit trail. The audit trail records when accounts login and logout, incorrect login attempts, account changes or password resets, changes to instrument settings, modifications to data logs and calibration logs, modifications to methods, meter software updates and meter resets.

1. Tap the Secure Mode option in the Main Menu to access the secure mode list for admins.
2. Tap the Secure Mode Parameters option.
3. Tap the Audit Trail option.
4. The audit trail can be viewed and exported.
    a. Once the audit trail is exported, the admin will have the option to delete it. When the audit trail becomes full, it must be exported and then deleted before new audit trail actions can be saved.
5. Tap the back arrow to return to the Secure Mode Parameters screen.

3.8.1.5 Set Password Expiration Time (Admin Only)

Set the password expiration time to 1 month, 3 months, 6 months or 12 months.

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1. Tap the Secure Mode option in the Main Menu to access the secure mode list for admins.
2. Tap the Secure Mode Parameters option.
3. Expand the Password Expiration Time option and select the desired expiration period.
4. Tap the Save button.

3.8.1.6 Deactivate Secure Mode (Admin Only)

Deactivate the secure mode and revert the meter to open mode. When secure mode is deactivated, all admin and user login and logout functionality is removed, all meter access restrictions are removed, the audit trail is erased and all user accounts are deactivated.

1. Tap the Secure Mode option in the Main Menu to access the secure mode list for admins.
2. Tap the Secure Mode Parameters option.
3. Tap the Deactivate Secure Mode option.
4. Confirm that you want to deactivate secure mode and tap the Continue button.
5. Select your username, enter your password and tap the Deactivate button.
6. Wait while the meter deactivates secure mode and then use the meter in open mode.

3.8.2 User Account Functions

User accounts can edit their account information in the secure mode.

3.8.2.1 Edit Own User Account

1. Tap the Secure Mode option in the Main Menu to access the secure mode list for users.
2. Tap the User Accounts option.
3. Tap your username.
4. Make any required changes to your account.
5. Tap the Save button.

3.8.3 Meter Logout and Login

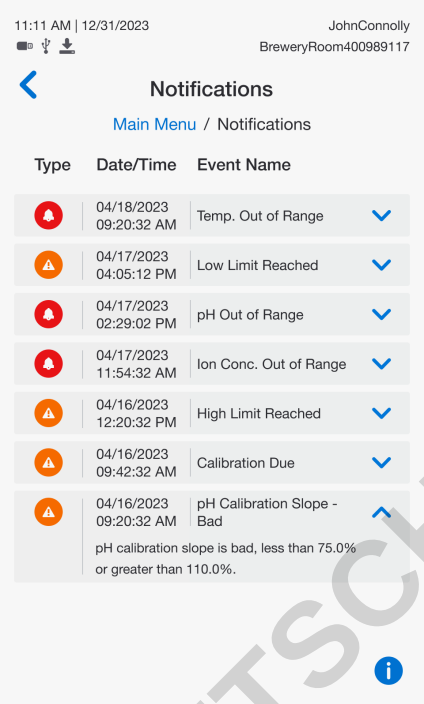
Logout of the meter whenever it will not be in use. The meter will automatically logout of an account when the sleep mode period of inactivity is reached or when the meter is powered off.

1. To logout of the meter in the measure mode, tap your username in the top right corner of the display. Confirm you want to logout and tap the Logout button.
2. To logout of the meter in the secure mode, tap the Secure Mode option in the Main Menu to access the secure mode list. Tap the Logout button. Confirm you want to logout and tap the Logout button.
3. When no account is logged into the meter, the login screen will be displayed. To login to the meter, select your username and enter your password.

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3.9 Notifications

Tap the Notifications option in the Main Menu to view a list of the latest warnings and errors that have been shown on the meter.



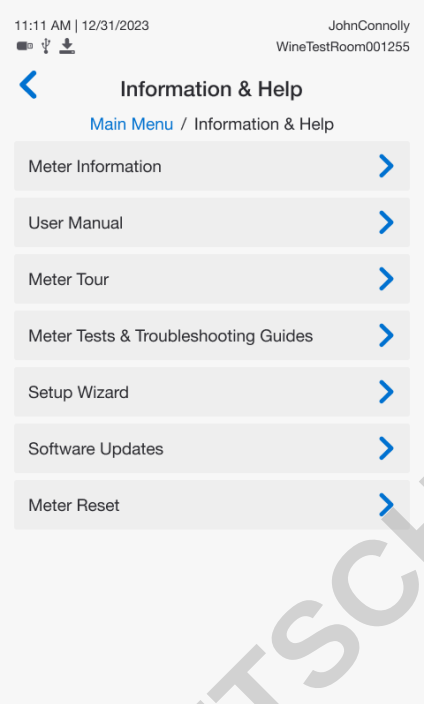
Onscreen notifications include info, success, warning and error notifications.

Icon	Notification Description
	Info notifications are triggered when there is a recommendation for the user to perform an action. Example: when it is recommended that the user performs a calibration.
	Success notifications are triggered when an action was completed correctly. Example: When a measurement is successfully logged and exported.
	Warning notifications are triggered when a user set reminder or alarm is activated or when an issue occurs that the user should address. Example: When no calibration is performed for 8 hours and the calibration alarm is set.
	Error notifications are triggered when there is a critical issue that needs immediate attention that the user must address before continuing to use the meter. Example: When the pH measurement is outside the acceptable range of -2 to 20 pH.

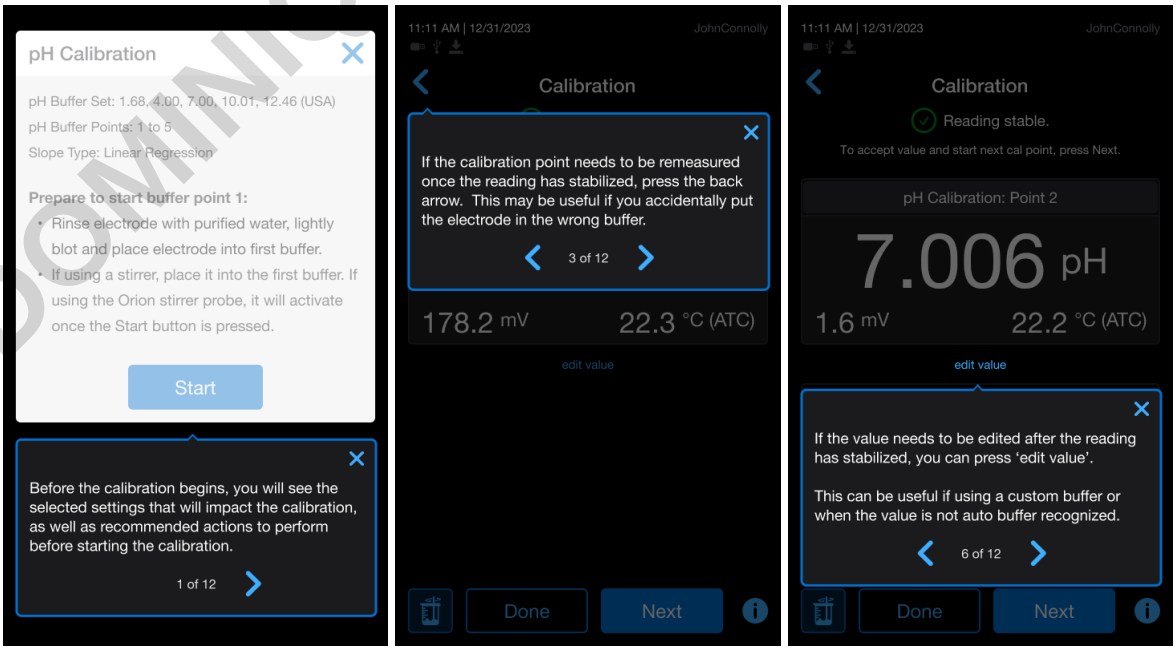
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3.10 Information & Help

Tap the Information & Help option in the Main Menu to access the meter information, user manual, meter tours, meter tests and troubleshooting guides, setup wizard, software updates and meter reset.



- Meter Information: View the meter model, type, serial number and current software version.
- User Manual: Access the meter user manual on the meter's display for easy access and use.
- Meter Tours: View onscreen meter tours to learn how to use important meter functions. Tours include pH calibration, conductivity calibration, measurements, meter connections, electrode stand assembly, pH electrode preparation, pH electrode storage and pH electrode cleaning. The following are example screens from the pH calibration tour:



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- Meter Tests & Troubleshooting Guides: Perform a meter self test, electrode stability test or pH electrode check for troubleshooting purposes. Select the type of test and follow all onscreen prompts to perform the selected test.
    - Meter Self Test: Meter will perform a series of internal verification tests to ensure the meter is functioning according to specifications.
    - Stability Test: Meter will test the stability performance of an electrode by measuring the electrode's raw input reading per minute drift and noise.
    - pH Electrode Check: Meter will walk the user through a series of test steps to determine the performance of a pH electrode.
- Setup Wizard: Relaunch the meter setup wizard and follow the displayed steps to set critical meter and measurement settings.
- Software Updates: Follow onscreen prompts to install the latest meter software version. Refer to the 6.3 Meter Software Update Procedure section for detailed instructions.
- Meter Reset: Perform a meter reset for troubleshooting purposes and select the type of reset. Follow all onscreen prompts to perform the selected reset.
    - Settings Reset: Erases all meter settings and restores meter settings to their factory default states; however, does not modify the meter's data log, calibration log, methods or secure mode. Performing the Settings Reset is helpful for troubleshooting when a meter setting is suspected to be the root cause of an issue.
    - Factory Reset: Restores the meter to its factory default state and erases all meter settings, data log, calibration log, methods, and secure mode settings and data. Performing the Factory Reset is helpful for troubleshooting when the root cause of a meter issue cannot be determined.
        - ***Note:*** *Backup all data before performing a factory reset, as it will be erased when the factory reset is completed.*

Note: *If Secure Mode is enabled, not all options may be accessible to users in the Information & Help list, depending on each user's meter permissions.*

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Chapter 4
Calibration

4.1 pH Calibration

Refer to the 3.10 Information & Help section and Meter Tours to access onscreen tours that explain how to use important meter functions including pH calibration.

Refer to the 3.2.2 pH/Ion Settings section and Alarm Settings to use the Calibration Reminder Alarm to set a reminder if calibration is not performed within the selected time interval.

4.1.1 pH Calibration Overview

For best results, periodic calibration with known, accurate and fresh pH buffers is recommended. Always use fresh aliquots of each pH buffer poured just before use into clean beakers to calibrate.

Calibrate with pH buffers that bracket the expected sample range and include a neutral buffer. For example, if samples will be in 6.2 to 9.5 pH range, calibrate with pH 4.01, 7.00, and 10.01 buffers.

To eliminate temperature errors associated with pH, use an automatic temperature compensation (ATC) probe with the pH electrode for best accuracy.

The non-volatile meter memory retains all data when powered off and in the event of power failure.

4.1.1.1 Determined pH Buffer Value

During the pH calibration, the meter will attempt to automatically recognize each pH buffer value using the selected pH Buffer Set and the mV signal measured by the pH electrode. Once the reading is stable and the pH buffer value is recognized, the meter will automatically display the exact pH buffer value at the measured temperature.

- If the mV value does not correspond within ±60mV of a buffer in the selected pH Buffer Set, once the pH reading is stable, the meter will display the theoretical pH value of the pH buffer according to the Nernst equation. The user can manually enter the pH buffer value at the measured temperature for accurate calibration.
- The pH buffer values can be manually entered for each calibration point. If the pH buffer value needs to be manually adjusted, edit the value of the pH buffer at the measured temperature.

The following pH buffers are automatically recognized within ±60mV. Refer to the 3.2.2 pH/Ion Settings section to change the selected pH Buffer Set.

- USA: 1.68, 4.01, 7.00, 10.01, 12.46
- DIN: 1.68, 4.01, 6.86, 9.18, 12.46
- STD: 1.00, 3.00, 6.00, 8.00, 10.00, 13.00
- Pure Water: 4.10, 6.97, 9.15
- Custom: Up to 5 custom buffer values

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4.1.2 pH Calibration Procedure

1. Ensure the active measure mode is set to pH.
    a. If using a method, ensure the method is loaded and active.
2. Tap the Calibrate button to start the calibration.
    a. If viewing multiple measurement channels, select the pH calibration option.
3. Rinse the pH electrode and ATC sensor with purified water and place into the pH buffer.
    a. If using a stirrer, place it into the pH buffer and begin stirring. If using the Orion stirrer probe, it will activate once the button is tapped.
4. Review the onscreen instructions, then tap the Start button (or Continue button) to begin measuring the pH buffer.
5. Wait for the pH value to stabilize. Once the reading is stable, the Determined pH Buffer Value is shown.
    a. To accept the pH buffer value, no action is required.
    b. To edit the pH buffer value, tap the edit value text. Tap the pH buffer value, then use the numeric keypad to enter the desired pH buffer value at the measured temperature. Tap the Save button to save the entered value.
6. Proceed to the next calibration point or end the calibration:
    a. To proceed to the next calibration point, tap the Next button.
        i. If using the Orion stirrer probe, it will deactivate once the Next button is tapped.
        ii. Repeat steps 3 to 5 for each pH buffer.
    b. To complete the calibration, tap the Done button.
        i. If performing a 1 point pH calibration, tap the slope value and use the numeric keypad to enter the desired slope value. Tap the Save button to save the entered value.
7. The meter will automatically save the calibration information to the calibration log and display a summary of the calibration. Tap the Measure button to proceed to the main measure mode.

Calibration Notes

- If a calibration point needs to be remeasured after the reading has stabilized, tap the back arrow. This may be useful if you accidentally put the electrode in the wrong solution.
- If a reading takes longer than 90 seconds to stabilize during the calibration, the force stabilize text will appear. This may be helpful if the electrode is responding more slowly than usual. Tap the force stabilize text to accelerate the reading stability (may give less accurate calibration results).
- If the pH Buffer Points in the 3.2.2 pH/Ion Settings section is changed from “1 to 5” to a set number of points (4, 3, 2 or 1), only the Next button will appear for each calibration point until the set number of points is completed, at which point the Done button will appear.

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4.1.3 pH Value vs. Temperature

The following tables list theoretical values for pH buffers at various temperatures. Actual values shown on the meter may vary due to rounding deviations from the actual pH and temperature measurements.

USA Buffer Set (Orion pH Buffers)

Temp. (°C)	pH 1.68 Buffer	pH 4.01 Buffer	pH 7.00 Buffer	pH 10.01 Buffer	pH 12.46 Buffer
0	1.667	4.000	7.111	10.320	13.474
5	1.668	3.999	7.082	10.249	13.245
10	1.669	3.999	7.056	10.182	13.030
15	1.672	4.001	7.033	10.121	12.828
20	1.675	4.005	7.013	10.064	12.638
25	1.678	4.010	6.997	10.013	12.460
30	1.683	4.016	6.984	9.967	12.293
35	1.688	4.024	6.974	9.925	12.137
40	1.693	4.033	6.967	9.889	11.991
45	1.700	4.044	6.964	9.858	11.855
50	1.707	4.057	6.963	9.832	11.728
55	1.715	4.071	6.966	9.811	11.609
60	1.724	4.086	6.973	9.794	11.499
65	1.733	4.103	6.982	9.783	11.396
70	1.744	4.122	6.995	9.777	11.301
75	1.755	4.142	7.011	9.776	11.213
80	1.766	4.163	7.030	9.780	11.130

DIN Buffer Set (Orion pH Buffers)

Temp. (°C)	pH 1.68 Buffer	pH 4.01 Buffer	pH 6.86 Buffer	pH 9.18 Buffer	pH 12.46 Buffer
0	1.667	4.000	6.984	9.455	13.474
5	1.668	3.999	6.952	9.391	13.245
10	1.669	3.999	6.924	9.332	13.030
15	1.672	4.001	6.900	9.278	12.828
20	1.675	4.005	6.881	9.229	12.638
25	1.678	4.010	6.865	9.184	12.460
30	1.683	4.016	6.853	9.143	12.293
35	1.688	4.024	6.844	9.106	12.137
40	1.693	4.033	6.838	9.072	11.991
45	1.700	4.044	6.834	9.041	11.855
50	1.707	4.057	6.833	9.013	11.728
55	1.715	4.071	6.837	8.964	11.609
60	1.724	4.086	6.841	8.942	11.499
65	1.733	4.103	6.847	8.922	11.396
70	1.744	4.122	6.854	8.903	11.301
75	1.755	4.142	6.861	8.885	11.213
80	1.766	4.163	6.984	9.455	11.130

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STD: 1.00, 3.00, 6.00, 8.00, 10.00, 13.00

Temp. (°C)	pH 1.00 Buffer	pH 3.00 Buffer	pH 6.00 Buffer	pH 8.00 Buffer	pH 10.00 Buffer	pH 13.00 Buffer
0	0.97	3.02	6.04	8.19	10.27	14.02
5	0.98	3.02	6.03	8.15	10.22	13.81
10	0.98	3.02	6.02	8.11	10.17	13.60
15	0.99	3.02	6.01	8.07	10.12	13.39
20	0.99	3.02	6.00	8.03	10.05	13.19
25	1.00	3.00	6.00	8.00	10.00	13.00
30	1.00	3.00	6.00	7.97	9.95	12.83
35	1.01	2.99	6.00	7.94	9.90	12.68
40	1.01	2.99	6.01	7.91	9.86	12.53
45	1.01	2.98	6.02	7.88	9.82	12.38
50	1.01	2.98	6.04	7.87	9.78	12.25
55	1.02	2.97	6.05	7.86	9.74	12.11
60	1.02	2.97	6.07	7.85	9.71	11.99
65	1.02	2.97	6.09	7.83	9.68	11.86
70	1.02	2.97	6.11	7.82	9.65	11.74
75	1.02	2.97	6.13	7.80	9.61	11.62
80	1.02	2.97	6.16	7.79	9.58	11.51

Pure Water: 4.10, 6.97, 9.15 (Orion pH Buffers)

Temp. (°C)	pH 4.10 Buffer	pH 6.97 Buffer	pH 9.15 Buffer
0	4.100	7.040	9.350
5	4.100	7.025	9.310
10	4.100	7.010	9.270
15	4.100	6.995	9.230
20	4.100	6.980	9.190
25	4.100	6.965	9.155
30	4.120	6.950	9.120
35	4.135	6.945	9.080
40	4.150	6.940	9.040
45	4.165	6.940	9.000
50	4.180	6.940	8.960
55	4.200	6.940	8.920
60	4.220	6.940	8.880
65	4.245	6.940	8.840
70	4.270	6.940	8.800
75	4.295	6.940	8.760
80	4.320	6.940	8.720

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4.2 ORP Calibration

Refer to the 3.2.2 pH/Ion Settings section and Alarm Settings to use the Calibration Reminder Alarm to set a reminder if a calibration is not performed within the selected time interval.

4.2.1 ORP Calibration Overview

The ORP calibration is a millivolt (mV) offset adjustment.

Oxidation reduction potential (ORP) or redox is useful as a relative indicator of the oxidizing or reducing nature of a sample solution. Using the offset adjustment in the ORP measure mode allows readings to be comparable to a reference. Enter an offset of up to ±250 mV from the raw mV value.

To eliminate temperature errors associated with ORP, use an automatic temperature compensation (ATC) probe with ORP electrode for best accuracy.

The non-volatile meter memory retains all data when powered off and in the event of power failure.

4.2.1.1 Determined ORP Standard Value

Refer to the Calibration Type option in the 3.2.2 pH/Ion Settings section.

- **E_H Calibration Type:** The meter will automatically recognize the Orion ORP standard (catalog number 967901 or 967961) during the calibration. Once the reading is stable, the meter will automatically display the value of the Orion ORP standard as E_H at the measured temperature.
- **ORP Calibration Type:** The meter will not attempt to recognize the ORP standard. The user must enter the value of the standard at the measured temperature during the calibration. This setting is useful when using an alternative ORP standard to perform the ORP calibration.

4.2.2 ORP Calibration Procedure

1. Ensure the active measure mode is set to ORP.
    a. If using a method, ensure the method is loaded and active.
2. Tap the Calibrate button to start the calibration.
    a. If viewing multiple measurement channels, select the ORP calibration option.
3. Rinse the ORP electrode and ATC sensor with purified water and place into the standard.
    a. If using a stirrer, place it into the standard and begin stirring. If using the Orion stirrer probe, it will activate once the button is tapped.
4. Review the onscreen instructions, then tap the Start button (or Continue button) to begin measuring the standard.
5. Wait for the ORP value to stabilize. Once the reading is stable, the Determined ORP Standard Value is shown.
    a. To accept the ORP value, no action is required.
    b. To edit the ORP value, tap the edit value text. Tap the ORP value and use the numeric

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keypad to enter the known ORP value of the standard at the measured temperature. Tap the Save button to save the entered value.

6. Tap the Done button to complete the calibration. The meter will automatically save the calibration information to the calibration log and display a summary of the calibration. Tap the Measure button to proceed to the main measure mode.

Calibration Notes

- If the calibration point needs to be remeasured once the reading has stabilized, tap the back arrow. This may be useful if you accidentally put the electrode in the wrong solution.
- If a reading takes longer than 90 seconds to stabilize during the calibration, the force stabilize text will appear. This may be helpful if the electrode is responding more slowly than usual. Tap the force stabilize text to accelerate the reading stability (may give less accurate calibration results).

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4.3 Ion Calibration

Refer to the 3.2.2 pH/Ion Settings section and Alarm Settings to use the Calibration Reminder Alarm to set a reminder if a calibration is not performed within the selected time interval.

4.3.1 Ion Calibration Overview

For best results, periodic calibration with known, accurate and fresh standards is recommended.

Calibrate with ion concentration standards that bracket the expected sample concentration and are 1 decade (10 times) apart in concentration.

Perform the calibration using the lowest concentration standard first, progressing to the highest concentration standard last, unless a different technique is recommended by your procedure.

To accurately prepare calibration standards from a stock solution, serial dilution using calibrated pipettes and volumetric glassware is recommended.

Refer to the ion selective electrode user manual for detailed instructions on electrode preparation, standard preparation, recommended rinsing solution and required solutions. Ionic Strength Adjuster (ISA) specific to the ion selective electrode must be added to all standards and samples. Add the same volume of ISA to all standards prior to calibration and samples prior to measurement to ensure a consistent dilution factor.

The ISE Type will determine the default slope value used to evaluate each calibration point during the calibration procedure. Refer to the 3.2.2 pH/Ion Settings section and ensure the correct ISE Type is selected before performing a calibration.

ISE Type	Default Slope at 25°C
Ammonia (NH_3)	-59.16
Ammonium (NH_4^+)	+59.16
Bromide (Br^-)	-59.16
Cadmium (Cd^{2+})	+29.58
Calcium (Ca^{2+})	+29.58
Carbon Dioxide (CO_2)	+59.16
Chloride (Cl^-)	-59.16
Chlorine (Cl_2)	+29.58
Copper (Cu^{2+})	+29.58
Cyanide (CN^-)	-59.16
Fluoride (F^-)	-59.16
Fluoroborate (BF_4^-)	-59.16

ISE Type	Default Slope at 25°C
Iodide (I^-)	-59.16
Lead (Pb^{2+})	+29.58
Nitrate (NO_3^-)	-59.16
Potassium (K^+)	+59.16
Silver (Ag^+)	+59.16
Sodium (Na^+)	+59.16
Sulfide (S^{2-})	-29.58
Thiocyanate (SCN^-)	-59.16
Monovalent Ion (X^-)	-59.16
Monovalent Cation (X^+)	+59.16
Divalent Ion (X^{2-})	-29.58
Divalent Cation (X^{2+})	+29.58

To eliminate temperature errors associated with ion concentration, it is recommended that all standards and samples be at the same temperature and an automatic temperature compensation (ATC) probe is used with the ion selective electrode to ensure temperatures are the uniform.

The non-volatile meter memory retains all data when powered off and in the event of power failure.

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4.3.2 Ion Calibration Procedure

1. Ensure the active measure mode is set to ion and the selected ISE Type matches the ion selective electrode to be calibrated.
    a. If using a method, ensure the method is loaded and active.
2. Tap the Calibrate button to start the calibration.
    a. If viewing multiple measurement channels, select the Ion calibration option.
3. Rinse the electrode and ATC sensor with purified water and place into the standard.
    a. If using a stirrer, place it into the standard and begin stirring. If using the Orion stirrer probe, it will activate once the button is tapped.
4. Review the onscreen instructions, then tap the Start button (or Continue button) to begin measuring the standard.
5. Wait for the concentration value to stabilize.
    a. To accept the standard value, no action is required.
    b. To edit the standard value, tap the edit value text. Tap the standard value and use the numeric keypad to enter the desired standard value. Tap the Save button to save the entered value.
6. Proceed to the next calibration point or end the calibration:
    a. To proceed to the next calibration point, tap the Next button.
        i. If using the Orion stirrer probe, it will deactivate once the Next button is tapped.
        ii. Repeat steps 3-5 for each standard, from lowest to highest concentration.
    b. To complete the calibration, tap the Done button.
        i. If performing a 1 point ion calibration, tap the slope value and use the numeric keypad to enter the desired slope value. Tap the Save button to save the entered value.
7. The meter will automatically save the calibration information to the calibration log and display a summary of the calibration. Tap the Measure button to proceed to the main measure mode.

Calibration Notes

- If a calibration point needs to be remeasured once the reading has stabilized, tap the back arrow. This may be useful if you accidentally put the electrode in the wrong solution.
- If a reading takes longer than 90 seconds to stabilize during the calibration, the force stabilize text will appear. This may be helpful if the electrode is responding more slowly than usual. Tap the force stabilize text to accelerate the reading stability (may give less accurate calibration results).
- If the Ion Calibration Points in the 3.2.2 pH/Ion Settings section is changed from “1 to 5” to a set number of points (4, 3, 2 or 1), only the Next button will appear for each calibration point until the set number of points is completed, at which point the Done button will appear.

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4.4 Conductivity, TDS and Salinity Calibration

Refer to the 3.10 Information & Help section and Meter Tours to access onscreen tours that explain how to use important meter functions including conductivity calibration.

Refer to the 3.2.3 Conductivity Settings section and Alarm Settings to use the Calibration Reminder Alarm to set a reminder if a calibration is not performed within the selected time interval.

When the conductivity calibration is the only calibration performed, it will be applied to conductivity, TDS, salinity and resistivity measurement modes. This is typically the most accurate way to calibrate.

- The TDS measure mode is automatically calibrated when a conductivity calibration is performed and the TDS factor is set. This is typically the most accurate way to calibrate for TDS measurements. Alternatively, the meter can be calibrated in TDS mode using TDS standards and the TDS calibration will be applied to TDS measurements only.
- The salinity measure mode is automatically calibrated when a conductivity calibration is performed. This is typically the most accurate way to calibrate for salinity measurements. Alternatively, the meter can be calibrated in salinity as % NaCl mode using a salinity as % NaCl standard and the salinity calibration will be applied to salinity as % NaCl measurements only.

4.4.1 Conductivity Calibration Overview

For best results, periodic calibration with known, accurate and fresh standards is recommended. Always use fresh aliquots of each standards poured just before use into clean beakers to calibrate.

Calibrate one or more conductivity standards near the expected sample ranges. Perform conductivity calibrations with 1 to 5 conductivity standards, using one conductivity standard per conductivity range.

- Recommended conductivity ranges are 0.00 to 20.00 µS/cm, 20.01 to 300.0 µS/cm, 300.1 to 9999 µS/cm, 10.00 to 99.99 mS/cm and 100.0 to 3000 mS/cm.
- When a one point calibration is performed, the meter will apply the calculated cell constant across all conductivity ranges.
- When a two or more point calibration is performed, the meter will apply the calculated cell constant to each applicable range for the standard used to calibrate and apply the most relevant calculated cell constant to any ranges where a standard was not used during calibration.

The non-volatile meter memory retains all data when powered off and in the event of power failure.

4.4.1.1 Determined Conductivity Standard Value

During the conductivity calibration, the meter will attempt to automatically recognize each conductivity standard value using the selected Nominal Cell Constant, Conductivity Standard Set and the signal measured by the conductivity electrode. Once the reading is stable and the conductivity standard is recognized, the meter will automatically display the conductivity value at 25°C.

- Refer to the 3.2.3 Conductivity Settings section and Nominal Cell Constant option to set the value to match the nominal cell constant of the conductivity electrode to be calibrated.
- Refer to the 3.2.3 Conductivity Settings section and Conductivity Standard Set option to set the

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calibration standards to be used for calibration to Orion (100.0 µS/cm, 1413 µS/cm, 12.88 mS/cm and 111.9 mS/cm) or Custom to enter 4 custom standard values.

- If the conductivity reading does not correspond with an automatically recognized conductivity standard value (within ±40% window), once the reading is stable, the meter will display the theoretical value of the conductivity standard according to the selected Nominal Cell Constant entered in the Conductivity Settings.
    - The user must manually enter the value of the conductivity standard at the measured temperature (conductance).

4.4.2 Conductivity Calibration Procedure

1. Ensure the active measure mode is set to conductivity.
    a. If using a method, ensure the method is loaded and active.
2. Tap the Calibrate button to start the calibration.
    a. If viewing multiple measurement channels, select the conductivity calibration option.
3. Rinse the conductivity electrode with purified water and place into the conductivity standard.
    a. If using a stirrer, place it into the standard and begin stirring. If using the Orion stirrer probe, it will activate once the button is tapped.
4. Review the onscreen instructions, then tap the Start button (or Continue button) to begin measuring the standard.
5. Wait for the conductivity value to stabilize. Once the reading is stable, the Determined Conductivity Standard Value is shown.
    a. To accept the conductivity value, no action is required.
    b. To edit the conductivity value, tap the edit value text. Tap the conductivity value, then use the numeric keypad to enter the desired conductivity value at the measured temperature. Tap the Save button to save the entered value.
6. Proceed to the next calibration point or end the calibration:
    a. To proceed to the next calibration point, tap the Next button.
        i. If using the Orion stirrer probe, it will deactivate once the Next button is tapped.
        ii. Repeat steps 3 to 5 for each conductivity standard.
    b. To complete the calibration, tap the Done button.
7. The meter will automatically save the calibration information to the calibration log and display a summary of the calibration. Tap the Measure button to proceed to the main measure mode.

Calibration Notes

- If a calibration point needs to be remeasured after the reading has stabilized, tap the back arrow. This may be useful if you accidentally put the electrode in the wrong solution.
- If a reading takes longer than 90 seconds to stabilize during the calibration, the force stabilize

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text will appear. This may be helpful if the electrode is responding more slowly than usual. Tap the force stabilize text to accelerate the reading stability (may give less accurate calibration results).

- If the Conductivity Cal. Points in the 3.2.3 Conductivity Settings section is changed from "1 to 5" to a set number of points (4, 3, 2 or 1), only the Next button will appear for each calibration point until the set number of points is completed, at which point the Done button will appear.

4.4.3 Conductivity Value vs Temperature

The following table list theoretical values for Orion conductivity standards at various temperatures. Actual values shown on the meter may vary due to rounding deviations from the actual conductivity and temperature measurements.

Temperature (°C)	Orion 100µS Standard (µS/cm)	Orion 1413µS Standard (µS/cm)	Orion 12.9mS Standard (mS/cm)	Orion 111.8mS Standard (mS/cm)
0	54.19	775.6	7.13	63.9
5	62.73	894.1	8.21	73.4
10	71.59	1017	9.34	82.9
15	80.77	1145	10.49	92.4
20	90.27	1277	11.68	102.1
25	100.1	1413	12.90	111.8
30	110.1	1552	14.14	121.7
35	120.6	1693	15.39	131.5
40	131.1	1837	16.67	141.5
45	142.4	1983	17.92	151.6
50	153.7	2130	19.26	161.7

4.4.4 TDS Calibration Overview

The TDS measure mode is automatically calibrated when a conductivity calibration is performed and the TDS factor is set. This is typically the most accurate way to calibrate for TDS measurements. Alternatively, the meter can be calibrated in TDS mode using TDS standards and the TDS calibration will be applied to TDS measurements only.

Perform TDS calibrations with 1 to 5 TDS standards, using 1 TDS standard per TDS range.

- TDS ranges are 0.00 to 10.00 ppm, 10.01 to 200.0 ppm, 200.1 to 9999 ppm, 10.00 to 99.99 ppt and 100.0 to 500.0 ppt.
- When a one point calibration is performed, the meter will apply the calculated cell constant across all TDS ranges.
- When a two or more point TDS calibration is performed, the meter will apply the calculated cell constant to each applicable range for the standard used to calibrate and apply the most relevant calculated cell constant to any ranges where a standard was not used during calibration.

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4.4.5 TDS Calibration Procedure

1. Ensure the active measure mode is set to TDS.
    a. If using a method, ensure the method is loaded and active.
2. Tap the Calibrate button to start the calibration.
    a. If viewing multiple measurement channels, select the TDS calibration option.
3. Rinse the conductivity electrode with purified water and place into the TDS standard.
    a. If using a stirrer, place it into the standard and begin stirring. If using the Orion stirrer probe, it will activate once the button is tapped.
4. Review the onscreen instructions, then tap the Start button (or Continue button) to begin measuring the standard.
5. Wait for the TDS value to stabilize. Once the reading is stable, enter the value of the TDS standard at the measured temperature.
    a. To edit the TDS value, tap the edit value text.
    b. Tap the TDS value, then use the numeric keypad to enter the desired TDS value at the measured temperature.
    c. Tap the Save button to save the entered value.
6. Proceed to the next calibration point or end the calibration:
    a. To proceed to the next calibration point, tap the Next button.
        i. If using the Orion stirrer probe, it will deactivate once the Next button is tapped.
        ii. Repeat steps 3 to 5 for each TDS standard.
    b. To complete the calibration, tap the Done button.
7. The meter will automatically save the calibration information to the calibration log and display a summary of the calibration. Tap the Measure button to proceed to the main measure mode.

Calibration Notes

- If a calibration point needs to be remeasured after the reading has stabilized, tap the back arrow. This may be useful if you accidentally put the electrode in the wrong solution.
- If a reading takes longer than 90 seconds to stabilize during the calibration, the force stabilize text will appear. This may be helpful if the electrode is responding more slowly than usual. Tap the force stabilize text to accelerate the reading stability (may give less accurate calibration results).
- If the TDS Calibration Points in the 3.2.3 Conductivity Settings section is changed from “1 to 5” to a set number of points (4, 3, 2 or 1), only the Next button will appear for each calibration point until the set number of points is completed, at which point the Done button will appear.

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4.4.6 Salinity Calibration Overview

The salinity measure mode is automatically calibrated when a conductivity calibration is performed. This is typically the most accurate way to calibrate for salinity measurements. Alternatively, the meter can be calibrated in salinity as % NaCl mode using a salinity as % NaCl standard and the salinity calibration will be applied to salinity as % NaCl measurements only.

4.4.7 Salinity Calibration Procedure

1. Ensure the active measure mode is set to salinity as % NaCl.
    a. If using a method, ensure the method is loaded and active.
2. Tap the Calibrate button to start the calibration.
    a. If viewing multiple measurement channels, select the salinity calibration option.
3. Rinse the conductivity electrode with purified water and place into the salinity standard.
    a. If using a stirrer, place it into the standard and begin stirring. If using the Orion stirrer probe, it will activate once the Start button is tapped.
4. Review the onscreen instructions, then tap the Start button to begin measuring the standard.
5. Wait for the salinity value to stabilize. Once the reading is stable, enter the value of the standard at the measured temperature.
    a. To edit the salinity value, tap the edit value text.
    b. Tap the salinity value, then use the numeric keypad to enter the desired salinity value at the measured temperature.
    c. Tap the Save button to save the entered value.
6. To complete the calibration, tap the Done button.
7. The meter will automatically save the calibration information to the calibration log and display a summary of the calibration. Tap the Measure button to proceed to the main measure mode.

Calibration Notes

- If a calibration point needs to be remeasured after the reading has stabilized, tap the back arrow. This may be useful if you accidentally put the electrode in the wrong solution.
- If a reading takes longer than 90 seconds to stabilize during the calibration, the force stabilize text will appear. This may be helpful if the electrode is responding more slowly than usual. Tap the force stabilize text to accelerate the reading stability (may give less accurate calibration results).

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4.5 Temperature Calibration

4.5.1 Temperature Calibration Overview

The thermistor sensor used for automatic temperature compensation (ATC) and measurements is both accurate and stable, so frequent calibration is not required. If desired, perform a temperature calibration to calibrate the ATC sensor when it is connected to the meter. A 1 to 2 point temperature offset calibration can be performed, up to ±5.0°C for each calibration point.

4.5.2 Temperature Calibration Procedure

1. Tap the Main Menu icon in the measure mode to access the Main Menu.
2. Tap the Calibrate option in the Main Menu.
3. Tap the Temperature Calibration option in the Calibrate list.
4. Select the ATC sensor or sensors to be calibrated from the channel list and tap the Continue button.
5. Place the ATC sensor or sensors into a solution with a known, stable temperature and NIST traceable thermometer.
    a. If using a stirrer, place it into the solution and begin stirring. If using the Orion stirrer probe, it will activate once the Start button is tapped.
6. Tap the Start button to begin measuring the solution.
7. Wait for the temperature value to stabilize. Once the reading is stable, the ATC temperature value is shown and the edit screen will appear.
    a. Tap the temperature value and use the numeric keypad to enter the desired temperature value from the NIST traceable thermometer.
    b. Tap the Save button to save the entered value.
8. Proceed to the next calibration point or end the calibration:
    a. To proceed to the next calibration point, tap the Next button.
        i. If using the Orion stirrer probe, it will deactivate once the Next button is tapped.
        ii. Repeat steps 5-7 for the second calibration point.
    b. To complete the calibration, tap the Done button.
9. The meter will automatically save the calibration information to the calibration log and display a summary of the calibration. Tap the Measure button to proceed to the main measure mode.

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Chapter 5 Measurements

5.1 Measure Mode Overview

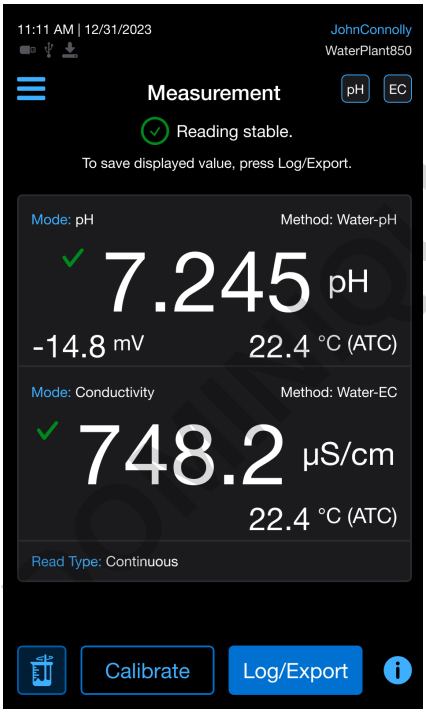
Refer to the 3.10 Information & Help section and Meter Tours to access onscreen tours that explain how to use important meter functions including measurements.

The Orion Pro Star PC215 meter offers 2 measurement channels, capable of measuring the following parameters:

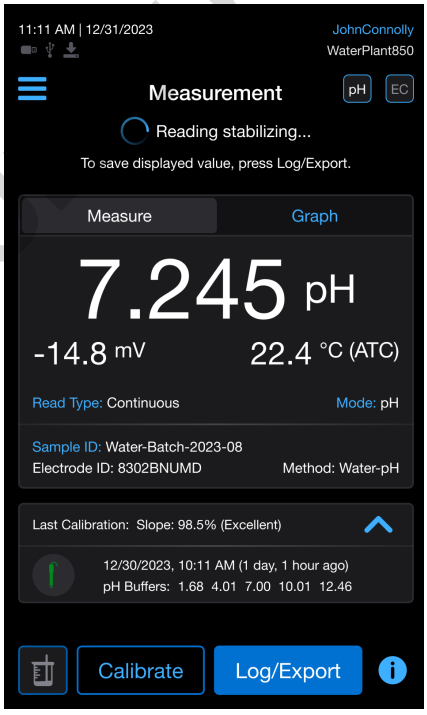
- Channel 1 (pH): pH, mV, ORP or ion concentration with temperature
- Channel 2 (EC): Conductivity, TDS, salinity or resistivity with temperature

Use the Channel Selection Icons to select the corresponding channels that are actively displayed in the measure mode. Tap each icon (pH, EC) to display or hide that channel. Active channels are indicated with white text and hidden channels are indicated with gray text.

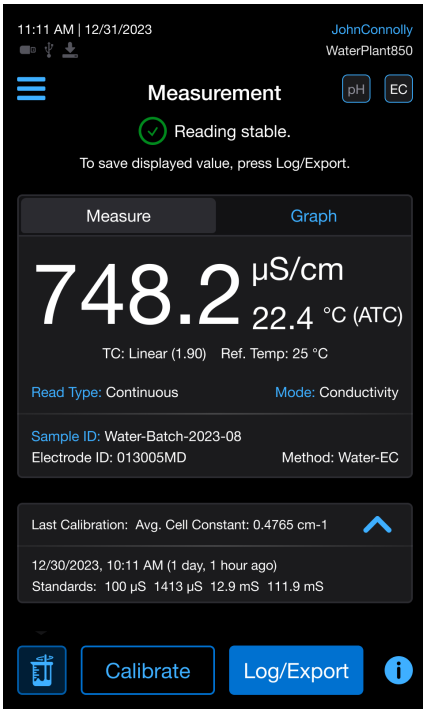
Two Active Channel Example (pH, EC)



One Active Channel Example (pH)



One Active Channel Example (EC)



Refer to the 2.5 Touchscreen Functions section for details on the display components and icons. Key interaction points on the screen are blue for easy navigation. Optionally, a USB mouse can be used to operate the touchscreen interface.

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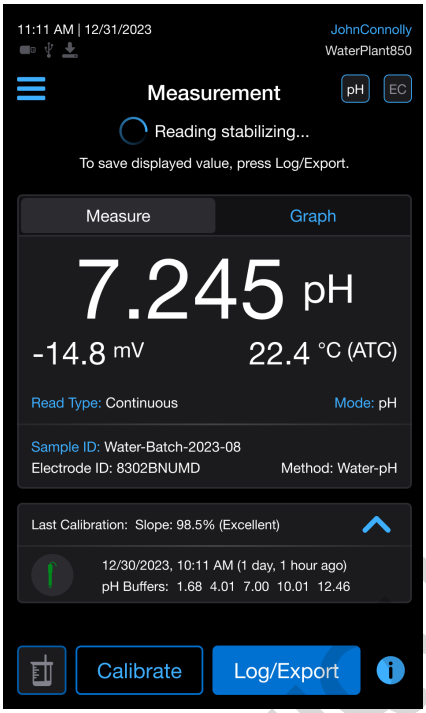
Change the Measurement Mode

Tap the blue Mode text to change the measurement mode for each channel. Set the mode for the pH/Ion Channel to pH, mV, ORP or ion concentration. Set the mode for the Conductivity Channel to conductivity, TDS, salinity or resistivity.

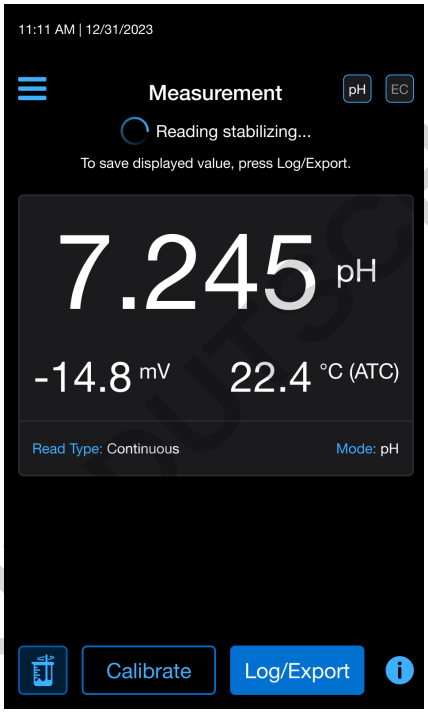
Customize the Display View

Refer to the 3.2.1 Instrument Settings section and Display settings to customize the information shown in the single channel view. When viewing a single channel, additional information is displayed including the sample ID, electrode ID and most recent calibration information. Alternatively, select Basic as the Custom Measure Layout in the Display settings to view a simplified single channel with less information. When viewing a single channel, the measurements can also be viewed as a graph.

Single Channel View, Advanced



Single Channel View, Basic



Single Channel View, Graph



View Active Calibration Details

When viewing a single channel, active calibration details are shown.

Mode	Example Calibration Details	Notes
pH Calibration	Last Calibration: Slope: 98.5% (Excellent) 12/30/2023, 10:11 AM (1 day, 1 hour ago) pH Buffers: 1.68 4.01 7.00 10.01 12.46	The pH electrode status icon represents the average slope of the most recent calibration. The icon is green when the slope is 92.0% to 102.0%. The icon is orange when the slope is 82.0% to 91.9% or 102.1% to 114.0%. The icon is red when the slope is less than 82.0% or greater than 114.0%. Ranges are adjustable.

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Mode	Example Calibration Details	Notes
Ion Calibration	Last Calibration: Slope: 59.16 mV per decade 12/30/2023, 10:11 AM (1 day, 1 hour ago) Standards: 1.000 10.00 100.0 1000 10000 ppm	The ion calibration will use the units selected in the pH/Ion Channel settings.
Conductivity Calibration	Last Calibration: Avg. Cell Constant: 0.4785 cm-1 12/30/2023, 10:11 AM (1 day, 1 hour ago) Standards: 100 µS 1413 µS 12.9 mS 111.9 mS	The conductivity calibration will show the average calculated cell constant value.

5.1.1 Measure Mode Read Types

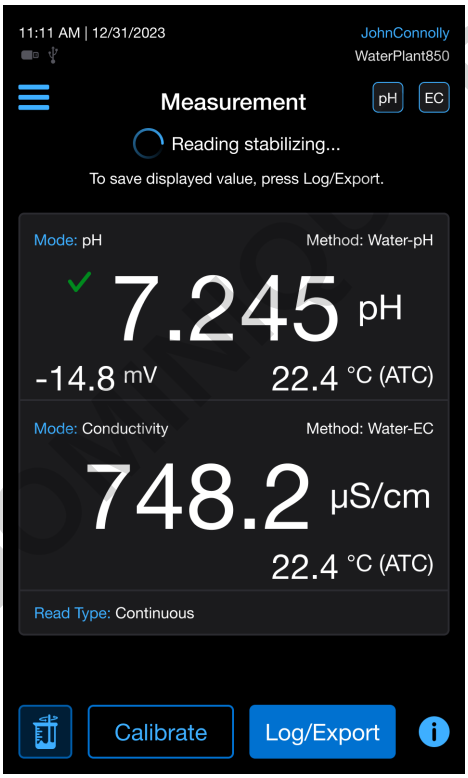
Refer to the 3.2.1 Instrument Settings section and Read Type setting to define how measurements are performed, saved and exported. Tap the blue Read Type text to change the selected read type.

Continuous Read Type

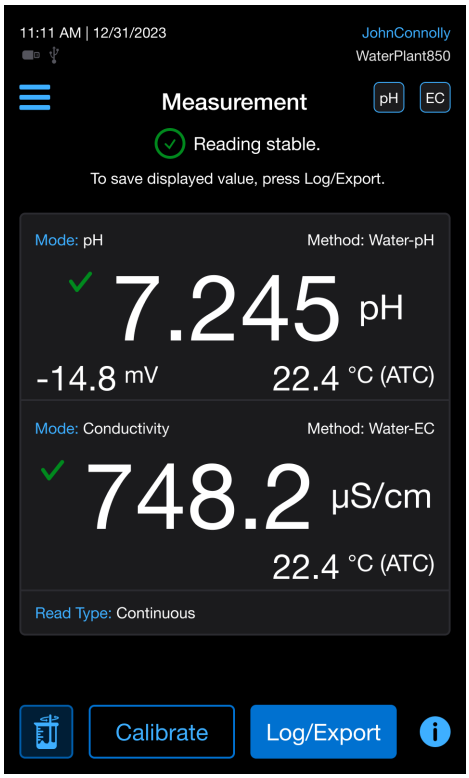
When Continuous is selected as the read type:

- Measurements are continuously updated on the display and the stabilizing or stable icon indicates the measurement stability status.
- Tap the Log/Export button to save a measurement to the data log and export it to an external device according to the Data Transfer Settings in the 3.2.1 Instrument Settings section.
- Tap the Stirrer button to turn the Orion stirrer probes on and off.

Continuous, Reading Stabilizing



Continuous, Reading Stable



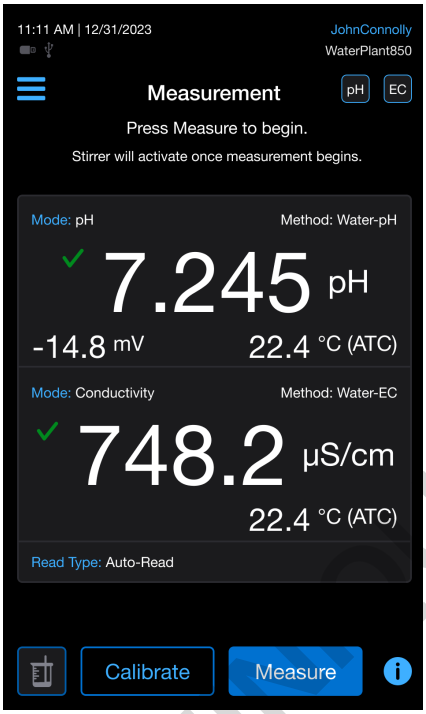
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Auto-Read Read Type

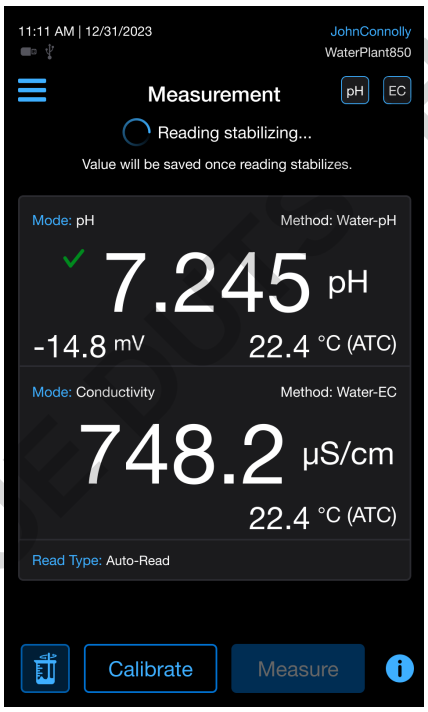
When Auto-Read is selected as the read type:

- Tap the Measure button to start a measurement.
- When the measurement is stable, the stable icon is shown and the measurement is locked on the display until the Measure button is tapped again.
- The stable measurement is automatically saved to the data log and exported to an external device according to the Data Transfer Settings in the 3.2.1 Instrument Settings section.
- Tap the Measure button to start a new measurement.
- Orion stirrer probes will turn on automatically when the Measure button is tapped. When on, tap the Stirrer button to manually turn off the stirrer probes. Orion stirrer probes will turn off automatically when the measurement is stable and locked.

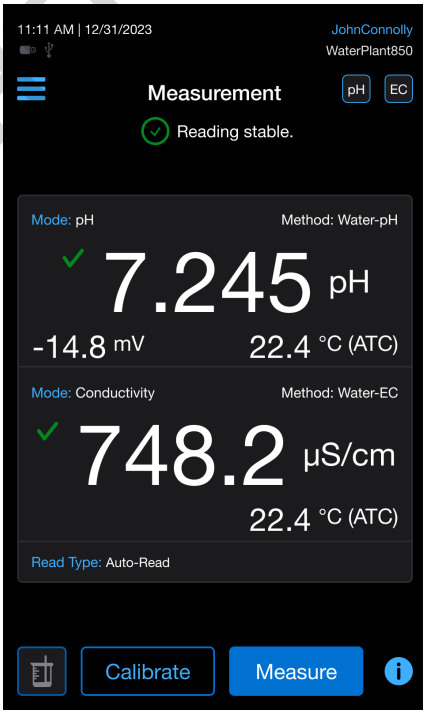
Auto-Read, Waiting



Auto-Read, Reading Stabilizing



Auto-Read, Reading Stable



Timed Read Type

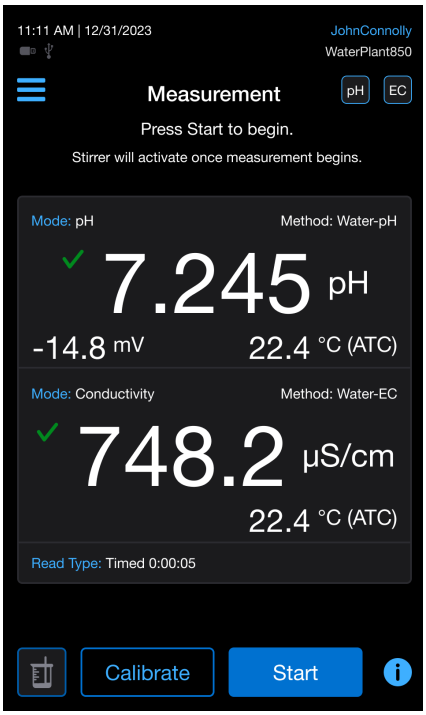
Timed intervals can be set from 3 seconds (0:00:03) to 2 hours (2:00:00). When Timed is selected as the read type:

- Tap the Start button to start taking timed measurements. Measurement values are continuously updated on the display.
- Measurements are automatically saved at the selected time intervals to the data log and exported to an external device according to the Data Transfer Settings in the 3.2.1 Instrument Settings section.
- Tap the Stop button or leave the measure mode to stop taking timed measurements.
- Orion stirrer probes will turn on automatically when the Start button is tapped. When on, tap the

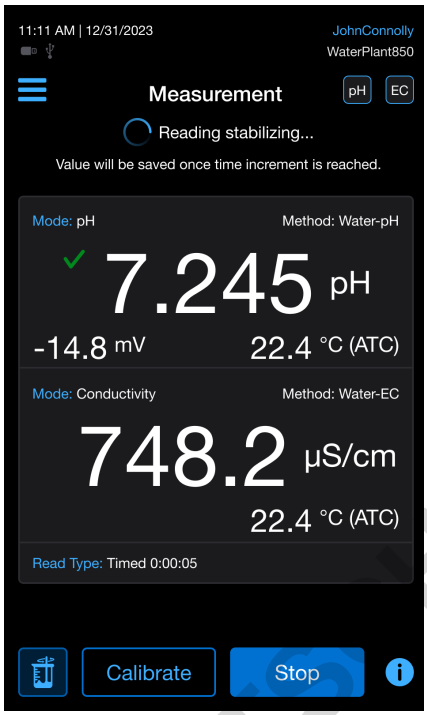
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Stirrer button to manually turn off the Orion stirrer probes. Orion stirrer probes will turn off automatically when the Stop button is tapped.

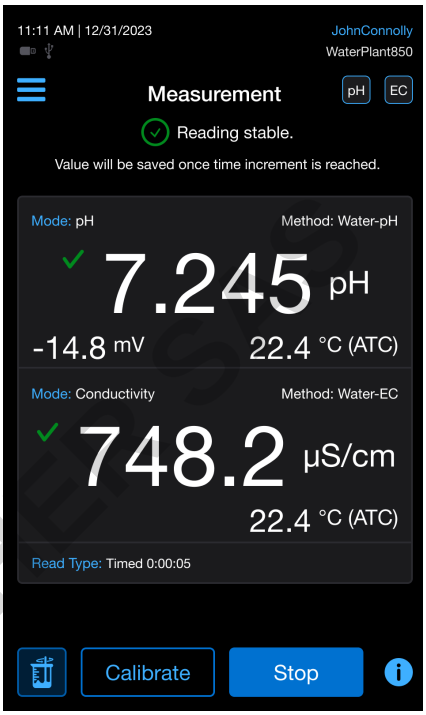
Timed, Waiting



Timed, Reading Stabilizing



Timed, Reading Stable



5.1.2 Sample ID

When using Sample ID to identify samples with measurements, determine which channels will be active in the measure mode and refer to the 3.2.2 pH/Ion Settings and 3.2.3 Conductivity Settings sections and Sample ID setting to turn on sample ID, set the type of sample ID and enter the sample ID.

Set the Sample ID for each active channel to Auto-incremental, Manual or Off.

- Auto-incremental: Enter up to 20 alphanumeric characters or select from the list of previously entered sample IDs. The meter will add “00001” to the end of the first sample ID and then automatically increase the sample ID by 1 for subsequent sample IDs.
    - Continuous Read Type: Sample ID will increase when the Log/Export button is tapped.
    - Auto-Read Read Type: Sample ID will increase when the Measure button is tapped.
    - Timed Read Type: Sample ID will increase when the Start button is tapped and each time interval is reached (3 seconds to 2 hours).
- Manual: Enter up to 25 alphanumeric characters or select from the list of previously entered sample IDs.
    - Continuous Read Type: Sample ID entry field will appear when the Log/Export button is tapped. Select the Apply ID to Multiple Readings option to use the same sample ID for subsequent readings and stop the Sample ID entry field from appearing.
    - Auto-Read Read Type: Sample ID entry field will appear when the Measure button is tapped. Select the Apply ID to Multiple Readings option to use the same sample ID for

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subsequent readings and stop the Sample ID entry field from appearing.

- Timed Read Type: Sample ID entry field will appear when the Start button is tapped and each time interval is reached (3 seconds to 2 hours). Select the Apply ID to Multiple Readings option to use the same sample ID for subsequent readings and stop the Sample ID entry field from appearing.

- Off: No sample ID is shown for measurements, logs or exported records.

In the measure mode, when sample ID is set to auto-incremental or manual, the sample ID can also be entered by tapping the blue Sample ID text in the single channel view.

5.1.3 Stirrer Button

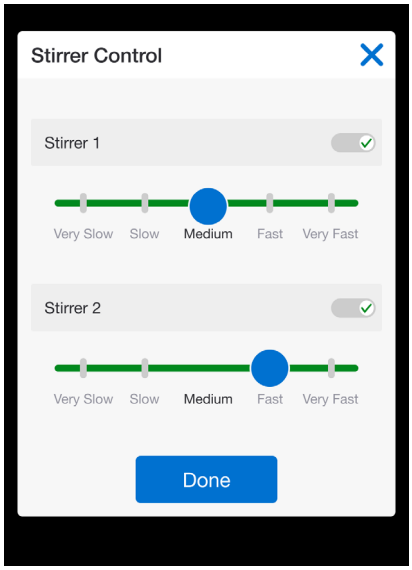
If using one or two Orion stirrer probes, determine which channels will be active in the measure mode and refer to the 3.2.2 pH/Ion Settings and 3.2.3 Conductivity Settings sections and Stirrer setting for all active channels to define which stirrer probe port is assigned to each active channel and the default speed for each stirrer probe.

Refer to the 3.2.1 Instrument Settings section and Read Type settings to define how the stirrer probes will function in the measure mode.

- Continuous Read Type: Tap the Stirrer button to turn the Orion stirrer probes on and off.
- Auto-Read Read Type: The Orion stirrer probes will turn on automatically when the Measure button is tapped. When on, tap the Stirrer button to manually turn off the stirrer probes. The Orion stirrer probes will turn off automatically when the measurement is stable and locked.
- Timed Read Type: The Orion stirrer probes will turn on automatically when the Start button is tapped. When on, tap the Stirrer button to manually turn off the Orion stirrer probes. The Orion stirrer probes will turn off automatically when the Stop button is tapped.

Press and hold the Stirrer button to access and change the stirrer control settings.

Note: *The Stirrer button is hidden if the stirrer function is turned off for all actively shown channels.*



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5.2 General Measurement Procedure

Refer to the electrode manuals for detailed instructions on electrode preparation, calibration and usage. Make sure the electrodes are fully prepared, properly calibrated and working correctly before taking sample measurements.

Refer to the 3.2.1 Instrument Settings section and Read Type settings to define how measurements are performed and when measurements are saved and exported.

If using one or two Orion stirrer probes, determine which channels will be active in the measure mode and refer to the 3.2.2 pH/Ion Settings and 3.2.3 Conductivity Settings sections and Stirrer setting for all active channels to define which stirrer probe port is assigned to each active channel and the default speed for each stirrer probe.

1. Rinse the electrode with purified water or appropriate solution and lightly blot with a lint-free tissue to remove excess water or solution.
2. Place the electrode into the sample with the sensing element fully submerged in sample.
3. Start the measurement and wait for the reading to stabilize or reach the predefined time. The selected Read Type will determine how measurements are performed and how the Orion stirrer probes will operate:
    a. Continuous: Wait for the Stable icon to appear.
        i. Tap the Stirrer button to turn the stirrer probes on and off.
    b. Auto-Read: Tap the Measure key and wait for the Stable icon to appear.
        i. The stirrer probes will turn on automatically when the Measure button is tapped. When on, tap the Stirrer button to manually turn off the stirrer probes. The stirrer probes will turn off automatically when the measurement is stable and locked.
    c. Timed: Tap the Start key and wait for the predefined time intervals to be reached.
        i. The stirrer probes will turn on automatically when the Start button is tapped. Once on, tap the Stirrer button to manually turn off the stirrer probes. The stirrer probes will turn off automatically when the Stop button is tapped.
4. Record the displayed measurements as required.
5. Remove the electrode from the sample.
6. Repeat steps 1-5 for all samples.
7. When all samples have been measured, store the electrode according to the instructions in the electrode manual.

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5.3 Data Viewing

Data Log

When saving measurements to the meter data log, refer to the 3.4 Data Logs section for detailed information and instructions on viewing and exporting the meter's data log.

Save up to 10000 data logs in the meter's non-volatile memory. Each data log is saved with its associated date and time stamp.

- When in Open Mode, the meter will save up to 10000 data logs and then automatically overwrite the oldest data log with the newest data log when the limit is reached.
- When in Secure Mode, the meter will save up to 10000 data logs and then prompt the Administrator and Level 1 accounts to export and delete data logs when the limit is reached.

Calibration Log

Refer to the 3.5 Calibration Logs section for detailed information and instructions on viewing and exporting the meter's calibration log.

Save up to 20 calibration logs per parameter in the meter's non-volatile memory. Each calibration log is saved with its associated date and time stamp.

- When in Open Mode, the meter will save up to 20 calibration logs per parameter and then automatically overwrite the oldest calibration log with the newest calibration log when the limit is reached.
- When in Secure Mode, the meter will save up to 20 calibration logs and prompt the Administrator and Level 1 accounts to export and delete calibration logs when the limit is reached.

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Chapter 6
Data Exporting and Importing

6.1 Data Transfer

Export live measurements, completed calibrations, data logs, calibration logs, methods, user lists (Secure Mode only) and audit trails (Secure Mode only) from the meter to a USB flash drive, computer or Orion ink printer (catalog number STARA-106).

To successfully export data:

1. Set all required data transfer settings in the Instrument Settings menu.
    a. If interfacing with a computer, set the meter's date and time settings to match the computer's date and time settings.
2. Fully connect the meter to the external device.
3. Verify that the destination for data to be transferred is fully functional.

6.1.1 Data Transfer Settings

Refer to the 3.2.1 Instrument Settings section and Data Transfer Settings to set all required options.

- Export Destination: Select one external device destination.
    - USB Drive: Data is exported to a USB flash drive when it is connected to the USB port on the side of the meter. Methods and software updates can also be imported from the USB flash drive to the meter.
    - Computer: Data is exported to a computer when it is connected to the Export port on the back of the meter using the included USB cable.
    - Printer: Data is exported to the Orion ink printer when it is connected to the Export port on the back of the meter using the printer cable included with the printer.
- Export Output Format: Set the format of exported files (for USB Drive and Computer only).
    - CSV (Comma Separated Values): Plain text file with data delimited by commas, useful for importing into LIMS and spreadsheet programs.
    - Report: Formatted file with organized data, useful for hardcopy records.
- Export Baud Rate: Set the data transfer baud rate (for Computer and Printer only).
- Custom Data Log Export: Select the amount of information to be exported from the data log. Select the "All Data" option when exporting data to LIMS software.
- Custom Calibration Log Export: Select the amount of information to be exported from the calibration log. Select the "All Data" option when exporting data to LIMS software.

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6.1.2 Connect the External Device

USB Flash Drive

For data transfer using a USB flash drive:

- Power on the meter.
- Insert a USB flash drive with USB-A plug into the USB meter input.

Computer

For data transfer using a computer:

- Power on the meter.
- Use the included USB computer cable and insert the cable into the Export meter input.
- Insert the USB computer cable into a standard USB-A port on the computer.
- Once the cable is connected with the computer, the computer should automatically identify the cable and install the required driver.
    - If the driver is not automatically installed, go to www.thermofisher.com/orionsoftware and download the driver for Orion Pro Star meters.
- Record the COM port location of the computer cable using the computer's Device Manager tool.
- Once the driver is installed, data can be transferred from the meter to a computer using a computer program such as LIMS, Putty, LabView, HyperTerminal or similar program.
    - Review the computer program's data transfer settings and adjust if required to ensure the meter can fully communicate with the computer program.

Printer

For data transfer using the Orion ink printer (catalog number STARA-106):

- Power on the meter.
- Use the printer cable included with the printer and insert the cable into the Export meter input.
- Insert the cable into a communication port on the printer. If needed, use the adapter cable included with the printer to match the current printer port type with the cable.
- Power on the printer. The printer data transfer settings are pre-matched to the meter settings.

Meter Serial Communication Protocol

Computer Setting	Printer Setting
Baud Rate : 115200 bps	Baud Rate : 9600 bps
Data bits: 8	Data bits: 8
Parity: None	Parity: None
Stop bits: 1	Stop bits: 1
Flow Control: None	Flow Control: None

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6.1.3 Verify the Data Destination

USB Flash Drive

For data transfer using a USB flash drive, perform a test export of data from the meter to the USB flash drive. Remove the USB flash drive from the meter, insert it in a computer and open the test export on the computer. Once the test is completed successfully, the data destination has been verified.

Computer

For data transfer using a computer, perform a test export of data from the meter to the selected computer program (LIMS, Putty, LabView, HyperTerminal, etc.). The meter's data transfer settings and date and time settings must match the computer program's data transfer settings and date and time settings. Verify the test export was successfully received by the selected computer program, the data is mapped as expected, in the expected format. Once the test is completed successfully, the data destination has been verified.

Printer

For data transfer using the Orion ink printer (catalog number STARA-106), perform a test export of data from the meter to the selected computer program. The meter's data transfer settings must match the printer's data transfer settings. Verify the test export was successfully received by the printer and the test data is printed properly. Once the test is completed successfully, the data destination has been verified.

6.2 Remote Commands

Remote commands allow the meter to be interfaced with computer software like LIMS, Putty, LabView and HyperTerminal.

Note: *When interfacing the meter with LIMS (Laboratory Information Management System), it is recommended that a systems integration specialist ensure the software and hardware components are interfaced correctly.*

The remote engine receives input from the serial port and processes it. Commands sent to the remote interface will be in the form of "OPCODE <OPERAND> CR".

- Only 1 command can be executed at a time. A new command cannot be issued until the previous command is done and prompt is given, shown as the greater than symbol (">") followed by a space.
- Empty commands (i.e. just a <CR>) will be ignored and a new prompt will be issued.
- <CR> (Carriage Return, ASCII 13) is used to terminate a command. Whenever this character is received, the internal buffer will be processed.
- Remote commands are not case sensitive.

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Remote Commands List

Remote Command	Action	Example Command
PGETMEAS <CR>	Prints the current measurement immediately	
PGETMEAS Data Count <CR>	Prints the current measurement for a set number of times Data Count = 1, 2, 3, etc.	PGETMEAS 2
GETCAL <CR>	Prints all current calibration data If no calibration is saved, returns ">" to receive next command	
GETCAL MODE <CR>	Prints the calibration data for specific mode MODE = PH or RMV	GETCAL PH
GETLOG <CR>	Prints all logged measurement data Output format is based on the Log Export Type setting If no data is logged, returns ">" to receive next command	
SYSTEM <CR>	Prints the system information including meter model, serial number, software version, date and time	
SETCSV <CR>	Sets the output format to Comma Separated Values (CSV)	
SETKEYLOCK NUMBER <CR>	Locks or unlocks the meter touchscreen interface NUMBER = 1 (lock) or 0 (unlock)	SETKEYLOCK 1
SETRTC YYYY-MM-DD-HH-MM-SS-TIMEMODE <CR>	Sets the date and time for the meter TIME MODE = 1 (PM), 2 (AM) or 3 (24 Hour)	SETRTC 2021-08-19-01-32-00-1
SETMODE MODE <CR>	Sets the meter measurement mode. MODE = PH or RMV	SETMODE PH
GETMODE <CR>	Prints the active measurement mode	

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6.3 Meter Software Update Procedure

Note: *Back up all data before performing the meter software update procedure, as it will be erased when the meter software update is completed.*

1. Power on the meter.
2. Download the latest Orion Pro Star meter software at www.thermofisher.com/orionsoftware.
3. Unzip/extract the Orion Pro Star meter software file.
4. Load the unzipped/extracted Orion Pro Star meter software file to the USB flash drive.
5. Insert the USB flash drive into the USB port on the side of the meter.
6. Wait for the USB flash drive to establish communication with meter.
7. Tap the Main Menu icon in the measure mode to access the Main Menu.
8. Tap the Information & Help option on the Main Menu list.
9. Tap on the Software Updates option on the Information & Help list.
10. Verify all actions have been completed and tap the Upload button.
11. Verify all data is backed up and tap the Install button.
12. Wait while the meter software is updating. Do not remove the USB flash drive while the meter software is updating.
13. Once the meter software update is complete, follow any onscreen prompts. The meter will restart and then the software update process is complete.

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Chapter 7 Troubleshooting

7.1 Meter Troubleshooting

Meter display not powering on:

- Use a surge protector or uninterrupted power supply (UPS) so an unintended power surge of electricity does not damage the meter or meter power supply.
- Check that the wall outlet is functional.
- Verify that the power cord is fully plugged into the meter and wall outlet.
- The power adapter plug has 2 prongs used to lock it onto the meter; ensure the prongs are properly aligned when connecting it with the meter.
- Press the Power button on the meter.

Meter not responding to any button taps:

- Check that the area being tapped is active for that action.
- Unplug and reconnect the meter power supply.
- Use a USB mouse to operate the touchscreen interface.
- Contact Technical Support.

Meter error shown:

- (Measurement) Out of Range, (Measurement) = pH, ORP, Ion Concentration, Conductivity, TDS, Salinity, Resistivity or Temperature:
    - Ensure the electrode is fully connected to the meter.
    - Check that the electrode cable and connector do not have any damage.
    - Check that the electrode does not have any damage, cracks or scratches.
    - Ensure the electrode is properly immersed in the sample solution, with the electrode sensing area submerged below the top of the sample solution.
    - Perform a factor reset on the meter.
    - Replace the electrode.
- pH Electrode Icon:
    - Troubleshoot the pH buffers and pH electrode.
    - Replace the pH buffers.
    - Clean and condition the pH electrode.

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- Replace the pH electrode as needed.

7.2 Measurement Troubleshooting

Reading is unstable, slow to stabilize:

- Consider changing the displayed measurement resolution. For example, some pH measurements only require 0.01 pH reporting. Changing the pH resolution from 0.001 to 0.01 will reduce the amount of time needed for the reading to stabilize.
- Clean the electrode to remove build-up or contaminants. See the electrode user manual for detailed instructions. For pH and ORP electrodes, 0.1M HCl is recommended and adding pepsin is helpful if protein build-up occurs.
- For pH and ORP electrodes, if the electrode was stored dry, soak the electrode in storage solution for at least 30 minutes.
- For pH and ORP electrodes, if the electrode is refillable, add the correct electrode fill solution and ensure the fill hole is uncovered during use.
- Check the electrode for damage, cracks or breaks.
- Check the electrode cables for damage or breaks.
- Replace the old electrode with a new electrode.
- If sample temperature is changing, allow temperature to stabilize.
- Remove any interfering devices from the area.

Reading freezes on display:

- Check the meter's Read Type setting. If the meter's Read Type is set to Auto-Read, tap the "Measure" key to start a new measurement.
- Check the electrode for damage, cracks or breaks.
- Check the electrode cables for damage or breaks.
- Replace the old electrode with a new electrode.

7.3 Calibration Troubleshooting

- Always use fresh, high-quality calibration solutions. Buffers and standards can degrade over time, leading to inaccurate calibrations. Check the expiration dates and storage conditions.
- Select calibration standards that bracket the expected range of your samples.
- Ensure the calibration solutions are at the same temperature as the samples you are measuring. Temperature variations can affect readings.
- Rinse the electrode with distilled or deionized water before and after immersing it in each calibration solution. This prevents contamination and ensures accurate readings.

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- Stir the calibration solutions gently to ensure uniformity but avoid creating air bubbles, which can affect the reading.
- Enable automatic temperature compensation (ATC) during calibration or manually adjust the calibration value of each buffer or standard based on the buffer/standard versus temperature charts.
- Allow the meter to stabilize and display a steady reading before recording the value during calibration. This ensures that the reading is accurate and not fluctuating.
- After calibration, store the electrode according to the electrode user manual.
- Regularly clean the electrode according to the electrode user manual to prevent buildup of residues or contaminants that can affect readings.

pH Calibration:

- Clean the pH electrode, 0.1M HCl is recommended and adding pepsin is helpful if protein build-up occurs. See the electrode user manual for detailed instructions.
- During the pH calibration, the meter will attempt to automatically recognize the pH buffer value and assign the true value of the pH buffer at the measured temperature. Before editing the pH value of the buffer, consult the pH and temperature chart for each pH buffer.
    - If the meter cannot automatically recognize the pH buffer value during the calibration, enter the true value of the pH buffer at the measured temperature using the pH and temperature chart for each pH buffer.
- Discard the current pH buffers, check the expiration date on the pH buffer bottle or pouch, pour a fresh portion of each pH buffer into a clean, dry beaker and repeat the calibration.

ORP Calibration:

- Clean the ORP electrode, 0.1M HCl is recommended and adding pepsin is helpful if protein build-up occurs. See the electrode user manual for detailed instructions.
- Discard the current ORP standard, check the expiration date on the ORP standard bottle, pour a fresh portion of the ORP standard into a clean, dry beaker and repeat the calibration.

Ion Concentration Calibration:

- Clean the ion selective electrode (ISE) according to the instructions in the electrode user manual.
- Discard the current standards, check the expiration date on the standard bottle, pour a fresh portion of the standard into a clean, dry beaker and repeat the calibration.
- Ensure the correct ionic strength adjuster (ISA) is used during calibration and measurements. See the electrode user manual for detailed instructions.

Conductivity Calibration:

- Clean the conductivity electrode, 0.1M HCl is recommended and adding pepsin is helpful if protein build-up occurs. See the electrode user manual for detailed instructions.
- Discard the current standards, check the expiration date on the standard bottle or pouch, pour a

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fresh portion of the standard into a clean, dry beaker and repeat the calibration.

- Do not allow conductivity standards to remain exposed to air for extended periods of time.
- Verify that the nominal cell constant value entered in the meter is appropriate for the conductivity electrode being used to calibrate.

7.4 Technical Support

Contact our Orion Technical Support team at 1-800-225-1480, +1-978-232-6000 or WLP.TechSupport@thermofisher.com. You will need the meter model, meter serial number and meter software revision information.

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Chapter 8
Meter Info

8.1 Meter Specifications

pH	
Range	-2.000 to 20.000 pH
Resolution	0.1, 0.01 or 0.001 pH
Relative accuracy	± 0.002 pH
Calibration points	1 to 5 points
Calibration method	Automatic buffer recognition, manual entry option
Calibration buffer sets	USA (1.68, 4.01, 7.00, 10.01, 12.46) DIN (1.68, 4.01, 6.86, 9.18, 12.46) Pure Water Buffers (4.10, 6.97, 9.15) Standard (1.00, 3.00, 6.00, 8.00, 10.00, 13.00) Up to 5 custom buffers
Slope type	Linear or segmented
Calibration summary	Slope and E_o offset, option to view as point-to-point graph
Isopotential point	7.000, user adjustable
Input impedance	>10^12 ohms
mV	
Range	-2000.0 to 2000.0 mV
Resolution	0.1 mV
Relative accuracy	± 0.2 mV or ±0.05 % of the reading, whichever is greater
Relative mV / ORP	
Range	-2000.0 to 2000.0 mV
Resolution	0.1 mV
Relative accuracy	± 0.2 mV or ±0.05 % of the reading, whichever is greater
Calibration points	1 point
Calibration method	ORP or E_H
Calibration offset	±250 mV
Ion	
Range	0.0001 to 19999
Resolution	0.0001 minimum, 1 to 5 digits

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Relative accuracy	± 0.2 mV or ±0.05 % of the reading, whichever is greater
Units	ppt, ppm, ppb, mg/L, M, mM, %, none or user-defined
Calibration points	1 to 5 points
Calibration method	Automatic standard recognition, manual entry option
Calibration standards	1.000, 10.00, 100.0, 1000; 10000 or up to 5 custom standards
Slope type	Linear or segmented
Calibration summary	Slope and E_o offset, option to view as point-to-point graph
Isopotential point	1.000, user adjustable
Blank correction	Yes
Low level stability	Yes
Incremental techniques	Single known addition, single known subtraction, double known addition, double known subtraction, analyte addition and analyte subtraction
Conductivity	
Range	0.010 µS/cm to 3000 mS/cm
Resolution	0.001 µS/cm minimum, auto-ranging, up to 4 digits
Relative accuracy	±0.5% reading
Calibration points	1 to 5 points
Calibration method	Automatic standard recognition, manual entry option
Calibration standards	Orion (100.0 µS/cm, 1413 µS/cm, 12.88 mS/cm, 111.9 mS/cm) or up to 4 custom standards
Nominal cell constant	0.100 cm-1, 0.475 cm-1, 0.550 cm-1, 1.000 cm-1, 10.00 cm-1 or user-defined from 0.001 to 199.9 cm-1
Temperature compensation	Linear (0.00 to 10.00 %/°C), nLFn (non-linear ultra-pure water), nLFu (non-linear ultra-pure degassed water), EP/USP or off
Reference temperature	5, 10, 15, 20, 25 or 30°C
TDS	
Range	0.010 ppm to 500.0 ppt (TDS factor of 1.00); or 0.010 mg/L to 500.0 g/L (TDS factor of 1.00)
Resolution	0.001 ppm or mg/L minimum, auto-ranging, up to 4 digits
Relative accuracy	±0.5% reading
Units	ppm to ppt; or mg/L to g/L
TDS factor	Linear (0.01 to 10.00), ISO/EN 27888, 442, NaCl
Salinity	
Range	0.010 to 80.00 ppt; 0.01 to 42.00 PSU; or 0.01 to 400.0 % NaCl
Resolution	0.001 ppt minimum; 0.01 PSU minimum; or 0.01 % NaCl minimum, auto-ranging
Relative accuracy	±0.5% reading

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Modes	Natural Seawater (ppt), Practical Salinity (PSU),or % NaCl
Resistivity	
Range	1.0 Ω to 100.0 MΩ
Resolution	0.1 Ω minimum, auto-ranging
Relative accuracy	±0.5% reading
Temperature	
Range	-30.0 to 130.0 ºC, -22.0 to 266.0 ºF
Resolution	0.1 ºC, 0.1 ºF
Relative accuracy	±0.3 ºC, ±0.5 ºF
Calibration points	1 or 2 points
Offset adjustment	Up to ±5.0 ºC
Temperature source	Automatic with ATC sensor, ambient with built-in meter temperature sensor or manual entry
Measurement Functions	
Measurement channels	2
Measurement parameters	Channel 1: pH, mV, ORP or ion concentration with temperature Channel 2: conductivity, TDS, salinity or resistivity with temperature
Read types	Continuous, Auto-Read or Timed
Timed reading intervals	3 seconds to 2 hours
Measurement layout	Customizable options for basic, advanced or user-defined
Measurement stability	Automatic, fast, medium or slow
Sample ID	Auto-incremental or manual, up to 25 alphanumeric characters
Electrode ID	Up to 20 alphanumeric characters
Graph / chart view	Single parameter with temperature
Set value alarm	1 high and 1 low value per parameter
Last calibration details	Calibration summary with date and time
Meter Features	
Display	7” high resolution color graphic LCD
Touchscreen type	Capacitive with lab glove compatibility
Onscreen prompts	On-demand information screens; onscreen user guide and step-by-step calibration guidance
Time and date	Yes
Time format	12 hour or 24 hour
Date format	Selectable as MM-DD-YYYY, DD-MM-YYYY or DD-MMM-YYYY
Instrument name	Up to 20 alphanumeric characters

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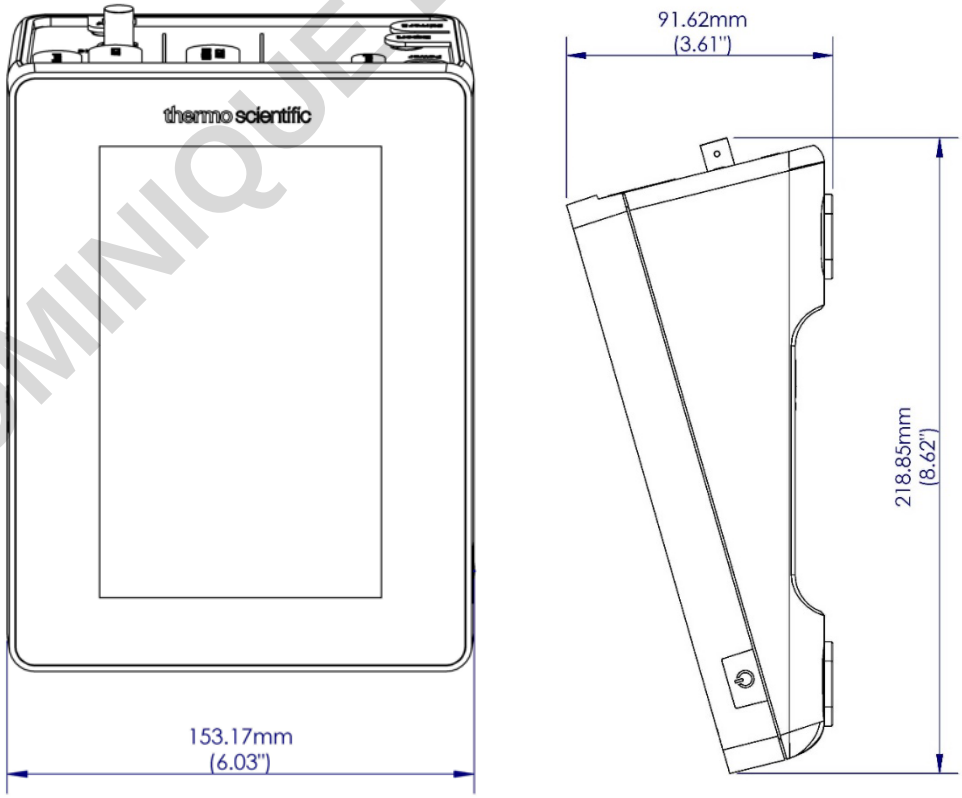
Secure mode	3 administrator and 30 user accounts with individual password protection, custom user access permissions and audit trail
Username	Optional, up to 20 alphanumeric characters
Methods	10 per channel (20 total)
Data outputs	USB flash drive, computer or Orion ink printer
Data output format	Report, CSV or print
Data log	10000 data sets with time and date
Data log export	Customizable options for basic (short), intermediate, advanced or all data
Calibration log	20 per parameter with time and date
Calibration log export	Customizable options for basic (short), intermediate, advanced or all data
Calibration reminder	1 alarm per parameter
Calibration alarm interval	1 hour to 30 days or off
Audible signal	User set for button tap, notifications and alarms, stable reading
Maintenance Reminder	Up to 5 electrode maintenance reminders and up to 5 solution maintenance reminders
Sleep mode	Selectable time interval of 5, 10, 20, 30, 60 minutes or off
Meter tests	Self-test, stability test and pH electrode check
Meter tours and guides	Calibration modes, measurement mode, meter connections, electrode stand assembly and pH electrode maintenance
Stirrer probe inputs	2
Stirrer probe speeds	5 selectable speeds from 250 RPM to 3600 RPM
Electrode inputs	Channel 1: BNC, 8-pin MiniDIN (ATC), reference pin-tip Channel 2: 8-pin MiniDIN
Data outputs	1 USB-A port for USB flash drive; 1 export port for computer or Orion ink printer
Accessory input	1 USB-A port for USB mouse, USB keyboard or USB barcode scanner
Memory	Non-volatile, to preserve data and settings in case of power loss
Display languages	Chinese, English, French, German, Italian, Japanese, Korean, Portuguese or Spanish
Meter warranty	2 years
Certifications	CE, TUV 3-1, FCC Class A
Enclosure	IP-54
Power	100-240 VAC, 50-60Hz, 9 DC adapter, 2.0A
Dimensions (L x W x H)	218.9 mm x 153.2 mm x 91.62 mm, 8.62” x 6.03” x 3.61”
Weight	1.00 kg, 2.20 lbs.

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Environmental Conditions	
Environmental conditions	Indoors
Altitude	Up to 2,000 Meters
Operating temperature	5°C to 45°C
Operating relative humidity	5 to 85%, non-condensing
Storage temperature	-20°C to 60°C
Storage relative humidity	5 to 85%, non-condensing
Mains fluctuation	±10% of range (100-240VAC)
Installation category	II
Pollution degree	2
Protection class	III

Note: *Specifications subject to change without notice. All relative accuracy values are influenced by the displayed least significant digit and should include ± 1 LSD for all relative accuracy calculations.*

8.2 Meter Dimensions



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8.3 Warranty

This meter is supplied with a warranty against significant deviations in material and workmanship for a period of 2 years from date of purchase. Electrode warranties are separate from the meter and differ based on the selected electrode.

If meter repair is necessary within the designated warranty period and has not been the result of abuse or misuse, please contact the Technical Support Team at WLP.TechSupport@thermofisher.com for return authorization and a correction will be made without charge. The manufacturer will determine if the meter problem is due to deviations or customer misuse.

Out of warranty products will be repaired on a charged basis.

The warranty on your meter shall not apply to defects resulting from:

- Improper or inadequate maintenance by customer
- Unauthorized modification or misuse
- Operation outside of the environment specifications of the products

8.3.1 Return of Items

Authorization must be obtained from our Technical Support Team or authorized distributor before returning items for any reason. Please include data regarding the reason the items are to be returned. For your protection, items must be carefully packed to prevent damage in shipment and insured against damage or loss. The manufacturer will not be responsible for damage resulting from careless or insufficient packing. A restocking charge will be made on all unauthorized returns.

Note: *The manufacturer reserves the right to make improvements in design, construction, and appearance of products without notice.*

8.3.2 Manufacturer Information

Thermo Fisher Scientific
GPS, Water Analysis Instruments
7 Gul Circle, Level 2M, Singapore 629563

International Phone: (65) 6778 6876
US Toll Free Phone: 1-800-225-1480
US Phone: 1-978-232-6000
Email: WLP.TechSupport@thermofisher.com
Website: www.thermofisher.com

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Chapter 9
Regulatory Compliance

9.1 Regional Approvals

CE	**European Union:** The European CE marking is applied on products that meet all the applicable requirements of the European Directives. Products not marked with a CE marking either do not operate in the 230V / 50Hz voltage range or are not intended to be sold to the EU Member States or European Economic area (EEA).
UKCA	**United Kingdom:** The UKCA marking is applied on products that meet all the applicable requirements of the UK Directives. Products not marked with a UKCA marking either do not operate in the 230V / 50Hz voltage range or are not intended to be sold to the UK region.
	Australia / New Zealand: The RCM marking is applied on products that meet all the applicable requirements of the regulations. Products not marked with the RCM marking either do not operate in the 230V / 50Hz voltage range or are not intended to be sold to the Australian or New Zealand region.

Please contact the manufacturer for declaration requests or questions regarding regulatory conformity.

9.2 Product Safety

Safety tested Production monitored TÜV SÜD C US

This product family has been tested to applicable global product safety standards by TUV SUD a Nationally Recognized Test Laboratory (NRTL) and may bear the NRTL's mark of safety compliance to those applicable standards. Additionally, this testing may be used to secure regional market-specific markings.

It is important to use only accessories as supplied or recommended by Thermo Fisher Scientific.

9.3 Electromagnetic Compatibility

The meter requires special precautions regarding electromagnetic compatibility (EMC) and needs to be installed and put into service according to the EMC information provided in this instruction manual.

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Recommendations for actions to ensure the product remains safe regarding electromagnetic disturbances:

1. Do not modify the product beyond the intended user-adjustable settings.
2. It is important to use only accessories as supplied or recommended by Thermo Fisher Scientific.
3. The equipment should be visually inspected regularly for damaged cables and connectors. Damaged cables should be replaced.
4. This equipment should not be used adjacent to or stacked with other equipment. However, if adjacent or stacked use is necessary, the equipment should be observed to verify normal operation in the configuration in which it will be used.

9.3.1 FCC Statement (USA)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following 2 conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

9.3.2 Canadian ISED IC Notice

This ISM digital apparatus complies with Canadian ICES-001, Class A.

Cet appareil ISM est conforme á la norme NMB-001 du Canada, Classe A.

9.3.3 South Korean KC Registration

사 용 자 안 내 문
이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

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[Translation of the above user notification: Equipment for business broadcasting and communication specified in Article 11, Subparagraph 1), Items (가), (바), and (사 1). This device has undergone suitability assessment for use in a business environment. If used in a residential environment, there may be concerns regarding radio interference.]

9.4 Environmental Compliance

9.4.1 REACH - Europe

We are committed to meeting all compliance obligations to evaluate, communicate, and register any Substances of Very High Concern (SVHC), substances of authorization and finding alternates where appropriate.

9.4.2 RoHS - Europe

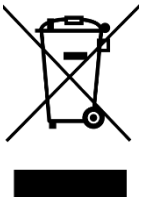
We are determined to reduce the impact we have on the environment, and so can declare that this product fully complies with the European Parliament's RoHS2 and RoHS2 amendment (Restriction of Hazardous Substances) Directive 2011/65/EU and 2015/863/EU, with respect to all the following substances:

- Lead (0,1 %)
- Mercury (0,1 %)
- Cadmium (0,01 %)
- Hexavalent chromium (0,1 %)
- Polybrominated biphenyls (PBB) (0,1 %)
- Polybrominated diphenyl ethers (PBDE) (0,1 %)
- Bis(2-ethylhexyl) phthalate (DEHP) (0,1%)
- Butyl benzyl phthalate (BBP) (0,1%)
- Dibutyl phthalate (DBP) (0,1%)
- Diisobutyl phthalate (DIBP) (0,1%)

Our compliance relies on declarations from our suppliers, testing and evaluations per the assessment requirements defined in standard EN 63000:2018. This confirms that any potential trace contamination levels of the substances listed above are below the maximum level set by the latest regulations or are exempt due to their application.

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9.5 WEEE Compliance



WEEE Compliance. This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU. It is marked with the following symbol. Thermo Fisher Scientific has contracted with 1 or more recycling/disposal companies in each EU Member State, and this product should be disposed of or recycled through them. Further information on our compliance with these Directives, the recyclers in your country, and information on Thermo Scientific products which may assist the detection of substances subject to the RoHS Directive are available at www.thermofisher.com.

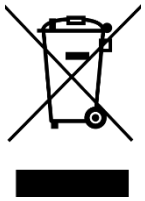


WEEE Konformittät. Dieses Produkt muss die EU Waste Electrical & ElectronicEquipment (WEEE) Richtlinie 2012/19/EU erfüllen. Das Produkt ist durch folgendes Symbol gekennzeichnet. Thermo Fisher Scientific hat Vereinbarungen getroffen mit Verwertungs-/Entsorgungsanlagen in allen EU-Mitgliederstaaten und dieses Produkt muss durch diese Firmen widerverwetet oder entsorgt werden. Mehr Informationen über die Einhaltung dieser Anweisungen durch Thermo Scientific, dieVerwerter und Hinweise die Ihnen nützlich sein können, die Thermo Fisher Scientific Produkte zu identizfizieren, die unter diese RoHS. Anweisungfallen, finden Sie unter www.thermofisher.com.



Conformità WEEE. Questo prodotto deve rispondere alla direttiva dell' Unione Europea 2012/19/EU in merito ai Rifiuti degli Apparecchi Elettrici ed Elettronici (WEEE). marcato col seguente simbolo.Thermo Fischer Scientific ha stipulato contratti con una o diverse società di riciclaggio/smaltimento in ognuno degli Stati Membri Europei. Questo prodotto verrà smaltito o riciclato tramite queste medesime. Ulteriori informazioni sulla conformità di Thermo Fisher Scientific con queste Direttive, l'elenco delle ditte di riciclaggio nel Vostro paese e informazioni sui prodotti Thermo Scientific che possono essere utili alla rilevazione di sostanze soggette alla Direttiva RoHS sono disponibili sul sito http://www.thermofisher.com.

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Conformité WEEE. Ce produit doit être conforme à la directive euro-péenne (2012/19/EU) des Déchets d'Equipements Electriques et Electroniques (DEEE). Il est marqué par le symbole suivant. Thermo Fisher Scientific s'est associé avec une ou plusieurs compagnies de recyclage dans chaque état membre de l'union européenne et ce produit devraitêtre collecté ou recyclé par celles-ci. Davantage d'informations sur laconformité de Thermo Fisher Scientific à ces directives, les recycleurs dans votre pays et les informations sur les produits Thermo Fisher Scientific qui peuvent aider le détection des substances sujettes à la directive RoHS sont disponibles sur http://www.thermofisher.com.

9.6 Proper Product Disposal

Some considerations and suggestions are listed below for proper disposal of this product (End of Life Care). While addressing these actions for safe recycling and disposal, please follow all guidelines, Safety Data Sheets (SDS), or regulations applicable to your country and region.

- This product has materials and components that may be recycled or reused according to local guidelines and regulations.
- Clean up any chemical safety hazards using appropriate methods.

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Chapter 10
Ordering Info

10.1 Meter Ordering Information

Description	Catalog Number
Orion Pro Star PC215 pH/ion and conductivity bench meter with electrode stand, includes USB flash drive, computer cable, 100-240V 50/60Hz universal power adapter (purchase electrodes separately)	PSTAR2150
Orion Pro Star PC215 pH/ion and conductivity bench meter standard kit; includes meter with stand (PSTAR2150); ROSS Ultra Triode refillable epoxy-body pH/ATC electrode (8157BNUMD); 4-cell epoxy/graphite-body K=0.475 conductivity/ATC electrode (013005MD); pH 4, 7, 10 buffers and rinse solution pouches; pH electrode storage solution and cleaning solution; pH electrode storage sleeve and base; 1413 µS/cm conductivity standard pouches	PSTAR2155
Orion Pro Star PC215 pH/ion and conductivity bench meter pure water kit; includes meter with stand (PSTAR2150); ROSS Ultra Triode refillable epoxy-body pH/ATC electrode (8157BNUMD); ultra-pure water 2-cell K=0.1 conductivity/ATC electrode with flow cell (013016MD); pH 4, 7, 10 buffers and rinse solution pouches; pH electrode storage solution and cleaning solution; pH electrode storage sleeve and base; 100 µS/cm conductivity standard bottles	PSTAR2156
Orion bench meter stirrer probe	096019-WA
Orion ink printer, includes meter cable, paper, ink ribbon, 100-240V 50/60Hz power adapter	STARA-106
Orion replacement ink ribbon for printer, 6 pack	STARA-108
Orion replacement paper for printer, 5 pack	STARA-109
Orion Pro Star series USB flash drive	PSTAR-UFD
Orion Pro Star series USB mouse	PSTAR-UMS
Orion Pro Star series USB keyboard	PSTAR-UKB
Orion Pro Star series USB barcode scanner	PSTAR-UBS
Orion Pro Star series electrode stand with base	PSTAR-ARM
Orion Pro Star series holder head for electrode stand	PSTAR-SHH
Orion Pro Star series weighted base for electrode stand	PSTAR-SWB
Orion Pro Star series universal power supply, 100-240V, 50/60 Hz	PSTAR-PWR
Orion Pro Star series USB computer cable	PSTAR-USB
Orion Pro Star series standard protective display cover	PSTAR-SPC
Orion Pro Star series rugged protective display cover	PSTAR-RPC

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10.2 Electrode and Solution Ordering Info

Description	Catalog Number
ROSS Ultra glass-body refillable pH/ATC Triode electrode	8302BNUMD
ROSS Ultra epoxy-body refillable pH/ATC Triode electrode	8157BNUMD
ROSS Ultra epoxy-body gel-filled pH/ATC Triode electrode	8107BNUMD
ROSS Ultra glass-body combination refillable pH electrode	8102BNUWP
ROSS Ultra epoxy-body combination refillable pH electrode	8156BNUWP
ROSS Ultra thin stem glass-body combination refillable pH electrode	8103BNUWP
ROSS Ultra thin stem epoxy-body combination refillable pH electrode	8115BNUWP
ROSS PerpHecT micro glass-body combination refillable pH electrode	8220BNWP
ROSS Ultra flat surface epoxy-body combination refillable pH electrode	8135BNUWP
ROSS spear tip glass-body combination refillable pH electrode	8163BNWP
ROSS Sure-Flow epoxy-body combination refillable pH electrode	8165BNWP
ROSS Sure-Flow glass-body combination refillable pH electrode	8172BNWP
ATC temperature probe with epoxy body	927005MD
ATC temperature probe with stainless steel body	927007MD
Micro ATC temperature probe with stainless steel tip	928007MD
ORP/ATC Triode single junction epoxy-body refillable electrode	9180BNMD
ORP Sure-Flow combination single junction epoxy-body refillable electrode	9678BNWP
Ammonia combination ion selective electrode	9512BNWP
Ammonia high-performance combination ion selective electrode	9512BNWP
Chloride Ionplus Sure-Flow combination ion selective electrode	9617BNWP
Fluoride Ionplus Sure-Flow combination ion selective electrode	9609BNWP
Sodium ROSS Sure-Flow combination ion selective electrode	8611BNWP
Conductivity/ATC DuraProbe 4-cell K=0.475 epoxy/graphite body electrode	013005MD
Conductivity/ATC ultra pure water 2-cell K=0.1 stainless steel body electrode	013016MD
Standard All-in-One pH buffer kit: 475 mL each pH 4.01, 7.00 and 10.01 buffers and pH electrode storage solution	910199
ROSS All-in-One pH buffer kit: 475 mL each pH 4.01, 7.00 and 10.01 buffers and ROSS pH electrode storage; 60 mL electrode cleaning solution	810199
pH 1.68 buffer, 475 mL	910168
pH 4.01 buffer, 475 mL	910104
pH 6.86 buffer, 475 mL	910686
pH 7.00 buffer, 475 mL	910107
pH 9.18 buffer, 475 mL	910918
pH 10.01 buffer, 475 mL	910110
pH 12.46 buffer, 475 mL	910112
pH 4.01 buffer, 25 individual-use pouches	910425

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Description	Catalog Number
pH 7.00 buffer, 25 individual-use pouches	910725
pH 10.01 buffer, 25 individual-use pouches	911025-WA
Electrode storage solution, 475 mL	910001
ROSS electrode storage solution, 475 mL	810001
ORP Standard, +420 mV standard hydrogen electrode E_H, 475 mL	967901
100 ppm Ammonia as nitrogen (N) standard, 475 mL	951207
Ammonia ionic strength adjuster (ISA) with pH-indicating blue dye, 475 mL	951211
100 ppm chloride standard, 475 mL	941707
Chloride ionic strength adjuster (ISA), 475 mL	940011
100 ppm fluoride standard, 475 mL	940907
10 ppm fluoride standard premixed with TISAB II, 475 mL	040908
5 ppm fluoride standard premixed with TISAB II5, 475 mL	F40905
2 ppm fluoride standard premixed with TISAB II, 475 mL	040907
1 ppm fluoride standard premixed with TISAB II, 475 mL	040906
0.5 ppm fluoride standard premixed with TISAB II, 475 mL	F40904
Fluoride TISAB II solution, 1 gallon	940909
100 ppm sodium standard, 475 mL	941107
Sodium ionic strength adjuster (ISA), 475 mL	841111
100 µS/cm conductivity/TDS standard, 5 x 60 mL	011008
1413 µS/cm conductivity/TDS standard, 5 x 60 mL	011007
12.9 mS/cm conductivity/TDS standard, 5 x 60 mL	011006
111.9 mS/cm conductivity standard, 5 x 60 mL	011005
1413 µS/cm conductivity/TDS standard, 10 individual-use pouches	01100710
12.9 mS/cm conductivity/TDS standard, 10 individual-use pouches	01100610
111.9 mS/cm conductivity standard, 10 individual-use pouches	01100510

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User Notes

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Orion Pro Star PC215 pH/Ion and Conductivity Bench Meter



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