Waltron AQUALERT® Division

Water Chemistry Measurement & Control

Aqualyzer® 9062 Dissolved Oxygen Analyzer
Instruction Manual

Revision 2.09

WALTRON CUSTOMER COMMITMENT

This instruction manual is a technical guide to aid the customer in the set-up 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

Whitehouse, New Jersey
Phone: (800)-242-7353 **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 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 1-(800)-242-7353.

Thank you for choosing Waltron!

Please note Waltron mailing and UPS shipping addresses:

DIRECT ALL CORRESPONDENCE TO:
Waltron Bull & Roberts, LLC
P.O. Box 70, 50 Tannery Rd.
Whitehouse, NJ 08888

DIRECT ALL UPS SHIPMENTS TO:
Waltron Bull & Roberts, LLC
50 Tannery Rd.
Somerville, NJ 08876

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 **Material Safety Data Sheets (MSDS)**, please contact Waltron or logon to 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 in Whitehouse, NJ 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:

-Via Mail:
Waltron Bull & Roberts, LLC
P.O. Box 70, 50 Tannery Rd.
Whitehouse, NJ 08888

-Via UPS/FED-EX/Motor Carrier:
Waltron Bull & Roberts, LLC
50 Tannery Rd.
Somerville, NJ 08876

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 monitors 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 monitor.
- √ Failure to carry out correct maintenance procedures may result in inaccurate monitor reading.

Table of Contents

1 INTRODUCTION

1.1 *GENERAL*

The Waltron Aqualyzer® 9062 Dissolved Oxygen Analyzer is a microcontroller-based unit used for online measurement of dissolved oxygen content in various water chemistry/treatment applications. Sampling points for power generation include mixed bed outlets, extraction pump discharge, boiler feed, boiler drum and steam. The measurement range of the 9062 analyzer spans from 0.01ppb to 20 ppm.

1.2 *MAIN FEATURES*

Features of Aqualyzer® 9062 Dissolved Oxygen analyzer unit includes:

1. Measurement of dissolved oxygen concentration
    - Wide range analysis - 0.01ppb to 20 ppm. Concentration and temperature are displayed continuously and analyzer adjusts automatically to user specified ranges.
    - Automatic temperature compensation
    - Protection from "Hot Sample"
2. Calibration
    - Fully automatic single point calibration
    - Internal diagnostics used to show sensor status
3. User Interface
    - 128x64 pixel graphics LCD with backlight
    - Large easy-to-read graphic display
    - Tactile membrane keyboard (4 keys) on front panel
    - Lower 2 lines of display used for user interface messages. Menu driven software interface for various operations including diagnostics, configurations, calibrations, and dispatch modes.
4. Communication interface via RS-232 & RS-485 using MODBUS RTU protocol.
5. Analyzer Configuration:
    - User configurable system; OXYGENATED or DEAERATED
    - User configurable settings for recorder outputs and alarm set points.
    - Factory defaults can be easily reloaded to override user settings
6. Automatically stores last 10 calibration & alarm logs
7. Complete analyzer diagnostics - individual transmitter module can be tested independently
8. Dispatch mode facility
9. For OXYGENATED System - 3 Relay outputs are provided for High, Low and General Alarm. For DEAERATED System – these same relay outputs are used for High-High, High Warning and General Alarm.
10. Two 4-20mA isolated current outputs
11. Wide range of input power supply 90VAC to 250VAC

1.3 *SYSTEM DESCRIPTION & ARCHITECTURE*

The 9062 Dissolved Oxygen analyzer system is comprised of the following:

1. Wet-Section (Sensor Unit)
    a. Hydraulic panel consisting of constant head, flowcell, tubing, thermistor and solenoid valve
    b. Dissolved oxygen sensor
2. Transmitter (electronics) unit

9062 Separated Transmitter Section

9062 Separated Wet Section

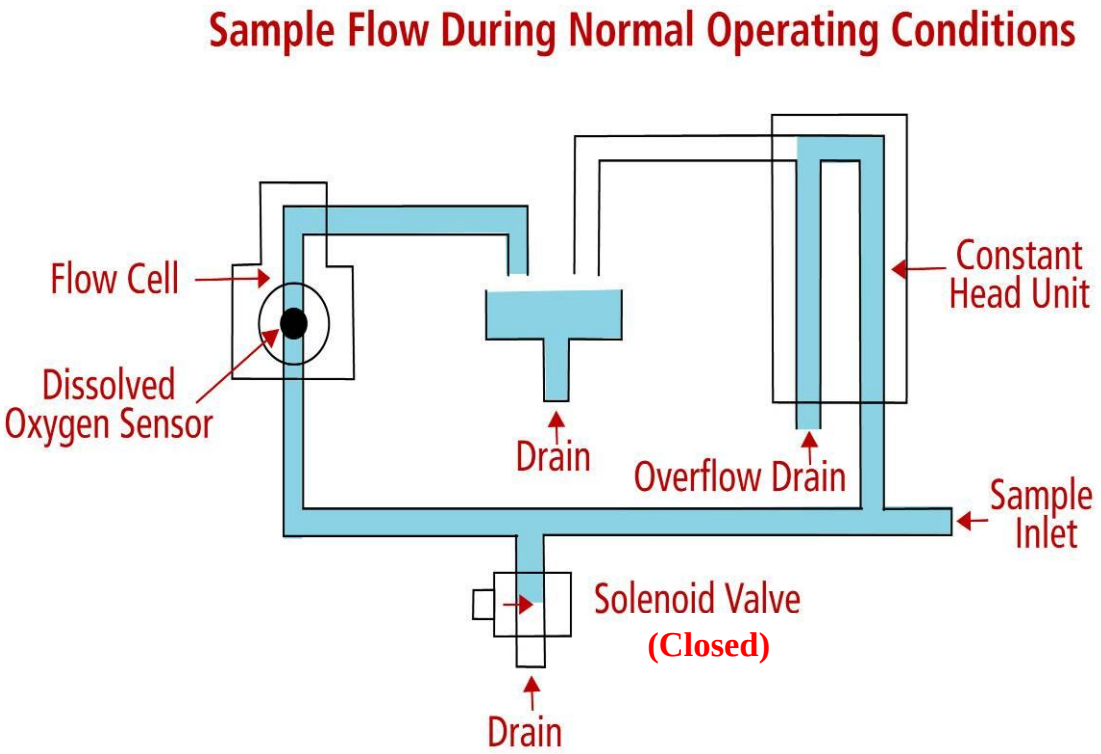
9062 Combined Wet Section

1.4 *WET SECTION: SENSOR UNIT*

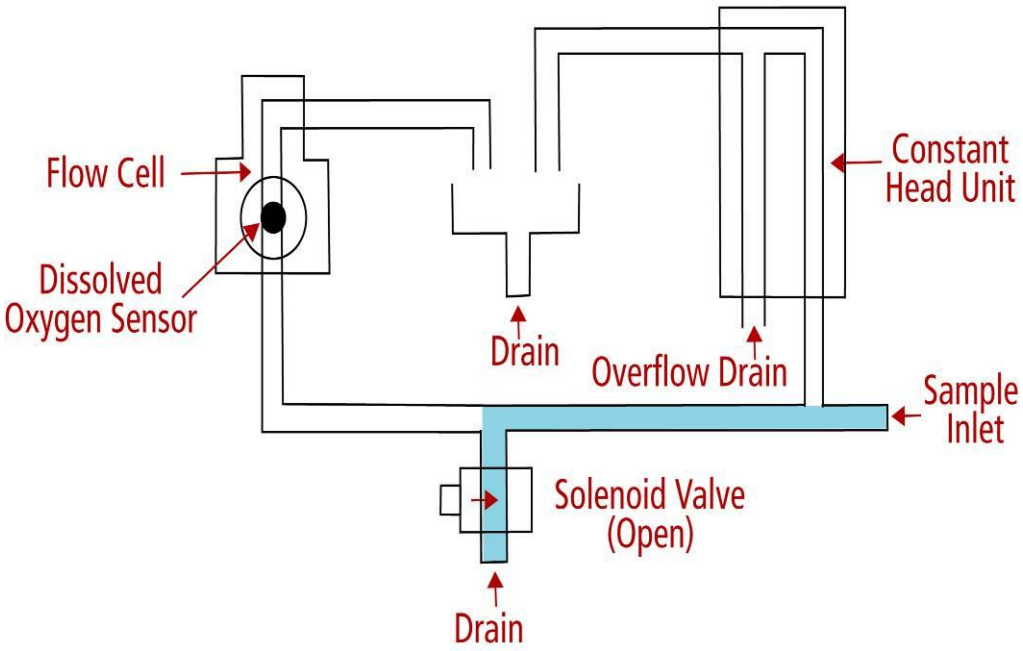
The 9062 Dissolved Oxygen system is capable of monitoring dissolved oxygen concentrations in sample feed. A single solenoid valve is used either to select sample feed during normal measurement or to expose the sensor to air during calibration. The sensor unit is comprised of an airtight flowcell that houses a disposable oxygen sensor which can be changed quickly and easily when exhausted.

In normal mode, the feed water flows from the sample inlet into the flowcell where it comes into contact with the dissolved oxygen sensor. The sensor transmits a current proportional to the dissolved oxygen in the sample. This output is then measured by the electrical system and converted into a ppb/ppm measurement. An internal thermistor (housed in flowcell) is used to monitor the water temperature for temperature compensation. If the sample temperature exceeds 131ºF then the sample automatically gets diverted to drain and the system displays "HOT".

The user should note that oxygen partial pressure, and hence the sensor current in air during calibration, is a function of the atmospheric pressure. Before a calibration is initiated, the relevant atmospheric pressure should be programmed into the system through the user interface keyboard on the system's front panel. The user is asked to input the elevation (in feet) at analyzer site. This introduces a correction factor into the final calculation of dissolved oxygen concentration.



Sample Flow During Calibration, Cal. Fail or Thermal Overload



1.4.1 *TRANSMITTER UNIT*

The transmitter unit interprets the current output from the dissolved oxygen sensor and displays the corresponding dissolved oxygen concentration (in ppb/ppm) and temperature. The transmitter unit controls all the operations of the analyzer system. The display is a graphics LCD with backlight.

2 INSTALLATION

2.1 *MOUNTING OF WET SECTION UNIT*

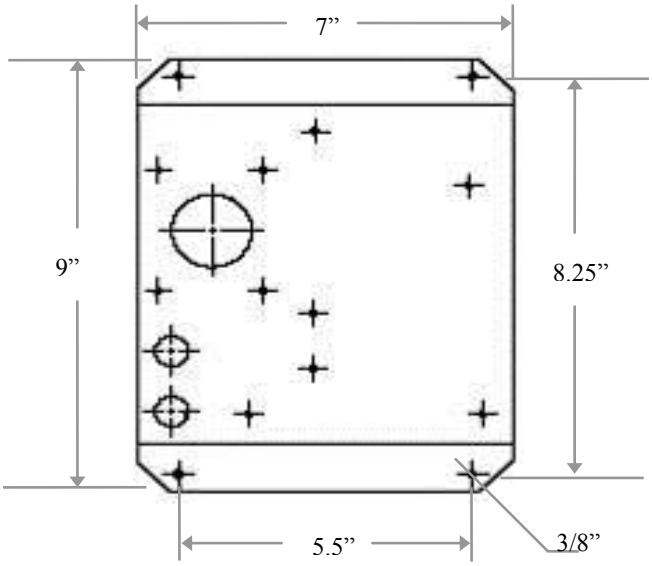


Figure 1. Dimensions to mount the Separated Wet Section. (Dimensions are Inches)

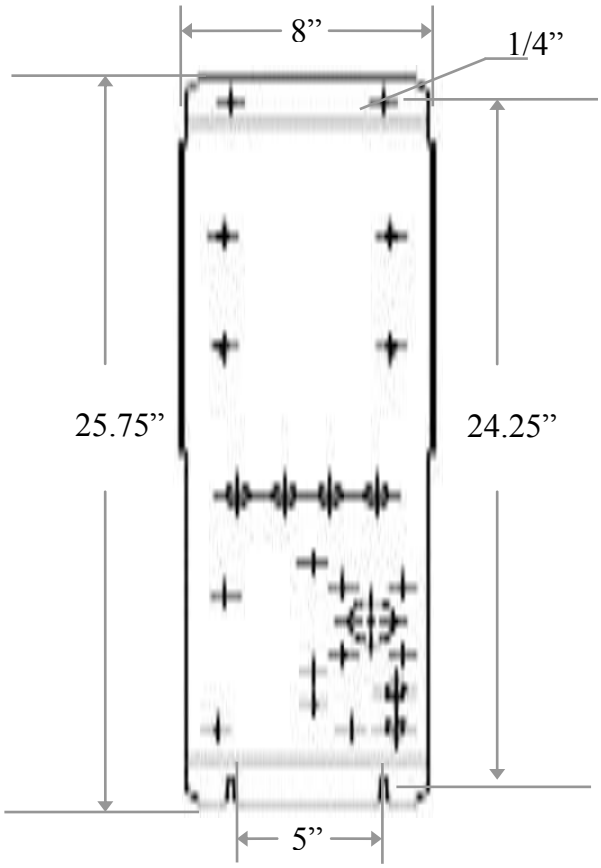


Figure 2. Dimensions to mount the Combined Wet Section. (Dimensions are Inches)

2.1.1 *LOCATION AND LAYOUT*

Mount the analyzer in a clean, vibration-free area avoiding direct radiant heat, sunlight and drafts. Avoid areas containing chlorinating equipment. Sensor Unit should be mounted no more than 330 feet (100meters) from the Transmitter Unit.

2.1.2 *MOUNTING OF TRANSMITTER UNIT*

The transmitter unit controls the operations of the analyzer. Power supply, CPU card, Analog card and input power terminal junction are housed in the transmitter enclosure. Transmitter unit is a NEMA 4X rated enclosure with cable glands for wiring. Size and layout of transmitter is shown below.

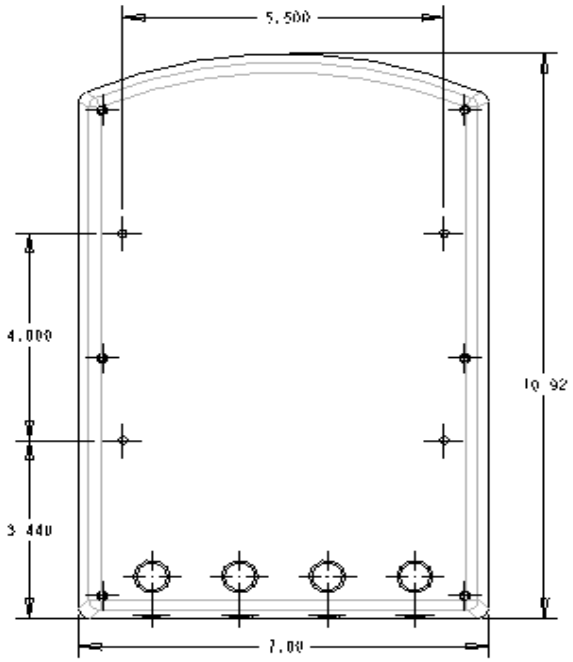


Figure 3. Dimensions of the transmitter unit. The transmitter for the Combined 9062 Analyzer mounts directly to wet section plate. (Dimensions are Inches)

For ease of mounting, the transmitter is attached to a sheet metal mounting bracket. The entire piece (transmitter on mounting bracket) can then be wall-mounted. Size and layout of mounting bracket is shown below.

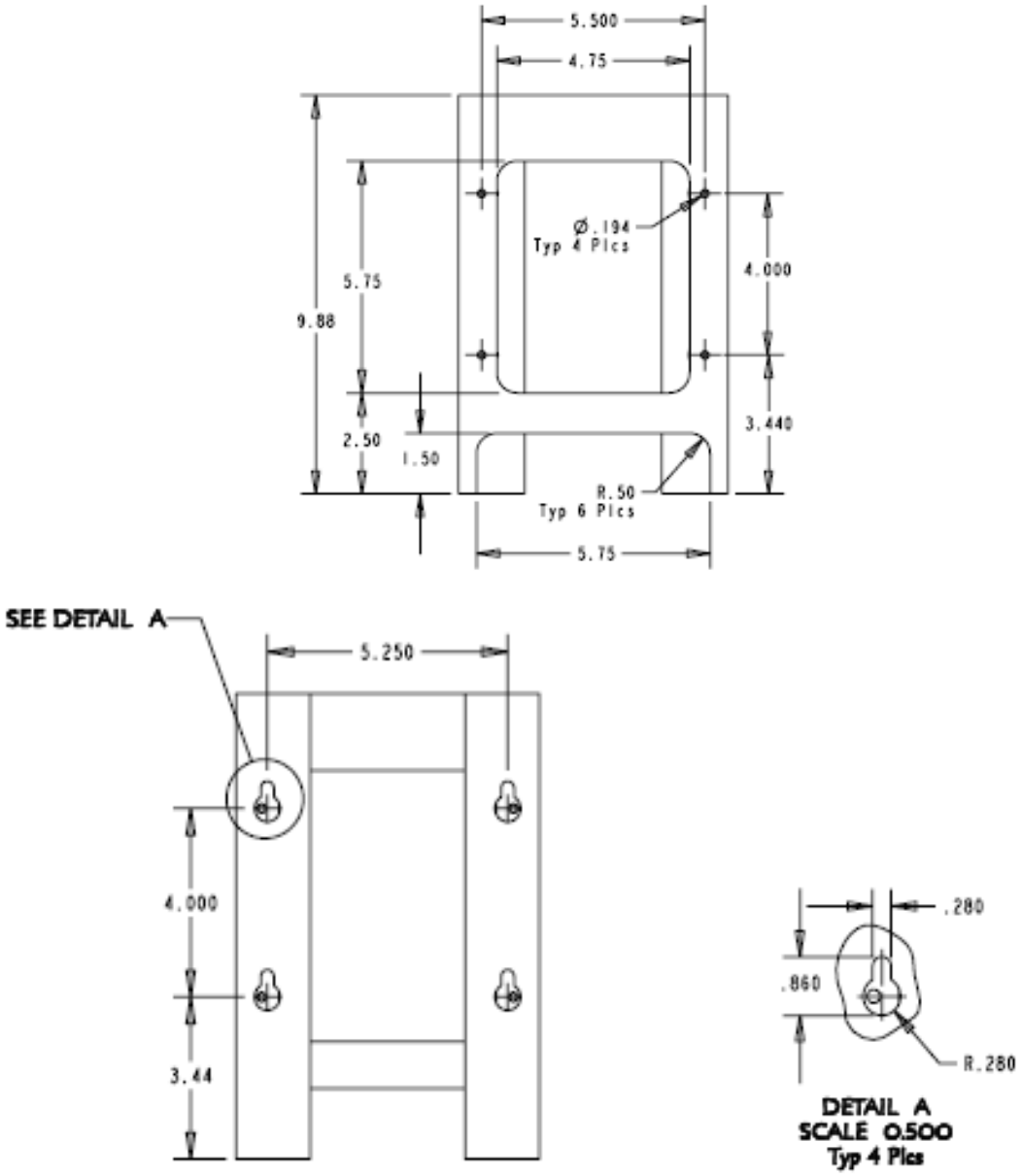


Figure 4. Dimensions for the transmitter mounting bracket. (Separate Mounted 9062 Analyzer only)

2.2 *SAMPLE REQUIREMENTS*

The maximum sample pressures and temperatures specified in the SPECIFICATION section should not be exceeded. The sample should be introduced to the system at a temperature and pressure suitable for measurement. If necessary, customer may choose to use sample cooling and pressure reducing equipment. **It is highly recommended that a flow meter is installed to the sample inlet stream to ensure that the sample flow rate is within the specified range.** When pressure reducing equipment is being used, a pressure relief valve should be installed between the sample point and sample inlet to ensure maximum safety.

2.3 *EXTERNAL PIPING CONNECTIONS*

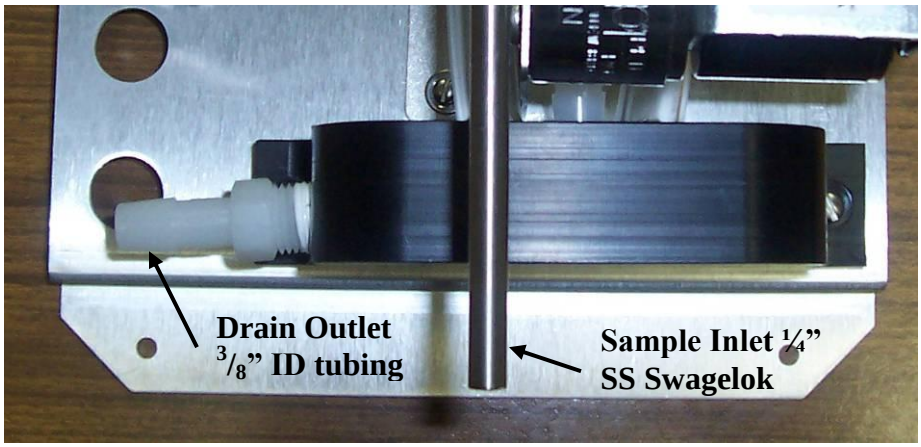


Figure 5. The bottom of the wet section plate, with the sample inlet and drain connections shown.

2.4 *ELECTRICAL CONNECTIONS*

2.4.1 *WET SECTION UNIT*

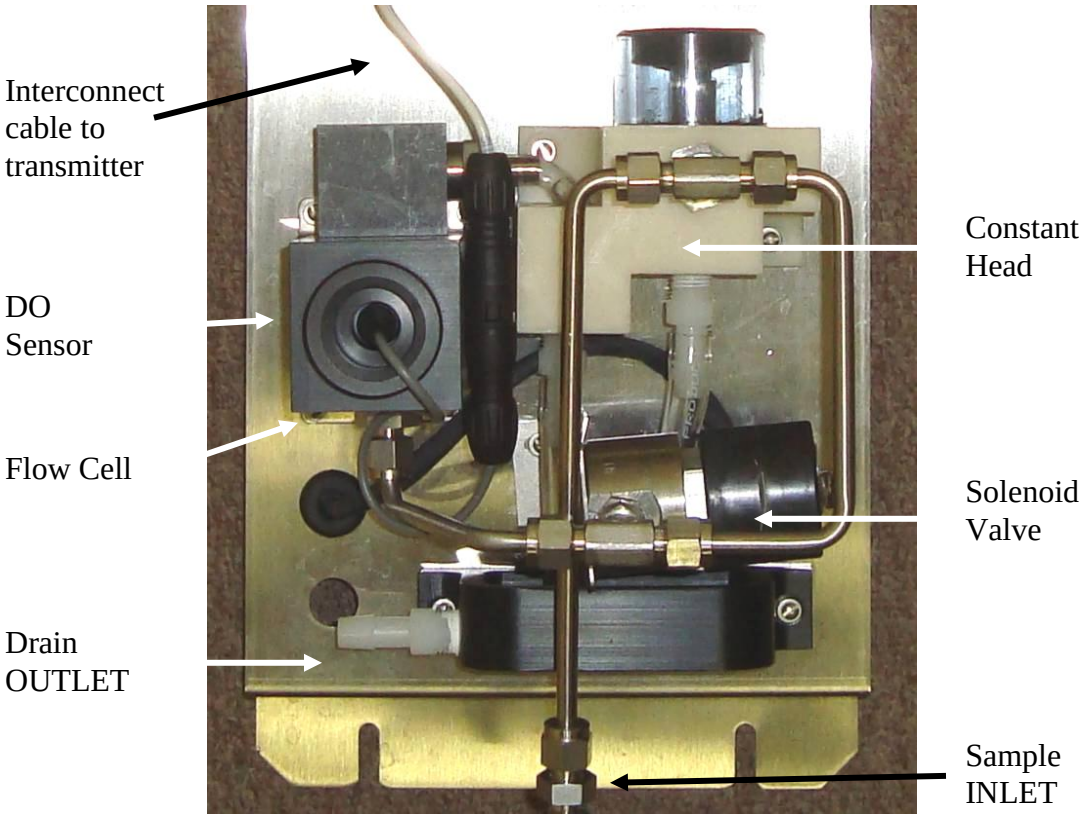


Figure 6. The wet section layout and connections for Separated Wet Section.

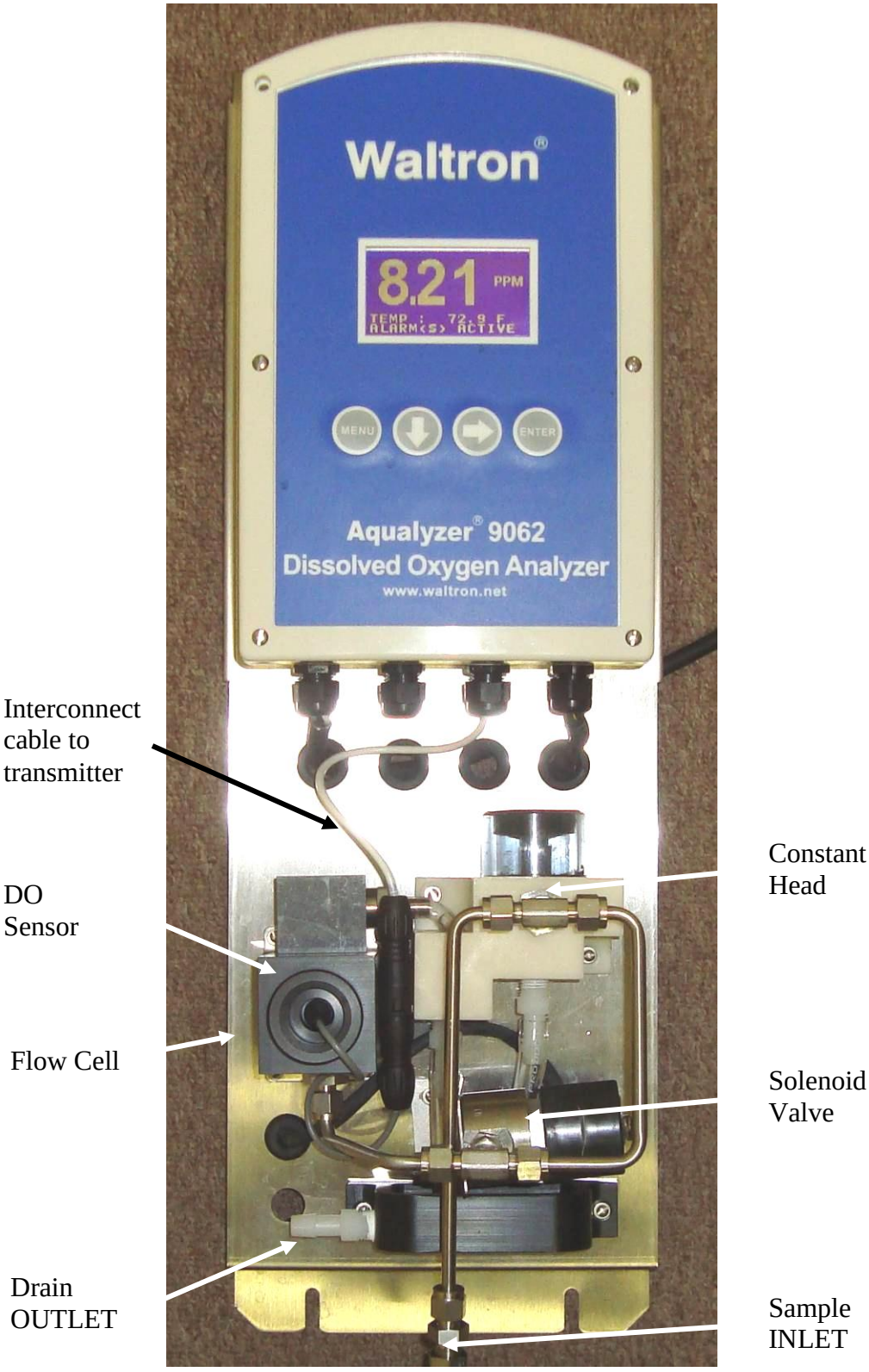


Figure 7. The wet section layout and connections for the Combined Wet Section.

2.4.2 *TRANSMITTER UNIT*

Proceed as follows to gain access when making the necessary wiring connections:

Remove the six screws securing the top cover of the transmitter unit. Pass appropriate cables thru the 4 cable glands for the following connections:

- Power Supply
- Solenoid and Alarms
- 4-20mA Current Output and Communication Interface
- Sensor Wiring

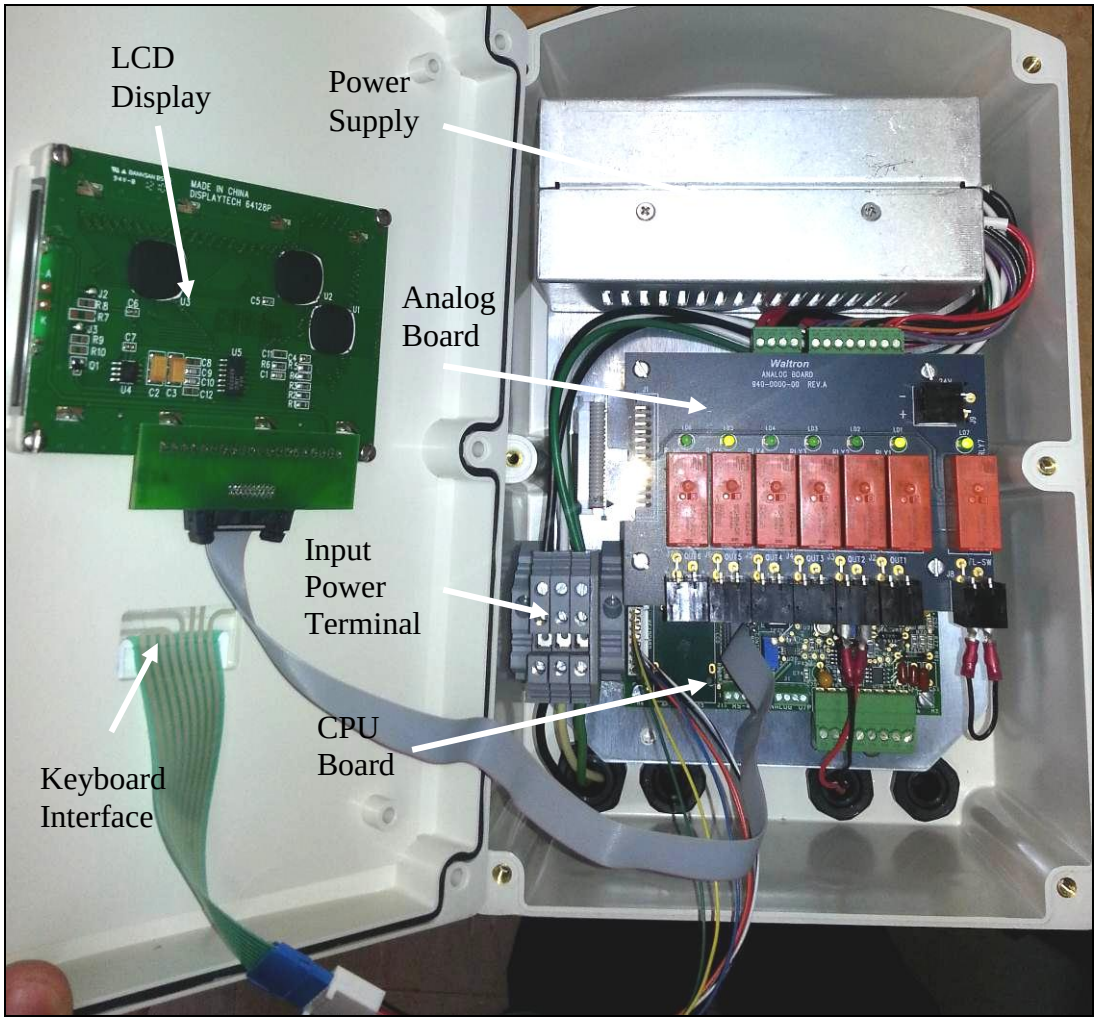


Figure 8. The layout and components of the transmitter case.

Note. Before connecting the analyzer to the main power supply check that there is correct voltage at the mains.

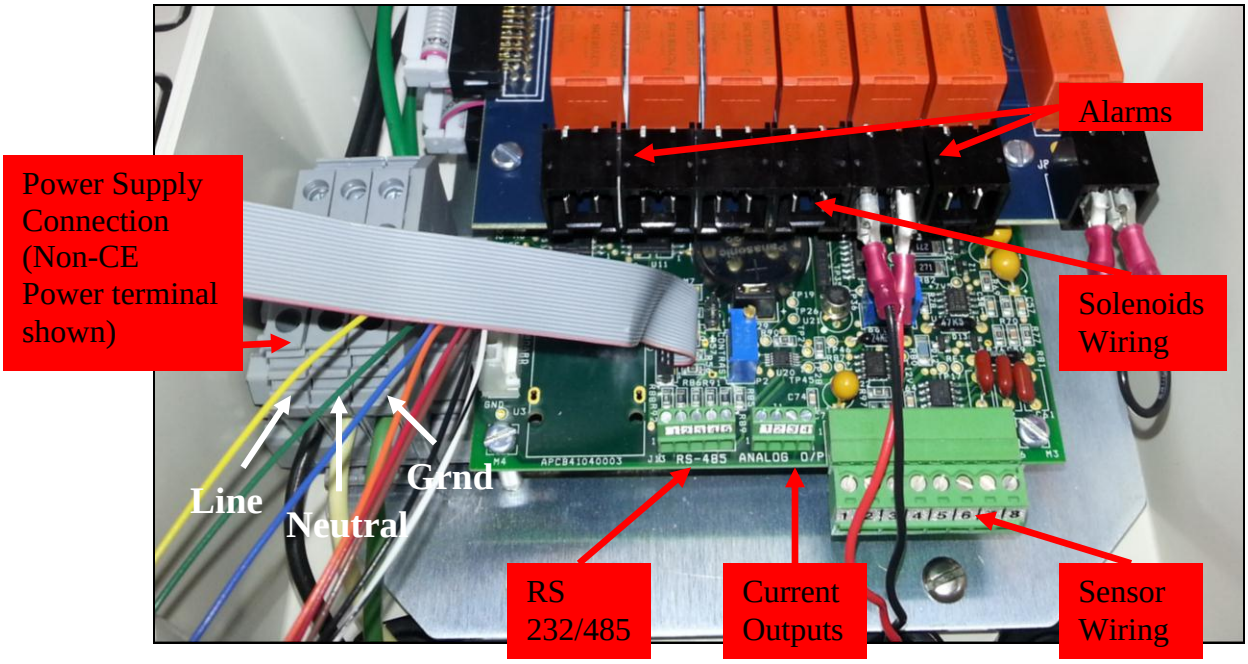


Figure 9. Location of the terminal block connections in the transmitter unit.

⃠**WARNING.** Although this instrument has internal fuse protection, the operator must use a suitably rated external protection device such as a fuse or miniature circuit breaker (MCB).
Switch **OFF** the power supply and high voltage power-operated control circuits before making any connections. This equipment operates on alternating current (AC) electricity. Always take suitable safety precautions to avoid the possibility of an electric shock.

⃠**WARNING.** Connecting the power supply earth (ground) ensures the safety of assembly personnel, reduction of the effects of Radio Frequency Interference (RFI), and ensures operation of the power supply interference filter.

2.4.3 *AC POWER TERMINAL BOX (OPTIONAL)*

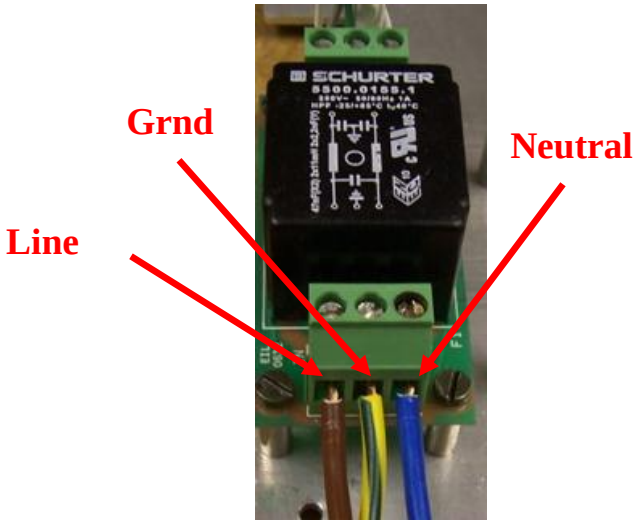
If user wishes to hard wire the system they can use an optional AC Power Terminal Box (P/N P1000-059).

If the user requires CE certification this box is mandatory.

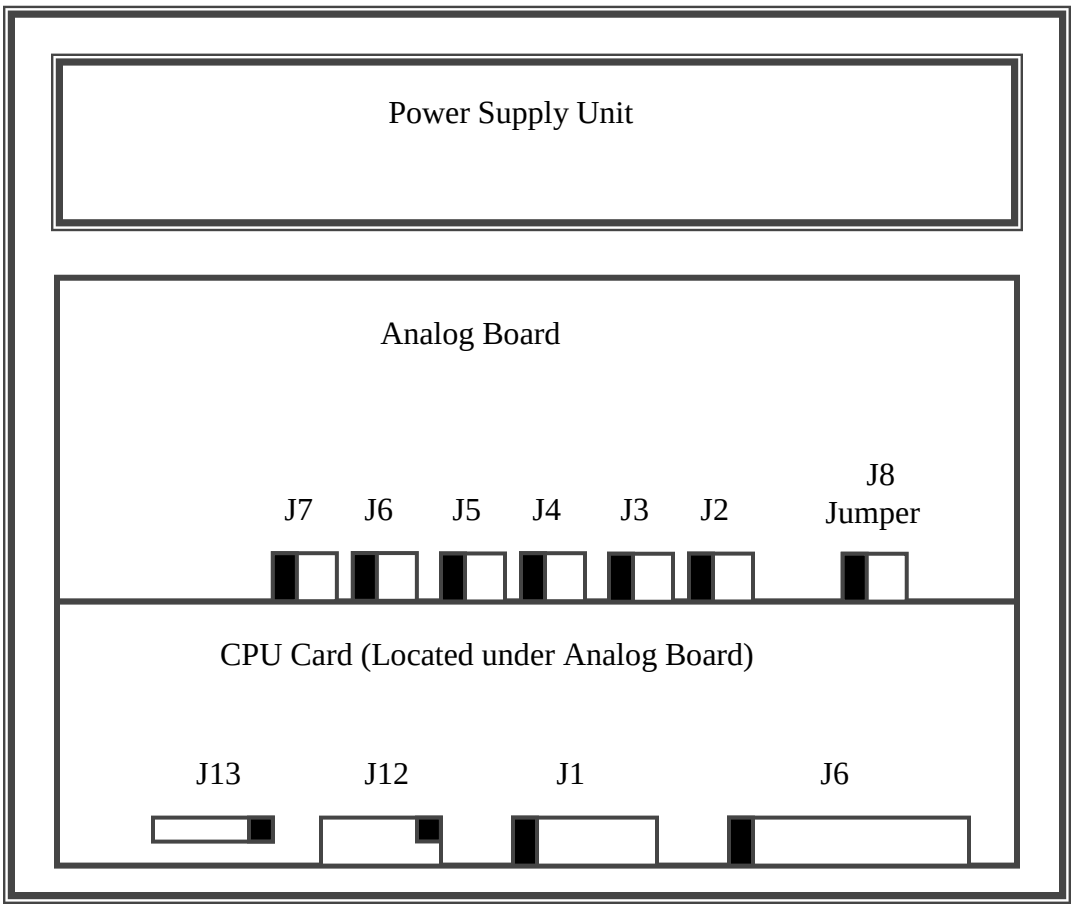
The user can turn ON/OFF power to the analyzer by pressing the GREEN button on the terminal box. When power is supplied to the analyzer the button will illuminate. The terminal box has IP66 rating and contains 3 AC power lines (LINE, GOUND, NEUTRAL) input and output. Picture of terminal box is shown below:

2.4.4 *CE POWER CONNECTIONS (OPTIONAL)*

For analyzers that are CE certified, the AC power box must be used (above). The power connections from the AC power box to the transmitter power terminal are shown below:



2.4.5 *WIRING TO TRANSMITTER*



Note: Pin 1 of all the connectors are shown in black

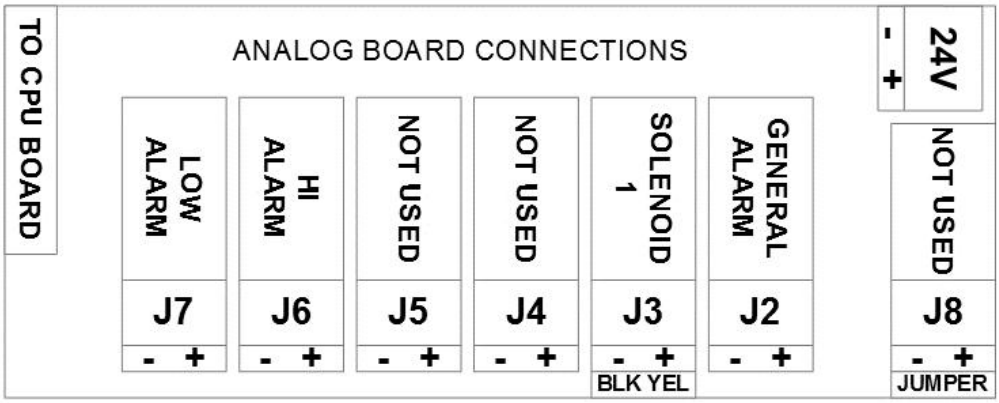


Figure 10. Pin locations for the Analog and CPU cards.

The Analog card is mounted above the CPU card. The CPU and Analog cards communicate with each other through a common flat ribbon cable and mating connectors. Power supply to the respective cards is routed through common cables and connectors.

The approximate dimensions of the subassemblies are as follows.

CPU card - 131.5 mm (L) x 130 mm (W)
Analog card – 131.5 mm (L) x 100 mm (W)
Power Supply cards x 2 – 127 mm (L) x 76.2 mm (W) [Housed in common enclosure]

All field I/Os are routed inside the instrument through cable glands. All field I/Os for the sensor inputs are terminated on PHOENIX connector terminals. The terminal receptacle is a "90 ° Block Header" with "socket to pin orientation" and the plug is 180° "wire to plug" orientation. The plug accepts a 30-14 AWG wire.

Connections to the Analog board are terminated via crimp terminals. Refer to the appendix in the back of the manual for instructions on properly crimping terminals to the wire ends.

Connecting the Wet Section to Transmitter:

The PVC shielded cables coming as an output from the sensor and thermistor are connected to J6 of CPU Card as follows:

Card	Connector	Pin Number	Connection	Color
CPU	J6	1	Thermistor	Purple
CPU	J6	2	DO Sensor +	Red
CPU	J6	3	DO Sensor -	Blue
CPU	J6	4	Thermistor	Purple
CPU	J6	5	NC	
CPU	J6	6	NC	
CPU	J6	7	NC	
CPU	J6	8	NC	

Connecting the Current Output(s) to Transmitter:

Two 4-20mA current outputs supplying analog output proportional to the dissolved oxygen concentration are provided on the J1 connector on the CPU card. The pin locations from the connector are shown below:

Card	Connector	Pin Number	Connection
CPU	J1	1	Iout1
CPU	J1	2	FGnd
CPU	J1	3	Iout2
CPU	J1	4	FGnd

Note: In case no load is connected, it is advisable to connect a 470-ohm load resistor between Pin 1 & 2 and Pin 3 & 4 respectively.

Connecting the Alarm outputs to Transmitter:

Potential free contacts for High Alarm/ High-High Alarm and Low Alarm/ High Warning Alarm are terminated on the J6 and J7 connectors (provided on the Analog Board) as shown in Figure 8.

The pin locations from the connector are shown below:

Card	Connector	Alarm/Solenoid	Pin Number	Connection
Analog	J7	Low Alarm OR High Warning	1	-
Analog	J7		2	+
Analog	J6	High Alarm OR High High Alarm	1	-
Analog	J6		2	+

Similarly, potential free contacts for General Alarm are terminated on the J2 connector (provided on the Digital I/O card) as shown in the Figure 8.

Card	Connector	Alarm/Solenoid	Pin Number	Connection
Analog	J2	General Alarm	1	-
Analog	J2		2	+

Connecting the Solenoid to the Transmitter:

The solenoid valve is terminated on the J3 connector (provided on the Analog card) as shown in Figure 8. The +24V DC excitation @ 400mA is provided on board.

The pin out of the connector is as shown below:

Card	Connector	Alarm/Solenoid	Pin Number	Connection
Analog	J3	Solenoid 1 (CAL)	1	S1- (BLACK)
Analog	J3		2	S1+ (YELLOW)

Connecting the Serial Communication Ports to Transmitter:

Two separate serial ports for RS-232 and RS-485 are provided on the CPU card. These ports are located near connector J1.

The pin locations from the communication ports are shown below:

Card	Connector	Serial Com	Pin Number	Connection
CPU	J12	RS-232	1	NC
CPU	J12		2	RxD
CPU	J12		3	TxD
CPU	J12		4	NC
CPU	J12		5	Gnd
CPU	J12		6	NC
CPU	J12		7	NC
CPU	J12		8	NC
CPU	J12		9	NC
CPU	J12		10	NC

Card	Connector	Serial Com	Pin Number	Connection
CPU	J4	RS-485	1	NC
CPU	J4		2	Data+
CPU	J4		3	Data-
CPU	J4		4	NC
CPU	J4		5	Gnd
CPU	J4		6	NC
CPU	J4		7	NC
CPU	J4		8	NC
CPU	J4		9	NC
CPU	J4		10	NC

3 OPERATING THE ANALYZER

3.1 *ANALYZER OPERATION*

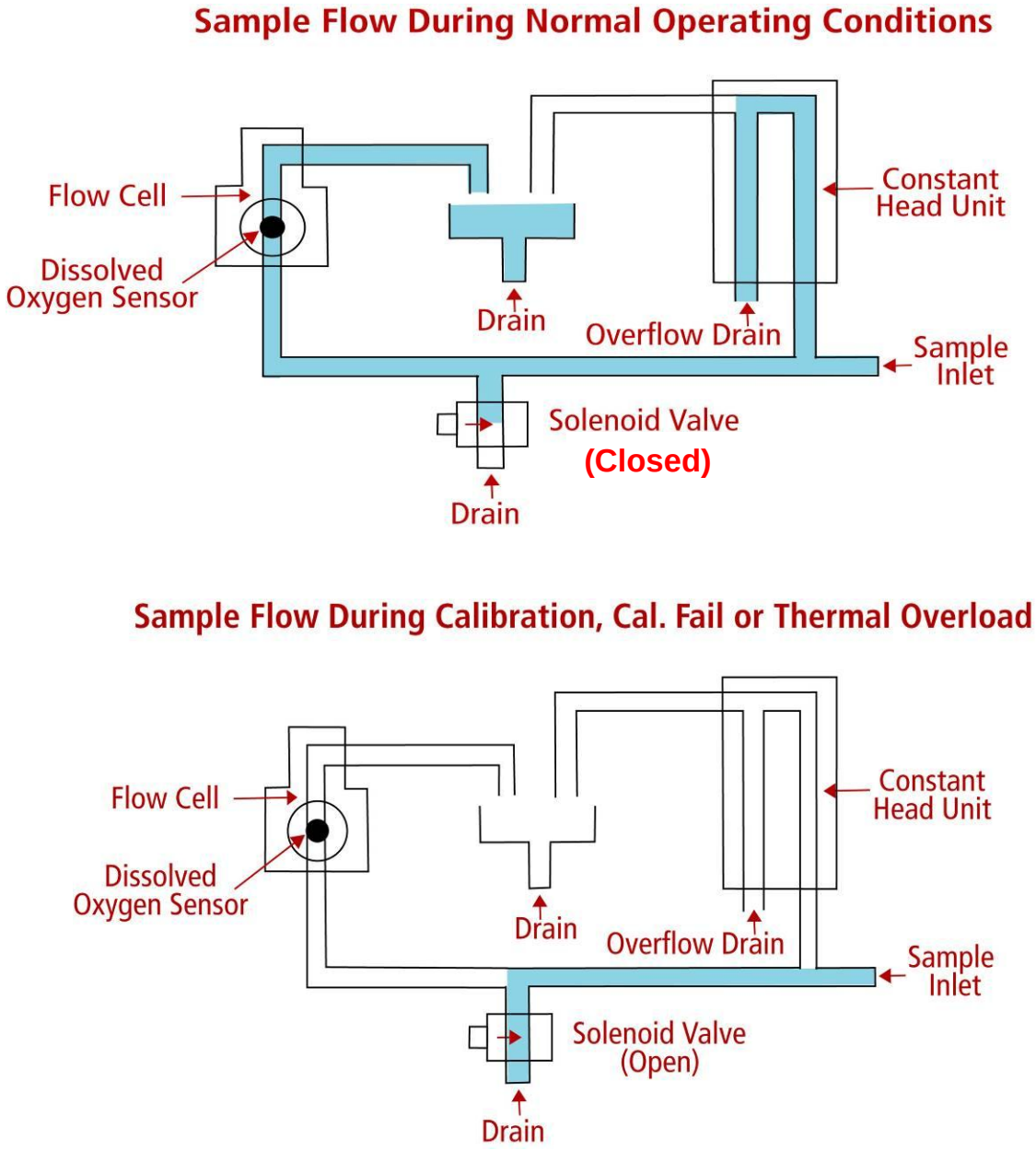


Figure 11. The path of sample through the system.

The 9062 Dissolved Oxygen analyzer wet section is comprised of a combination sheet metal and plastic enclosure. The internal hydraulic components and pipe work are mounted onto a sample panel connected to the cabinet. Sample enters through the inlet compression fitting at the bottom of the case.

After entering the system, the sample passes through internal pipe work. The sample is first sent to the constant head unit where the effects of changes in sample inlet flowrate are stabilized. The sample is also sent through the solenoid valve. The solenoid valve allows sample to enter the flowcell. The solenoid valve is also used to drain the flowcell and expose the sensor to air during the calibration sequence. Sample overflow from the constant head unit and the outlet sample from the flowcell are sent to a common drain in the bottom of the case. A schematic diagram of the sample flow is given in Figure 8.

The oxygen sensor is a Teflon-membrane galvanic cell in the form of disposable body and wire assembly. The galvanic cell utilizes a silver cathode and a lead anode to generate a current output proportional to the amount of dissolved oxygen. The expected life of a sensor is 2 years in continuous operation. However, certain factors such as high dissolved oxygen levels and increased temperatures have a direct affect on the life of the sensor.

The dissolved oxygen sensor assembly plugs into the interconnect cable which is consists of a male connecting jack and two leads for wiring into the transmitter. The sensor assembly is attached to the flowcell by a knurled clamping screw. A temperature sensor (thermistor) is located inside the flow cell and is used to detect the temperature of the sample. The thermistor is connected to the transmitter unit and compensates for changes in output from the sensor over a range of 41°F to 131°F (5 °C to 55°C).

Calibration of the analyzer is controlled by a micro-controller. After the user connects the transmitter unit to the wet section, it is necessary to perform one successful calibration. See Section 3.6 for more details on calibration. Once a successful calibration is performed, the unit is now ready to measure the dissolved oxygen concentration in the sample. The display then shows the ppm/ppb concentration of the sample while the analyzer compensates for the variations in the sample temperature automatically.

3.2 *ALARMS*

DEAERATED WATER SYSTEM

When the 9062 Dissolved Oxygen system is in DEAERATED mode both alarms operate as ‘high’ alarms. Each alarm will be activated when the oxygen level increases beyond the set values. For example, the HIGH setting will act as a warning that the oxygen level has increased beyond a reasonable level, and the HIGH-HIGH setting may be used in a shut-down capacity. See Section 3.6.2.4 for details on setting the set points for the two alarms. The two dissolved oxygen alarms control the relays provided, each relay has one pair of changeover contacts rated at 2A, 250VAC (non-inductive).

The terminal connections are located at J2, J6, and J7 of the Analog card - see Section 2.4 for more detail.

DEAERATED WATER SYSTEM		
Symbol	ALARM	DESCRIPTION
A1	High Warning	Activates when DO in sample feed is higher than “Low Set Point”.
A2	High-High Alarm	Activates when DO in sample feed is higher than “High Set Point”.

OXYGENATED WATER TREATMENT SYSTEM

When the 9062 dissolved oxygen system is in OXYGENATED mode one alarm operates as a “low” alarm and the other operates as a ‘high’ alarm. Alarm 1 (A1) operates as a LOW alarm when the oxygen level decreases below the set value. Alarm 2 (A2) operates as a HIGH alarm when the oxygen level increases above the set value. The two dissolved oxygen alarms control the relays provided, each relay has one pair of changeover contacts rated at 2A, 250VAC (non-inductive).

OXYGENATED WATER TREATMENT SYSTEM		
Symbol	ALARM	DESCRIPTION
A1	Low Alarm	Activates when DO in sample feed is lower than “Low Set Point”.
A2	High Alarm	Activates when DO in sample feed is higher than “High Set Point”.

Various Alarm Descriptions

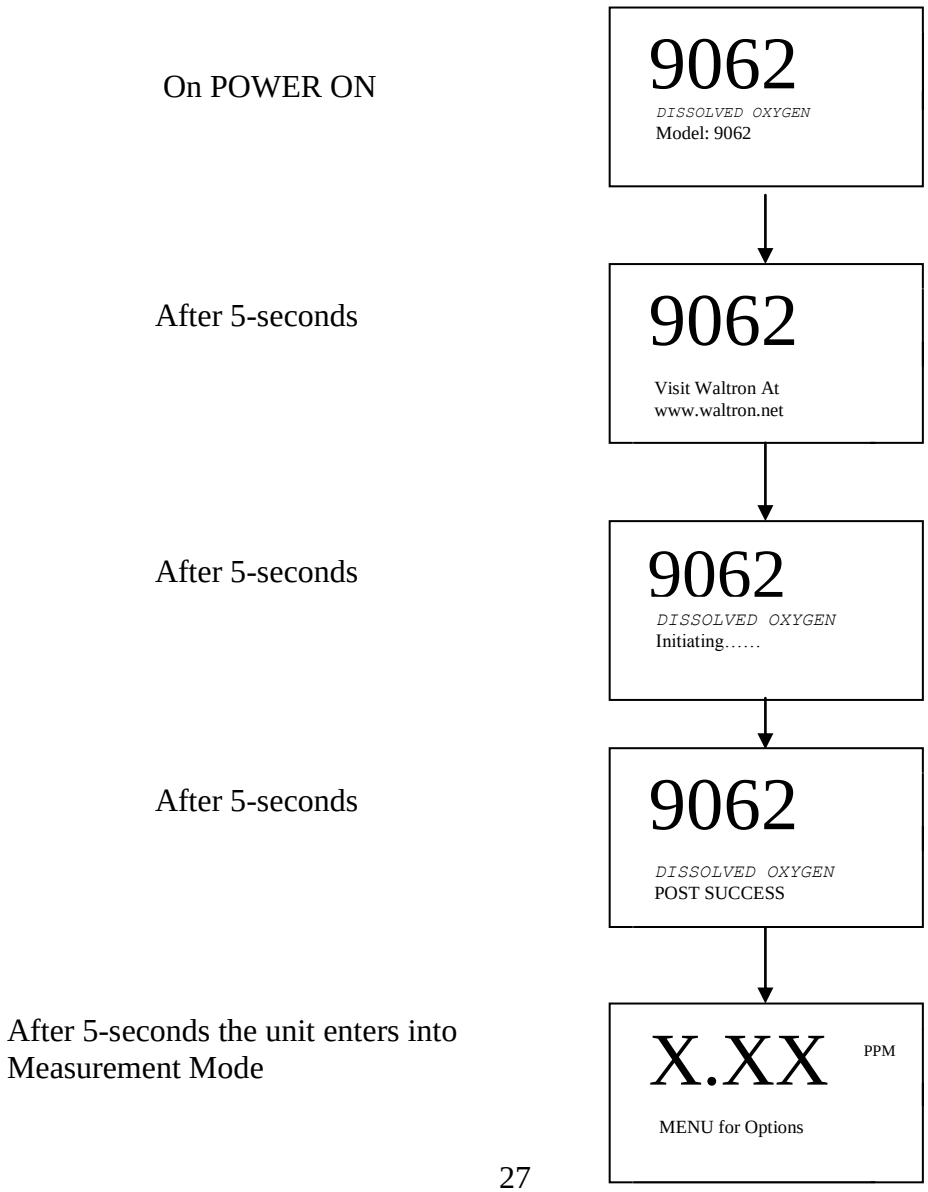
ALARM	DESCRIPTION
CF	Calibration Fail
HOT	Sample temperature over range (131F)
TEMP	No thermistor response
Output 1 Out	Concentration is outside O/PmA 1 set range
Output 2 Out	Concentration is outside O/PmA 2 set range
Conc. Low	Concentration is below Low Alarm set point
Conc. High	Concentration is above High Alarm set point
OVR	Concentration is above limits of analyzer (>10ppm)

3.3 *GETTING STARTED*

- Insert the power cord into the terminal connector housed inside the electronics section and switch ON the system. The power up sequence should be as mentioned in Section 3.4. After power up, the analyzer enters into Measurement Mode.
- The analyzer automatically displays the concentration of dissolved oxygen read by the sensor. Units of measurement (ppb/ppm) are displayed on the right hand side of the LCD.
- If the analyzer is being started up for the first time, or if it was not in operation for a long time, the user should perform a calibration as detailed in Section 3.7.1.

3.4 *POWER UP SEQUENCE*

- After switching ON the analyzer the following start up sequence is displayed:



3.5 *KEY-BOARD FUNCTIONS*

Figure 12. The front panel of the transmitter unit.

There are four keys on front panel (shown above) which are used to navigate/view/edit the various menus/parameters. The functionality of the keys is described below:

- **MENU**: The MENU key can be used at anytime to return to the Main Menu. When the MENU key is pressed the Main Menu options are displayed. There are 6 Main Menu options and only 2 sub menus are displayed at a time, on two separate lines.

- **DOWN ARROW**: By pressing this key the user can navigate through the various menu and sub-menu options. This same key also functions as an increment key during numerical entry**.**

- **RIGHT ARROW**: This key is used to position the cursor at the desired place; the cursor moves in a left to right direction.

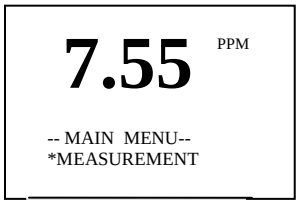
- **ENTER**: This key is used to enter into a selected menu. It is also used to confirm/store entered values.

3.6 *ANALYZER MODES*

There are 6 Main Menu options; each is listed below:

1. **MEASUREMENT** – Displays information during normal operation
2. **CONFIGURATION** – Used to configure analyzer settings
3. **MANUAL CALIB** – Perform manual calibration
4. **FAIL SAFE** – Used to shut-down/power off analyzer
5. **DIAGNOSTICS** – Stores data logs and aids in troubleshooting
6. **DISPATCH MODE** – Used to troubleshoot/calibrate electronics

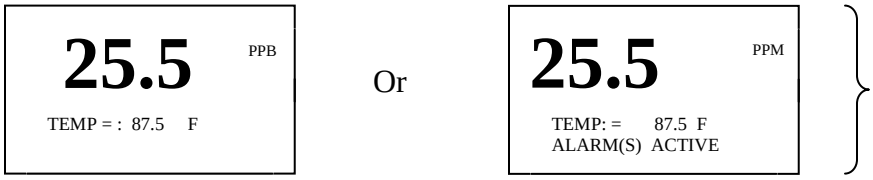
To enter the Main Menu press the MENU Key. The following screen is displayed:



Note: The '*' indicates the selected item of that particular menu item/sub-menu:

3.6.1 *MEASUREMENT*

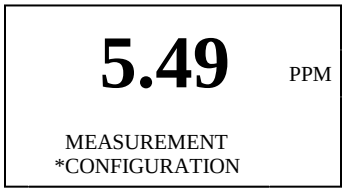
Press the ENTER key to go to MEASUREMENT screen. The display shows:



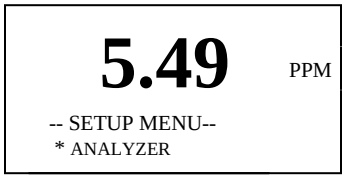
Note:	The system loops backs to the MEASUREMENT mode and displays the measurement screen if there is no keypad activity for 60 seconds.

3.6.2 *CONFIGURATION*

To go to the CONFIGURATION menu press the DOWN arrow key once to display the following screen.



Press the ENTER key to enter CONFIGURATION menu; the following sub-menu is displayed:



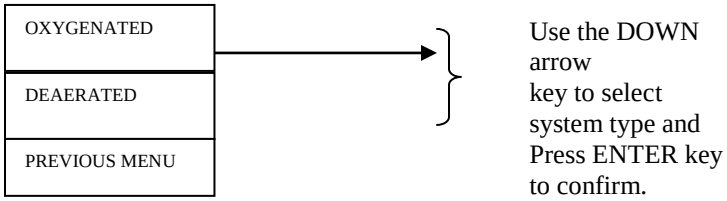
Press the DOWN arrow key to scroll down the remaining sub-menus. The CONFIGURATION menu has the following sub-menus:

1. **ANALYZER** – Used to select Oxygenated or Deaerated modes
2. **CALIB SETUP** – View/change frequency and settings for manual/auto calibration
3. **O/P mA SETUP** – View/change settings for current output (4-20mA) alarms
4. **ALARM SET PTS** – View/change settings for High/Low/General Alarms
5. **DATE & TIME** – View/change date and time settings
6. **SERVICE PARAMS** – Password protected; controls valve timing during CAL
7. **SERIAL PORT** – View/change settings used for remote interface communication
8. **PREVIOUS MENU** – Reverts back to previous menu (Main Menu)

To navigate through the sub-menus press the DOWN arrow key. To select an item from the menu press the ENTER key whenever that sub-menu item is highlighted (‘* ‘). The logical flow is shown below. For simplicity all the sub-menus are shown at once.

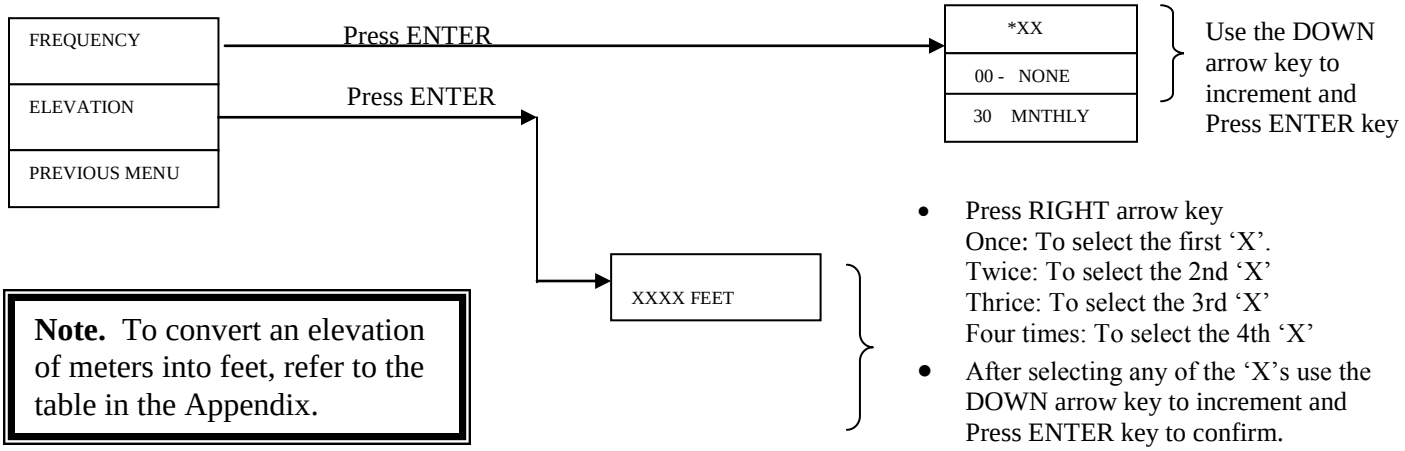
3.6.2.1 ANALYZER SYSTEM

The sub-menus for ANALYZER SYSTEM are as follows:



3.6.2.2 CALIB SETUP (Calibration Set-Up)

The sub-menus for CALIB SETUP are as follows:

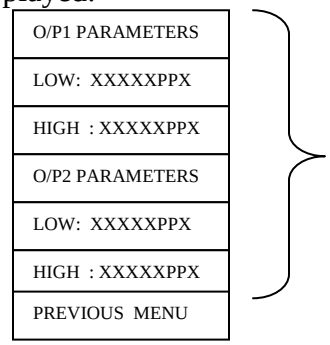


Note. To convert an elevation of meters into feet, refer to the table in the Appendix.

- Press RIGHT arrow key
  Once: To select the first ‘X’.
  Twice: To select the 2nd ‘X’
  Thrice: To select the 3rd ‘X’
  Four times: To select the 4th ‘X’
- After selecting any of the ‘X’s use the DOWN arrow key to increment and Press ENTER key to confirm.
- Pressing the ENTER key when the PREVIOUS MENU is displayed, loops back the display to the previous menu.

3.6.2.3 O/P mA SETUP

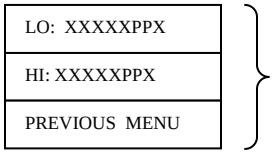
Press the ENTER key when O/P mA menu is displayed. The following sub-menus are displayed:



- XXX.XX and the last character of PPX all editable parameters.
- Press RIGHT arrow key
  Once: To select the first 'X'.
  Twice: To select the 2nd 'X'
  Thrice: To select the 3rd 'X'
  Four times: To select the 4th 'X'
  Five times: To select the 5th 'X'
- After selecting any of the 'X's use the DOWN arrow key to increment and Press ENTER key to confirm.
- Pressing the ENTER key when the PREVIOUS MENU is displayed loops back the display to the previous menu. . i.e, O/P mA SETUP

3.6.2.4 ALARM SET PTS

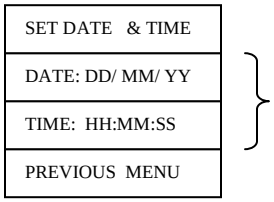
Press the ENTER key when ALARM SET PTS menu is displayed. The following sub-menus are displayed:



- XXX.XX and the last character of PPX all editable parameters.
- Press RIGHT arrow key
  Once: To select the first 'X'.
  Twice: To select the 2nd 'X'
  Thrice: To select the 3rd 'X'
  Four times: To select the 4th 'X'
  Five times: To select the 5th 'X'
- After selecting any of the 'X's use the DOWN arrow key to increment and press ENTER key to confirm.
- Pressing the ENTER key when the PREVIOUS MENU is displayed loops back the display to the previous menu.i.e, ALARM SET PTS

3.6.2.5 DATE & TIME

Press the ENTER key when DATE & TIME menu is displayed. The following sub-menus are displayed:

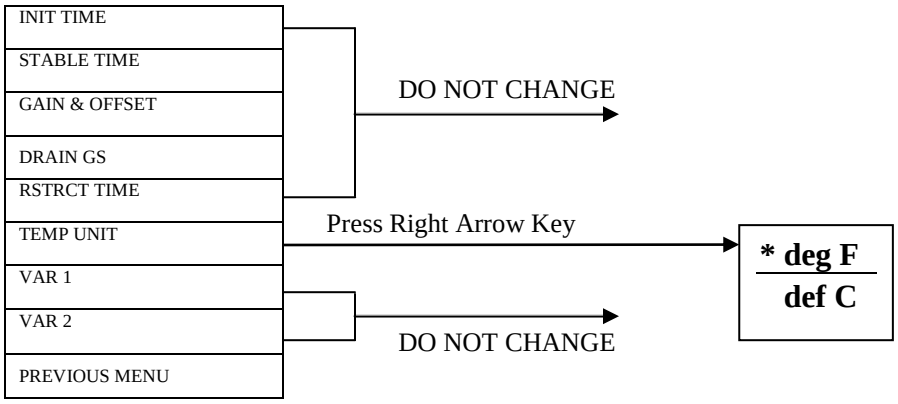


- DD, MM, SS, HH MM, SS are all editable parameters where DD is the Day, MM the Month, YY the Year, HH the Hours, MM the Minutes and SS the Seconds.
- Press RIGHT arrow key
  Once: To select 'DD'.
  Twice: To select 'MM'
  Thrice: To select 'YY'
- The highlighted value may be changed using the DOWN arrow key to increment and followed by ENTER key to confirm
- Pressing the ENTER key when the PREVIOUS MENU is displayed loops back the display to the previous menu (DATE & TIME)

The above explanation is valid while editing TIME also.

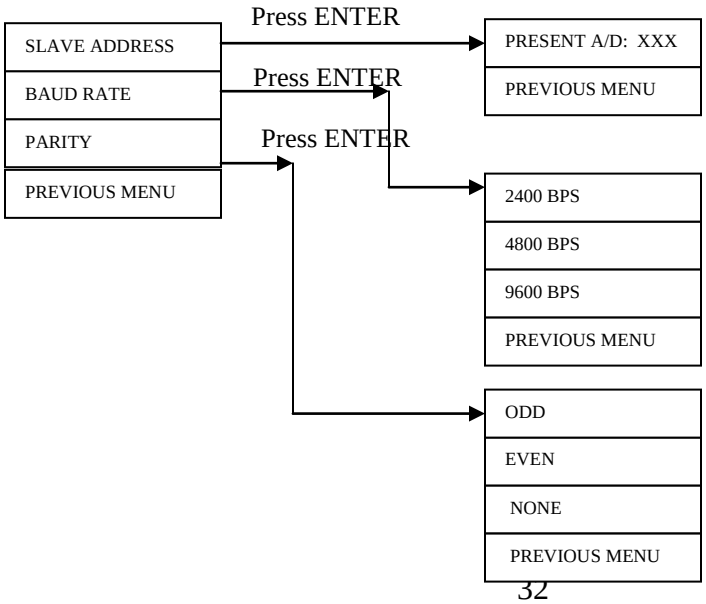
3.6.2.6 SERVICE PARAMATERS

1. Press ENTER key when Service Params menu is displayed. This menu is password protected and these default settings should not be changed.
2. Enter password by pressing menu key, down arrow key, right arrow key, enter key.
3. Use down arrow key to select degree display unit and press ENTER key to confirm.
4. Do NOT change the other default menu settings.
5. Pressing the ENTER key when the PREVIOUS MENU is displayed loops back the display to the previous menu.



3.6.2.7 SERIAL PORT

Press the ENTER key when SERIAL PORT menu is displayed. The following sub-menus are displayed:



- "XXX" are all editable parameters.
- Press RIGHT arrow key
  Once: To select the first 'X'.
  Twice: To select the 2nd 'X'
  Thrice: To select the 3rd 'X'
- After selecting any of the 'X's use the DOWN arrow key to increment and Press ENTER key to confirm
- Use DOWN arrow key to select and highlight baud rate /parity.
- Pressing the ENTER key when the PREVIOUS MENU is displayed loops back the display to the previous menu.

3.6.2.8 PREVIOUS MENU

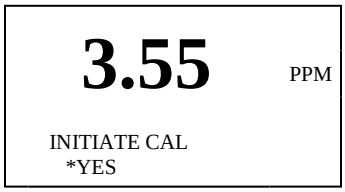
Pressing the ENTER key when the PREVIOUS MENU is displayed reverts back to the previous menu.

3.6.3 *MANUAL CALIBRATION*

Go to the MANUAL CALIB menu and press ENTER; the following screen will appear:

Press ENTER key

Else, press DOWN arrow key



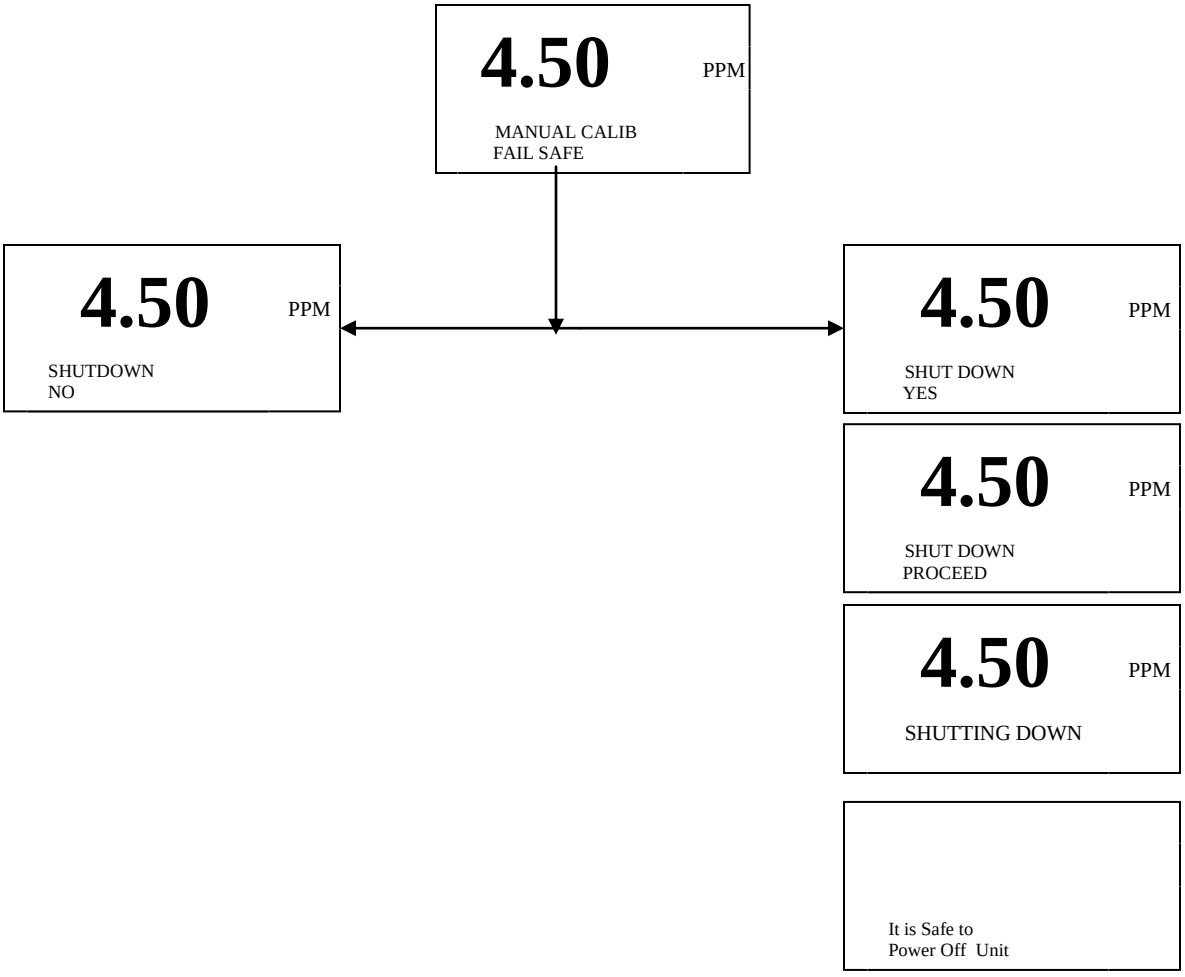
After confirmation, the system will initiate CALIBRATION cycle.

If the ENTER key is pressed at this point the Calibration cycle ends. The menu guides you through the abort process.

3.6.4 *FAIL SAFE*

This mode is used to perform a safe shut down so that the necessary parameters and changed default values are properly saved. To perform a safe shutdown go to the FAIL SAFE menu and press ENTER.

To go to the FAIL SAFE menu press the MENU key to get to MAIN MENU. Press DOWN arrow key to FAIL SAFE and press ENTER. The display will show the following screen during shutdown:

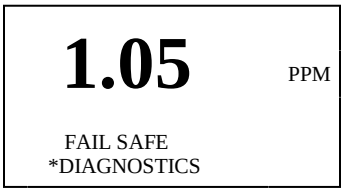


NOTE: Switching off the system abruptly, without going into FAIL SAFE mode may result in malfunctioning of the system after next power ON.

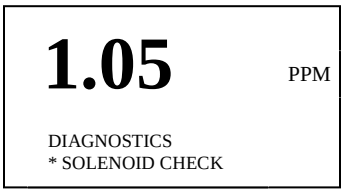
3.6.5 *DIAGNOSTICS*

A complete set of system diagnostics is provided so that various system parameters and diagnostic tasks such as switching relays ON/OFF, activating/de-activating the alarms and viewing logs may be carried out quickly and easily.

To access diagnostic parameters press the MENU key to get to MAIN MENU and go into the DIAGNOSTICS menu and press ENTER to display the following screen:



Press the ENTER key to display the sub-menus. The display shows:



The DIAGNOSTICS menu has the following sub-menus:

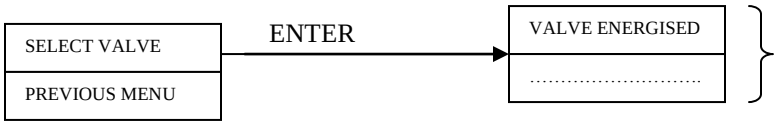
1. **SOLENOID CHECK** – Manually checks the operation of each solenoid valve
2. **CALIB LOG** – Stores data for the last 10 calibrations
3. **ALARM LOG** – Stores data for the last 10 alarms
4. **PROBE DETAILS** – Input probe data for historical record
5. **THERM CHECK** – Checks real-time output from thermistor
6. **SENSOR CHECK** – Check real-time output from probes
7. **RELAY CHECK** – Checks status of relays
8. **O/P mA CHECK** – Manually sends 4-20mA outputs
9. **DIGITAL I/PS** – Checks status of digital I/Ps
10. **SERIAL CHECK** – Checks communication of serial port
11. **S/W VERSION** – Shows current version of software
12. **PREVIOUS MEN**U – Returns to previous menu (Main Menu)

To navigate through the sub-menus, press ENTER key whenever the sub-menu is highlighted (‘* ‘).

3.6.5.1 SOLENOID CHECK

This mode is used to check the operation/status of the solenoid valves. To perform a solenoid check go into the DIAGNOSTICS menu and select SOLENOID CHECK. The menu layout of the solenoid check cycles is as follows:

Press the DOWN arrow key to select which valve you want to initiate. Press ENTER to activate the valve.

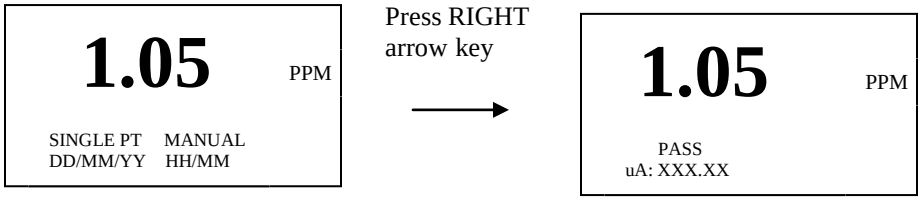


Press DOWN, RIGHT and ENTER keys to go to previous sub menu.

3.6.5.2 CALIBRATION LOG

The Calibration Log (CALIB LOG) stores the relevant data taken during a calibration. The data for each CALIB LOG is stored on 2 separate pages (press the RIGHT arrow key to toggle between pages).

Select CALIB LOG in DIAGNOSTICS menu and press the ENTER key. The following screen is displayed:



The **first** page of the CALIB LOG shows:
- Calibration---→Single PT
- Type----------→Auto, Manual
- Date---------- → Date of Calibration
- Time--------- → Time of Calibration

The **second** page of the CALIB LOG shows:
- Strength---→Calibration performance
- PASS/FAIL----------→Calibration result
- uA---------- → uA seen during CAL1 sequence

To view the logs use the DOWN arrow key. A maximum of 10 logs are maintained in memory.

3.6.5.3 ALARM LOG

By pressing the ENTER key the following screen is displayed:

A log typically shows the:
Alarm Name→ Output1 Set, Conc. High Set etc.
Date---------- → Date of Alarm
Time--------- → Time of Alarm

To view the logs use the DOWN arrow key.
A maximum of 10 logs are maintained in memory.

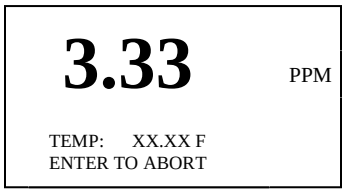
3.6.5.4 PROBE DETAILS

Upon pressing the ENTER key a screen asking for a password is displayed.
After entering the correct password the following screen is displayed:

The MfgDT is the editable part of this menu. The editing procedure is same as explained in the DATE AND TIME section.

3.6.5.5 THERM CHECK

By pressing the ENTER key the following screen is displayed:



Press the ENTER key to abort. The system will then loop back to the Previous Menu.
If no key is pressed the system will loop back to the MEASUREMENT screen after 30 seconds.

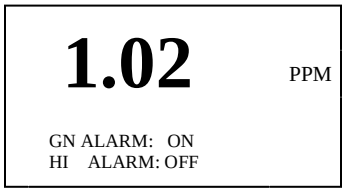
3.6.5.6 SENSOR CHECK

By pressing the ENTER key the following screen is displayed:

Press ENTER key to abort and go to the previous menu.

3.6.5.7 RELAY CHECK

By pressing the ENTER key the following screen is displayed:

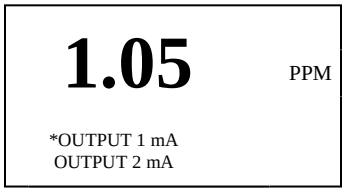


Press DOWN arrow key twice to get the following display:

This menu is used to test the Alarms. Select the sub-menu by pressing the DOWN arrow key and pressing ENTER. Use the RIGHT arrow key to select the relay and DOWN arrow key followed by ENTER key to activate or de-activate the alarms.
Pressing the ENTER key when PREVIOUS MENU is highlighted loops the system to previous menu.

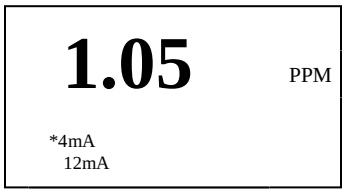
3.6.5.8 OUTPUT mA CHECK

By pressing the ENTER key the following screen is displayed:



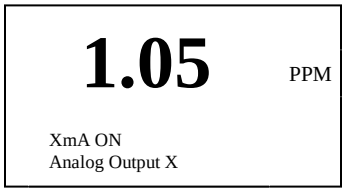
By default OUTPUT 1 mA is highlighted. Use the DOWN arrow key to select OUTPUT 1 mA or PREVIOUS MENU.

Press ENTER to display the following:



Press the DOWN arrow key to display the next option:

Press ENTER key to display the following:



Selecting PREVIOUS MENU loops the system back to the previous menu.

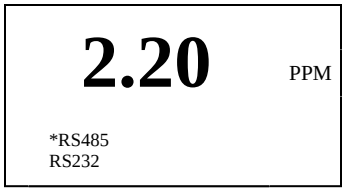
3.6.5.9 *DIGITAL* I/PS

By pressing the ENTER key the following screen is displayed:

The line "XXXXX…" corresponds to status of digital I/Ps. Press any of the four keypad keys to see a change in state. This screen can be aborted only by leaving the keyboard idle for at least 60 seconds.

3.6.5.10 SERIAL CHECK

By pressing the ENTER key the following screen is displayed:

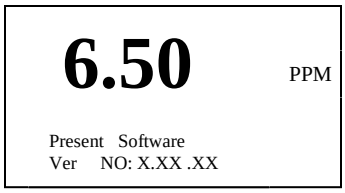


Select the type of communication (RS485 or RS232) by pressing the DOWN arrow key and press ENTER to check the serial outputs. User should get the following display:

Press the RIGHT arrow key or DOWN arrow key to go to the previous menu.

3.6.5.11 S/W VERSION

By pressing the ENTER key the following screen is displayed:



Press any key to go back to the previous menu.

3.6.6 *PREVIOUS MENU*

Selecting PREVIOUS MENU loops the system back to the previous menu.

3.6.7 *DISPATCH MODE*

DISPATCH MODE is to be used for Waltron in-house testing only.

To go to the DISPATCH MODE menu press the MENU key and the DOWN arrow key six times and then press the ENTER key to display the following screen:

Enter the password.

The following is displayed:

After connecting the mA source and pressing ENTER key, or after 30 seconds, the following screen is displayed:

The system is now in DISPATCH MODE.
To abort press the ENTER key. The user-friendly menus guide you through the abort process.

3.7 *CALIBRATION PROCEDURE*

Frequency of calibrations depends on the operating conditions and sensor conditions. Waltron recommends calibrating the instrument at least once a month however more frequent calibrations may be performed to eliminate drift due to changing sensor response.

Please be sure the following tasks are performed before executing a CALIBRATION cycle:

1) Elevation height is entered correctly and is properly stored in Calibration Setup

Detailed Description of Calibration Process

1-Point Calibration (Manual and Automatic):

1. After CAL is initiated, solenoid valve is opened for 5 minutes and sample is drained from flowcell.
2. Dissolved oxygen sensor calibrates to air inside flowcell.
3. Calibration is complete. Results are shown on display for 1 minute and then stored into CAL LOG.

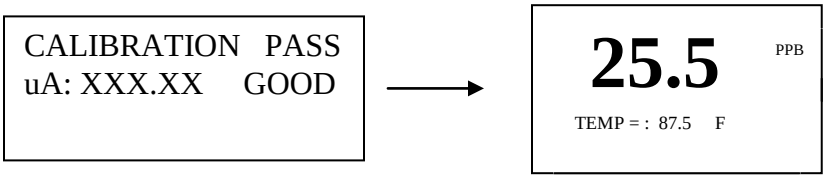
3.7.1 *CALIBRATION*

During calibration, the solenoid valve is energized and the sample in the flowcell is drained exposing the sensor to air.

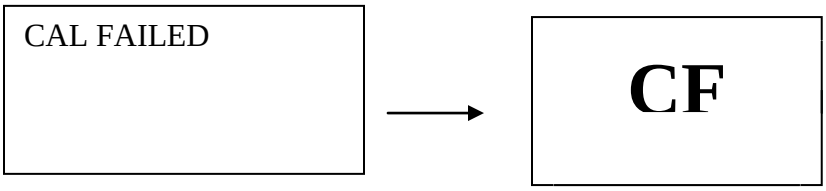
To perform Calibration:

1) Press the MENU key.
2) Press the DOWN arrow key to scroll to MAN CALIB menu and press the ENTER key to select.
3) After initiating a calibration the following message is displayed on the bottom 2 lines of the LCD.

4) After successfully completing calibration the following message is displayed and the system returns to the measurement mode.



In case of CAL FAIL the system displays the following message:



NOTE: A calibration cycle may be interrupted at any time by pressing the ENTER key. In order to avoid accidental key press, the calibration cycle is aborted only after confirmation from the user. Once the calibration process is aborted, the measurement screen is displayed.

3.7.2 *AUTO CALIBRATION*

The analyzer can be set up to perform an automatic calibration during a user-defined period. The period is user selectable and is programmed in "days" through the keyboard.

1) Press the MENU key to access MAIN MENU. Select CONFIGURATION.
2) Using the DOWN arrow key scroll down to CALIB SETUP menu and press the ENTER key to select.
3) Select FREQUENCY by pressing ENTER key.
4) Press RIGHT arrow key to move the cursor to the editable part of the display.
5) Use the DOWN arrow key to increment the number of days. Confirm the entry made by pressing the ENTER key. If ENTER key is NOT pressed the newly entered settings will NOT be stored.
6) Pressing the MENU key at any time will abort the activity and the system will not apply the recent settings. However the previous settings will remain.

3.7.3 *CALIBRATION FAILURE*

A Calibration Fail (CAL FAIL) condition will occur after a calibration if the sensor response does not meet requirements. This happens when the sensor's uA output is at or below 60% of expected level. This could be caused by a number of factors (See Troubleshooting Section).

4 MAINTENANCE

4.1 *SCHEDULED SERVICING*

No routine maintenance is required for this instrument other than periodically performing a calibration. Calibration may be performed manually or automatically.

4.2 *UNSCHEDULED SERVICING*

The monitor will indicate error/alarm conditions directly on the display.

4.2.1 *REPLACEMENT OF THE SENSOR*

- Turn off sample flow to the analyzer. (If the user does not wish to turn off sample flow they can manually activate the solenoid valve (DIAGNOSTICS – SOLENOID CHECK) so that sample drains out of the flowcell.
- When the flowcell has drained, unscrew the clamping screw and remove the sensor assembly from the front of the flowcell. Remove and inspect the large o-ring located **inside** the flowcell.
- Inspect the existing sensor and large o-ring. If the sensor membrane is stained or dirty attempt to remove deposits by gently wiping the membrane with a moist paper tissue. For oily and greasy deposits the tissue may be moistened with a mild detergent or isopropyl alcohol. After sensor is cleaned, dry the interior of the flowcell with a paper tissue or soft cloth and make sure that the larger o-ring is correctly positioned inside the flowcell up against the shoulder near the end of the cavity. Reinstall the sensor and attempt another calibration. If original sensor continues to fail calibration replace with new sensor.
- **To replace sensor**, remove the sensor from the flowcell by unscrewing the black screw clamp. Disconnect the sensor from its mating connection at the interconnect cable. Also remove and discard the large o-ring located inside the flowcell. Install new large o-ring in flowcell making sure it is correctly located on the shoulder near the end of the cavity.
- Remove the storage bottle from the new sensor and plug the sensor into the interconnector cable. Retain the bottle for any shut down procedure required in the future. Note: the o-ring in the storage bottle should be removed from the sensor body prior to installation into the flowcell.
- Carefully insert the sensor into the flow cell and tighten the retaining nut firmly.
- Turn back on sample flow or abort SOLENOID CHECK cycle.
- Press the CAL button on the transmitter unit to start a calibration sequence with the new sensor.

Caution
✓ Take care not to damage the delicate membrane on the end of the capsule.

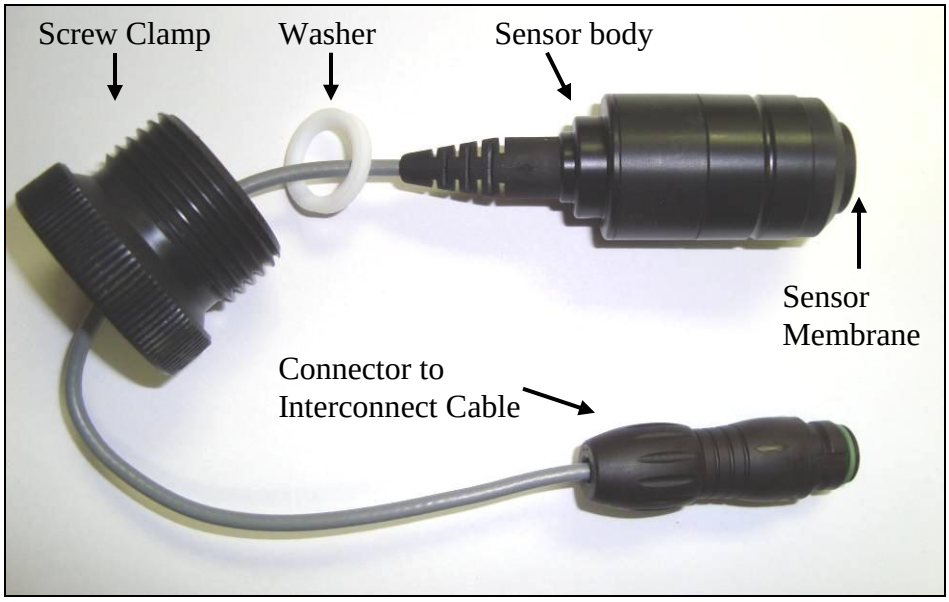


Figure 11. The Sensor Assembly.

4.3 *EXTENDED PERIOD (2+ weeks) SHUT DOWN PROCEDURE*

4.3.1 *SENSOR UNIT*

- Turn off sample flow to analyzer.
- Drain flowcell by manually activating the solenoid valve (DIAGNOSTICS – SOLENOID CHECK) so that sample drains out of the flowcell. Unscrew the clamping screw and remove the sensor assembly from the flow cell.
- Store the sensor in its original bottle making sure that membrane is kept moist. Make sure that sponge at the bottom of the bottle is wetted with DI water and that the membrane is in contact with the sponge pad. Store sensor in refrigerator until next use.
- Dry the interior of the flow cell with a tissue or soft cloth.

4.3.2 *TRANSMITTER UNIT*

Isolate the electrical supply to the unit. In the case of power loss, the programmed data will be retained for up to 10 years.

4.4 *SENSOR ELECTRICAL CHECK*

A simple electrical check can be performed to check status of sensor. Current output (micro-amp) of dissolved oxygen probe must be greater then 15 µA. To test current output of sensor, connect digital multimeter to the two terminal leads on dissolved oxygen probe while membrane is exposed to air. Make sure temperature of sensor is around room temperature (25C). Measure current output in µA, replace sensor if output is less then 15 µA.

5 DISSOLVED OXYGEN SENSOR INFORMATION AND MAINTENANCE

Tips for Prolonging the Life of DO Sensors-

** Some Helpful Background Information on DO Sensor **

Think of the DO sensor as if it was the battery in your car, except that it does not have an alternator to recharge it. If you leave the lights on, the battery goes dead quickly. If you have a corroded wire to your starter, the battery voltage is reduced greatly before it gets to the starter and you can not start your car. The DO sensor operates as a battery. It puts out more current when exposed to high concentrations of DO thus draining its charge.

The following tips, if followed, will extend the life of your DO sensors:

- Avoid exposing DO sensors to high ambient and/or sample temperatures. Higher temperatures increase the rate of the chemical reaction that takes place at the sensor membrane thus reducing the life of the sensor. (For every 10C above 30C, sensor life is cut in half.)
    - Use a chiller to reduce sample temperature so it remains constant in the range 20-30C

- If DO sensor is used to monitor high (ppm) level sample concentrations the life of the sensor will be reduced. High sample concentrations increase the rate of the chemical reaction that takes place at the sensor membrane thus reducing the life of the sensor.

- Remove sensor if sample is shut off or disconnected for more than 3 days. When sensor is exposed to AIR or stagnant sample a more rapid chemical reaction takes place and the life of the sensor is reduced. If a sensor is left exposed to AIR for one or two days the life of the sensor will be reduced considerably. If flow is stopped sample will remain in the flow cell for some period of time but evaporation will occur and eventually the flow cell will be dry. NOTE: If the analyzer is set to perform an automatic calibration the solenoid will activate and drain the water in the flowcell thus exposing the sensor to AIR.

- Do not over-tighten clamping screw when installing the sensor assembly into the flowcell. Only finger-tighten the clamping screw when installing into the flowcell.

- Do not touch sensor membrane with your hands.

Proper Storage of DO Sensors-

Please follow these steps for proper storage of DO sensors:

1. Store the sensor in its original bottle making sure that membrane is kept moist. Make sure that sponge at the bottom of the bottle is wetted with DI water and that the membrane is in contact with the sponge pad.
2. Dry the interior of the flow cell with a tissue or soft cloth.
3. Store sensor is a cool dry place such as a refrigerator.
4. If you do not have the original sensor storage bottle then store the sensor in a cool dry place making sure the membrane remains moist.

Proper Replacement of DO Sensors-

Proper placement of o-ring is essential to the successful operation of dissolved oxygen analyzers. Please see the pictures below showing the proper location of the large o-ring. Note that this o-ring does not go on the sensor itself.

Incorrect installation of o-ring will lead to analyzer problems such as failing calibration and/or incorrect sample readings.

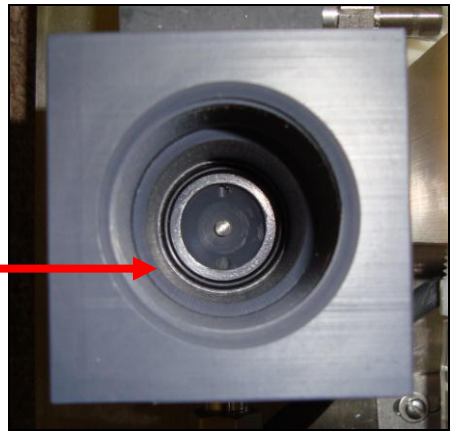


Figure – DO Analyzer Flowcell

Troubleshooting Tips for Frequent Replacement of DO Sensors-

1. Higher temperature and/or higher DO sample concentrations significantly reduce the life of a DO sensor. Please monitor and know sample concentration and sample temperatures. (For every 10C above 30C, sensor life is cut in half.)

2. Check the temperature readout on the analyzer display. If displayed temperature is not within 3-4C of the true sample temperature then analyzer thermistor needs to be replaced. Please contact Waltron to order a new thermistor.

3. Check to make sure sample flowrate is steady and constant. Depending on severity of sample flowrate fluctuation – readings may change and sensor life may be affected.

As always, if you have any questions or concerns please feel free to contact Waltron Technical Service at 800-242-7353 (option #2) or email us at technicalsupport@waltron.net.

6 SPARE PARTS

Recommended Spare Parts

PART NUMBER	DESCRIPTION
K3010-200	Sensor Replacement Kit
K3500-356	Re-tubing Kit
K3010-164D	Thermistor Assembly
K1048-600	Thermistor O-ring
K1048-604	Flowcell Sealing Washer
K1152-200	Nupro Filter, Stainless Steel, 60 micron
K1048-612	Dissolved Oxygen Sensor O-ring
P1000-137	Valve, Solenoid
P2000-051	Long Interconnect Cable, 9062 Separated
P2000-052	Short Interconnect Cable, 9062 Combined

Additional Spare Parts

PART NUMBER	DESCRIPTION
K2554-057	Housing Assembly, O2 Sensor
K2510-205C	Constant Head Unit Assembly
P1000-017A	CPU card
P1000-010	LCD Display
P1000-059	AC Power Terminal Box, 9001 Series
940-0000-00	Analog Board
907-0000-00	Crimp Terminal Kit

7 TROUBLESHOOTING

Problem	Possible Cause(s)	Solution(s)
Calibration Fail (CF)	POOR (low) sensor output.	Check interconnect cable connection and other connections to sensor.
Calibration Fail (CF)	Faulty Solenoid Valve	Run Solenoid Check cycle in Diagnostics – check status and connections of solenoid valve. Verify operation of valve by removing sensor from flowcell and perform another CAL with sensor exposed to atmosphere.

Calibration Fail (CF)	POOR (low) sensor output.	Old/bad sensor. Replace sensor.
Calibration Fail (CF)	POOR (high) sensor output.	New sensor – needs to rinse down. Let sensor run on sample for 1 hour – repeat calibration.
Readings are not accurate – too low.	Poor sensor performance. Bad calibration. Bad thermistor.	Replace sensor. Check CAL log and run another CAL if last result is not good. Verify temperature as indicated on analyzer.
Readings are not accurate – too high.	Poor sensor performance. Bad calibration. Dissolved Oxygen leak in sample system. Bad thermistor.	Let sensor run on sample water for 1-2 hours; then run another CAL. Replace sensor. Check CAL log and run another CAL if results are not good. Bench test sample water. Check temperature.
Current outputs (4-20mA) not functioning correctly.	Disconnected wiring at transmitter or along wire path. DCS/recording system not set up properly. Bad CPU board.	Check output set-up to make sure values are entered properly. Run Diagnostics – O/Pma Check cycle and check output coming from transmitter. Replace CPU board.
Alarms not functioning correctly.	Disconnected wiring at transmitter or along wire path. DCS/recording system not set up properly. Bad DIO board.	Check alarm set-up to make sure values are entered properly. Run Diagnostics – Relay Check cycle and check alarm output directly from transmitter. Replace DIO board if output is not correct.
Display read “HOT”	Sample temperature over specified range (>131F). Faulty thermistor.	Check sample temperature. Clean/replace thermistor.
Display read “TEMP”	No thermistor response.	Clean/replace thermistor. Check thermistor connection on card.
Display read “OVR”	Signal from sensor too high – sample concentration over maximum range (>20ppm)	Check sample concentration. Check sensor connections.

8 SPECIFICATIONS

Range:	0-1000ppb, 1-20ppm
Accuracy:	+/- 1ppb or reading
Stability:	+/- 5% of reading or +/- 2ppb per week (whichever is greater)
Response Time:	90% step change in less than 3 minutes
Precision:	+/- 0.5ppb of reading
Current Outputs:	Two isolated 4-20mA current (analog) outputs
Alarms:	Three voltage-free contacts, alarm points set from transmitter rated at 2A, 250VAC (non-inductive)
Power:	Wide range of input power supply 90VAC – 250VAC
Sample:	Temperature: 41-131F (5-55C); Flow 150-400ml/min
Ambient Temp:	32-131F (0-55C)
Pressure:	5-30psig
Composition:	Sample should be filtered to 60 microns, free of film forming compounds
Power Consumption:	Less than 20VA
Sample Inlet Fitting:	¼” Swagelok
Sample Outlet Fitting:	Barbed Fitting for 3/8” ID hose connection

9 APPENDIX 9062

This appendix is to be used as a reference. The information provided here is approximate and theoretical.

Dissolved Oxygen Concentration	Theoretical Input (uA)
9.6ppm	25uA
5.7ppm	15uA
2.3ppm	6uA
155ppb	0.40uA
6.9ppb	0.018uA

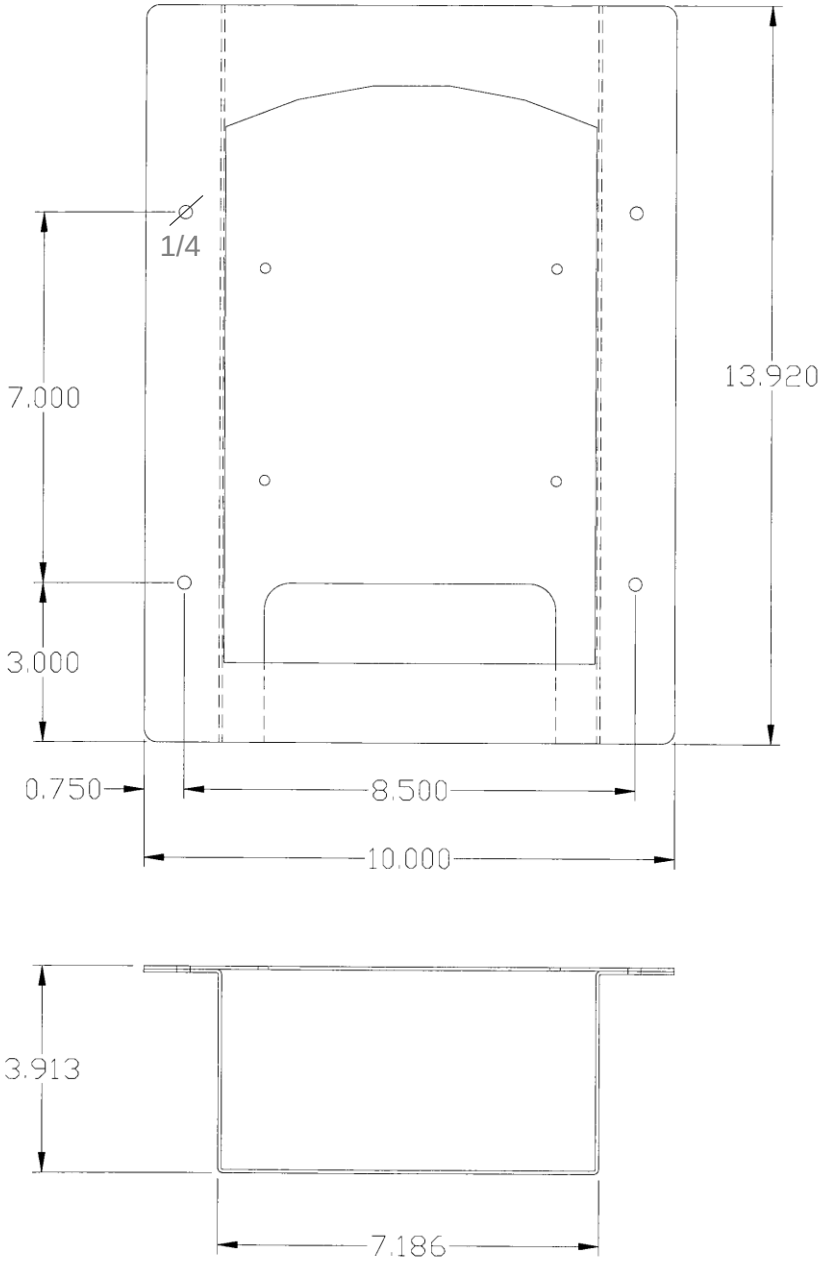
Approximate conversion of meters into feet for use in the elevation input.

Meters	Feet
0	0
10	33
25	82
50	164
100	328
200	656
300	984
400	1312

Meters	Feet
500	1640
600	1968
700	2296
800	2624
900	2952
1000	3280
2000	6560
3000	9840

10 APPENDIX Panel Mount

This Appendix shows the schematics of the Panel Mount Bracket option for the transmitter case.



11 APPENDIX Instructions for Crimping Terminals

11.1 *Crimping Terminal onto Wire Ends*

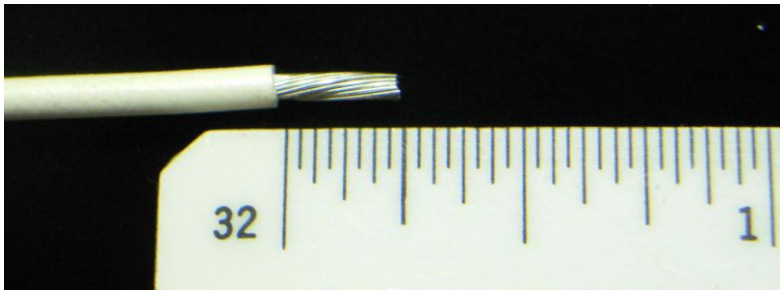


Figure 1: Strip the wire to approximately 0.25in. Ideally, use at least 20AWG wire but your wire terminal kit will accommodate gauges from 22-10AWG.

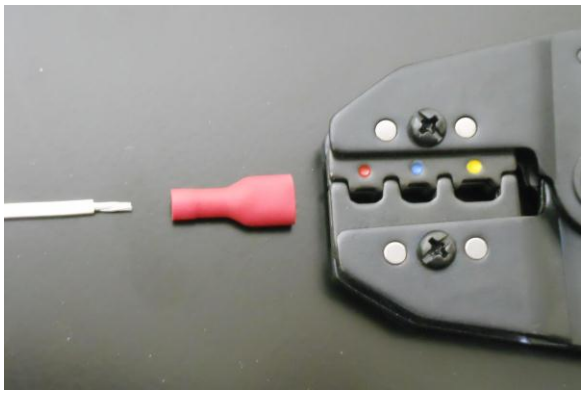
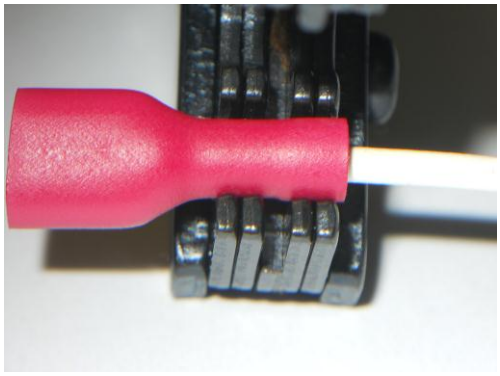


Figure 2: Select the appropriate terminal based on the wire gauge used. Red-colored terminals handle 22-18AWG; blue terminals are for 16-14AWG and yellow are for 12-10AWG. Note the corresponding color dots on the crimp tool die set. Match the terminal to the position on the die. Do not over-crimp by using a smaller die position for the terminal – you will damage the wire strands and wind up with a weak connection.



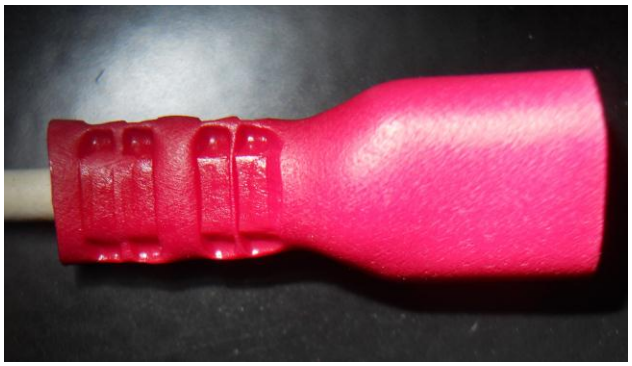


Figure 3A: Position the terminal in the die, as shown at the left. It is important to have the terminal positioned so that the connector end of the terminal is even with the jaw and the crimp part of the terminal mates correctly with the crimp tool die.

Figure 3B: If done correctly, the crimped terminal should appear as in the photo at the right. The die was centered in the crimp area and there is a good dual crimp made on that part of the terminal.

Note that there are actually two crimping actions – one to make the electrical connection (the rightmost pinch) and one to make a mechanical strain relief (the leftmost pinch). Take the time to seat the terminal in the die accurately. If the terminal twists or shifts on the die, reposition it before executing the crimp.

11.2 *Attachment of Terminated Wires to the Analog Board*

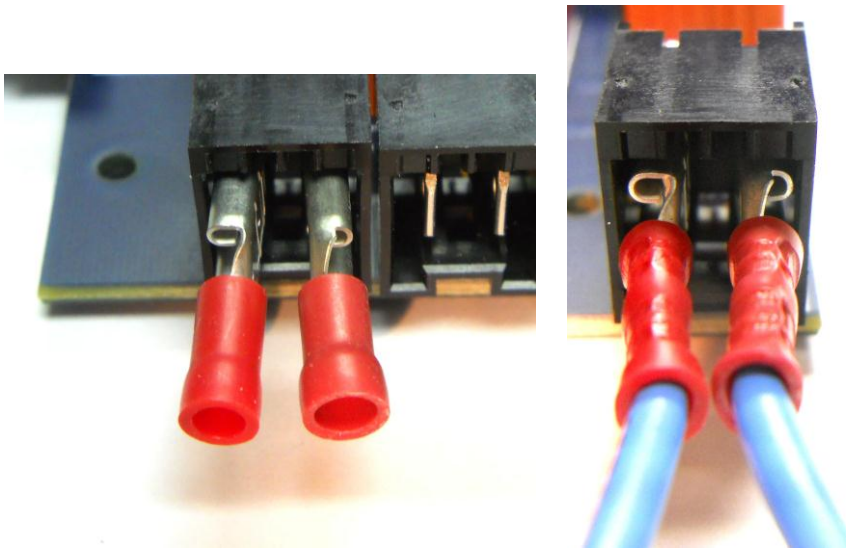


Figure 4A: Only partially shrounded terminals will fit onto the Analog Board's connectors. An assortment of suitable connectors and a crimp tool is supplied in Waltron's Terminal Kit, p/n 907-0000-00. Note that the orientation of the terminals is important to maintain maximum electrical separation. Position the connectors facing in the directions shown before fully inserting.

Figure 4B: Here is a completed wire termination to the Analog Board. The wires are mechanically secured in the terminals by the crimp tool action and the terminals are positively mechanically secured by a dimple in the board connector mating to a similar dimple in the crimp terminal. For this reason, Waltron only recommends using TE Connectivity (AMP) terminals when terminating to the Analog Board.