EXPERTS IN WATER CHEMISTRY SINCE 1903

9165 Luminescent Dissolved Oxygen Analyzer User Manual

Document 101-063-B.1

WALTRON CUSTOMER COMMITMENT

This instruction manual is a technical guide to aid the customer in the set-up, operation, and maintenance of their new Waltron measuring system. Waltron provides continuous product improvement and reserves the right to make any modifications to the information contained herein without notice.

Technical questions concerning this product should be addressed to:

Waltron Technical Service Department
Flemington, New Jersey
Phone: (908)-534-5100
Fax: (908)-534-5546
www.waltron.net

Please be ready to provide the following information:

- Date analyzer was purchased
- Analyzer model and serial number
- Recent maintenance history
- Calibration values, dates, and detailed description of problem

Waltron's technical expertise and extensive experience provides personalized solutions to the water quality industry. It is Waltron's commitment to provide the customer with timely and accurate technical service and support.

Waltron fully expects the customer to be satisfied with the quality, performance, and cost of this product.

If there are any questions or concerns regarding this product, please feel free to contact Waltron at (908)-534-5100.

Thank you for choosing Waltron!

Please note the Waltron mailing and shipping address:

Waltron Bull & Roberts, LLC
25 Minneakoning Road, Suite 101
Flemington, NJ 08822

SAFETY

Please observe proper safety and handling precautions when installing, operating, maintaining, and servicing this product. The following should be noted and adhered to:

- Read and understand manual before working with analyzer.
- Pay special attention to warning labels on enclosures, containers, packages and chemicals.
- Only qualified personnel should be involved in the installation, operation, and servicing of the analyzer.
- Follow safety precautions when operating analyzer in conditions of high pressure and/or temperature.
- Keep analyzer chemicals away from heat and extreme temperatures. Reagent powders must be kept dry.
- Follow all regulations and warning labels when disposing of chemicals. Do not mix chemicals.

To obtain analyzer safety information or Safety Data Sheets (SDS), please contact Waltron or visit the website at www.waltron.net .

WARRANTY AGREEMENT

If, within one year from the date of shipment, the customer experiences any equipment defects or is not satisfied with the analyzer manufacturing, Waltron will repair, or at its option, replace any defective part(s) free of charge. This warranty requires that the defective part(s) be returned to Waltron with shipping charges prepaid.

At Waltron discretion, a Technical Service Specialist may be sent out to repair or replace the defective part(s) on location. Traveling time and expenses of the Technical Service Specialist is at the customer's expense.

Equipment sent to Waltron must be appropriately packaged and the following information must be provided prior to returning to Waltron:

- The Return Authorization (RA) number assigned to the customer by the Waltron Technical Service Department
- Customer name, address and department
- Name and telephone number of the individual responsible for returning items for repair
- Brief problem description

Ship to Waltron service center:

Waltron Bull & Roberts, LLC
25 Minneakoning Road, Suite 101
Flemington, NJ 08822

The Waltron Warranty Agreement:

- Covers expendable sensors for one month after shipment and reusable electrodes for six months after shipment.
- Does not apply to damages occurred during shipping.
- Warranty will be nullified if goods have been used for purposes other than those for which they are intended or if any seal has been removed, broken or tampered with or if the Waltron trademark or serial number has be removed, defaced, or altered.
- Does not cover expendable supply items such as reagents, tubing and electrolytes.
- Does not cover misuse or mistreatment by the user.
- Does not cover previous repair or alteration by unauthorized individuals.

Waltron does not assume responsibility for contingent liability through alleged failure or failures of products or product accessories.

CHECKLIST OF MATERIALS

- In order to ensure customer satisfaction, Waltron does its best to provide adequate and timely packaging and shipping services. Please perform the following after receiving a shipment:

- Inspect all shipping containers upon receipt and record any visible damage. If there are any outward signs of damage, please retain all containers and packages for inspection by carrier. Please retain all packing material so that it can be used for future moving and shipping needs.

- Check all items received against those on the packing list. Chemicals are usually shipped in a separate package and will be itemized accordingly.

- Verify that the number of packages received agrees with the packing list and shipping papers.

- Notify both Waltron and the carrier if any problems occur.

Important Notice:

- All analyzers are inspected and tested prior to shipment.
- In normal use, the unit should require only minor maintenance and should operate correctly and without fault over a long period of time.
- Please note that if electronic components need to be replaced, it may be necessary to adjust and/or calibrate the analyzer.
- Failure to carry out correct maintenance procedures may result in inaccurate analyzer readings.

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1.1 TECHNICAL SPECIFICATIONS

Range		[ppb]	0.0 to 2,000
		[ppm]	0.00 to 2.00
		[%] O_2	0.000 to 4.180
Temperature		[^{o} C]	0 to 70.0
		[^{o} F]	32.0 to 158.0
Accuracy *	Measurement	[ppb]	± (0.5 ppb + 2% of the measured value)
		[ppm]	± (0.0005 ppm + 2% of the meas. value)
	Temperature	[° C]	± 0.1° C
		[° F]	± 0.2° F
Max. Pressure		[barg]	10.00 barg
		[psi]	145.0 psi
		[kg/cm^2]	10.20 kg/cm^2
		[kPa]	1,000 kPa
Measurement frequency		[s]	Adjustable to every 10 sec. up to 999 s + automode
Memory			1 month of data per O2 probe
Voltage	Standard		90 – 240 V ~ 50 – 60 Hz, 25 W
Installation	Sensor		One - Four Sensor Configurations
Transmitter	Standard		Wall-mounted
	Optional		Panel-mounted
IP class	Sensor		IP67
	Transmitter		IP65
Dimensions	Sensor	mm	Ø 84 x 240, excluding plug
	Transmitter	mm	W178 x H278 x D90
Weight	Sensor	kg	2.2 kg
	Transmitter	kg	1.8 kg
O_2-probes per Transmitter			4 max.

* The accuracy from the 9165 is determined at 20° C

1.2 INTENDED USE

The Waltron 9165 Dissolved Oxygen Analyzer utilizes new luminescent technology for measuring dissolved oxygen in water at ppb levels. Luminescent technology has unique features and benefits compared to traditional dissolved oxygen sensing technologies. The 9165 provides high accuracy with excellent long-term stability. The 9165 Dissolved Oxygen Analyzer can be used in a variety of online analysis applications throughout many different industries.

The 9165 must be connected to a sample line. The connections to the flowcell are ¼" Swagelok fittings. The dissolved oxygen must be measured in a full, flowing sample line. Using the sensor in a pipe that is not full or taking the measurement while the product is not flowing will cause errors.

Features:

- Analysis range: 0.0ppb – 2000ppb (others available upon request)
- No calibration for up to 2 years
- Extremely fast response
- No sample interference, except for aromatic organics; chlorine gas will damage sensor spot
- Excellent results regardless of sample flowrate
- Use in liquid and gas applications
- High temperature alarm
- Multiple sensor configuration

Benefits:

- No sensor maintenance (no membrane, no electrolyte)
- Simple operation
- Compact design

1.3 SAFETY

1.3.1 SYMBOLS

The symbols 'Note:', 'Warning!' and 'Danger' used in this instruction manual have the following meanings.

NOTE:	Instructions for the correct and effective use of the instrument.
WARNING!	Incorrect or careless use may cause serious damage to the instrument.

Incorrect or careless use may place the user or the surroundings in **DANGER**.

1.3.2 PRECAUTIONARY MEASURES AND SAFETY INSTRUCTIONS

WARNING!

To avoid a short circuit, never insert metal objects into the connector.

The use of chlorite-based or fluorine-based cleaning products is not permitted. These may cause damage to the instrument.

Ensure that the pipe is not pressurized and that the instrument is disconnected from the power supply during assembly and disassembly. This will prevent electric shocks.

During CIP/cleaning, the outside of the instrument may become hot. The sensor will turn itself off automatically when the inside of the sensor reaches a temperature of 65°C. Do not touch the outside of the instrument.

2 INTRODUCTION

2.1 ANALYZER OVERVIEW

The 9165 has two main sections:

1. Transmitter
2. Sensor Housing

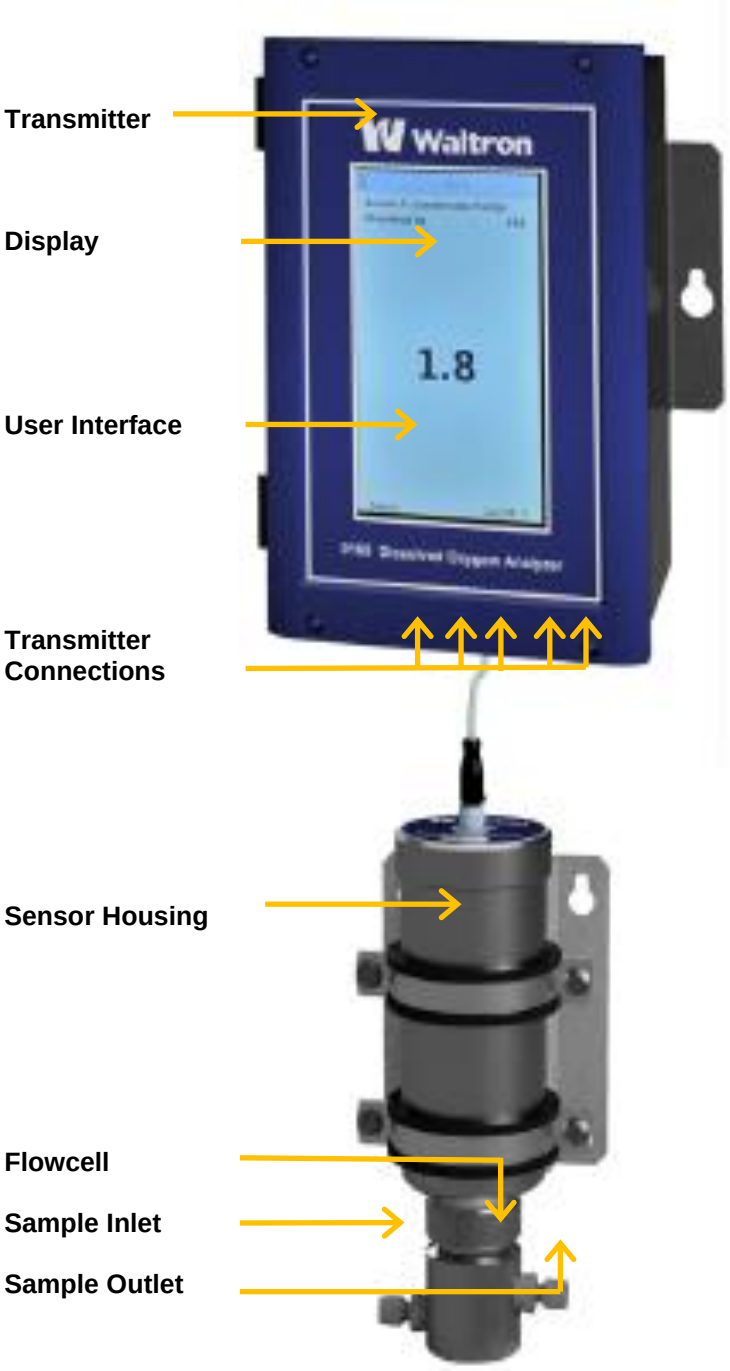


Figure 2.1: Analyzer overview.

2.2 SENSOR

The bottom of the sensor housing provides the location of the dissolved oxygen sensor, shown in the figure below.

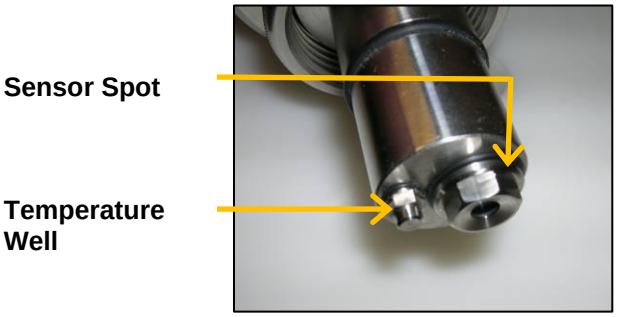


Figure 2.2: Sensor Head.

2.3 SENSOR SPOT

The 9165 Sensor Spot is recognizable by its hexagonal shape.

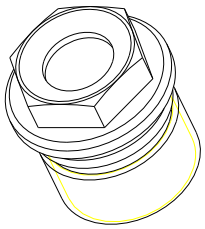


Figure 2.3: 9165 Sensor Spot.

2.4 O_2 MEASUREMENT PRINCIPLE

The O_2 measurement is based on measuring the luminescence of a layer that is sensitive to oxygen. The luminescence correlates to the partial oxygen pressure. The quantity of dissolved oxygen gas in the liquid is calculated with the aid of the measured pressure and the temperature.

The oxygen sensor optically measures the liquid's O_2 content based on the luminescence measurement principle, where an oxygen-sensitive layer is exposed to blue light. As a result, molecules in the oxygen-sensitive layer are excited.

In the absence of oxygen, the molecules fluoresce. In the presence of oxygen, the oxygen molecules take energy from the molecules in the oxygen-sensitive layer. Through this process, a link is created between the oxygen concentration and the speed at which the light intensity is reduced from the inital pulse. The light intensity reduces when the oxygen concentration is higher, whilst the light intensity reduces at a faster speed.

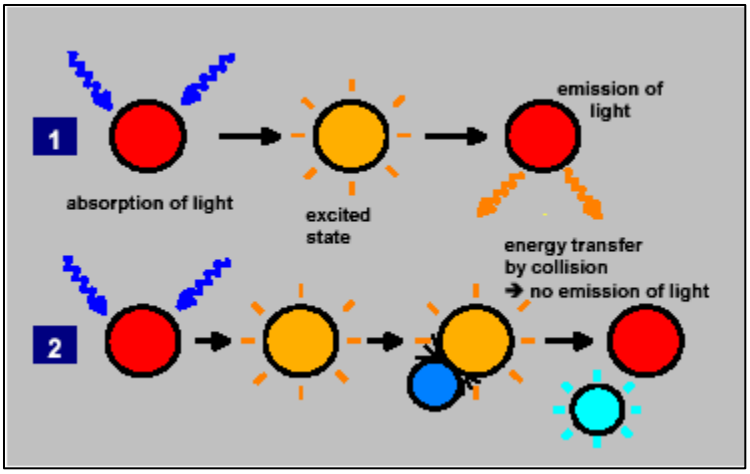


Figure 2.4: Luminescence in the absence of oxygen (1) and in the presence of oxygen (2).

The oxygen content is calculated using the time difference between the exposure to the blue light and the molecules lighting up (phase shift) and the product temperature.

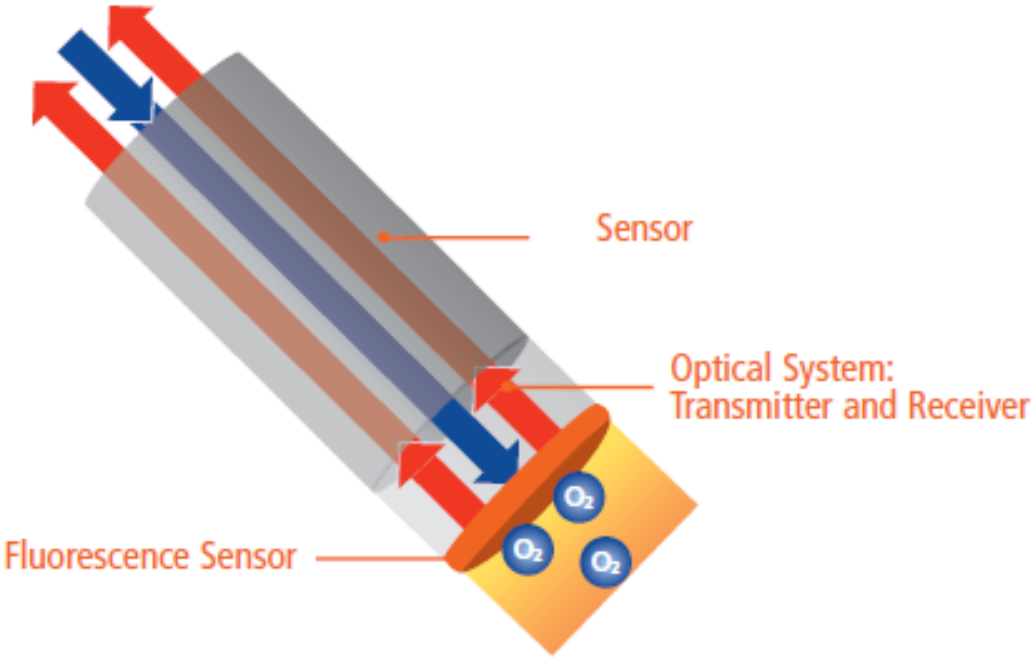


Figure 2.5: Optical sensor depiction.

3 INSTALLATION

3.1 CONTENT OF THE DELIVERY

The 9165 is calibrated, checked and tested by Waltron before shipment and the instrument is, therefore, ready for immediate use. It is not necessary to calibrate the instrument again before it is used for the first time.

Check whether the delivery is complete and undamaged. If the delivery is incomplete or damaged, contact Waltron or the Waltron representative in your region immediately (see www.waltron.net). Always state the serial number, the order number or the invoice number (as given by Waltron) of the 9165 in all correspondence.

NOTE: Before using the instrument, you must make sure the instrument is complete and no parts are missing.

The delivery includes:

- Transmitter
- Sensor
- Mounting plate
- Power cable
- Sensor communication cable
- I/O cable for the analog and relay outputs
- Instruction manual

Optional extras that can be ordered:

- Sensor Calibration Kit
- Sensor Spot Replacement Kit
- Sensor housing mounting bracket

See section 10 for a complete list of spare parts and components.

3.2 PRE-INSTALLATION

Make sure the 9165 is not connected to a sampling point that produces pressures or pressure peaks greater than 10 bar.

3.3 MOUNTING THE 9165

The 9165 can be mounted on a wall or a flat surface using the dimensions shown in the figure below.

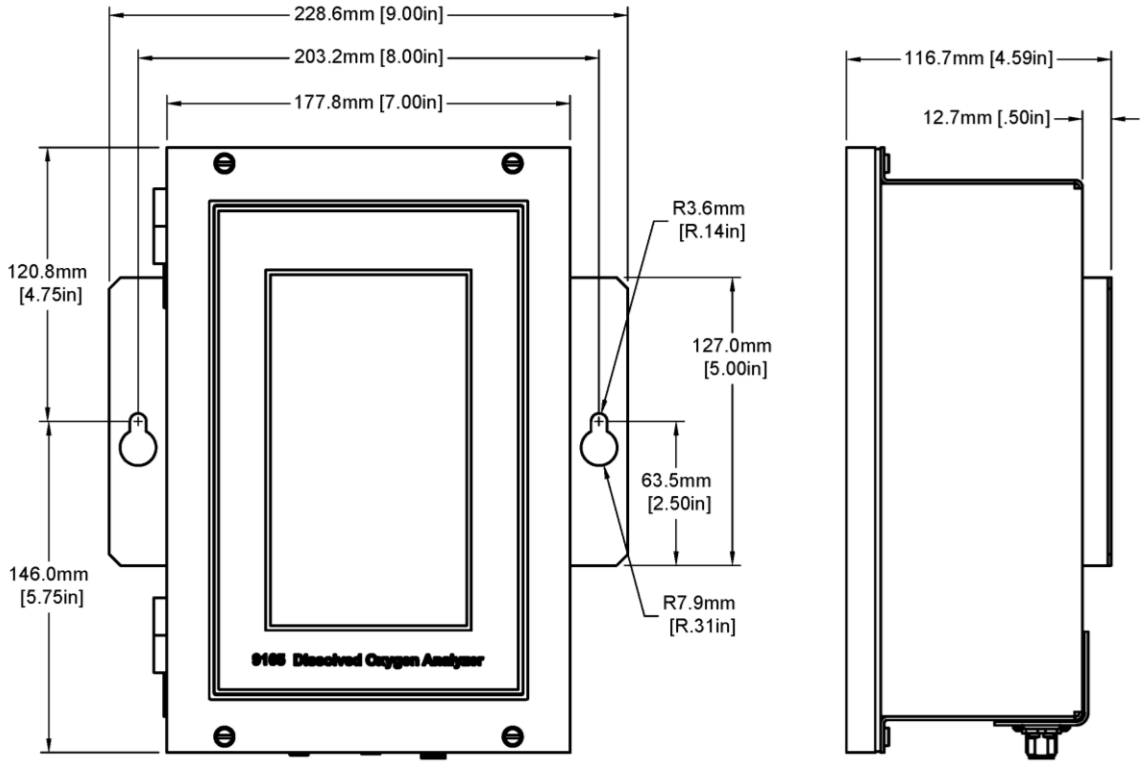


Figure 3.1: Dimensions of the 9165 transmitter for wall mounting.

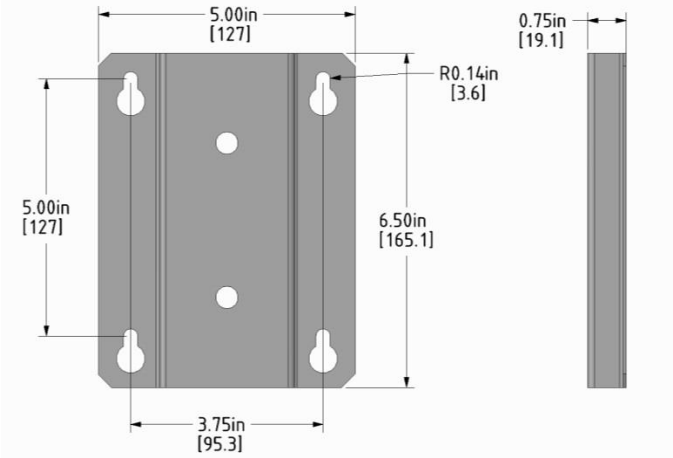


Figure 3.2: Dimensions of the 9165 sensor mounting bracket.

3.4 ASSEMBLING THE SENSOR

The sensor housing and transmitter are fully assembled to the mounting plate. The figure below shows how the sensor properly fits into the flowcell.

Figure 3.3: Fitting the sensor into the flowcell.

3.5 SAMPLE CONNECTIONS

The inlet and outlet sample connections to the flowcell are ¼" Swagelok fittings. It is highly recommended to use stainless steel tubing for the sample lines to prevent outside oxygen from entering the sample stream.

Figure 3.5: Sample Connections.

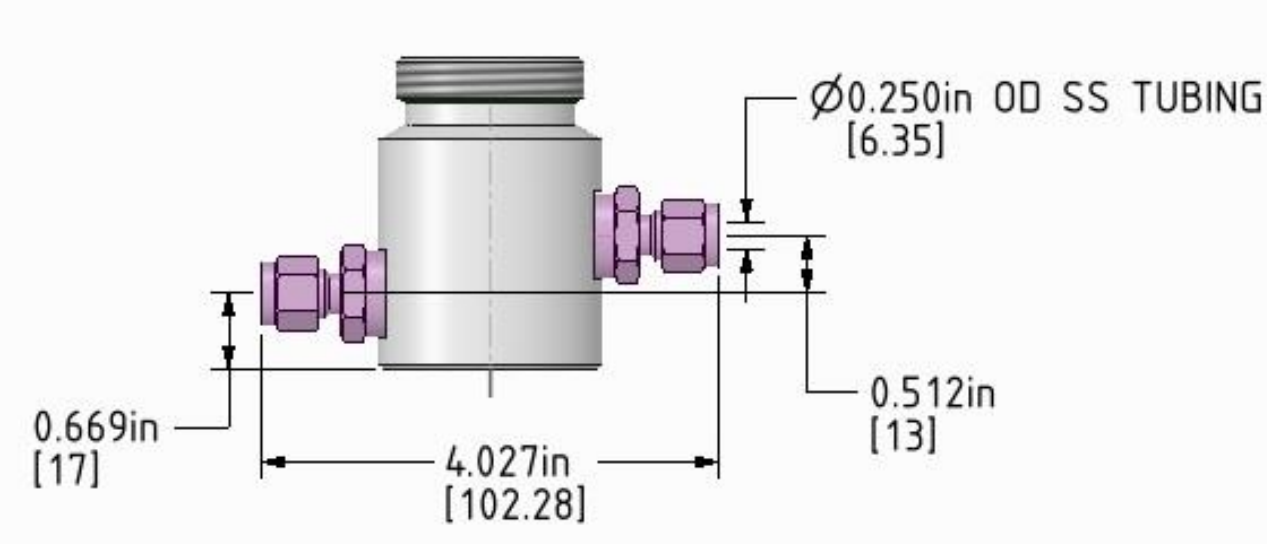


Figure 3.6: Sample Connection Dimensions.

3.6 ELECTRICAL CONNECTIONS

3.6.1 TRANSMITTER CONNECTIONS

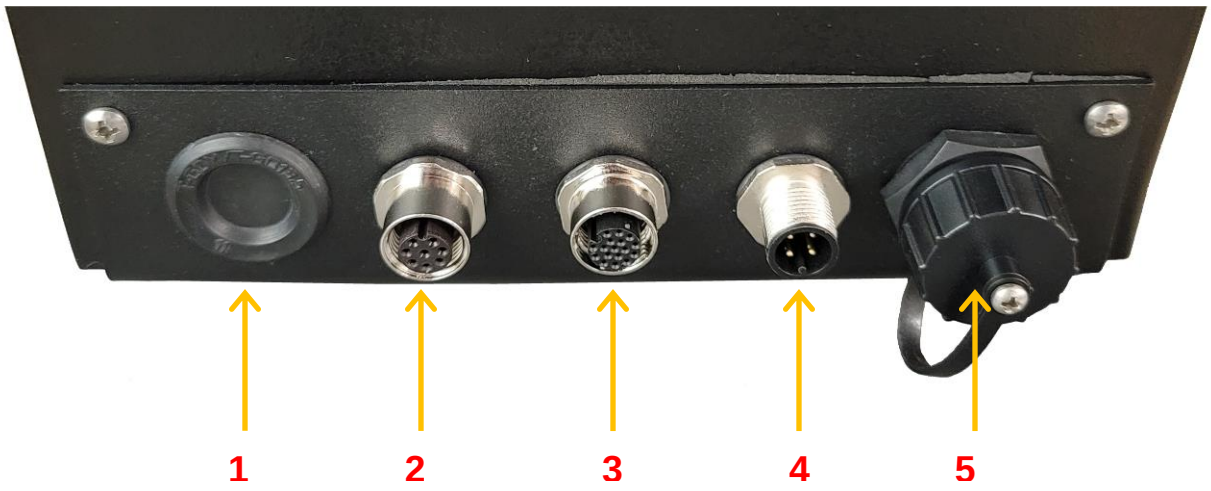


Figure 3.7: Connections to the Transmitter.

Table 3.1: Connections to the Transmitter.

Connector No.	Connector Description	Cable Connection
1	Grommet	None
2	M12 Female, 8 pin	Sensor Cable
3	M12 Female, 17 pin	I/O Cable
4	M12 Male, 4 pin	Power Cable
5	Panel Mount USB	USB Drive

3.6.2 POWER CABLE

Table 3.2: Connector 1: Power supply range: 90V AC – 230V AC.

Pin No.	Type	Wire color
1	Hot	Black
2	Neutral	White
3	PE	Brown/Blue

3.6.3 I/O CABLE

The 17 pin I/O cable plugs into the bottom of the transmitter and the leads should be wired to the external system according to Table 3.3 below. The default configuration for the alarm relays is set for a non-powered passive loop, but can alternatively be configured as a 24VDC powered relay. Refer to Sections 3.6.4 and 3.6.5 for the configuration settings.

Table 3.3: Connector 5: I/O Cable.

Cable	PIN	Terminal	Signal
Brown	1	CH 1 AO +	0-10V / 0,4-20mA
Blue	2	CH 1 AO -	0-10V / 0,4-20mA
White	3	CH 2 AO +	0-10V / 0,4-20mA
Green	4	CH 2 AO -	0-10V / 0,4-20mA
Pink	5	CH 3 AO +	0-10V / 0,4-20mA
Yellow	6	CH 3 AO -	0-10V / 0,4-20mA
Black	7	CH 4 AO +	0-10V / 0,4-20mA
Gray	8	CH 4 AO -	0-10V / 0,4-20mA
Red	9	Relay 1 +	Passive or 24V DC
Violet	10	Relay 1-	Passive or 24V DC
Gray/Pink	11	Relay 2+	Passive or 24V DC
Red/Blue	12	Relay 2-	Passive or 24V DC
White/Green	13	Relay 3+	Passive or 24V DC
Brown/Green	14	Relay 3-	Passive or 24V DC
White/Yellow	15	Relay 4+	Passive or 24V DC
Yellow/Brown	16	Relay 4-	Passive or 24V DC
White/Gray	17	SPARE	

3.6.4 NON-POWERED RELAY CONFIGURATION

Wire pairs are set up with dry contacts, which will open or close the circuit when trigger criteria is reached. This will also depend on relay settings (Normally Opened / Normally Closed) on the device. Connector J6 of the main electronics board should be wired as shown in Figures 3.8 and 3.9. Note that this is the default configuration.

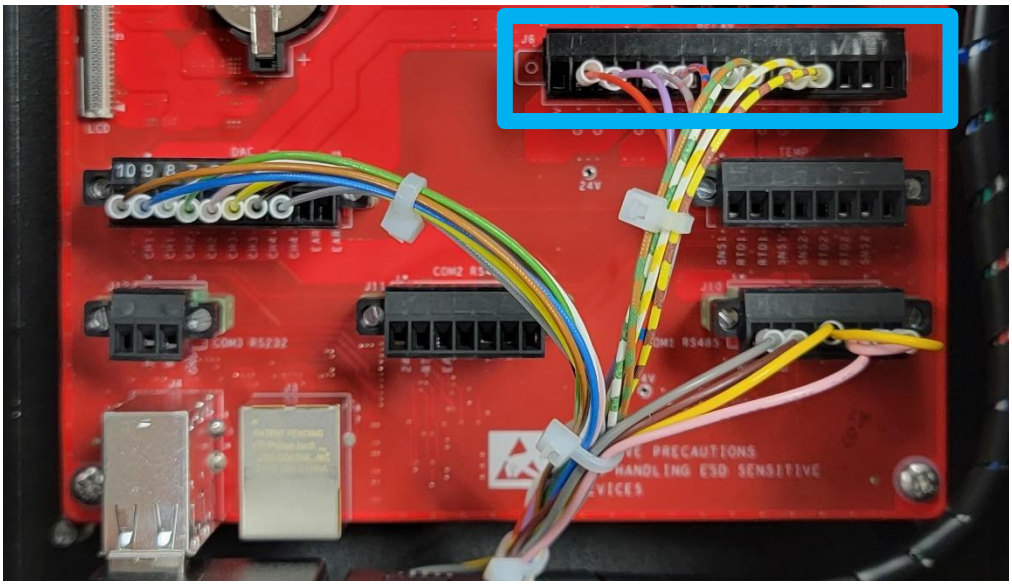


Figure 3.8: J6 Connector on Main Board for Relay Configuration.

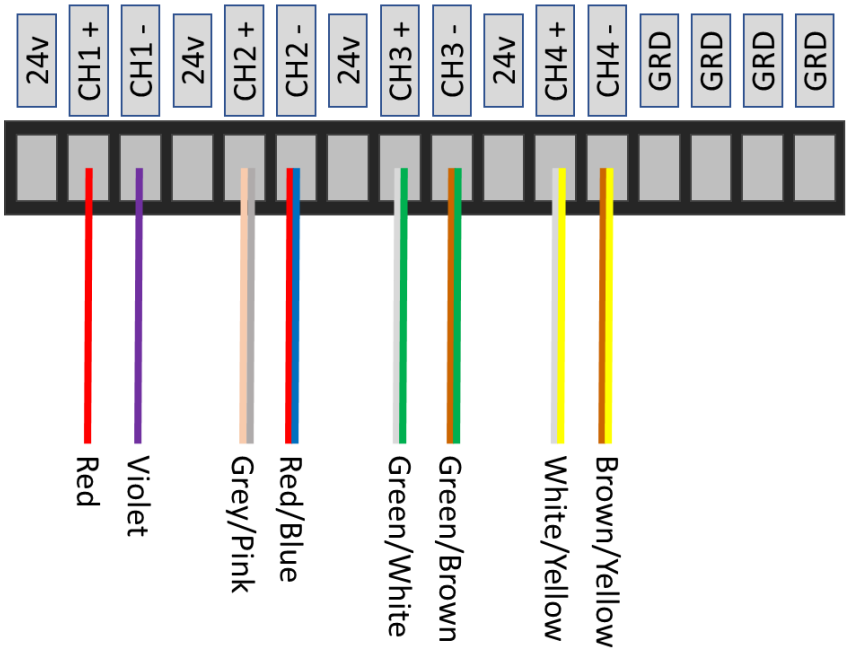


Figure 3.9: Non-Powered relay configuration of J6.

3.6.5 POWERED RELAY CONFIGURATION

24V from the relay rail is connected into the negative channel relay. The negative/return wire is moved to ground. When the relay toggles, it sends 24v to the relay/alarm outside of the analyzer and returns to ground.

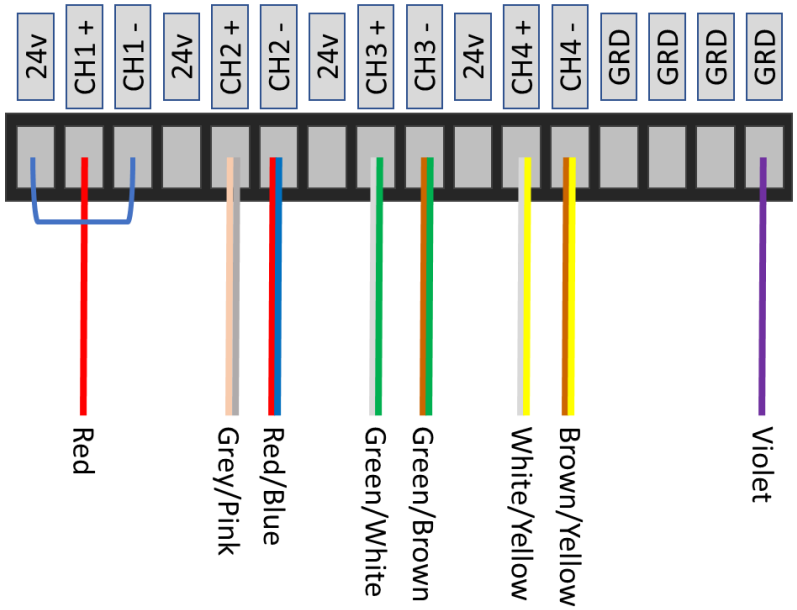


Figure 3.10: Powered Relay Configuration of J6; Relay #1 only.

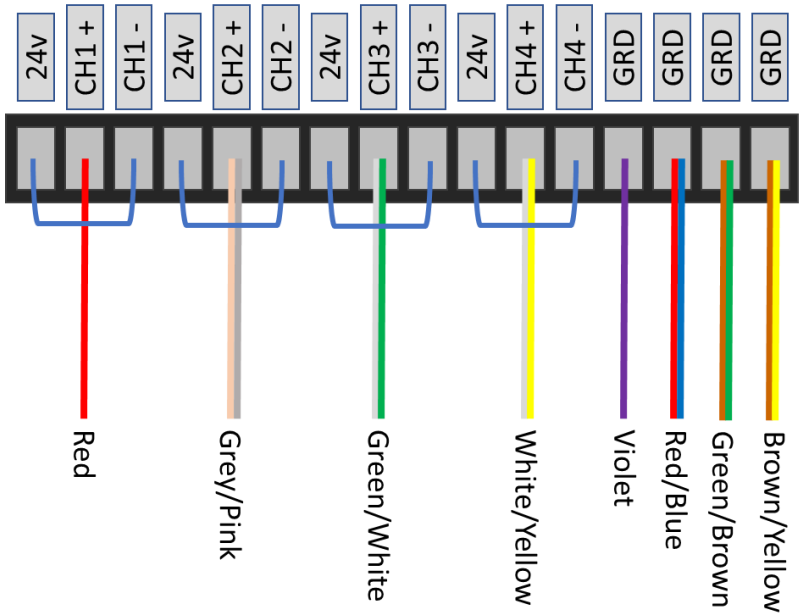


Figure 3.10: Powered Relay Configuration of J6; All Relays.

3.7 PREPARATION AND START-UP

Power can be supplied to the analyzer after all the cables have been connected. The 9165 will initialize automatically once the power is turned on.

Hard materials, such as woodchip and/or grindings, may damage the 9165 measuring head.

4 USER INTERFACE

4.1 CONTROL BUTTONS

The transmitter faceplate contains a full touchscreen which allows the user to navigate through the interface and communicate with the analyzer.

Figure 4.1: Transmitter with display screen.

4.2 DISPLAY SCREEN

4.2.1 SCREEN ON START UP (HOME)

The home screen will be displayed after the power has been supplied to the analyzer and the interface has had time to load.

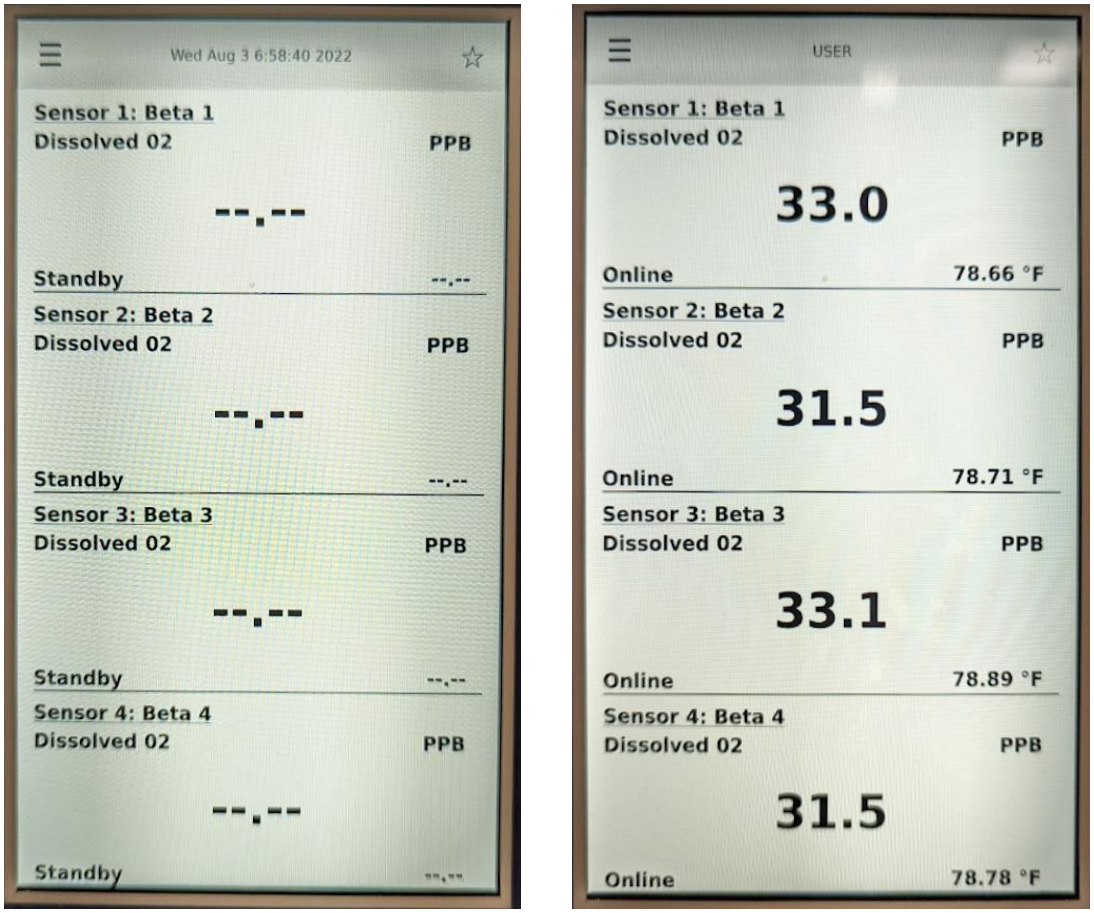


Figure 4.2: Left: Main screen with the analyzer in stand-by mode, Right: Main Screen in Online Mode

When the control box starts up for the first time, the home screen will appear after a brief load screen.

- If sensors are properly addressed and connected, the device will automatically detect them and display their status.
- New sensors will be shipped set to address 1 and additional sensors on the same device will require address assignment during start up.

The current time, operating mode, current screen, and user login will display on the top line. If there is more than one alarm, then each one will be displayed in turn for 3 seconds. The status of the O_2 measurement is displayed on the bottom left of the individual sensor area.

4.2.2 SHORTCUT MENU

Pressing the three bars in the upper left of the screen shows the main menu. This is accessable from all screens on the analyzer. The menu allows direct access to all setup and configuration screens. Tapping on the right, off of the menu will close the menu on the screen you are currently on. While all screens will display, they may not be interactive without first logging in.

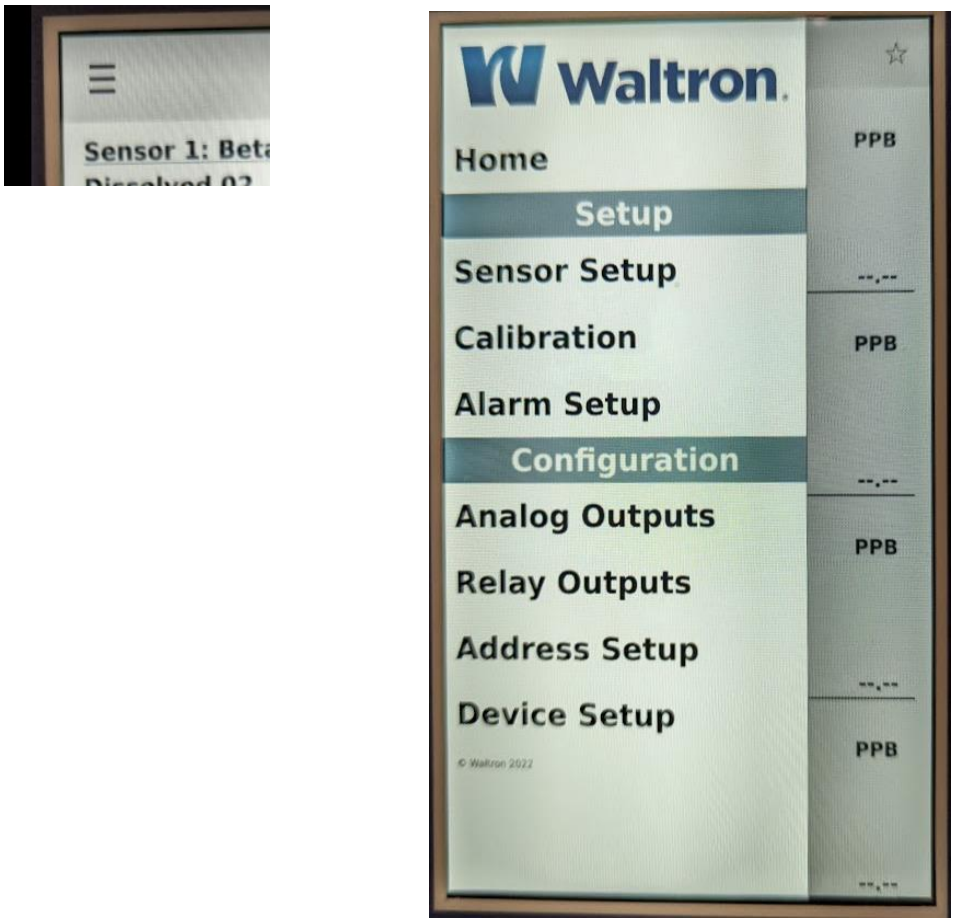


Figure 4.3: Menu Screen.

4.3 OPERATING MODES

The possible sesnsor operating modes of the 9165 are as follows:

MEASURING

Depending on the number of sensors that have been connected and properly addressed, the respective number of sensor screens will display.

STANDBY

In Standby mode, an O_2 measurement is not taken and a dotted line is displayed instead of the O_2 value. The sensor's temperature is, however, still displayed.

CALIBRATION

In the calibration screen, the analyzer will go into calibration mode and no readings will be taken until exiting calibration. Sensor readings will be taken in % O2 in this mode.

4.4 USER LEVELS

Sensors are shipped with the transmitter already calibrated and with the sensor address set to one. For the addition of multiple sensors, please reference Address Setup (Section 4.5.6). There are two access levels on this device. The user can log into admin level access in the Device Setup screen (Section 4.5.7).

- User Level
- Admin Level

User level provides veiwing only access to all of the screens. When the analyzer is provided power or upon reset, it will be in this mode.

Admin level access allows for the changing of settings and configuration in the analyzer.

The software will automatically switch back to the Operator level after 10 minutes. This cannot be altered.

4.5 SETTINGS

The 9165 is highly configurable with multipe user option. All screens for these settings are availsble through the menu.

4.5.1 SENSOR SETUP SCREEN

Entering the Sensor Setup screen through the menus will allow the user to veiw the names, unit, and sampling rate for the sensor of a specific address. If logged in as an Admin user, these settings can be changed. User must be logged in to make changes.

Sensor name - This can be set using the virtual keyboard that appears at the bottom after tapping the field.

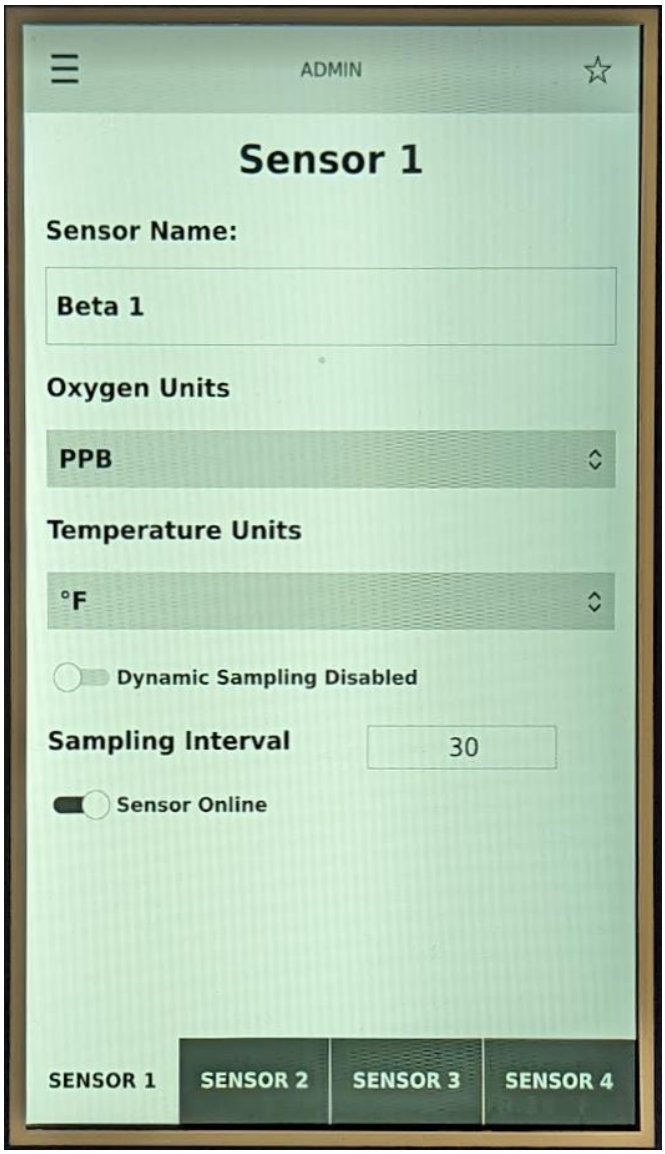
Oxygen Units - Selectable between PPM (parts per million), PPB (parts per billion), and %O2 (percentage of oxygen by mass (liquid) or volume (dry))

Temperature Units - Selectable between degrees fahrenheit (°F) and celsius (°C)

Sampling Interval - User can input between 3 - 999 seconds. It is not recommended for the user to select less than ten seconds, due to extreme shortening of consumible lifespan.

Dynamic Sampling - This setting can be toggled on or off. Dynamic sampling increases or decreases the sampling rate based on change detected in the reading. If the sample reading has changed more than 10% compared to the last readings, the sampling interval will be shorted.

Sensor Online - Toggling this will switch the sensor between measuring and standby modes.



The bottom of the screen will appear with the addresses of the sensors detected and allow for easy switching between sensors in this screen.

4.5.2 CALIBRATION SCREEN

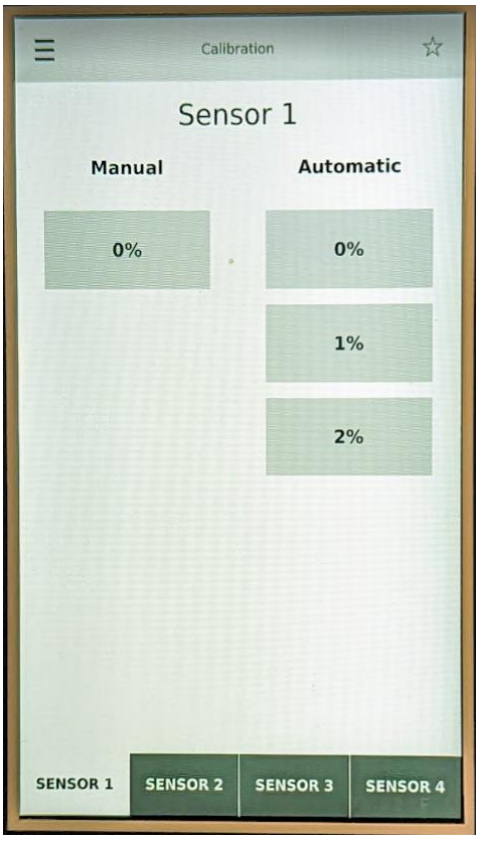
Entering the Calibrtation screen will allow the user to select between manual and automatic calibrations. While in this screen, the analyzer will switch readings to %O2 (by volume) to accomidate both wet and dry 0% calibration methods and dry 1% and 2% calibration.

Manual Calibration - Allows the user to enter a desired phase number that will correspond with a zero reading. (This method of calibration is not recommended outside of Waltorn trained technicians).

Automatic Calibration - Allows the user to view the sensor response based on either calibration gas or zeroing liquid, and on pressing “Set Calibration” the transmitter will automatically establish parameters for the specified reading level. Percent Oxygen selection in 0%, 1%, or 2% are available.

Due to minimal drifting associated with optical technology, regular calibration other than 0% is not required.

User must be logged in to make changes.For detailed instructions on sensor calibrations please see (Section 4.5.7).



4.5.3 ALARM SETUP SCREEN

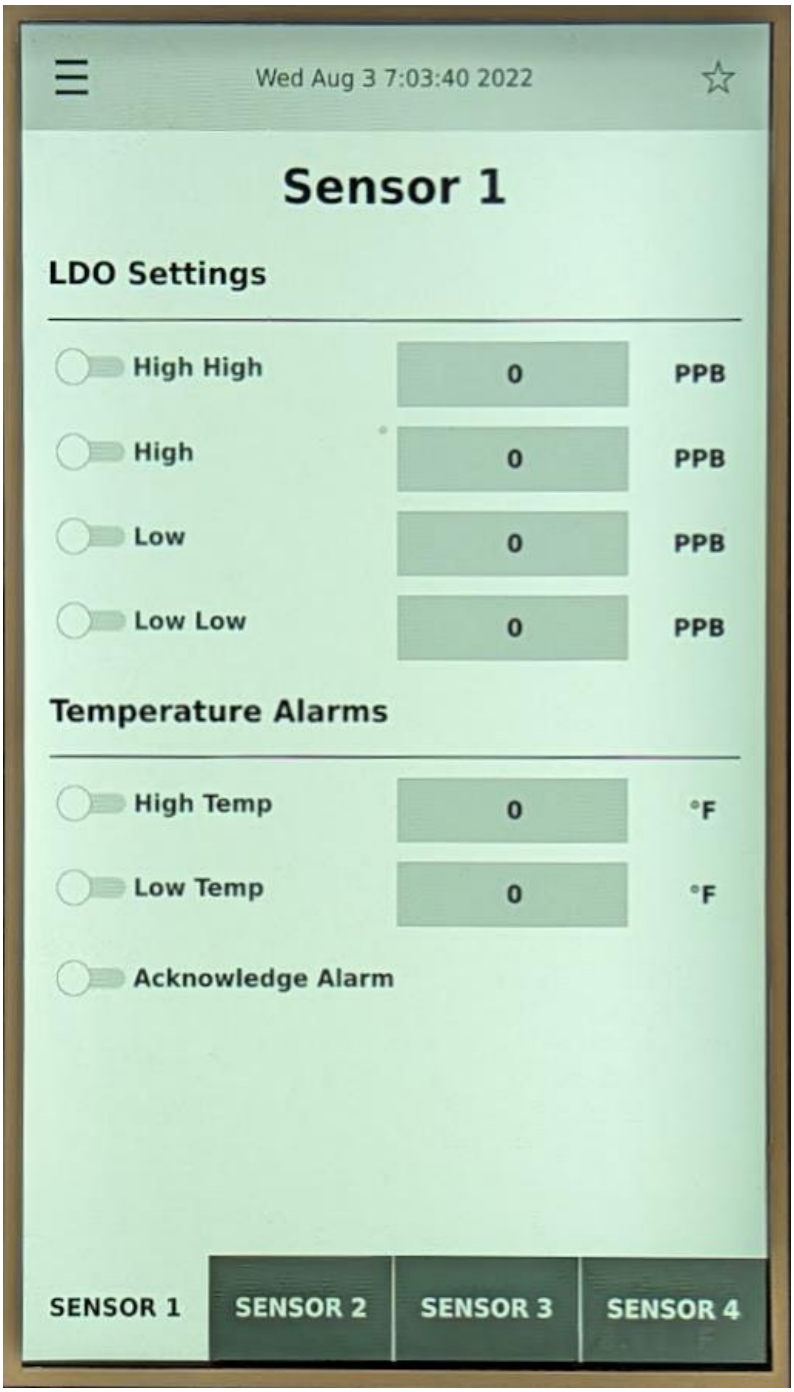
Entering the alarm setup screen allows for the customization of alarms associated with the sensor as a specific address. All, some, or none of these can be activated at the same time. User must be logged in to make changes.

LDO Settings will establish alarm levels for the sensor based on the resultant reading of the Dissolved Oxygen measurement.

Temperature Alarms will establish alarm levels for the most recent temperature reading from the sensor.

Note: Units of measurement will change automatically with the sensor settings in the sensor settup screen.

Acknoledge Alarm: Toggling this switch will take the sensor (display and relays) out of alarm state without turning off the alarm. Alarm will reactivate upon re-entering conditions for established alarm.



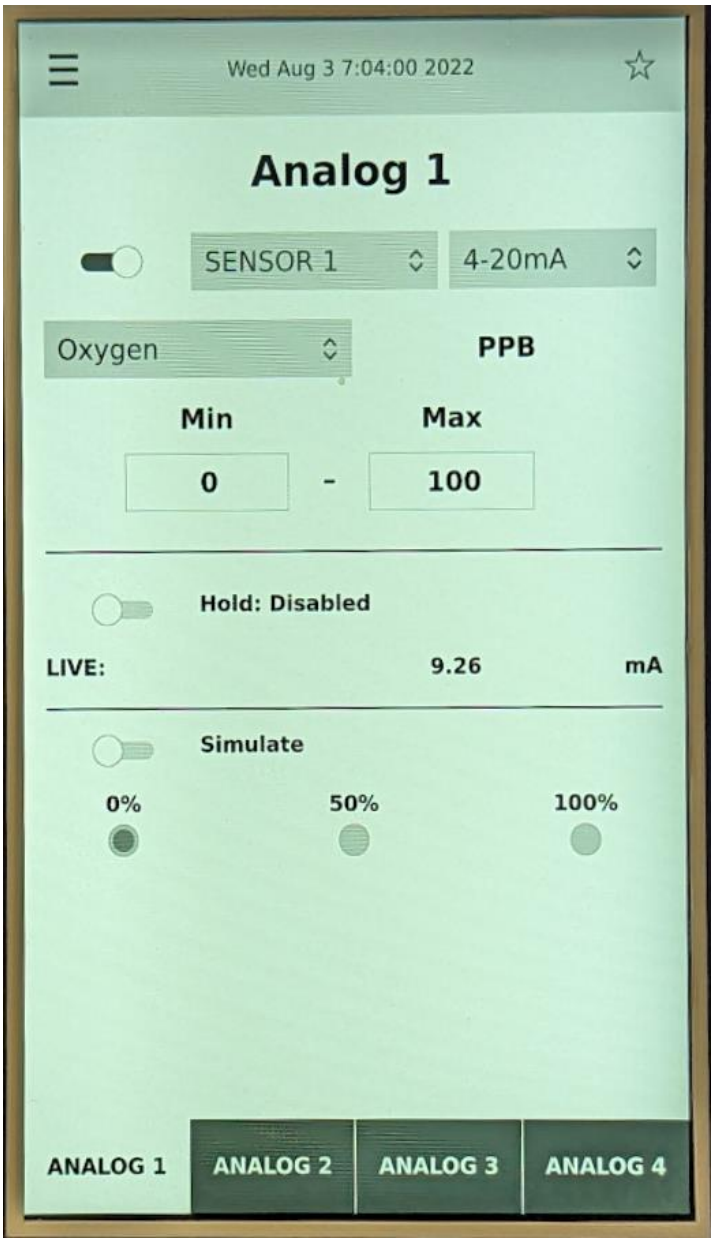
The bottom of the screen will appear with the addresses of the sensors detected and allow for easy switching between sensors in this screen.

4.5.4 ANALOG OUTPUTS SCREEN

Entering the Analog Outputs screen will allow for the setup and configuration of up to four independant analog signals (identified as 1 - 4). User must be logged in to make changes.

Settings:

- Toggling the switch in the upper left will activate the analog output.
- Select sensors 1 - 4, depending on the addresses detected by the transmitter.
- Select if the output is to be associated with the Oxygen or Temperature reading.
- Select if the output is to be:
  - 0-20mA,4-20mA, or 0-10V.
- Set the range of the output
  - Note: Units will change automatically.



Hold: Allows for the user to lock an output to its current reading while the instrument is in operation.

Simulate: Allows the user to simulate an output from the transmitter for the aid of setting up a connecting device.

Example: 4 - 20 mA will simulate:

- 0%: 4 mA
- 50%: 12 mA
- 100%: 20 mA

The bottom of the screen will appear with the available output channels and allows for easy switching between outputs in this screen.

4.5.5 RELAY OUTPUTS SCREEN

Entering the Relay Outputs screen allows the user to establish the relationship between four available digital relays and established alarms for the sensors. User must be logged in to make changes.

Trip Relay: allows the user to toggle the state of the relay from its normal state

Sensor Select: allows the user to select which sensor to associate the relay with. Note: Multiple relays can associate with the same sensor.

Output Type: Allows the user to select between:

N/O - Normaly open
N/C - Normaly closed

Note: Normally open means that the relay will remain as an open circuit until the relay is tripped by an associated alarm. Normaly closed means that the relay will remain as a closed circuit until it is tripped by an associated alarm.

Toggle selection: User is able to select anyalarms associated with the relay. Selecting all alarms will allow the relay to act as a general alarm.

The bottom of the screen will appear with the available relay channels and allows for easy switching between outputs in this screen.

4.5.6 ADDRESS SETUP SCREEN

Entering the Address Setup screen allows the user to check the address (es) of their sensors and to set them to new addresses. User must be logged in to make changes.

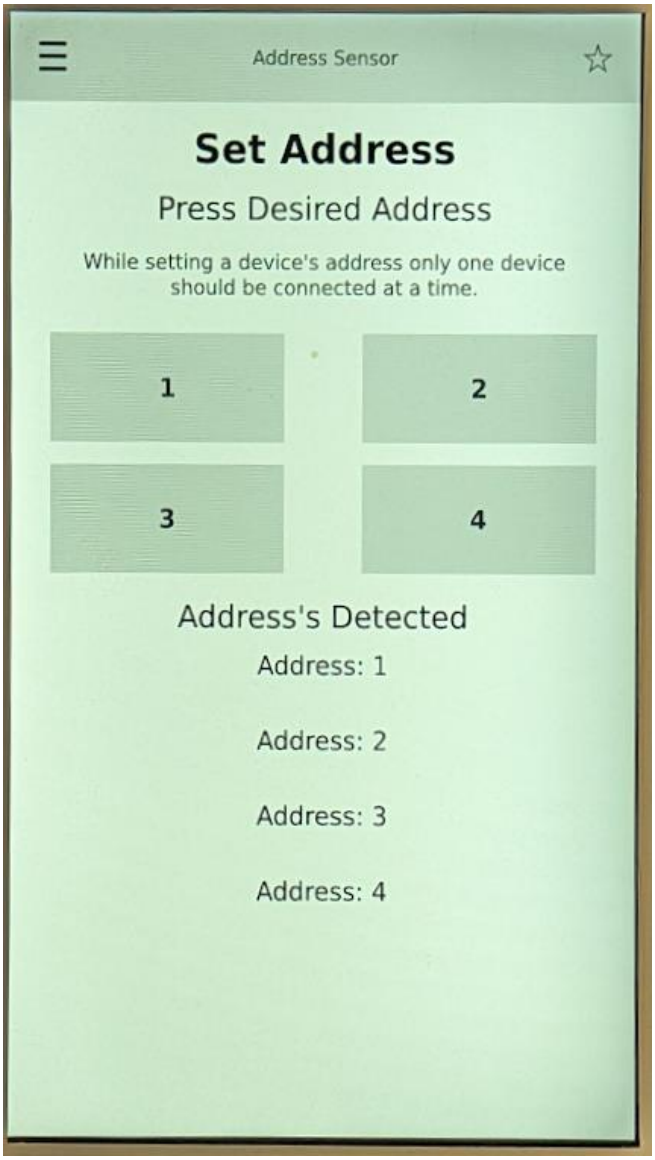
Note: New sensors are shipped from Waltron set to address one.

It is important to connect **one sensor at a time** to check / set it to the desired address.

Setting two or more sensors to a single address, example: setting both to address 1, will result conflicting data on the bus.

Instructions:

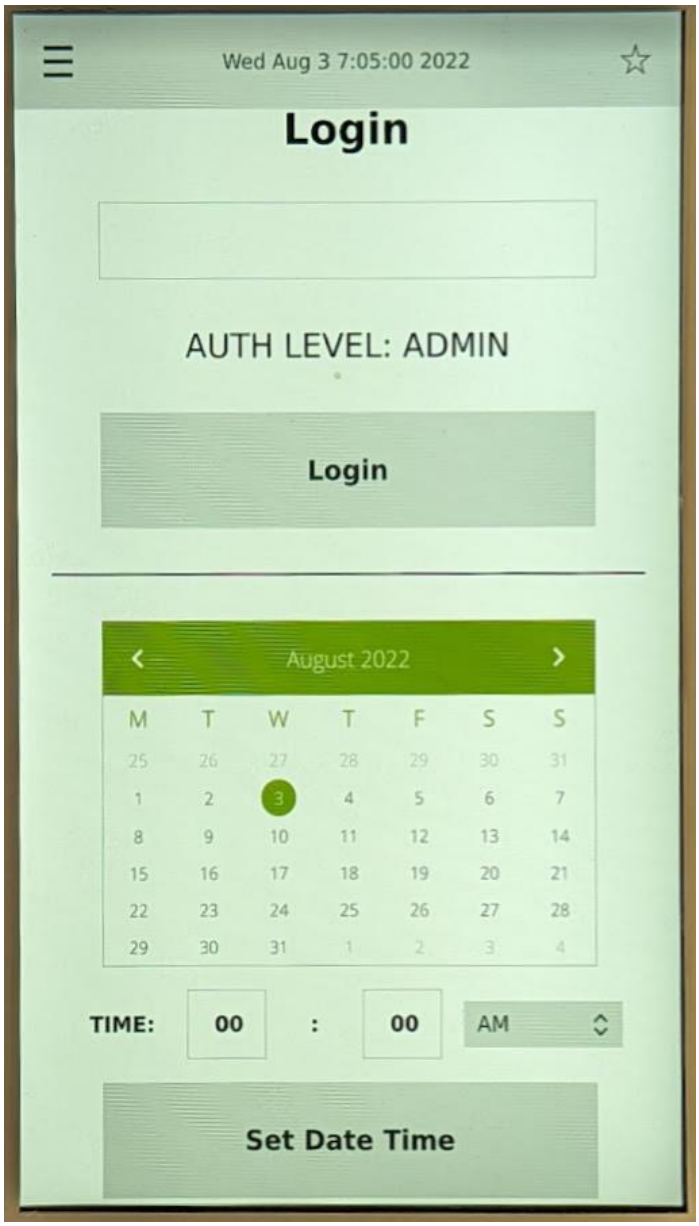
1. Connect the first sensor to the transmitter.
2. Wait a few moments for the address to be detected and display at the bottom of the screen.
3. Tap the desired address and wait for it to detect it at the new number. Note: It might take a few moments to clear the previous address.
4. If there are more sensors, disconnect first sensor and repeat with new sensor.
5. Once complete, connect all sensors to ensure all addresses are recognized.



Note: Should a sensor not have an established address, the field will remain blank. Tapping an address will write to the new sensor, but will require that the transmitter conduct a soft restart. This will happen automatically.

4.5.7 DEVICE SETUP SCREEN

Entering the device setup screen allows the user to login as an administrator. Logging in as an administrator unlocks the ability to make changes to the analyzer settings, outputs, and to calibrate sensors.



Login: Tap on the field to bring up a virtual numberic keypad at the bottom of the screen.

- Enter the code: 1903
- Tap 'Login'

User will remain logged in for a period of 10 minutes. After this period of time, the user level will defult back to basic level.

Date and Time:
While logged in, tapping on the calender will allow the user to set the date. The left and right arrows will allow the user to switch months. Tapping on a number will select the date for that month.

Tapping on the feild adjacent to TIME: will allow the user to select the respective hour and minute. **Note:** hours are on a 12 hour clock, with AM and PM selectible in a drop down menu.

Advancing the transmitter forward in time has the potential to activate the automatic dim feature. Tapping anywhere on the screen will restore brightness.

USB: With a USB stick insterted, the transmitter will automatically detect and display a button to write data to the memory device. Tapping this button will cause "Writing to USB" to appear breifly. After writing is complete it will revert to "Export Data"

4.5.8 ANALOG OUTPUTS

The 9165 offers four analog outputs that can be configured as desired from the analog outputs screen. The O2 and temperature settings depend on the unit that has been selected on the sensor settings screen. The range is not changed automatically if the unit is changed.

Table 4.2: Configurable settings for the analog outputs.

Item	Options	Note
Toggle Analog	Output On/Off	Must be on to change other options
Sensor select	1,2,3,4	Can only select detected addresses
Output signal	0-20 mA, 4-20 mA, 0-10 V	
Parameter	Oxygen, Temperature	
Range	Any rational number	Max must be greater than min
Toggle Hold	On/Off	Freeze output at time of toggle
Toggle Simulate	On/Off	Force output based on selected signal
Simulate Value	0%, 50%, 100%	Force output based on percent of selected signal range
Analog # (TAB)	1-4	available based on detected addresses

The settings can be set/changed as follows:

1. Analog output settings are independant of each other.
2. One sensor/parameter per output.
3. Multiple outputs can be assigned to the same sensor/parameter.
4. User must be logged in to change settings.

4.5.9 ALARM AND RELAY SETTINGS

Setting the alarms and setting the relays occur on two seperate screens. Alarms are configured directly to the specific sensor. Relays can be associated to any or all alarms established for a single, specific sensor. Multiple relays can be associated with the same sensor.

Setting an alarm and relay output can be made as follows:

1. Select the alarm setup screen from the menu.
2. Use the bottom tabs to go to the desired sensor. (If your sensor does not appear, confirm that it is properly connected and that its address is established as desired)
3. Use the left toggle switches to activate the alarm level and the right fields to input the deisred alarm values.
4. Go to the Relay Setting screen from the menu.
5. Select which relay you wish to set up from the bottom four tabs.
6. Select which sensor to associate with the relay by choosing from the drop down menu under sensor select.
7. Choose whether you would like your relay to be configured as Normally Open or

normally closed.

8. Using the toggle buttons on the left of the options under O2 Alarms and Temp Alarms, select one or multiple alarms to associate with the relay.

4.5.10 RELAY OUTPUTS

The 9165 comes with four available relay output that can be independantly configured to any or all of the sensor alarms.

Relay options:

- Normaly Open or Normally Closed
- Select any or all alarm options (once established in Alarm Settings screen)
- Passive (default) or powered (24V)

5 OPERATION

5.1 GENERAL INFORMATION

Prior to using the 9165 for online measurement, be sure that all installation and start-up procedures have been properly followed.

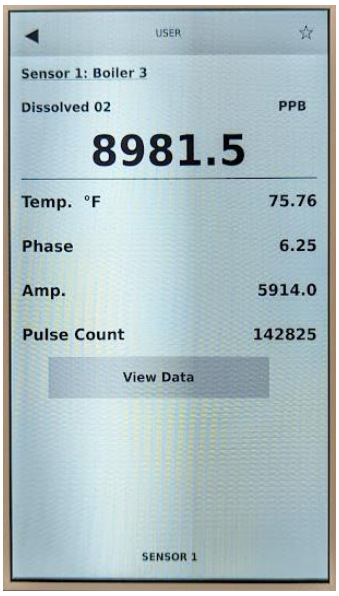
5.2 MEASUREMENT

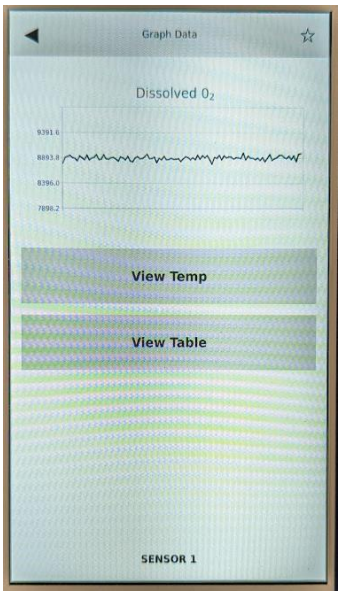
The 9165 will start measurements once the sensors are connected, properly addressed and the sensors are put into online mode. Please follow the instructions in the Address Setup screen to connect single or multiple sensors. Online mode is set for the sensor in the Sensor Settings screen. The user will have to log in as administrator in order to adjust settings.

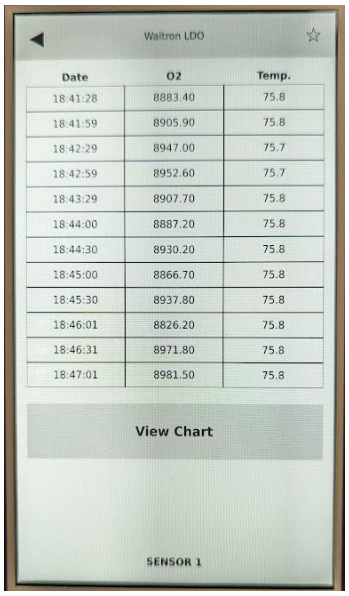
Once placed online, the 9165 will begin online measurement. The measurement frequency depends on the sample time that has been selected during the configuration (see Sensor Setup screen). The last month's worth of measurements will be saved to memory. After one month, the oldest measurements are deleted and the most recent measurements are saved.

5.3 DATA LOGBOOK AND GRAPH

Log data is stored by sensor and can be accessed by tapping on the reading from the home screen.







Tapping on view data will bring up a trendline plot of the trailing 100 readings. This can be toggled between Oxygen and Temperature by pressing View Temp or View O2.

Pressing View Table will bring up a listing of previous readings from both parameters in numberical form.

5.4 EXPORTING DATA

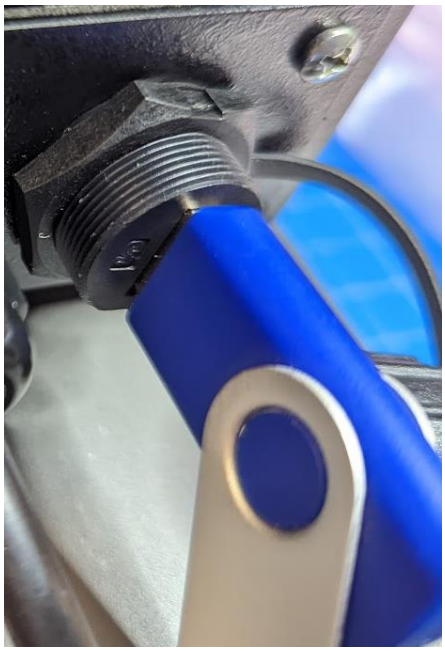
Measurement data is stored internal by the 9165 for a period of one month. After which, old data is trimmed.

NOTE: This is an automatic function that references the Real Time Clock (RTC) of the processor. Changing the date/time settings of the RTC can cause the processor to trim / retain data. It is advised that clock settings be adjusted only at initial setup, or after downloading stored data.

USB:

Data may be downloaded from the Device Configuration screen. After logging in, insert a USB (FAT32 format) and wait for the Export Data Window to appear. Tapping on the window will breifly display “Exporting Data”

Data is stored to the drive in the univeral spreadsheet configuration (*.CSV) format. This file is viewable in Excel and multiple other spreadsheet progams.



6 CALIBRATION

6.1 CALIBRATION OF THE TEMPERATURE SENSOR

The temperature sensor is an accurate RTD and does not require calibrating.

6.2 CALIBRATING THE O_2 SENSOR

Since the oxygen sensor only experiences a very slight amount of wear as a result of exposure, regular calibration is not necessary. It has been empirically determined that after 1 million exposures (equal to 1 million O_2 measurements), the O_2 deviation from the zero point is less than 5 ppb and that at higher O_2 values, no deviation is detectable.

After 900,000 pulses recorded on a sensor between calibrations, the transmitter will display a yellow warning screen in the sensor reading field. This screen can be turned off by acknowleging the warning in the Alarms Setting screen. Note: This will prevent other alarms for this sensor from displaying, the relay associated with the alarms will still activate. Calibrating the sensor will reset this counter.

The following two principle methods are described to calibrate the oxygen sensor:

1. One point calibration
   - This method is recommended if a high accuracy for lower oxygen concentration is required.
2. Calibration with two gasses
   - This method is recommended to ensure the specified accuracy over the whole oxygen measuring range.

6.2.1 CALIBRATION FREQUENCY

It is recommended to recalibrate the sensor after 1 million exposures. If the default sample time (1 measurement/30 seconds) is used, the sensor must be recalibrated once a year, assuming that the sensor is in operation 24 hours a day, seven days a week. If a shorter sample time is used, the sensor will reach 1 million light exposures sooner and will, therefore, require calibration sooner.

6.2.2 ONE POINT GAS CALIBRATION

For most applications in the low oxygen measuring range a calibration of the zero point is sufficient.

Preparation for 0% gas calibration:

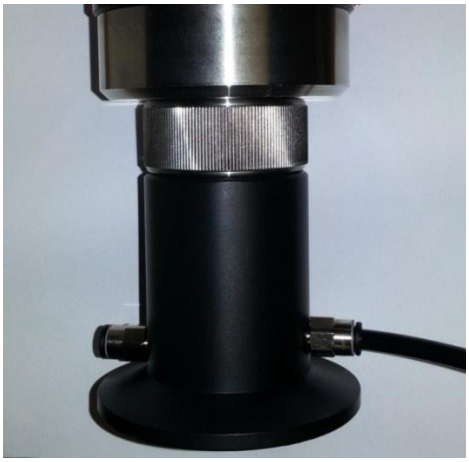
- The calibration gases must be dry.
- The zero-point calibration should be carried out using a gas with a certified oxygen content of ≤ 0.001%. The use of nitrogen or carbon dioxide with a purity of 99.9990% (Class 5.0) is reccomended.
- The inside of the 9165 must be dry during calibration with a gas. Rinse the 9165 for approx. 15 minutes with N_2, CO_2 or oil-free compressed air. During the calibration process, the % unit is used.

NOTE:	For an accurate O_2 calibration, the sensor must be at the same temperature as the gas. To achieve this, allow the sensor and calibration gas to acclimatize for 4 hours in the same room.

NOTE:	If using oxygen free water, such as Waltron Zero Water, drying the sensor is not required. After the solution is added to the beaker and mounted to the sensor, follow instructions starting at step 10.

Procedure:

1. Put analyzer into standby mode from the Sensor settings screen.
2. Turn off sample flow to the sensor and disconnect sample inlet and outlet tubings from the sensor flowcell.
3. Remove the flowcell by loosening the knurled nut. Take care not to damage the sesnor spot and temperature sensor while removing the flowcell.
4. Install the calibration beaker onto the bottom of the sensor.



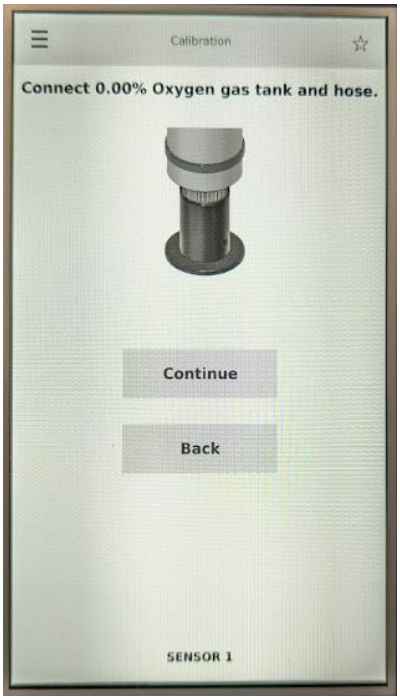
5. Connect calibration gas to the inlet of the calibration beaker.
6. Turn the calibration gas flow on at a maximum flowrate of 30 l/h and let the gas dry the sensor for 15 minutes.
7. Log into the analyzer as an admin user by entering "1903" in the Device Setup screen.
8. Enter the calibration screen and tap on 0% Calibration under Automatic.
9. Ensure that the the calibration beaker and gas are connected and gas is flowing and tap continue.

    a. Upon entering the sensor calibration screen, the analyzer will transition its unit of reading to % Ogygen. (Note: In some instances, the tranistion between units may be recorded as a reading.) The units will change back to the previously selected unit of measurement upon exiting the calibration screen.

10. Allow the sensor to rinse down for approximately 15 minutes. Before proceeding, verify that the actual O_2 value is stable. For a 0% calibration, the phase value should be between 65 - 68 and stable at its highest point.

11. Tapping the Set Calibration button will store the zero setting and back out of this page. The calibration process is complete.

12. Disconnect the calibration gas from the calibration beaker and remove the calibration beaker from the sensor.
13. Replace the flowcell on the sensor, again taking caution to prevent damaging the sensor spot and temperature sensor.
14. Reconnect sample lines and restore sample flow to the sensor.
15. Ensure that the sensor is placed back into online measurement mode.



6.2.3 CALIBRATION WITH TWO GASES

Preparation:

- Both the zero point and a (single) high calibration point can be calibrated with a defined oxygen concentration. The calibration gases must be dry.
- The zero-point calibration should be carried out using a gas with a certified oxygen content of ≤ 0.001%. The use of nitrogen or carbon dioxide with a purity of 99.9990% (Class 5.0) is reccomended.
- The high calibration point for the sensor must be calibrated with an accuracy of ± 1% using a gas with a certified oxygen content of 1% or 2%. N_2 or CO_2 with 1% or 2% O_2 can be used for this.
- The inside of the 9165 must be dry during calibration with a gas. Rinse the 9165 for approx. 15 minutes with N_2, CO_2 or oil-free compressed air. During the calibration process, the % is used.

NOTE: For an accurate O_2 calibration, the sensor must be at the same temperature as the gas. To achieve this, allow the sensor and calibration gas to acclimatize for 4 hours in the same room.

Procedure:

Follow the procedure for Calibration with One Gas from steps 1 to 15. Select 1% or 2% for the high calibration instead of 0%.

During the high calibration the phase should stabalize between 20 - 40. After approximately 15 minutes press the set calibration button. This will store the high point setting and back out of the calibration screen.

6.2.4 MANUAL ZERO POINT CALIBRATION

This process is only recommended for technicians immediately following a zero calibration with Oxygen free gas or liquid. This method is not recommended as part of regular service and inproperly executing this function would require recalibration.

Manual calibration will allow for the input of a new phase angle for the zero point. It does not overwrite the temperature. This enables for fine adjustment of this point.

1. Connect the calibration gas to the calibration beaker as with the previous methods.
2. Select 0% under Manual.
3. Enter the adjusted phase for zero calibration.

7 CLEANING AND MAINTENANCE

7.1 INSPECTION

Whenever possible, it is recommended to inspect the 9165 for the following and correct if necessary:

- Make sure there is no dirt or dust on the instrument.
- Check whether the plugs and cables have been inserted correctly.
- Connectors that are not used must be covered.

7.2 CLEANING

Only use water (or water with a detergent) to clean the sensor or the outside of the control box.

Warning!	Never use tools to clean the sensor coating. Touching the coating may cause serious damage to the instrument.

Regular CIP of the process pipes with a suitable cleaning product.

Required cleaning products:

- Product- Alkaline cleaner with an NaOH or KOH base.
  - (≤ 95° C, ≤ 5% NaOH or KOH)
- Acid cleaner with an HNO_3 or H_3PO_4 base.
  - (≤ 60° C, ≤ 3% HNO_3 or H_3PO_4)
- Flow 0 – 10 m/s

NOTE:	Maintenance must be carried out by personnel who are familiar with the applicable maintenance regulations. Do not allow liquid or any cleaning agents to enter the electronics enclosure.

	Wear suitable protection against chemicals and pay special attention to hot cleaning agents.

8 TROUBLESHOOTING AND REPAIR

8.1 TROUBLESHOOTING

Problem	Cause	Solution
Sensor is not showing up	The sensor connection is not seated properly The address is not properly set or multiple sensor to the same address.	Check cabling connections. Follow instruction for setting sensor addresses in section 4.5.6.
The O_2 value seems to be incorrect.	Out of calibration. Connections to sensor leaking oxygen.	Check calibration data and pulse count, consider recalibration. Check tubing from sample to sensor to ensure no ingress of oxygen.

8.2 REPAIR AND MAINTENANCE

Before performing any maintenance on the 9165, make sure the instrument is disconnected from the power supply during assembly and disassembly so that there is no risk of an electric shock.

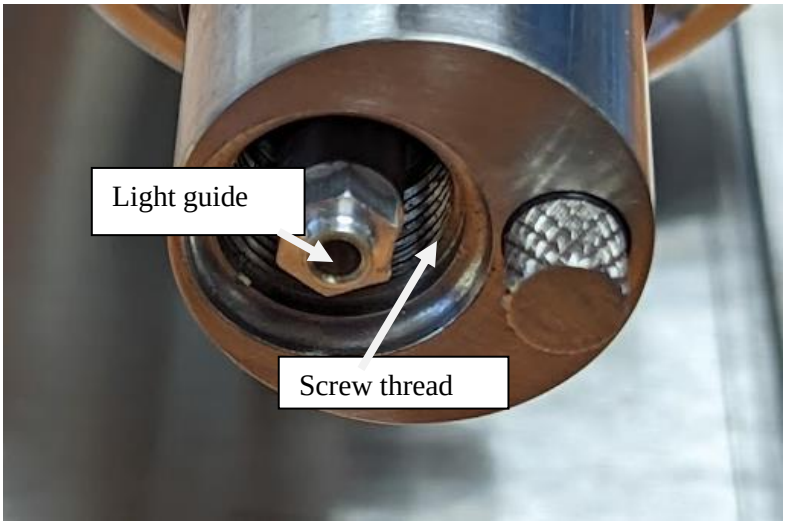
8.2.1 REPLACING THE SENSOR SPOT

If the sensor spot is faulty or damaged, then a new one must be placed on the sensor. The instructions for replacing the spot are given below.

1. Remove the sensor from the mounting plate and place it on a level surface so that it cannot roll onto the floor.

2. Use a 10mm open or closed ended spanner to unscrew the sensor spot from the measuring head.

3. Use a brush or a small screwdriver to remove any glue or dirt from the screw thread around the light guide. Do not damage the light guide.



4. Fit the O-ring to the new coating holder.

5. Apply a drop of Loctite (found in the sensor spot kit) to the inside of the coating holder's screw thread. This is to stop the coating holder from shaking loose. **Make sure no glue gets on the pink side!**

   Screw the coating holder back on to the sensor, return the sensor to the mounting plate, and calibrate the sensor.

Warning!	Never unscrew or loose the temperature sensor. Unscrewing the temperature sensor will void the warranty.

9 DEACTIVATING, STORAGE AND TRANSPORT

9.1 DEACTIVATING

If the 9165 is no longer used, the components must be sent to an appropriate waste disposal organization or the entire unit can be returned to Waltron. The materials from which the main components are made are given below:

- Control box: ABS Lid, metal housing, various prints.
- Sensor: stainless steel, oxygen print, POM.

9.2 STORAGE

The instrument must be stored in a dry location and be protected against mechanical and/or chemical damage. If the 9165 is not going to be used for a long time, the instrument must be thoroughly rinsed with water to clean it. The instrument must then be emptied, flushed with air and dried.

The 9165 must be completely dry when it is stored.

9.3 TRANSPORT

When the 9165 is transported, the transmitter display must be protected against direct mechanical impact. It is recommended to save the packaging materials provided by Waltron for reuse whenever the 9165 is transported.

The 9165 must be completely dry when it is transported.

10 SPARE PARTS

If you order spare parts, we kindly request you to include all the information given below.

- Serial number of the 9065
- Part number
- Description

Table 10.1: Consumable Parts Listing.

Description	Part No.
Sensor Spot Kit	K5000-010
O-ring 20x2.5 (Sensor Head)	K5000-011
LDO Zero Point Calibration Kit	K6000-101
Zero Water (4-pack with rubber beaker)	K6000-121
Zero Point Calibration Gas, 105L	K6000-110
High Point (1%) Calibration Gas, 105L	K6000-111

Table 10.2: Spare Parts Listing.

Description	Part No.
Power Cable, 9165, 2m	K5002-004
Power Cable, 9165, 5m	K5002-005
Power Cable, 9165, 10m	K5002-006
Sensor Cable, 9165, 3m	K5002-007
Sensor Cable, 9165, 5m	K5002-008
Sensor Cable, 9165, 10m	K5002-009
I/O Cable, 9165, 3m	K5002-010
I/O Cable, 9165, 5m	K5002-011
I/O Cable, 9165, 10m	K5002-012
Sensor communication tee adapter	K1111-214
LDO Smart Sensor	K7000-020
Calibration Beaker Assembly	K5000-042
Flowcell with Sample Fittings	K5000-103
LDO Sensor Bracket	K5000-008A
Regulator, Fixed Flow, Calibration Gas 105L Cylinder	K6000-115
Connection Hose, LDO Calibration Kit	K6000-117
Tube Connection Fitting, LDO Calibration Kit	K6000-118

11 APPENDIX A: GNU GENERAL PUBLIC LICENSE

GNU GENERAL PUBLIC LICENSE

Version 3, 29 June 2007

Preamble

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For example, if you distribute copies of such a program, whether gratis or for a fee, you must pass on to the recipients the same freedoms that you received. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

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For the developers' and authors' protection, the GPL clearly explains that there is no warranty for this free software. For both users' and authors' sake, the GPL requires that modified versions be marked as changed, so that their problems will not be attributed erroneously to authors of previous versions.

Some devices are designed to deny users access to install or run modified versions of the software inside them, although the manufacturer can do so. This is fundamentally incompatible with the aim of protecting users' freedom to change the software. The systematic pattern of such abuse occurs in the area of products for individuals to use, which is precisely where it is most unacceptable. Therefore, we have designed this version of the GPL to prohibit the practice for those products. If such problems arise substantially in other domains, we stand ready to extend this provision to those domains in future versions of the GPL, as needed to protect the freedom of users.

Finally, every program is threatened constantly by software patents. States should not allow patents to restrict development and use of software on general-purpose computers, but in those that do, we wish to avoid the special danger that patents applied to a free program could make it effectively proprietary. To prevent this, the GPL assures that patents cannot be used to render the program non-free.

The precise terms and conditions for copying, distribution and modification follow.

TERMS AND CONDITIONS

0. Definitions.

“This License” refers to version 3 of the GNU General Public License.

“Copyright” also means copyright-like laws that apply to other kinds of works, such as semiconductor masks.

“The Program” refers to any copyrightable work licensed under this License. Each licensee is addressed as “you”. “Licensees” and “recipients” may be individuals or organizations.

To “modify” a work means to copy from or adapt all or part of the work in a fashion requiring copyright permission, other than the making of an exact copy. The resulting work is called a “modified version” of the earlier work or a work “based on” the earlier work.

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An interactive user interface displays “Appropriate Legal Notices” to the extent that it includes a convenient and prominently visible feature that (1) displays an appropriate copyright notice, and (2) tells the user that there is no warranty for the work (except to the extent that warranties are provided), that licensees may convey the work under this License, and how to view a copy of this License. If the interface presents a list of user commands or options, such as a menu, a prominent item in the list meets this criterion.

1. Source Code.

The “source code” for a work means the preferred form of the work for making modifications to it. “Object code” means any non-source form of a work.

A “Standard Interface” means an interface that either is an official standard defined by a recognized standards body, or, in the case of interfaces specified for a particular programming language, one that is widely used among developers working in that language.

The “System Libraries” of an executable work include anything, other than the work as a whole, that (a) is included in the normal form of packaging a Major Component, but which is not part of that Major

Component, and (b) serves only to enable use of the work with that Major Component, or to implement a Standard Interface for which an implementation is available to the public in source code form. A “Major Component”, in this context, means a major essential component (kernel, window system, and so on) of the specific operating system (if any) on which the executable work runs, or a compiler used to produce the work, or an object code interpreter used to run it.

The “Corresponding Source” for a work in object code form means all the source code needed to generate, install, and (for an executable work) run the object code and to modify the work, including scripts to control those activities. However, it does not include the work's System Libraries, or general-purpose tools or generally available free programs which are used unmodified in performing those activities but which are not part of the work. For example, Corresponding Source includes interface definition files associated with source files for the work, and the source code for shared libraries and dynamically linked subprograms that the work is specifically designed to require, such as by intimate data communication or control flow between those subprograms and other parts of the work.

The Corresponding Source need not include anything that users can regenerate automatically from other parts of the Corresponding Source. The Corresponding Source for a work in source code form is that same work.

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