Waltron AQUALERT® Division

Water Chemistry Measurement & Control

Aqualyzer® 9032 Sodium Analyzer
Instruction Manual

Revision 2.13

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 slope 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® 9032 Sodium Analyzer is a microcontroller-based unit used for online measurement of sodium 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 9032 analyzer spans from 0.01ppb to 10ppm.

1.2 *MAIN FEATURES*

Features of Aqualyzer® 9032 Sodium Analyzer unit include:

1. Measurement of sodium concentration
    - Wide range analysis - 0.01ppb to 10ppm. Concentration and temperature are displayed continuously and analyzer adjusts automatically to user specified ranges.
    - Automatic temperature compensation
    - Protection from "Hot Sample"
    - Grab sample measurement
    - Missing sample flow switch
2. Calibration
    - Single & two point calibration
    - Process calibration
    - Fully automatic calibration (single & two point)
    - Low reagent and standard consumption
    - Internal diagnostics used to show probe status
3. User Interface
    - 128x64 pixel graphics LCD with backlight
    - Large easy to read graphic display
    - Tactile membrane keypad (4 keys) on front panel
    - Lower 2 lines of display 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 settings for recorder outputs and alarm set points
    - Factory defaults can easily be reloaded to override user setting
6. Automatically stores last 10 calibration and alarm logs.
7. Complete analyzer diagnostics
8. 3 Relay outputs for High, Low and General Alarm
9. Two 4-20mA isolated current outputs
10. Quick connect electrodes with probe positioning clamps
11. Redesigned drain for easy sample pH measurement
12. Automatic KCl refill system (optional)

1.3 *SYSTEM DESCRIPTION & ARCHITECTURE*

The 9032 Sodium analyzer system is comprised of the following:

1. Wet-Section (Sensor Unit)
    a. Reagent solution containers
    b. Hydraulic panel consisting of constant head, flowcell, tubing, thermistor and 3 solenoid valves
    c. Sodium and reference electrodes
    d. 2 sodium standard solution containers (CAL1 and CAL2)
    e. Grab sample bottle
2. Pre-Amp and Junction Box units
3. Transmitter (electronics) unit

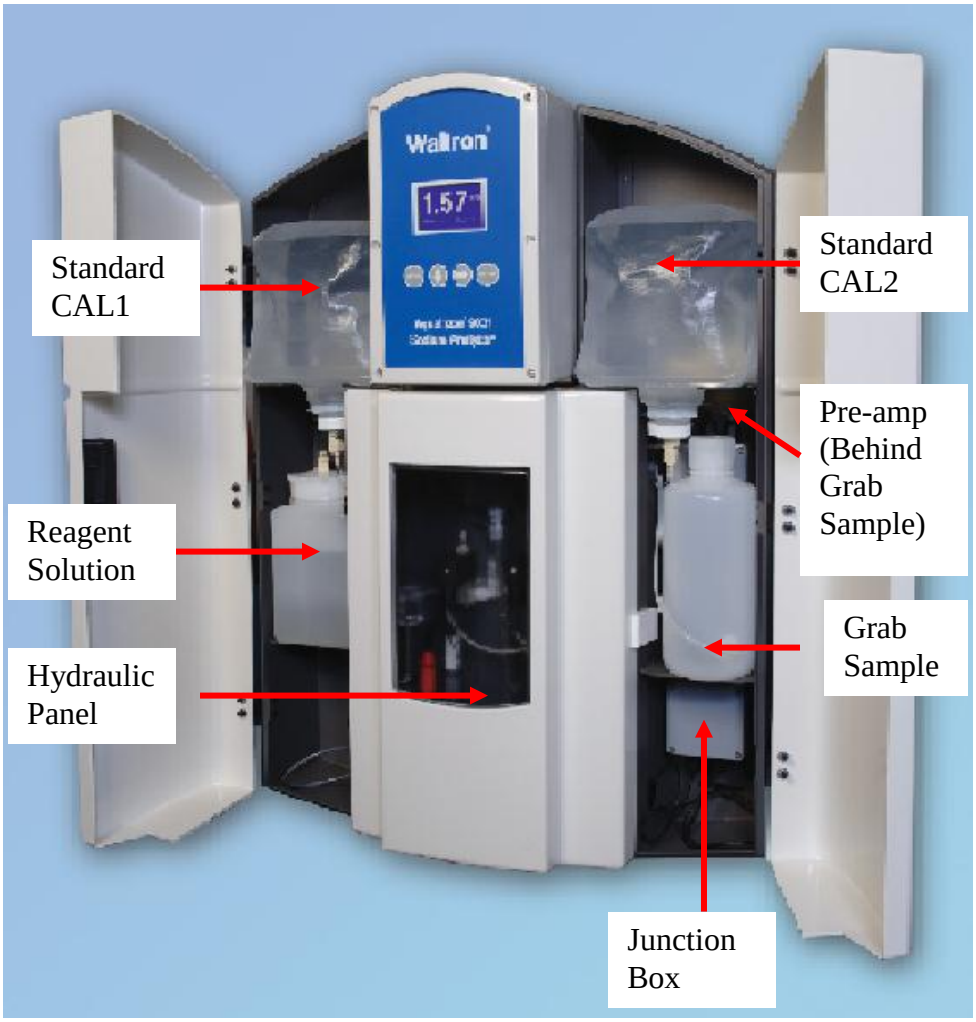


Figure 1. Overall system architecture.

1.3.1 WET SECTION UNIT

The 9032 Sodium system is capable of monitoring sodium concentrations in sample feed. Three solenoid valves are used to select between analyzing the sample, calibration solution 1 (CAL1), calibration solution 2 (CAL2) and grab sample.

In normal mode, the feed water flows through the flow switch, into the heat exchanger, through the solenoid valves and into the flowcell where it comes into contact with the sodium and reference electrodes. The electrodes transmit a voltage proportional to the sodium content in the feed water. 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 sample temperature for temperature compensation. If the sample temperature exceeds 131°F, sample automatically gets diverted to drain and the system displays "HOT".

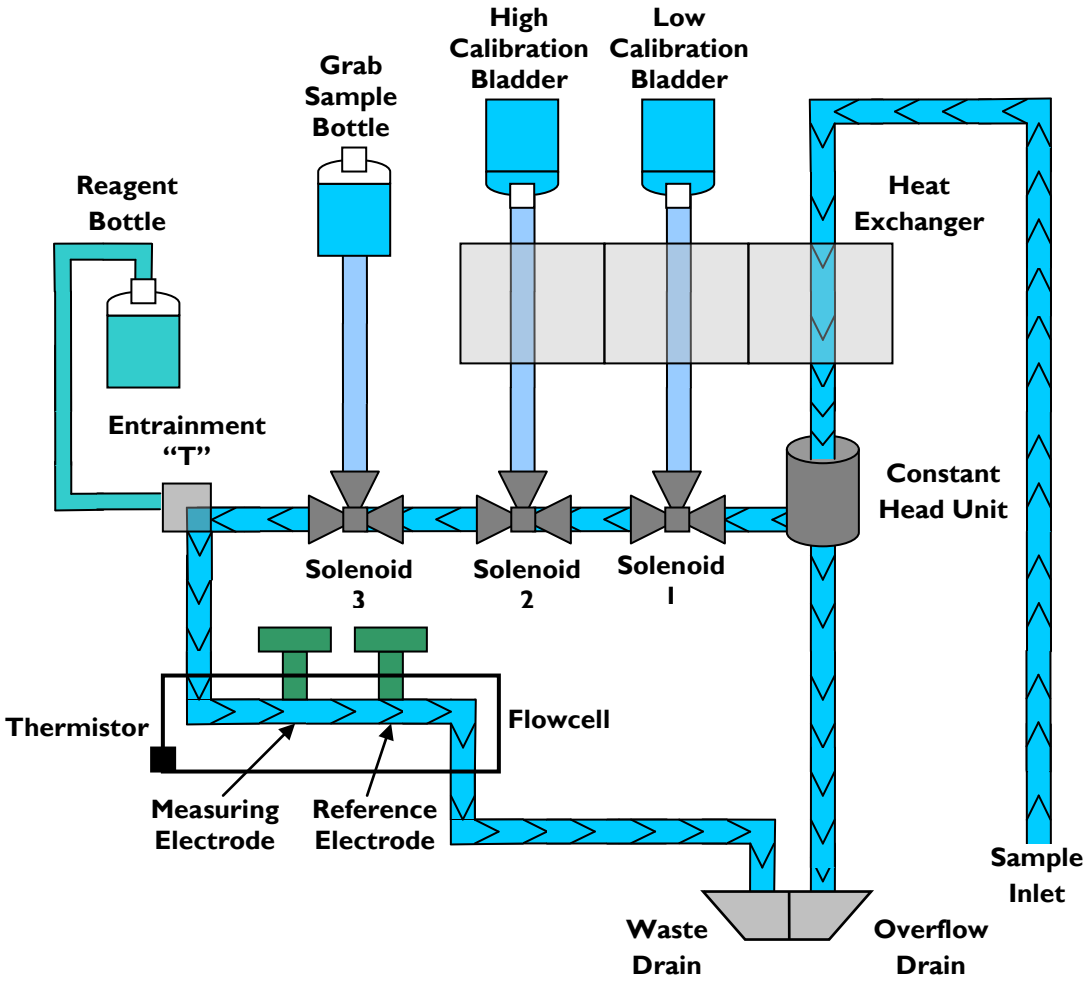


Figure 2. Sample flow during normal operation.

1.3.2 PRE-AMPLIFIER AND JUNCTION BOX

The 9032 Sodium analyzer requires a pre-amplifier unit which amplifies and converts the voltage output from the electrodes into proportionate current. Thermistor output is also fed to transmitter unit via pre-amp section. The junction box houses the wiring connection terminals from electrodes and sends the signal to pre-amplifier unit. The terminal junctions at the junction box allows for quick and easy change-out of electrodes.

1.3.3 TRANSMITTER UNIT

The transmitter unit interprets electrode response and temperature output from the pre-amp and displays the corresponding sodium 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 ANALYZER*

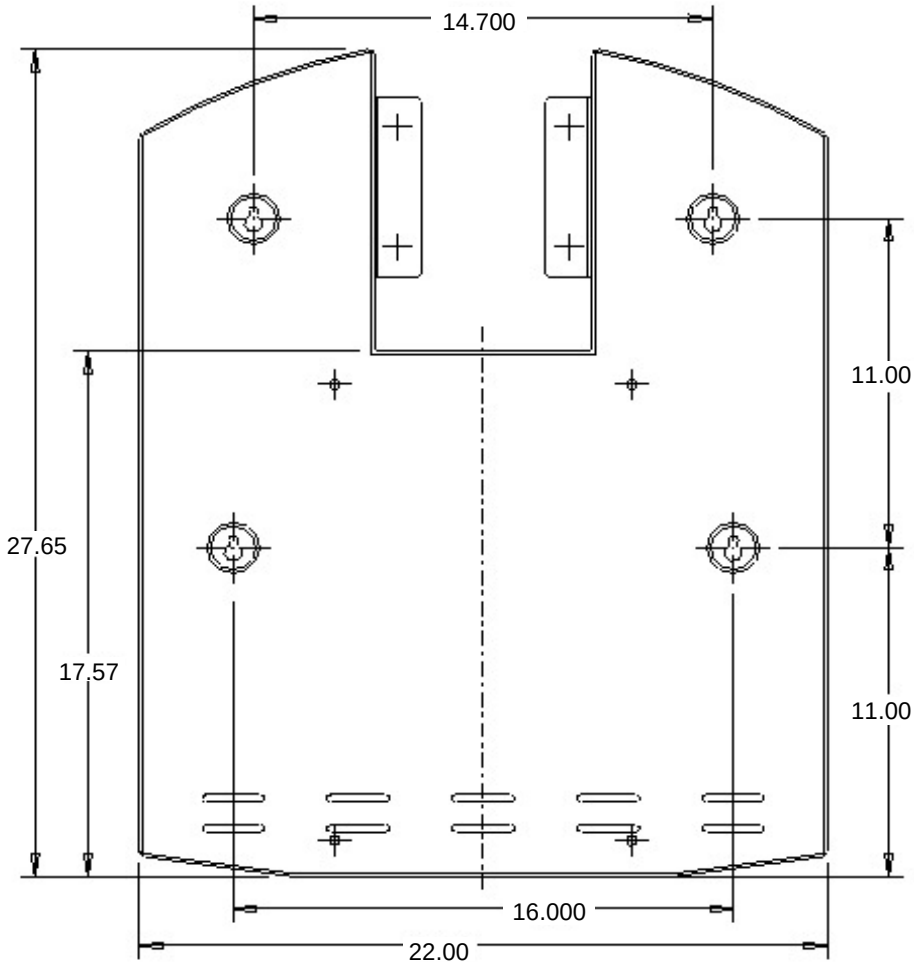


Figure 3. Dimensions to mount the Wet Section. (All dimensions in inches)

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. The 9032 Sodium analyzer default design has the two main sections (transmitter and wet section) combined as a single unit. If need be the sensor unit can be mounted separately as long as it is no more than 330 feet (100meters) from the transmitter unit.

2.1.2 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.

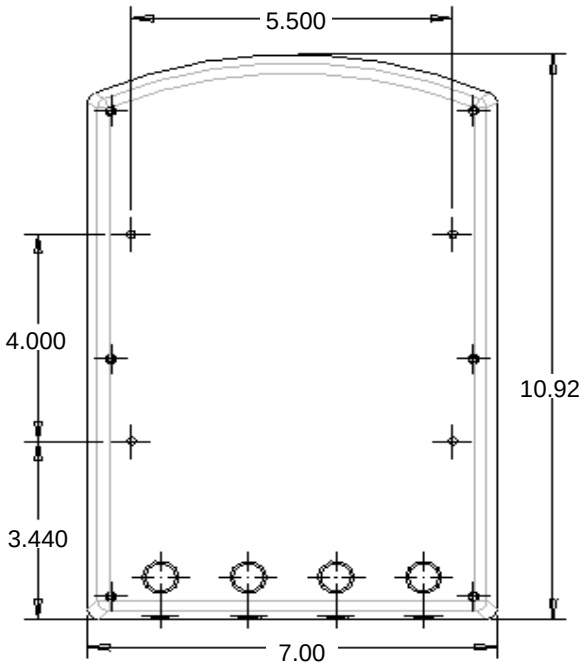


Figure 4. Dimensions of the transmitter unit. (All dimensions in inches)

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*

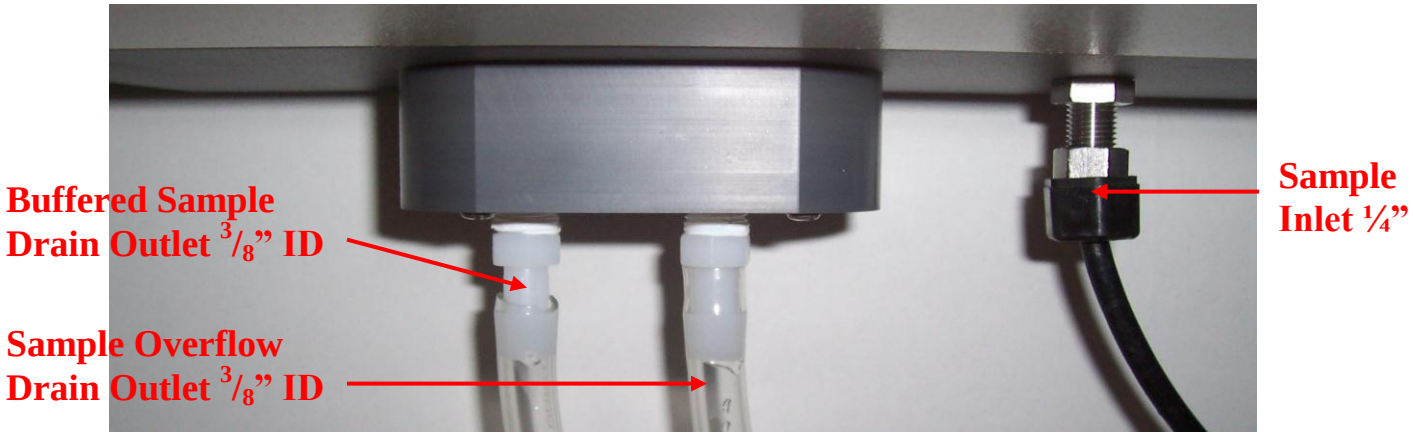
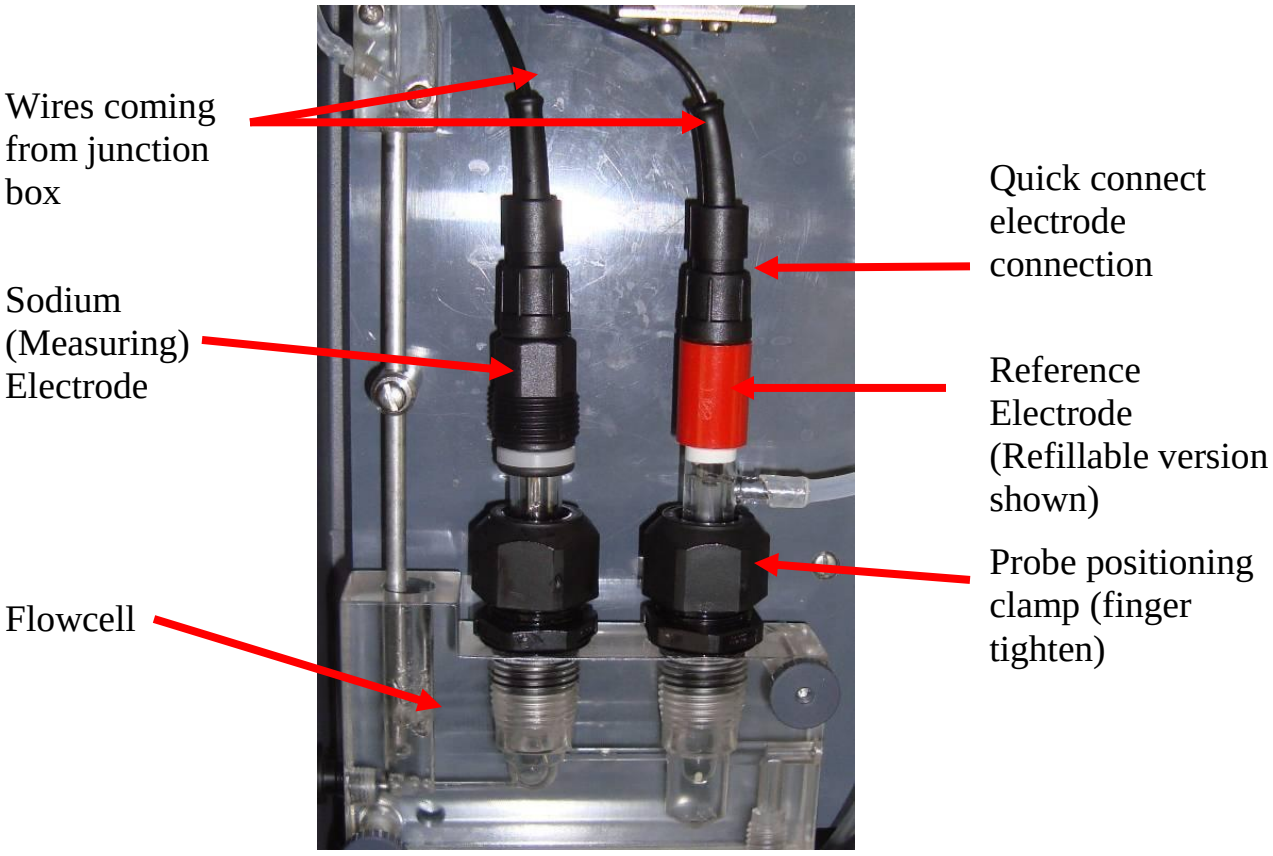


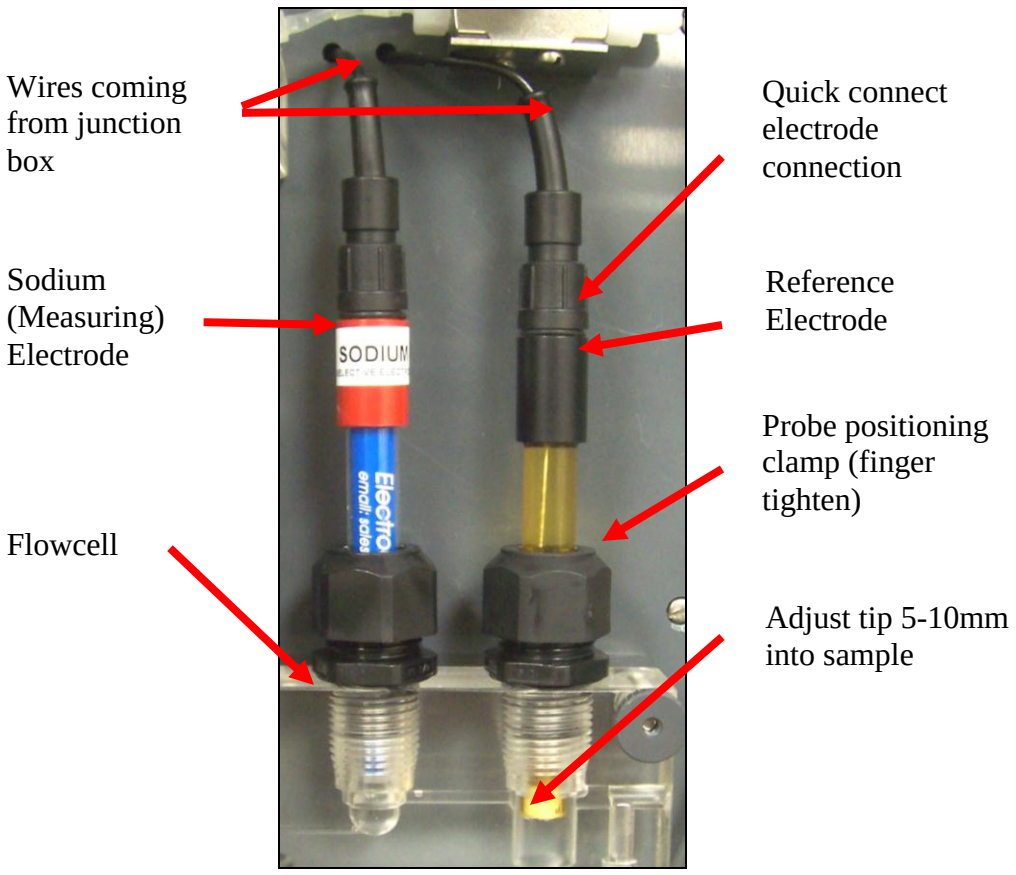
Figure 5. The bottom of the wet section case, with the sample inlet and drain connections shown.

2.4 *ELECTRODE INSTALLATION*

2.4.1 PROBE CONNECTIONS



2.4.2 GEL FILLED REFERENCE ELECTRODE



The Gel filled reference electrode has an inner element consisting of a gel solution which does NOT require electrolyte refilling.

2.4.3 AUTOMATIC KCL REFILL SYSTEM (OPTIONAL)

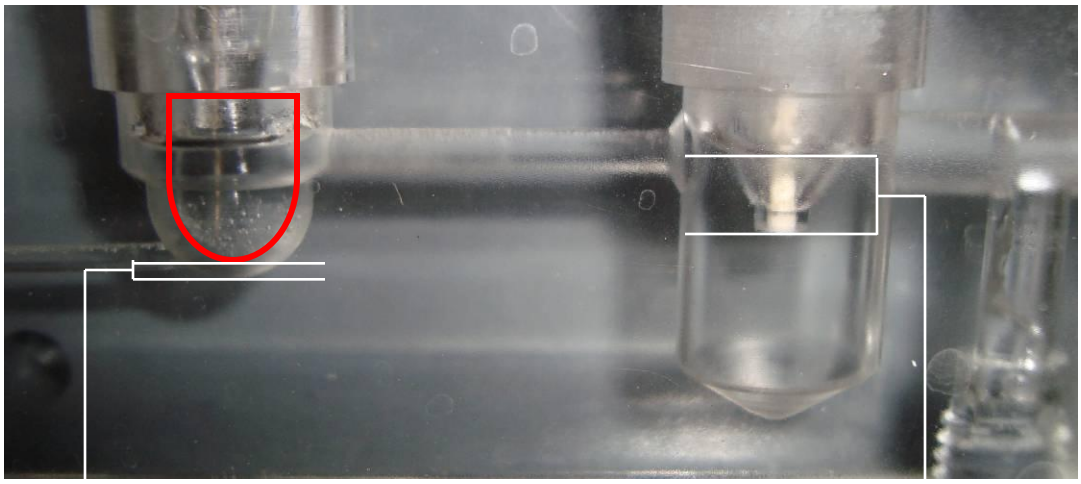
(9033 Wet Section Shown)

Directions for installing and using the KCl refill system:

1. Feed inner (smaller diameter) tubing through outer (larger diameter) tubing.
2. Feed inner tubing through the side-arm of the reference electrode and connect the outer tubing over the side-arm.
3. Clip nozzle of KCl bottle, making sure the hole is large enough for inner tubing to pass through and that KCl solution can flow freely around it.
4. Insert inner tubing through nozzle of bottle and connect outer tubing over the nozzle of bottle. Make sure the inner tubing reaches the top of the bottle while the other end remains inside the reference electrode.
5. Install KCl bottle into the bottle clamp and finger-tighten wing nut to hold the bottle in place.
6. Poke a small hole in the top of the bottle so KCl flows freely and vacuum does not form.
7. Rinse off any spilled KCl with DI water before installing probe in the flowcell. (KCl will interfere with sample reading if it gets in the flowcell.)

2.4.4 PROBE INSTALLATION PROCEDURES

1. Remove the protectors from the tip of each electrode
2. Connect electrodes to wires from junction box. Be sure to match the correct wires to the correct probe.
3. Use fingers to rotate the probe positioning clamp counterclockwise to loosen. Carefully insert the electrode through the clamp and into the flowcell. Electrodes may have to be inserted at an angle.
4. For reference electrode - insert the electrode so that the tip of the electrode is 5mm into the sample. Correct placement within the flow cell is important. Refer to figure below.
5. For measuring electrode – insert the electrode so that the tip is just off the bottom of the flowcell. Refer to figure below.



Tip of measuring electrode positioned just off bottom of flowcell

Tip of reference electrode positioned 5mm into sample

2.5 *ELECTRICAL CONNECTIONS*

2.5.1 WET SECTION UNIT

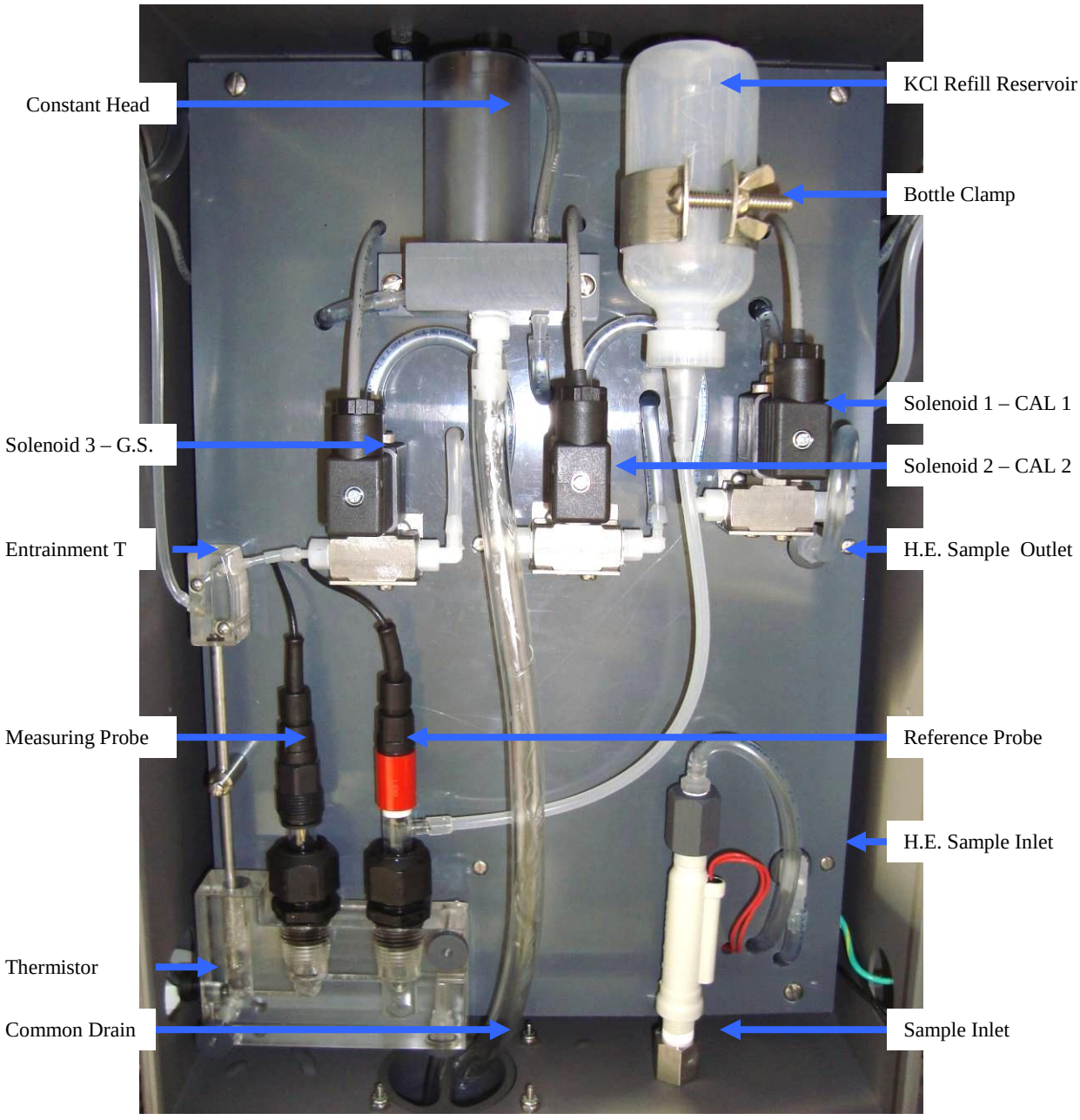
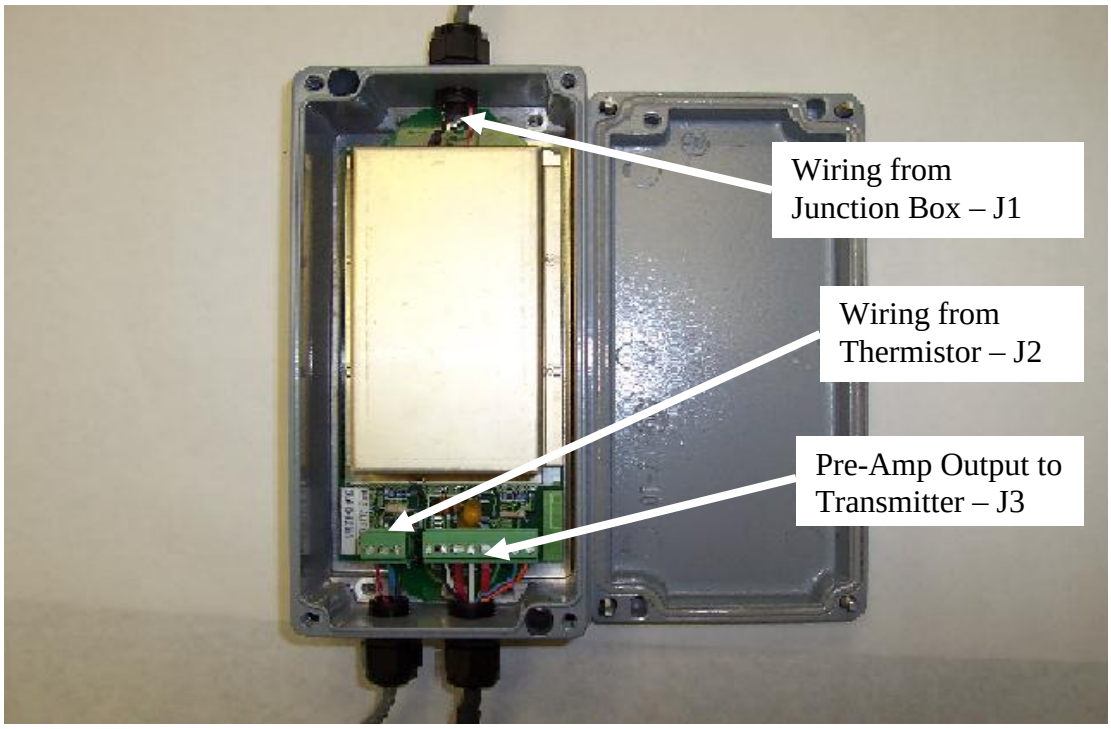


Figure 6. The wet section layout and connections.

2.5.2 PRE-AMP UNIT



The pre-amplifier unit has 3 connection terminals (J1, J2, J3) shown below:

Figure 7. Pre-amplifier layout. Pin 1 of all the connectors is shown in black.

The following cables/connections are used in pre-amp system:

1. Multicore cable (8-Core) for interfacing the transmitter unit with pre-amp at J3.

   Pin 1 (Black Wire)
   Pin 2 (White/Black Wire).
   Pin 3(Red Wire)
   Pin 4(White Wire)
   Pin 5(Red/Black Wire)
   Pin 6(Green Wire)
   Pin 7(Blue Wire)
   Pin 8(Orange Wire)
   Pin 4(Shield – Optional).

2. Multicore cable (2-Core PVC Shielded Twisted) for interfacing the sodium electrodes (from Junction Box) with pre-amp at J1.

Red Wire	:	From Reference Electrode to Pin 1 of J1
Black Wire	:	From +ve of Na electrode to Pin 3 of J1
Black Heat Shrink (Shield)	:	From -ve of Na electrode to Pin 2 or 4 of J1

3. Multicore cable (2-Core PVC Shielded Twisted) for interfacing the thermistor with pre-amp at J2.

Blue Wire	:	From +ve Thermister to Pin 1 of J2
Red Wire	:	From -ve Thermister to Pin 2 of J2
Black Heat Shrink (Shield)	:	From shield to Pin 3 of J2

2.5.3 JUNCTION BOX

The measuring and reference electrodes are wired through the junction box enclosure. Remove the lid of the enclosure and pass the leads for both electrodes through the cable glands. Connect the leads to the terminal block as shown in Figure 8.

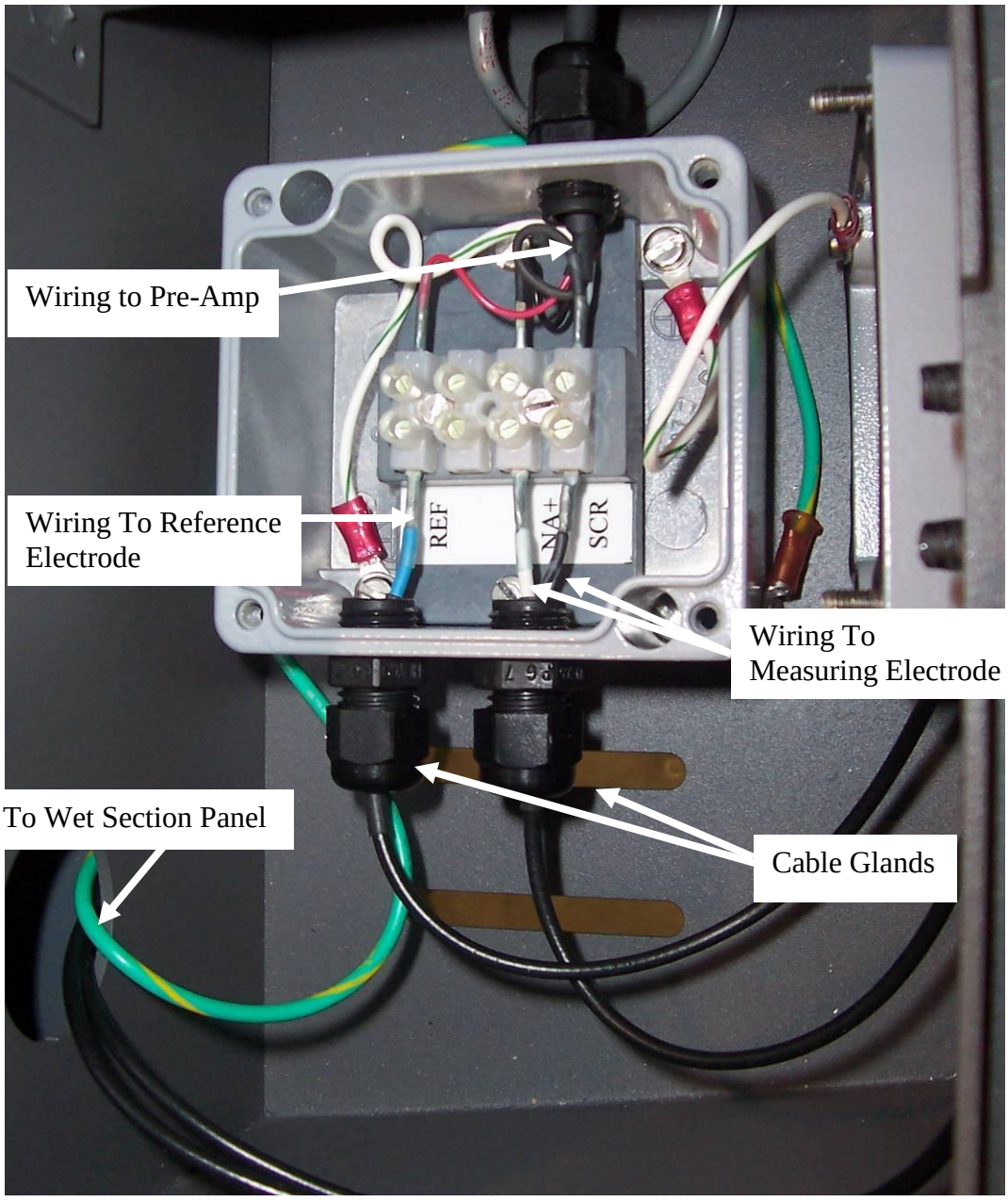


Figure 8. Sensor wiring to the junction box.

2.5.4 TRANSMITTER UNIT

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

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

- Power Supply
- Solenoid and Alarms
- Pre-amp Input (sensor and thermistor wiring)
- 4-20mA Current Output and Communication Interface
- Sample Flow Switch

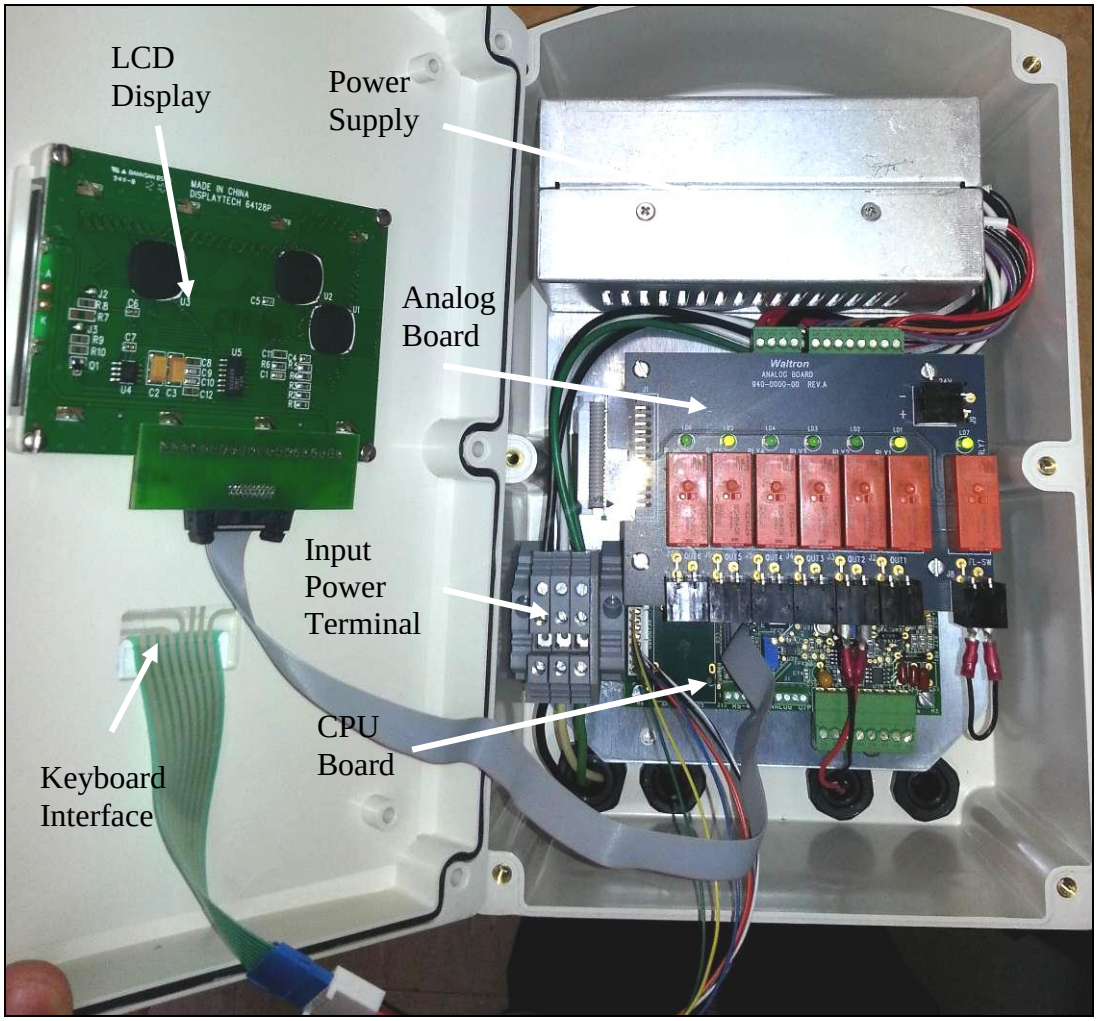


Figure 9. The layout and components of the transmitter case.

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

Note. Power terminal shown is for non-CE transmitters. For CE transmitter power connections, please refer to Section 2.5.6 on the following page.

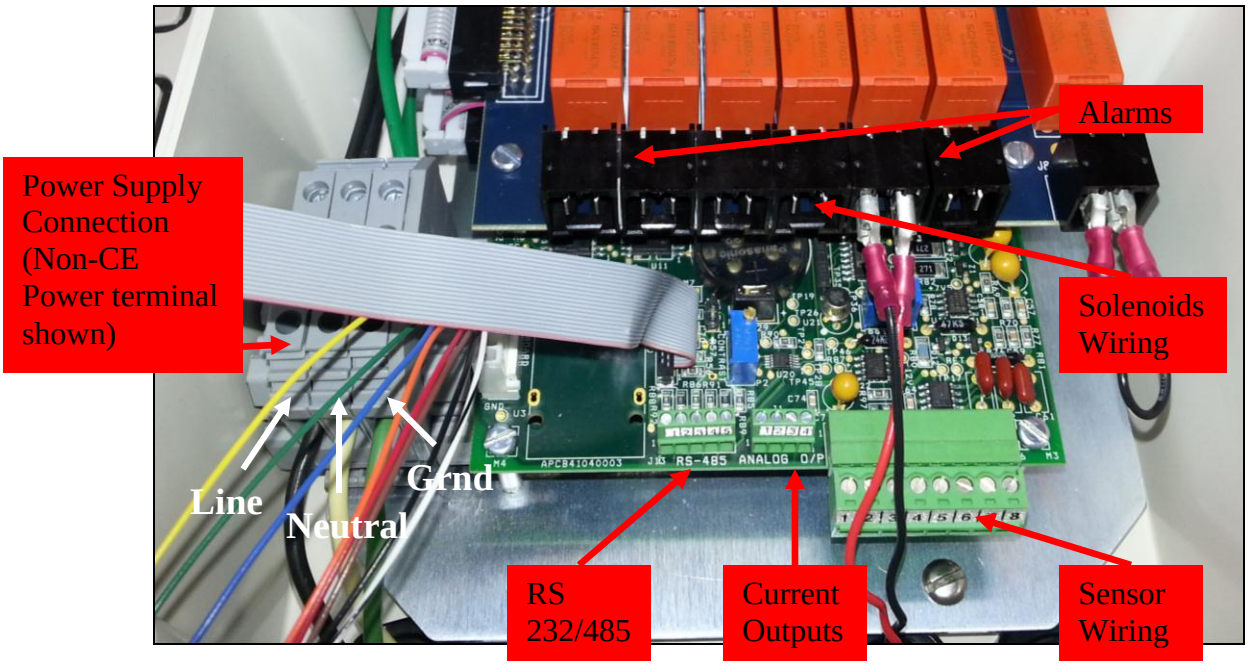


Figure 10. Location of the terminal block connections in the transmitter unit.

⦸**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.

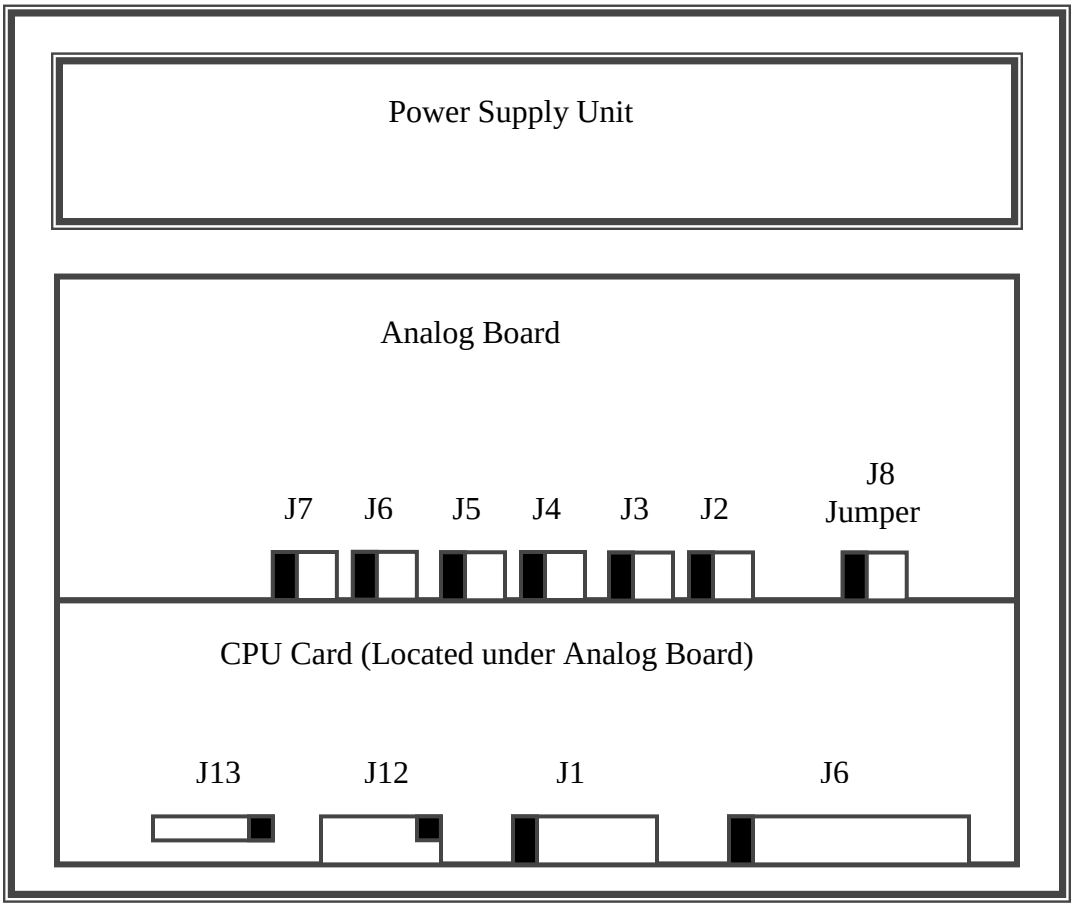
2.5.5 AC POWER TERMINAL BOX (OPTIONAL)

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:

2.5.6 WIRING TO TRANSMITTER



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

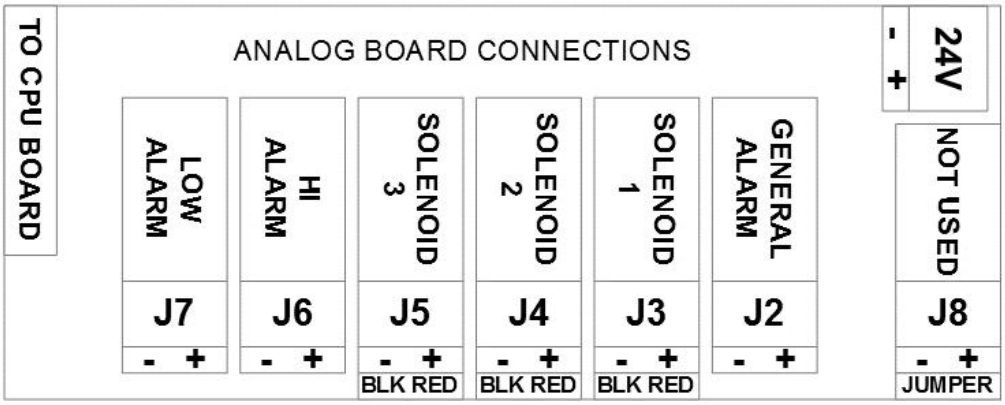


Figure 11. Pin locations for the Analog and CPU cards.

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 PCB sub-assemblies 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 via 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 Pre-amp Output to Transmitter:

The 8-Core PVC shielded cable coming as an output from the pre-amplifier is connected to J6 of CPU Card, as follows:

Pin 1 (Black Wire)
Pin 2 (White/Black Wire).
Pin 3 (Red Wire)
Pin 4 (White Wire)
Pin 5 (Red/Black Wire)
Pin 6 (Green Wire)
Pin 7 (Blue Wire)
Pin 8 (Orange Wire)

Card	Connector	Pin Number	Wire Color
CPU	J6	1	Black
CPU	J6	2	White/Black
CPU	J6	3	Red
CPU	J6	4	White
CPU	J6	5	Red/Black
CPU	J6	6	Green
CPU	J6	7	Blue
CPU	J6	8	Orange

Connecting the Sample Flow Switch to Transmitter (optional):

Sample flow switch gives indication of sample flow status. It is an optional accessory and does not come installed in the analyzer. The pin locations from the connector are shown below:

Card	Connector	Pin Number	Connection
Analog	J8	1	Wire
Analog	J8	2	Wire

Connecting the Current Output(s) to Transmitter:

Two 4-20mA current outputs supplying analog output proportional to the sodium concentration are provided on 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(s) outputs to Transmitter:

Potential free contacts for High Alarm and Low Alarm are terminated on the J6 and J7 connectors (provided on the Analog card) as shown in Figure 11.

The pin out of the connector is as shown below:

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

Similarly, potential free contacts for General Alarm are terminated on the J2 connector (provided on the Analog card) as shown in the Figure 11.

The pin out of the connector is as shown below:

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

Connecting the Solenoids to Transmitter:

Solenoid valves for CAL1, CAL2 and Grab Sample operation are terminated on the J3, J4, and J5 connectors, provided on the Analog card, as shown in Figure 8. The +24V DC excitation @ 400mA, each, 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 (CAL1)	1	S1- (BLK)
Analog	J3		2	S1+ (RED)
Analog	J4	Solenoid 2 (CAL2)	1	S2- (BLK)
Analog	J4		2	S2+ (RED)
Analog	J5	Solenoid 3 (Grab Sample)	1	S3- (BLK)
Analog	J5		2	S3+ (RED)

Connecting the serial communication ports to Transmitter:

Two separate serial ports RS-232 and RS-485 are provided on the CPU card. These ports are located near connector J1.
The pin out of the connector is as 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*

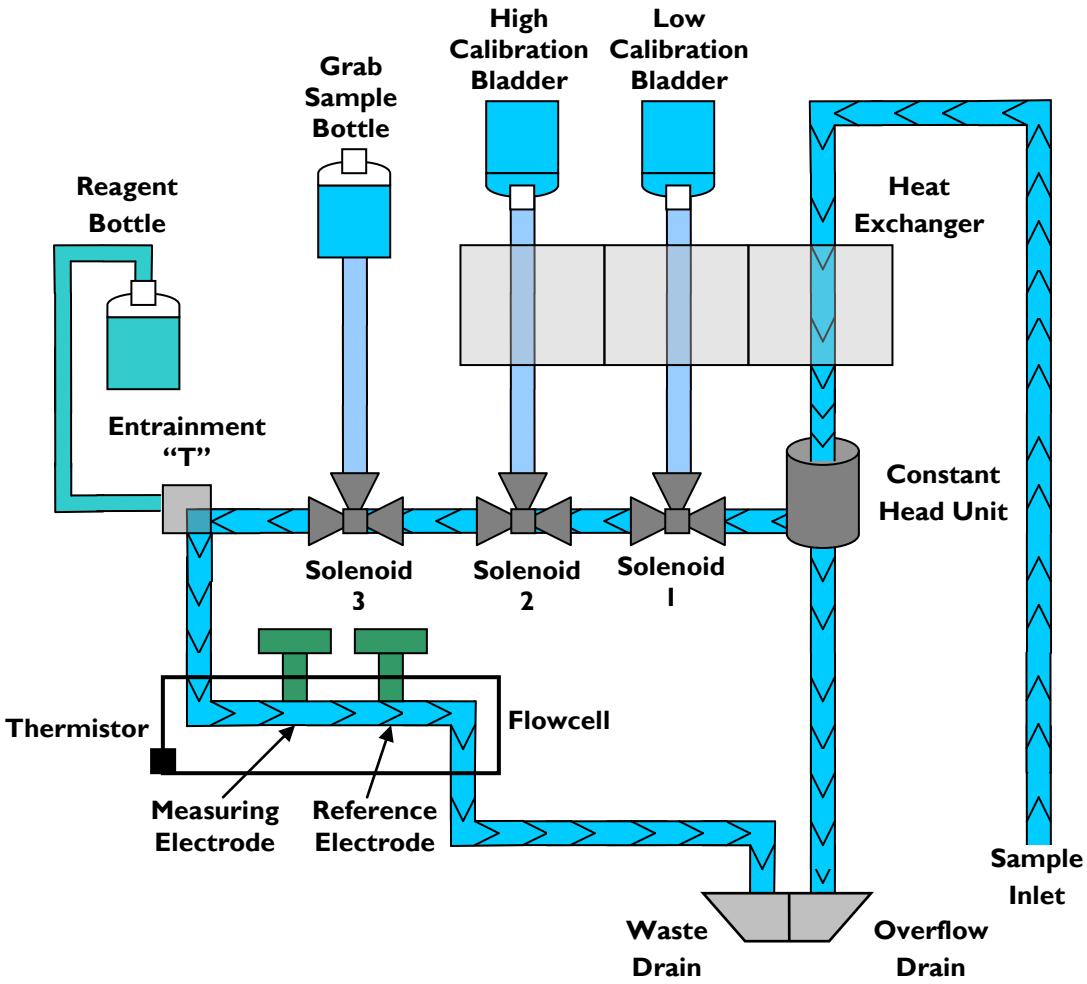


Figure 12. Sample flow during normal operation.

The 9032 Sodium analyzer system 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 and first passes through the sample flow switch before going to the heat exchanger. The heat exchanger is used to keep the sample temperature and calibration solutions temperature at equilibrium during calibration. Drastic and sudden changes in solution temperature may have a negative effect on electrode performance.

After flowing through the heat exchanger, the sample passes through a constant head (the constant head unit stabilizes the effect of changes in sample inlet flowrate) and then through the 3 solenoid valves. After flow passes through the third solenoid valve (valve furthest to the left) it is then delivered to the entrainment 'T' where an alkaline vapor buffer is added to the sample in order to raise the pH value. After the sample and vapor reagent are mixed, the solution is sent to the flowcell where it comes into contact with the sodium and reference electrodes.

The sample flows past the electrodes and exits the flowcell. Sample then exits through the left-side portion of the drain located in the bottom of the case. (The drain has two exits – one for buffered sample and one for sample overflow.) The potential developed between the sodium measuring (ion-responsive) electrode and reference electrode is logarithmic with respect to changes in sodium ion concentration. The signal from the electrodes is fed to the pre-amplifier, which converts the voltage into current. The output from pre-amplifier is then sent to the transmitter unit via the interconnection cable.

A temperature sensor (thermistor) is housed in the flow cell and detects the temperature of the sample. The thermistor is connected to the transmitter unit and compensates for changes in output from the electrode pair over a range of 41°F to 131°F (5 °C to 55°C).

Calibration of the analyzer is controlled by the micro-controller. After the user connects the transmitter unit to the wet section, it is necessary to perform one successful two point calibration. See Section 3.7 for more details on calibration. Once a successful calibration is performed, the unit is now ready to measure the sodium 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*

Sample Concentration Alarms

When the 9032 Sodium system is in normal operation mode one alarm operates as a "low" alarm and the other operates as a 'high' alarm. Alarm 1 (A1) operates as a LOW alarm and is activated when the sodium level decreases below the set value. Alarm 2 (A2) operates as a HIGH alarm and is activated when the sodium level increases above the set value. The two sodium alarms control the relays provided. Each relay has one pair of changeover contacts rated at 2A, 250VAC (non-inductive). The terminal connections for alarm relays are located at J2, J6, and J7 on the Analog card.

CONCENTRATION ALARM DESCRIPTIONS		
Symbol	ALARM	DESCRIPTION
A1	Low Alarm	Activates when Na in sample feed is lower than "Low Set Point".
A2	High Alarm	Activates when Na 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)
OUT	Sample flowrate to analyzer is not sufficient

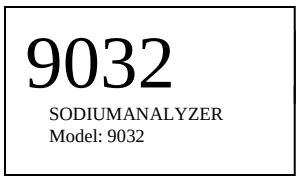
3.3 *GETTING STARTED*

- Insert the POWER cord in the AC mains socket terminal connector located in transmitter 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 sodium interpreted by the electrodes. Units of measurement (ppb/ppm) are displayed on the right-hand-side on 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 3.7.2.

3.4 *POWER UP SEQUENCE*

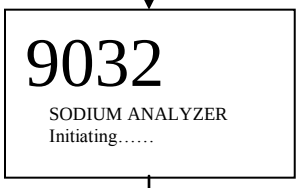
- After switching ON the analyzer the following start up sequence is displayed:

On POWER ON



After 5-seconds

After 5-seconds



After 5-seconds

After 5-seconds the unit enters into Measurement Mode

3.5 *KEY-BOARD FUNCTIONS*

Figure 13. The front panel of the transmitter unit

There are four keys on front panel (shown in 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 pressed at any time to return to the Main Menu. When the MENU key is pressed the Main Menu options are displayed. There are 7 Main Menu options and only 2 main/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 desired place; the cursor moves in a left to right direction.

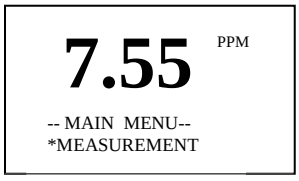
- **ENTER**: This key is used to enter into a selected menu. It is also used to confirm/store entered values.

3.6 *MAIN MENU - ANALYZER MODES*

There are 7 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. **GRAB SAMPLE** – Perform manual grab sample
5. **FAIL SAFE** – Used to shut-down/power off analyzer
6. **DIAGNOSTICS** – Stores data logs and aids in troubleshooting
7. **DISPATCH MODE** – Used to troubleshoot/calibrate electronics

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

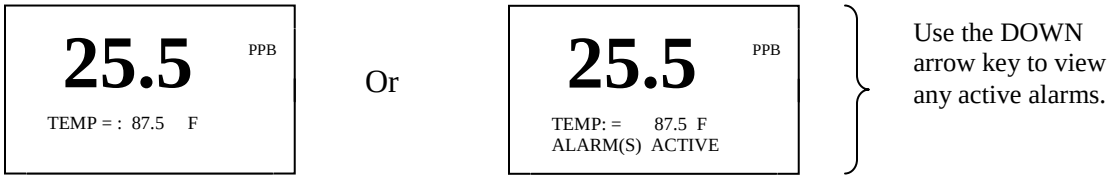


Note: The '*' indicates the selected item of that particular menu or sub-menu.

3.6.1 MEASUREMENT

.

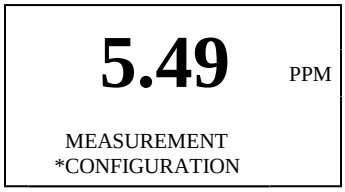
Press the ENTER key to go to MEASUREMENT screen. The display shows:



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:

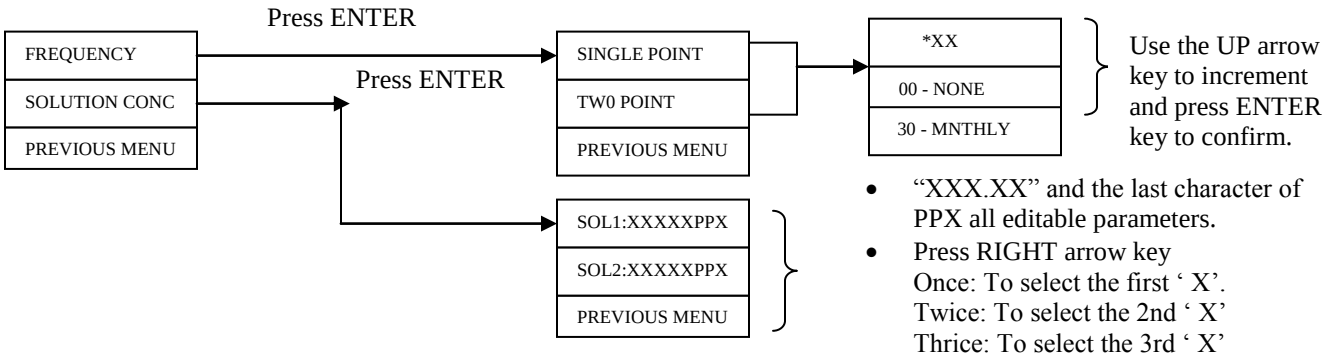
Press the DOWN ARROW key to scroll down the remaining sub-menus. The CONFIGURATION menu has the following 7 sub-menus:

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

To navigate through the sub-menus press the DOWN arrow key and 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 CALIB SETUP (Calibration Set-Up)

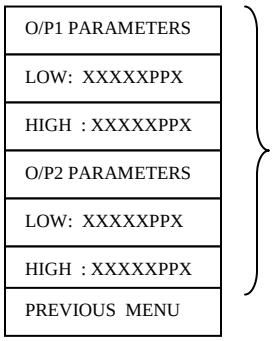
The sub-menus for CALIB SETUP are as follows:



- “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 UP 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.

3.6.2.2 O/P mA SETUP

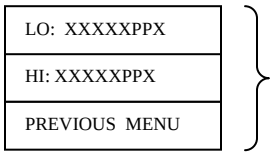
Press the ENTER key when O/P mA menu is displayed. The following sub-menus are displayed:



- "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

3.6.2.3 ALARM SET PTS

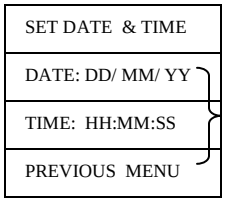
Press the ENTER key when ALARM SET PTS menu is displayed. The following sub-menus are displayed:



- "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

3.6.2.4 DATE & TIME

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

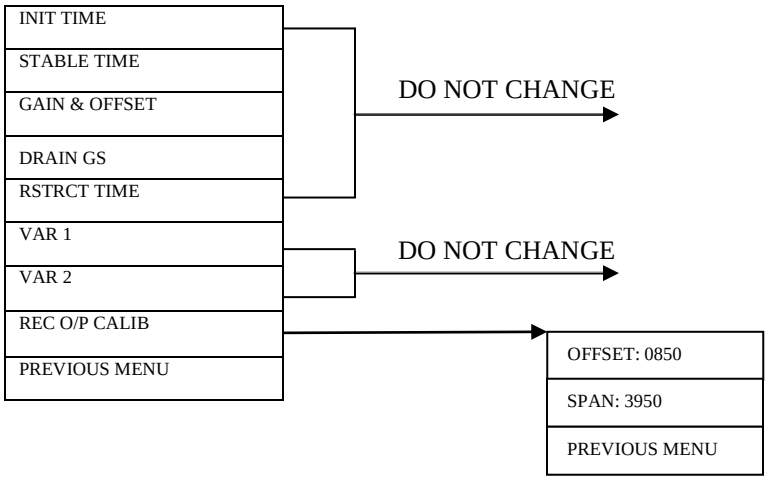


- DD, MM, SS, HH MM, SS are all editable parameters where DD is the Day, MM the Month, YY the Year, HH the Hours, MM the Minutes and SS the Seconds.
- Press RIGHT arrow key
  Once: To select 'DD'.
  Twice: To select 'MM'
  Thrice: To select 'YY'
- The highlighted value may be changed using the DOWN arrow 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.i.e, DATE & TIME

The above explanation is true while editing TIME also.

3.6.2.5 SERVICE PARAMS

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 the down arrow key to select REC O/P CALIB
    a. Use Offset to adjust the 4 mA output
    b. Use Span to adjust the 20 mA output
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.



3.6.2.6 TEMP UNIT

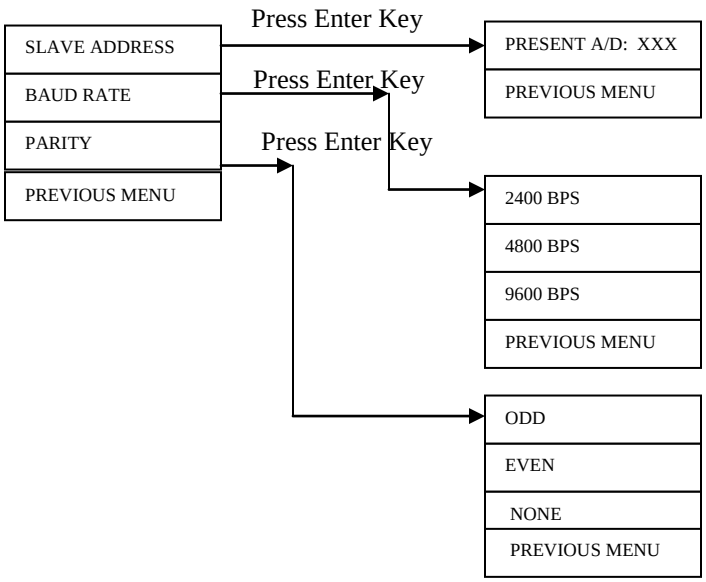
Press the ENTER key when TEMP UNIT menu is displayed. Select between degrees Fahrenheit or degrees Celsius and press ENTER.

3.6.2.7 DISPLAY UNIT

Press the ENTER key when DISPLAY UNIT menu is displayed. Select between ppb and ppt for measuring range and press ENTER.

3.6.2.8 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 UP arrow key to increment and press ENTER key to confirm.
- Use UP 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.

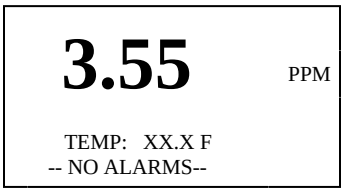
3.6.2.9 PREVIOUS MENU

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

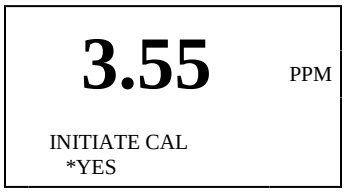
3.6.3 MANUAL CALIBRATION

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

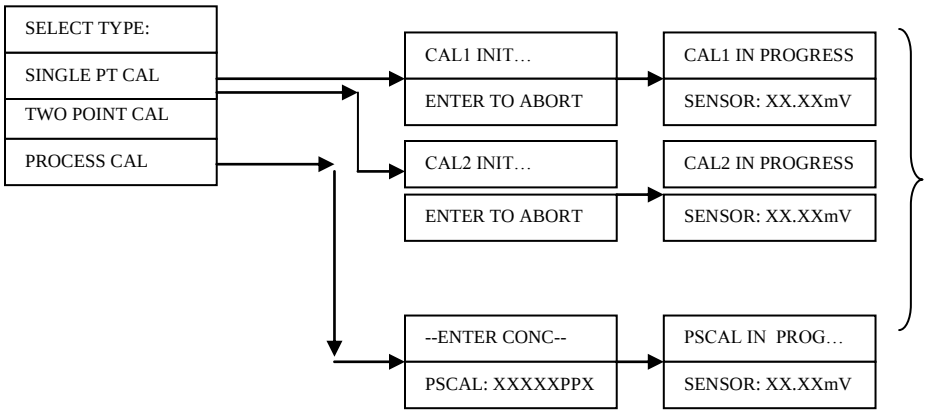
Press ENTER key



Else, press DOWN arrow key



MANUAL CALIB mode has following sub-menus:



- "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.

3.6.4 GRAB SAMPLE

Go to the GRAB SAMPLE menu and press ENTER to display the following screen:

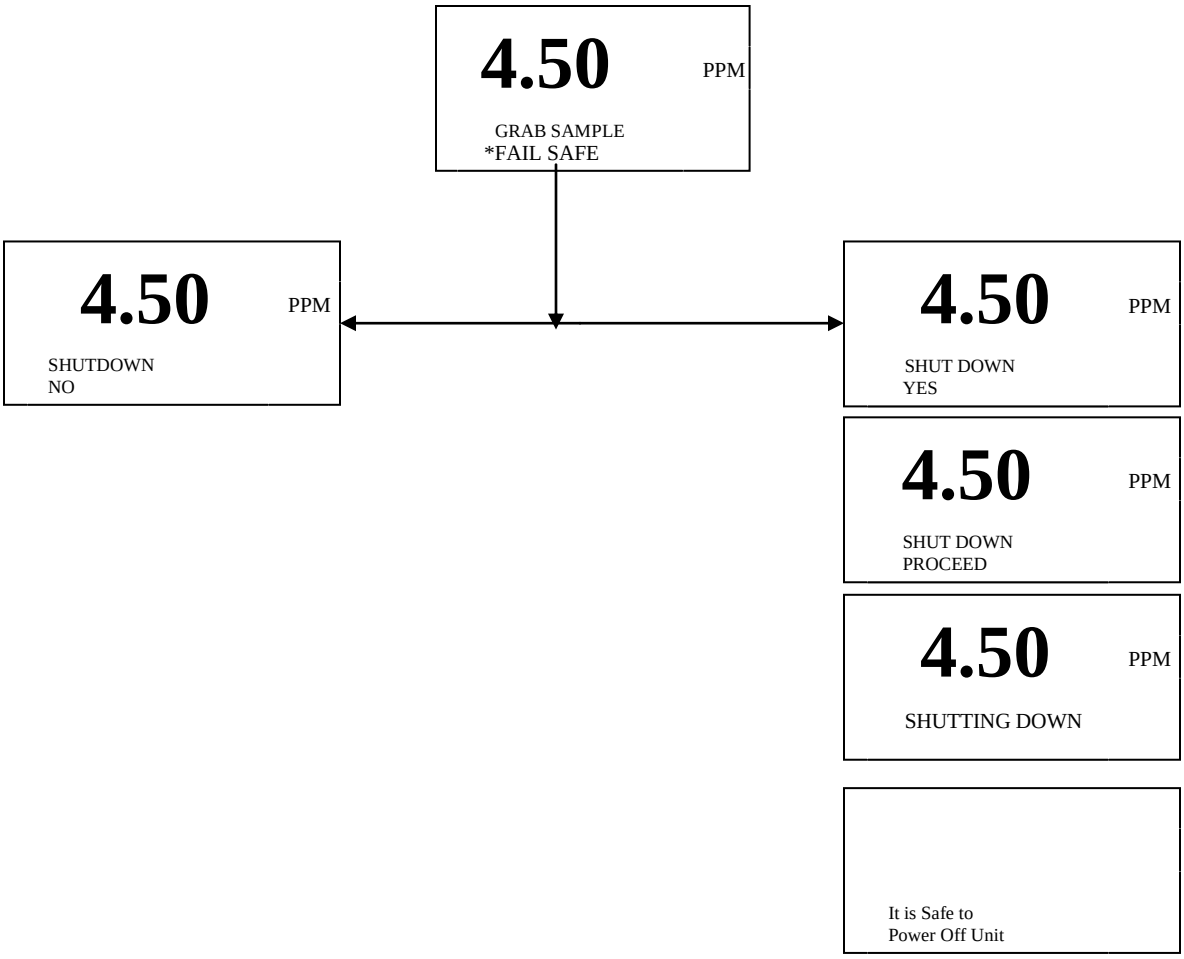
The GRAB SAMPLE cycle is helpful in that it can be used as a bench test or QA/QC check. The grab sample is used to measure the sodium concentration of any "grab sample" solution. The grab sample solution should be poured into the grab sample container before initiating the cycle. When GRAB SAMPLE is initiated, solenoid 3 is activated and the grab sample solution is brought into the system. All the other solenoids are de-activated and the recorder outputs will continue to hold their last measured value obtained during normal measurement.

If ENTER key is pressed at any time during the GRAB SAMPLE cycle the sequence can be aborted immediately. The friendly menu guides the user through the abortion process. The system completes the GRAB SAMPLE cycle for a set period of time (stabilization time) and loops to the normal measurement screen after the cycle is complete. Concentration of grab sample is continuously displayed while the system is in GRAB SAMPLE mode and final results are stored in Grab Sample Log – See Diagnostics.

3.6.5 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 mode 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:



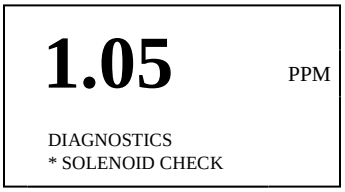
NOTE: Switching off the system abruptly, without going into FAIL SAFE mode may result in malfunctioning of the system after next power ON.

3.6.6 DIAGNOSTICS

A complete set of 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:

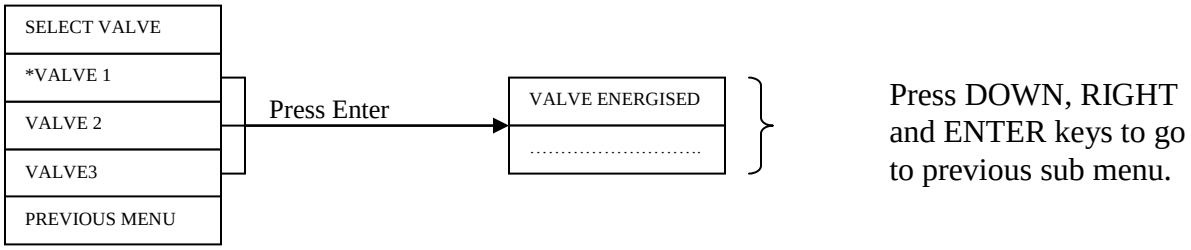
1. **SOLENOID CHECK** – Manually checks the operation of each solenoid valve
2. **CALIB LOG** – Stores data for the last 10 calibrations
3. **ALARM LOG** – Stores data for the last 10 alarms
4. **PROBE DETAILS** – Input probe data for historical record
5. **THERM CHECK** – Checks real-time output from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

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

3.6.6.1 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:

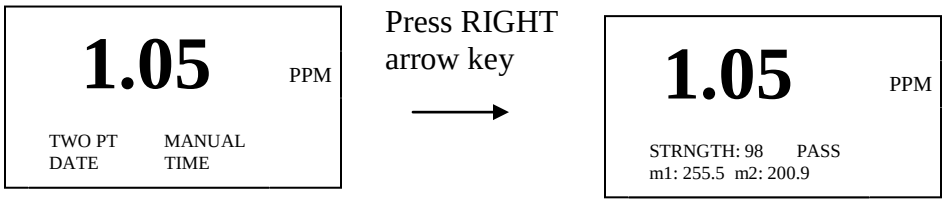
Press the DOWN arrow key to select which valve you want to initiate. Press ENTER to activate valve.



3.6.6.2 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, Two Point, Pro Cal
- 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
- m1---------- → mV seen during CAL1 (100ppb) sequence
- m2--------- → mV seen during CAL2 (1ppm) sequence

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

3.6.6.3 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.

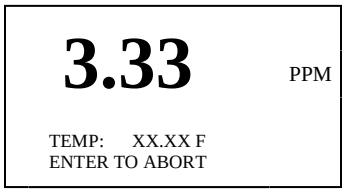
3.6.6.4 PROBE DETAILS

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.

3.6.6.5 THERM CHECK

By pressing 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.

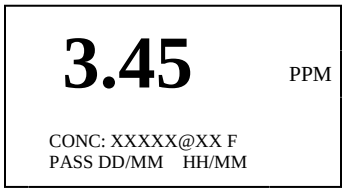
3.6.6.6 SENSOR CHECK

By pressing ENTER key the following screen is displayed:

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

3.6.6.7 GRAB SAMPLE LOG

By pressing the ENTER key the following screen is displayed:

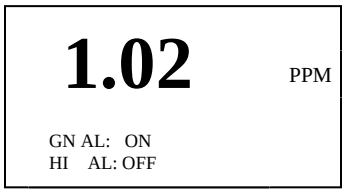


A log typically shows the:
Grab Sample Concentration → Concentration of Grab Sample solution
Status of Grab Sample → Pass or Fail
Date---------- → Date of Log
Time--------- → Time of Log

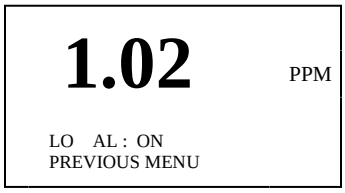
The GRAB SAMPLE LOG maintains the log of the last grab sample cycle performed.

3.6.6.8 RELAY CHECK

By pressing ENTER key the following screen is displayed:



Press DOWN arrow key twice to get the following display:

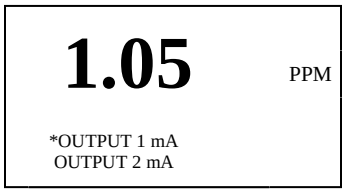


This menu is used to test the Alarms. Select the sub-menu by pressing the DOWN arrow key and pressing ENTER. Use the RIGHT arrow key to select the relay and DOWN arrow key followed by ENTER key to activate or de-activate the alarms.

Pressing the ENTER key when PREVIOUS MENU is highlighted loops the system to previous menu.

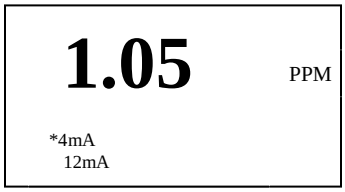
3.6.6.9 OUTPUT mA CHECK

By pressing the ENTER key the following screen is displayed:



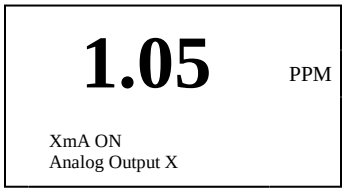
By default OUTPUT 1 mA is highlighted. Use DOWN arrow key to select OUTPUT 1 mA or PREVIOUS MENU.

Press ENTER to display the following:



Press DOWN arrow key to display the next option:

Press ENTER key to display the following:



Press down and select PREVIOUS MENU to return to the previous menu.
Note: Failure to exit this menu by selecting and following the PREVIOUS MENU chain back to the display screen (select PREVIOUS MENU three times) will keep the 4-20mA output at the diagnostic value and NOT the measured value.

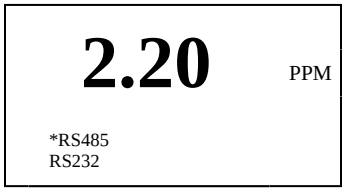
3.6.6.10 DIGITAL I/PS

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.

3.6.6.11 SERIAL CHECK

By pressing the ENTER key the following screen is displayed:

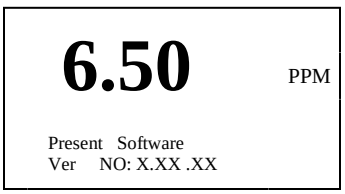


Select the type of communication (RS485 or RS232) by pressing the DOWN arrow key and press ENTER to check the serial outputs. User should get the following display:

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

3.6.6.12 S/W VERSION

By pressing the ENTER key the following screen is displayed:



Press any key to go back to the previous menu.

3.6.6.13 PREVIOUS MENU

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

3.6.7 DISPATCH MODE

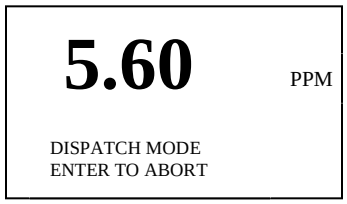
****DISPATCH MODE is to be used for Waltron in-house testing only.****

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:

Please 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*

A 2-Point CAL must be performed (and passed) for the instrument to function correctly. Before initiating a calibration sequence, please rinse the two standard solution containers with high-purity (DI) water and fill them with fresh sodium standard solutions. If the user wishes to perform a single point calibration, only one standard solution CAL1 (100ppb standard) is required. If the user wishes to perform a two point calibration, both the CAL1 (100ppb) and CAL2 (1ppm) standards are required.

The frequency of calibrations depends on the operating conditions and electrode conditions. Waltron recommends performing a 2-Point CAL at least once a month however more frequent calibrations may be done to eliminate drift due to changing electrode response.

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

1) Sample is delivered to analyzer at flow rate of 150-400ml/min
2) Low concentration solution (100ppb) is placed in the container CAL1.
3) High concentration solution (1ppm) is placed in the container CAL2.
4) The high and low solution concentrations need to be entered in the system under CALIBRATION SETUP. Refer to Section 3.5.2.1 for more details**.**
5) The Grab Sample bottle is empty or disconnected**.**

Detailed Description of Calibration Process

2-Point Calibration (Manual and Automatic):

1. After CAL is initiated, solenoid valve #3 (Grab Sample) is opened for 2 minutes to drain any grab sample solution left in bottle.
2. Solenoid valve #1 (CAL1) is opened for 10 minutes to rinse out system and update with 100ppb solution.
3. Solenoid valve #3 is then activated and CAL1 flow is restricted for 3 minutes. This allows the sodium electrodes to continue measuring standard without using excess calibration solution.
4. Solenoid valve #1 is then opened again and CAL1 solution flows through system for 10 minutes; final millivolt output for CAL1 (m1) reading is taken and stored into memory.
5. Solenoid valve #2 (CAL2) is opened for 10 minutes to rinse out system and update with 1ppm solution.
6. Solenoid valve #3 is then activated and CAL2 flow is restricted for 3 minutes. This allows the sodium electrodes to continue measuring standard without using excess calibration solution.
7. Solenoid valve #2 is then opened again and CAL2 solution flows through system for 10 minutes; final millivolt output for CAL2 (m2) reading is taken and stored into memory.
8. Calibration is complete. Results are shown on display for 1 minute and then stored into CAL LOG.

1-Point Calibration (Manual and Automatic):

1. After CAL is initiated, solenoid valve #3 (Grab Sample) is opened for 2 minutes to drain any grab sample solution left in bottle.
2. Solenoid valve #1 (CAL1) is opened for 10 minutes to rinse out system and update with 100ppb solution.
3. Solenoid valve #3 is then activated and CAL1 flow is restricted for 3 minutes. This allows the sodium electrodes to continue measuring standard without using excess calibration solution.
4. Solenoid valve #1 is then opened again and CAL1 solution flows through system for 10 minutes; final millivolt output for CAL1 (m1) reading is taken and stored into memory.
5. Calibration is complete. Results are shown on display for 1 minute and then stored into CAL LOG.

3.7.1 SINGLE POINT CALIBRATION

A Single Point (1-Pt) calibration should be performed only if the analyzer has successfully passed a 2-Pt calibration. For 1-Pt calibration, the first solenoid valve is energized and CAL1 solution flows through the flow cell. During a 1-Pt calibration the analyzer calibrates by changing the **offset** of the slope taken during the last 2-Pt calibration.

NOTE: During single point calibration sample needs to be delivered to analyzer at flow rate of 150-400ml/min. If not, calibration will result in CF.

To perform 1-Pt Calibration:

1) Press the MENU key.
2) Press the DOWN arrow key to scroll to MAN CALIB menu and press ENTER key to select.
3) Select PROCEED. The sub-menu gives the user the option to select the type of calibration.
4) Scroll to Single PT CALIB and press ENTER.
5) Once a 1-Pt calibration is in progress the following message is displayed on the bottom 2 lines of the LCD:

CAL1 in progress SENSOR: XXX.XXmV

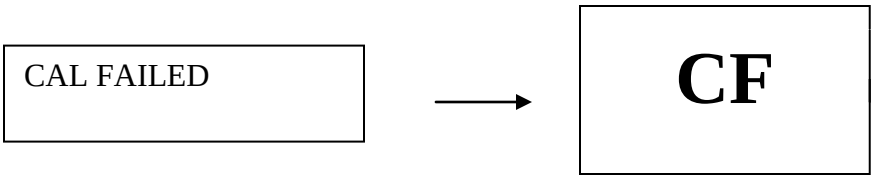
6) After successfully completing 1-Pt calibration the following message is displayed and the system returns to the normal measurement mode:

CAL SUCCESS mV1: xxx.x

→

25.5	PPB
TEMP = : 87.5 F	

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



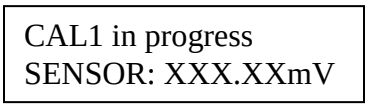
3.7.2 TWO POINT CALIBRATION

During a 2-Pt calibration the first solenoid valve is energized first and CAL1 solution flows through the flow cell. Once analyzer finishes measuring the CAL1 solution, the first solenoid valve is deactivated and the second solenoid is activated thus allowing CAL2 solution to flow through the flowcell. The analyzer calibrates by measuring the change in mV values between the CAL1 and CAL2 solutions and comparing this "strength" (sometimes called "slope") to theoretical values.

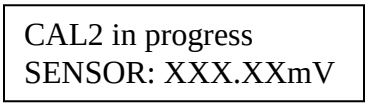
NOTE: During two point calibration sample needs to be delivered to analyzer at flow rate of 150-400ml/min. If not, calibration will result in CF.

To perform 2-Pt Calibration:

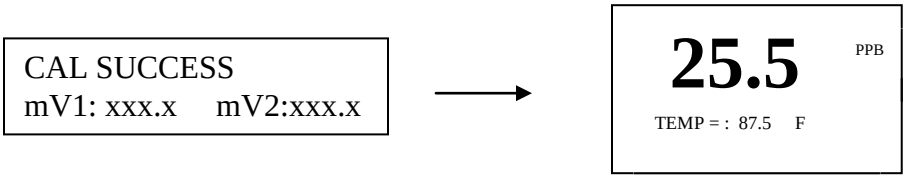
1. Press the MENU key.
2. Press the DOWN arrow key to scroll to MAN CALIB menu and press ENTER key to select.
3. Select PROCEED. The sub-menu gives the user the option to select the type of calibration.
4. Scroll to TWO PT CALIB and select ENTER.
5. Once 2-Pt calibration is in progress CAL1 solution will begin flowing into the system and the following is displayed on the bottom 2 lines of the LCD:



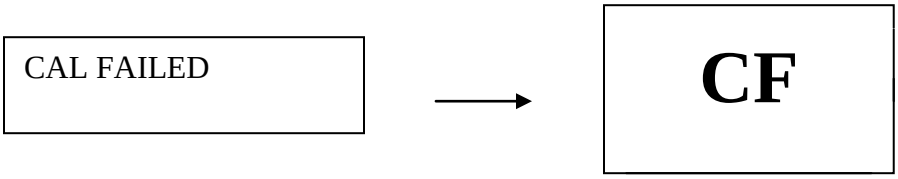
6. After CAL1 is finished, CAL2 solution will begin flowing into the system and the following message is displayed:



7. After successfully completing the 2-Pt 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:



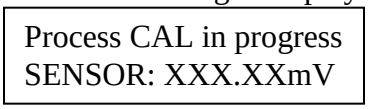
Note: A calibration cycle may be interrupted at any time by pressing the ENTER key. In order to avoid accidental key press, the calibration cycle is aborted only after confirmation from the user. Once the calibration process is aborted, the measurement screen is displayed.

3.7.3 PROCESS CALIBRATION

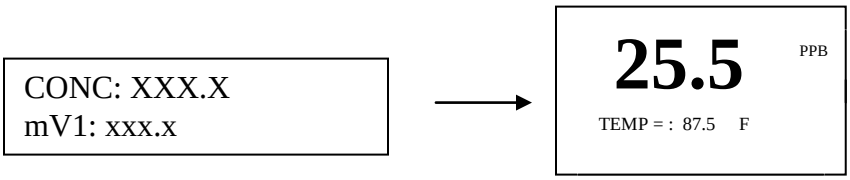
A Process Calibration (PROCESS CAL) can be performed only if the analyzer has successfully passed a 2-Pt calibration. During PROCESS CAL, none of the solenoid valves are energized and the instrument is calibrated directly to the sample running through the flowcell. The analyzer calibrates by changing the **offset** of the strength/slope taken during the last 2-Pt calibration.

To perform Process Calibration:

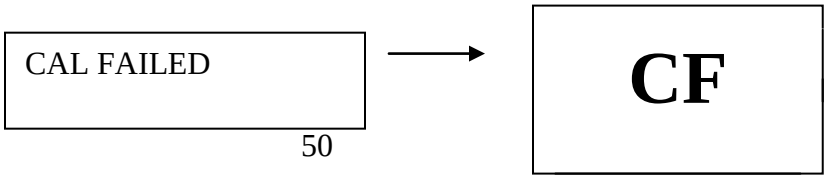
1) Press the MENU key.
2) Press the DOWN ARROW key to scroll to MAN CALIB menu and press ENTER key to select.
3) Select PROCEED. This sub-menu gives the user the option to select the type of calibration.
4) Scroll to PROCESS CALIB and press ENTER.
5) Once the PROCESS CALIB is in progress the sample will continue flowing into the system and the following is displayed on the bottom 2 lines of the LCD:



6) After successfully completing the Process Calibration the following message is displayed and the system returns to the measurement mode:



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



3.7.4 AUTO CALIBRATION

The analyzer can be set up to perform an automatic 1-Pt or 2-Pt 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) The following screen is displayed:

Single Point Two Point

5) Press the DOWN arrow key to select "Single Point" or "Two Point" calibration and press ENTER key. The following screen is displayed:

6) Press RIGHT arrow key to move the cursor to the editable part of the display.
7) 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.
8) Similarly the system can be configured to automatic perform a two-point calibration.
9) 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.

3.7.5 CALIBRATION FAILURE

A Calibration Fail (CAL FAIL) condition will occur after a 2-Pt calibration if the electrode response does not meet requirements. This happens when the electrodes "strength" ("slope") from a 2-Pt calibration is below 83 or greater than 110. This could be caused by a number of factors (See next section - Troubleshooting).

NOTE: During single and two point calibrations sample needs to be delivered to analyzer at flow rate of 150-400ml/min. If not, calibration will result in CF.

4 TROUBLESHOOTING – CALIBRATION FAIL

STRENGTH LESS THAN 83%

- ✓ Make sure standard containers (CAL1 and CAL2) are full of solution.
- ✓ Check that vapor bubbles are emerging from the bottom of the stainless steel entrainment tube.
- ✓ Check the condition of the reagent solution.
- ✓ Regenerate the sodium measuring electrode. See Section 5.5.2
  If the slope value is not improved after the sodium measuring electrode is regenerated, the electrode may need to be replaced.

STRENGTH MORE THAN 100%

- ✓ Possible cause may be faulty reference electrode. Check status of reference electrode filling solution and add more if using N3010-174.
- ✓ Check the status of reference electrode and replace if necessary.
- ✓ Make sure standard containers (CAL1 and CAL2) are full of solution.

VERY LOW OR 0% SLOPE

- ✓ Check the operation of the solenoid valve(s).
- ✓ Check flow of standard solution through flow cell.
- ✓ Check the level of the salt bridge solution in the reference electrode, if using N3010-174.
- ✓ Check for open circuit reference electrode by substituting it with an electrode of known performance.
- ✓ Check all electrical connections in the electrode junction box and interconnect cable.
- ✓ Make sure standard containers (CAL1 and CAL2) are full of solution.

5 MAINTENANCE

5.1 *BUFFER SOLUTION(S)*

> ⃠**WARNING**. These buffers are mildly toxic and hazardous, and should be handled with care.

Two alternative reagent solutions may be used, depending on the required lower limit of measurement. Concentrated ammonia solution, which provides adjustment of sample pH to 10.7 is suitable for measurements of sodium ion to approximately 0.5ppb. At concentrations below 0.5ppb, hydrogen ion interference becomes significant and a reagent of diisopropylamine solution should be used. This adjusts the sample pH to 11.2 - 11.5 and enables measurements to be made to concentrations below 0.5ppb.

Concentrated Ammonia Solution - 1 liter

> ⃠**WARNING**. This buffer should only be handled under a fume hood. It causes burns and is irritating to the eyes, respiratory system and skin. Wear rubber gloves and eye protection. In warm weather pressure increases in the bulk container of ammonia and the cap must be released with care.

> **Note.** Waltron L.L.C. offers Ammonium Hydroxide in a 2.5 liter container. Part N1234-116.

Diisopropylamine Solution

> ⃠**WARNING**. Diisoproplyamine is an extremely inflammable and irritating colorless liquid with a strong smell of ammonia. It should be handled with care at all times. The following points should also be noted:
>
> Avoid breathing vapor and avoid contact with skin and eyes.
>
> Work under a fume hood, wearing rubber gloves and eye protection.
>
> In the event of a fire, extinguish with water spray, foam, dry powder or carbon dioxide.

If a spill occurs, shut off all possible sources of ignition, and instruct others to keep at a safe distance. Mop up spill with plenty of water, diluting greatly. Ventilate the area well to evaporate any remaining liquid and dispel vapor.

Effluent from the analyzer contains diisoproplyamine (if this buffer is used). Contact with it should also be avoided.

5.2 *STANDARD SOLUTIONS*

- ✓ Waltron L.L.C. offers Sodium Standard, 100 ppb, in a 1 gallon container. Part Number N1234-540.
- ✓ Waltron L.L.C also offers Sodium Standard, 1 ppm, in a 1 gallon container. Part Number N1234-541.

- o Do not use static sodium solutions of less than 50ppb because low concentration solutions rapidly become contaminated and change in concentration.

- o Although the HIGH and LOW standard solutions are typically one decade apart in sodium concentration, any concentration difference can be used within the constraints of i) above and the need to have a significant change in electrode output to achieve an accurate calibration.

Note. High purity water is water containing less than 2ppb sodium ions and a specific conductivity of less than approximately 0.2µS/cm.

5.3 *ETCHING SOLUTION*

Note. Waltron L.L.C. offers the solution under our Part Number N1234-543, Sodium Electrode Regeneration Solution, 2 oz size.

For use on applications where the sample sodium concentration is below 1ppb - see also Section 5.5.2.

⃠WARNING. Sodium Fluoride is toxic. Avoid inhaling the dust and prevent contact with skin and eyes. Wear a dust mask, rubber gloves and eye protection. When prepared, the etching solution contains 0.1M Hydrofluoric acid (0.2% HF). Take care to prevent contact with skin and eyes.

5.4 *REFERENCE ELECTRODE FILL SOLUTION (For Use with N3010-174)*

Waltron L.L.C. offers a stock solution of 3.5 KCL Ref. Electrode Filling Solution in a 2oz. size. Part Number N1234-548.

This solution is required for refilling the calomel reference electrode. This solution should be stored in a tightly sealed plastic bottle. The electrode is conveniently filled using the automatic KCl refill system.

5.5 *SCHEDULED SERVICING*

The following procedures are guides to the maintenance requirements of the monitor. The procedure chosen depends on the particular installation and sample conditions.

5.5.1 WEEKLY

If the monitor is continuously running at high concentrations, greater than 100ppb, a weekly Single Point Calibration is recommended. See Section 3.7.1 Single Point Calibration.

5.5.2 MONTHLY

- Replace the bottle of reagent buffer solution. The level of solution should not be allowed to fall below about three-quarters full. On high ambient temperature installations and for low sodium concentrations, the solution may require replacement more frequently.

- Check the level of reference electrode filling solution; refill as required.

- The following procedures should be carried out:

When the sodium concentration is above 1ppb, carry out a Two Point Calibration - see Section 3.7.2; note the slope value.

Sodium Measuring Electrode Etching/Regeneration Instructions:

When the sodium concentration is below 1ppb, apply the following regen/etch procedure before carrying out a Two Point Calibration:

> **Note**. When used for prolonged periods at low concentrations, leeching of sodium ions from the electrode surface accelerates the aging process of the electrode which is shown by poor response time, low slope value and a limitation to respond to low levels. Calibration may then be in error because of slow response and poor reproducibility. The regen procedure minimizes problems from these sources.
> **Also: Etching is not for new probes- this should be done as part of the monthly maintenance procedure.**

- Remove the sodium electrode from the flowcell and slide off the sleeve and 'O' ring; it is not necessary to detach the electrode lead.
- Prepare two plastic beakers, one containing about 50ml of etching solution, the other about 200ml high purity water.
- Dip the electrode in the etching solution for 60 (±5) seconds; then rinse in high purity water.

> **Caution**. It is important not to exceed the etching time or the performance of the electrode may be permanently degraded.

- Dispose of the etching solution by diluting to waste with plenty of water. Use fresh etching solution each time.

Fit the 'O' ring and sleeve and return the electrode to the flowcell. Prior to performing a calibration, run the monitor for one to two hours on low level sodium sample. No further calibration should be needed until the next regen procedure.

This procedure must be carried out at regular monthly intervals and the process started as soon as a new electrode is put into service.

> **Note**. It is extremely difficult to recover an 'old' electrode.

As the buffer solution, is replaced monthly, the following procedure should be carried out 24 hours after replenishment to allow pH stability to be achieved.

This procedure applies to both ammonia and amine buffered systems.

5.6 *SHUT-DOWN PROCEDURE - (Prolonged Shut-Down, 1+ months)*

- Close the sample valve upstream of the monitor.
- Remove the buffer container and safely dispose of the solution. Rinse the containers thoroughly.

> ⃠WARNING. For safe handling instructions of buffer solutions refer to Chapter 6.

- Fill the CAL1 calibration solution container with high purity water and do a single point calibration to flush the system.
- Remove the electrodes and follow procedure in Section 5.6.1.
- Use a syringe to flush all tubing with high purity water. This removes any particulate deposits.
- Switch off the main power supply to the Transmitter Unit.

5.6.1 STORAGE OF ELECTRODES

Fill the rubber teat, supplied with the **sodium electrode**, with 5M sodium solution. Push the teat over the end of the electrode. For strong the refillable reference electrodes, fill the rubber teat with the refillable solution and push teat over the end of the electrode. Refit the filling hole plug to seal the refill aperture. For storing the Gel-filled electrode, fill the rubber teat with a dilute KCl solution and push teat over the end of the electrode.

> **Note**. Do not let either electrode dry out!!!

5.7 *pH EFFECTS*

Measuring the pH of the effluent from the flowcell indicates adequate buffering. The minimum pH depends on the minimum sodium concentration, but the pH value is calculated as:
pH must be greater than pNa + 3, so ideally at:

- 100ppb Na+, the pH must be greater than 8.4
- 10ppb Na+, the pH must be greater than 9.4
- 1ppb Na+, the pH must be greater than 10.4
- 0.5ppb Na+, the pH must be greater than 11.4

Note. If the buffer is allowed to become completely exhausted, the reading may be very erratic due to the lack of ionic strength adjustment of the high purity sample.

6 SPARE PARTS

Recommended Spare Parts

PART NUMBER	DESCRIPTION
N3010-177	Measuring Electrode
N3010-174	Refillable Reference Electrode
N3010-173	Gel-filled Reference Electrode
N3010-176	Detachable Lead, 9032
P2000-049	Kit, Re-tubing & O-Ring
N1234-543	Sodium Electrode Regeneration Solution (2 fl.oz.)
N1234-548	3.5 M KCl Reference Solution Kit, 9032
N1234-116	29% Ammonium Hydroxide (2.5 L)
N1234-540	Sodium Standard, 100ppb, 1 Gallon Cube, 9032
N1234-541	Sodium Standard, 1000ppb (1 ppm), 1 Gallon Cube, 9032
P2000-038	Flow Switch Assembly, 9032

Additional Spare Parts

PART NUMBER	DESCRIPTION
N1234-579	99% Di-Isopropylamine (1 Gallon)
N3010-170C	Thermistor, Flow Cell
N1234-544	Sodium Standard, 100 ppb (5 gal.)
N1234-545	Sodium Standard, 1000 ppb (5 gal.) - (1 ppm)
P2000-039A	Flowcell Assembly, 9032
P2000-016	Kit, expendables 9032
N1053-106A	Earthing Tube
K1152-200	Nupro Filter, Stainless Steel, 60 Micron
P2000-009	Pre-Amp w/Junction Box, 9032, Complete
P1000-067	Standard Bladder Cap
N2554-066A	Entrainment “T” Assembly
P1000-017	CPU card
P1000-010	LCD Display
P1000-006	Solenoid valve Assembly
P1000-013	Fitting 1/8” x 5/32” Elbow
P1000-014	Fitting 1/8” x 5/32” Straight
P1000-015	Fitting, Straight with 1/8” BSP to Entrainment T
P1000-019	Fitting, 5mm x 1/8, Solenoid
P1000-059	AC Power Terminal Box, 9001
P1000-066	Grab Sample Bottle
P1000-076	Connector for Grab Sample Bottle
P1000-121	Cable Gland Fitting, Flowcell 9032
P1000-001	Solenoid valve bracket
P2000-001	Heat Exchanger Assy, 9032
P2000-002	Vessel Assy, Constant Head, 9032
940-0000-00	Analog Board
907-0000-00	Crimp Terminal Kit

7 TROUBLE-SHOOTING

Troubleshooting 9032		
Problem	**Possible Cause(s)**	**Solution(s)**
Calibration Fail (CF)	Empty or Contaminated Standards Solutions Container(s)	Check to make sure CAL standard bottles are full, check CAL tubing to make sure it is not pinched. Replace CAL standard with fresh solution and try again.
Calibration Fail (CF)	Faulty Solenoid Valve(s)	Run Solenoid Check cycle in Diagnostics – check status and connections of solenoid valves.
Calibration Fail (CF)	Strength is too low. <83	Make sure both containers of standard (CA1 & CA2) are full of solution.
Calibration Fail (CF)	Strength is too low. <83	Verify condition of reagent solution. Replace monthly.
Calibration Fail (CF)	Strength is too low. <83	Verify electrodes are connected properly
Calibration Fail (CF)	Strength is too low. <83	Check that vapor bubbles are emerging from bottom of entrainment tube.
Calibration Fail (CF)	Strength is too low. <83	Ensure reference electrode tip is 42-48 mm from the top of the flowcell (5mm into sample)
Calibration Fail (CF)	Strength is too low. <83	Ensure calibration standard is flowing. Perform Solenoid Check cycle in Diagnostics to verify.
Calibration Fail (CF)	Strength is too low. <83	Regenerate the sodium measuring electrode. See section 5.5.2 in manual.
Calibration Fail (CF)	Strength is too high. >110	Make sure both containers of standard (CA1 & CA2) are full of solution.
Calibration Fail (CF)	Strength is too high. >110	Check level of reference electrode salt bridge solution; add more if necessary
Calibration Fail (CF)	Strength is too high. >110	Faulty reference electrode. Replace with one of known performance.

Calibration Fail (CF)	Strength is close to zero.	Make sure both containers of standard (CA1 & CA2) are full of solution.
Calibration Fail (CF)	Strength is close to zero.	Ensure there is flow of standard solution through flow cell.
Calibration Fail (CF)	Strength is close to zero.	Check all connections in electrode junction box and interconnect cable.
Calibration Fail (CF)	Strength is close to zero.	Verify operation of solenoid valves.
Calibration Fail (CF)	Strength is close to zero.	Check level of salt bridge solution in reference electrode.
Calibration Fail (CF)	Strength is close to zero.	Faulty reference electrode. Replace with one of known performance.
Calibration Fail (CF)	No standard flow.	Check for clogs in system. Check for air trapped in tubing. Gently squeeze standard containers to verify flow during appropriate solenoid test. Filter sample if deposits found in analyzer tubing.
Calibration Fail (CF)	No sample flow.	Check to make sure sample flow is being delivered to analyzer at flow rate 150-400ml/min.
Readings are not accurate – too low.	Old/bad reagent. Poor electrode performance. Bad calibration.	Replace reagent solution. Regenerate/replace sodium measuring electrode, refill/replace reference electrode. Check CAL log and run another CAL if results are not good.
Readings are not accurate – too high.	Poor electrode performance. Bad calibration. Sodium leak in sample system.	Regenerate/replace sodium measuring electrode, refill/replace reference electrode. Check CAL log and run another CAL if last result is not good.
Readings are not accurate – erratic	Exhausted reagent	Replace reagent. Recommended monthly

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 directly from transmitter. Replace CPU board if output is not correct.
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 at pre-amp.
Display read “OVR”	Signal from electrodes too high – sample concentration over maximum range (>10ppm)	Check sample concentration. Check electrode connections at junction box and pre-amp.

8 SPECIFICATIONS

Range:	0.1ppb – 10ppm
Accuracy:	+/-5% of reading or +/- 0.1ppb (whichever is greater) within +/- 5C of calibration temperature
Reproducibility:	+/-5% of reading or +/- 0.1ppb (whichever is greater) at constant temperature
Response Time:	90% of 1-10ppb step: less than 4 minutes; 90% of 100-1ppm step: less than 6 minutes
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

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

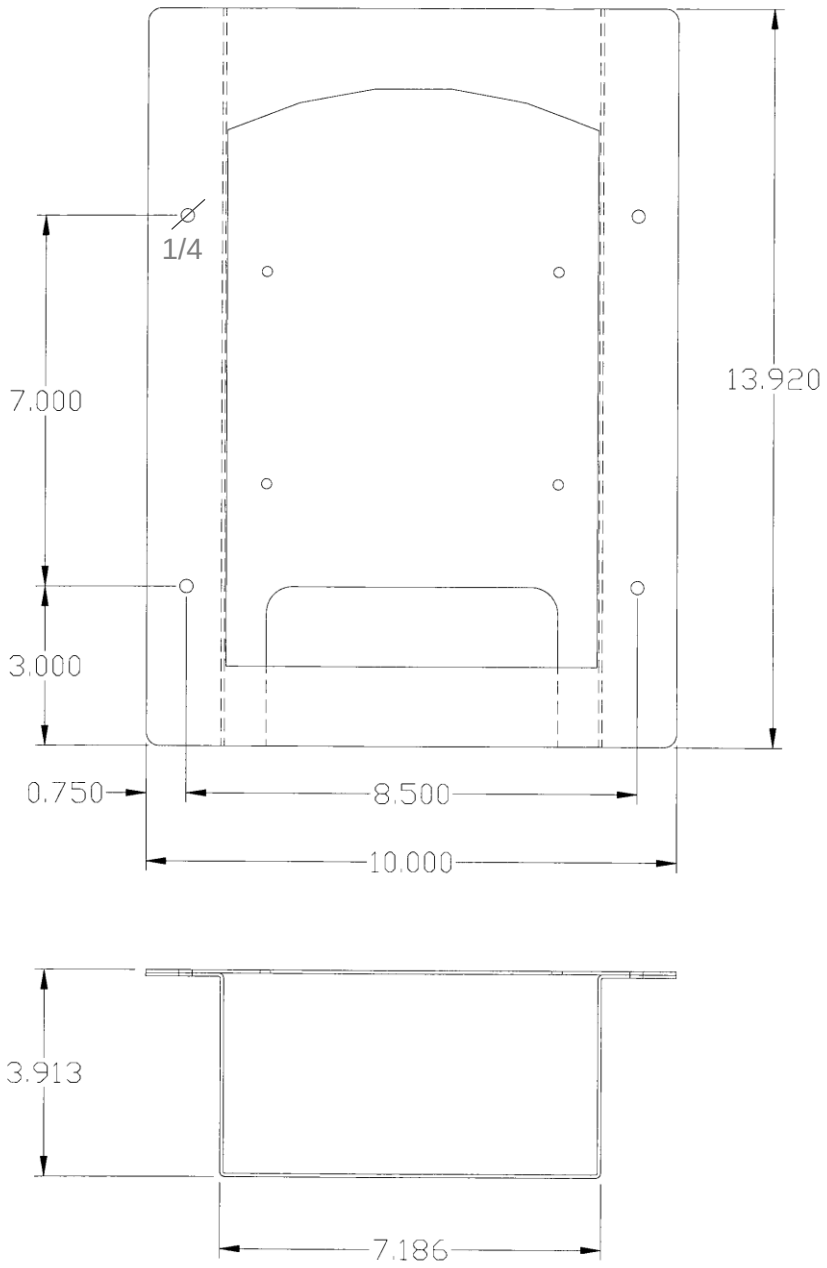
Sodium Concentration	Theoretical Preamp Input with Sensors (mV)
0.01 ppb	-476.63
0.02 ppb	-458.82
0.05 ppb	-435.27
0.1 ppb	-417.47
0.2 ppb	-399.66
0.5 ppb	-377.11
1 ppb	-358.31
2 ppb	-340.5
5 ppb	-316.95
10 ppb	-299.15
20 ppb	-281.34
50 ppb	-257.79
100 ppb	-239.99
200 ppb	-222.18
500 ppb	-198.63
1 ppm	-180.83
2 ppm	-163.02
5 ppm	-139.47
10ppm	-121.67

Approximate electrode mV outputs for calibrations using Waltron Electrodes:

Refillable Reference Electrode		Gel-Filled Reference Electrode	
mV 1 (100 ppb)	mV 2 (1 ppm)	mV 1 (100 ppb)	mV 2 (1 ppm)
240-260 mV	180-200 mV	240-260 mV	180-200 mV

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*

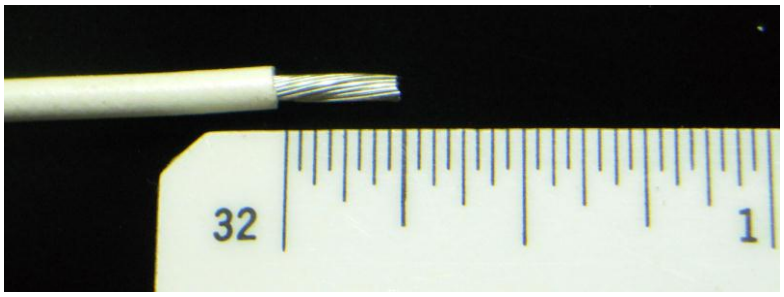


Figure 1: Strip the wire to approximately 0.25in. Ideally, use at least 20AWG wire but your wire terminal kit will accommodate gauges from 22-10AWG.

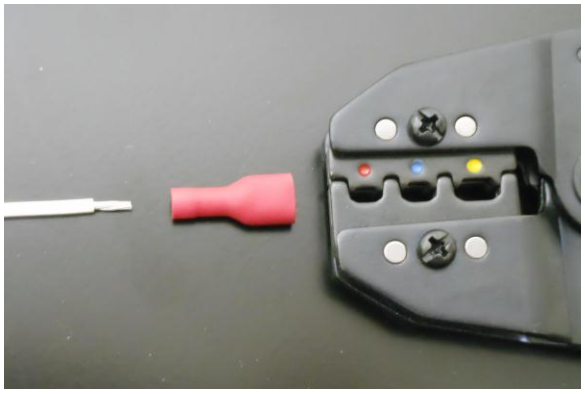
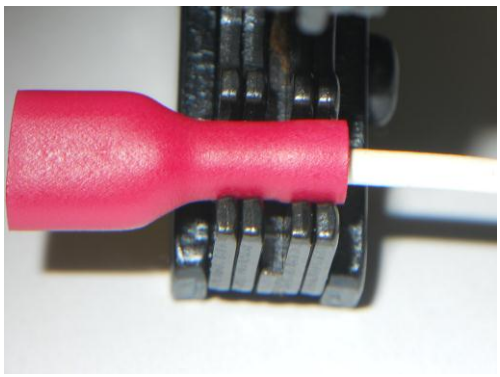


Figure 2: Select the appropriate terminal based on the wire gauge used. Red-colored terminals handle 22-18AWG; blue terminals are for 16-14AWG and yellow are for 12-10AWG. Note the corresponding color dots on the crimp tool die set. Match the terminal to the position on the die. Do not over-crimp by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



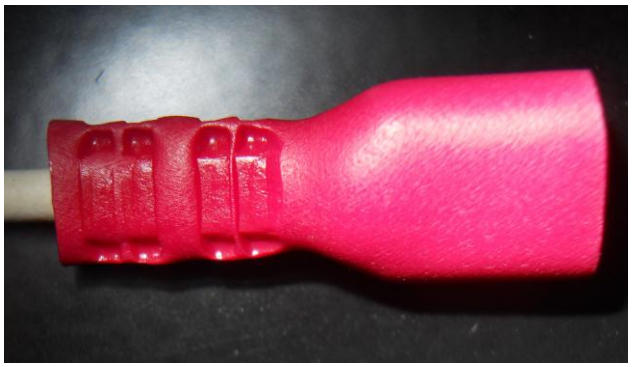


Figure 3A: Position the terminal in the die, as shown at the left. It is important to have the terminal positioned so that the connector end of the terminal is even with the jaw and the crimp part of the terminal mates correctly with the crimp tool die.

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*

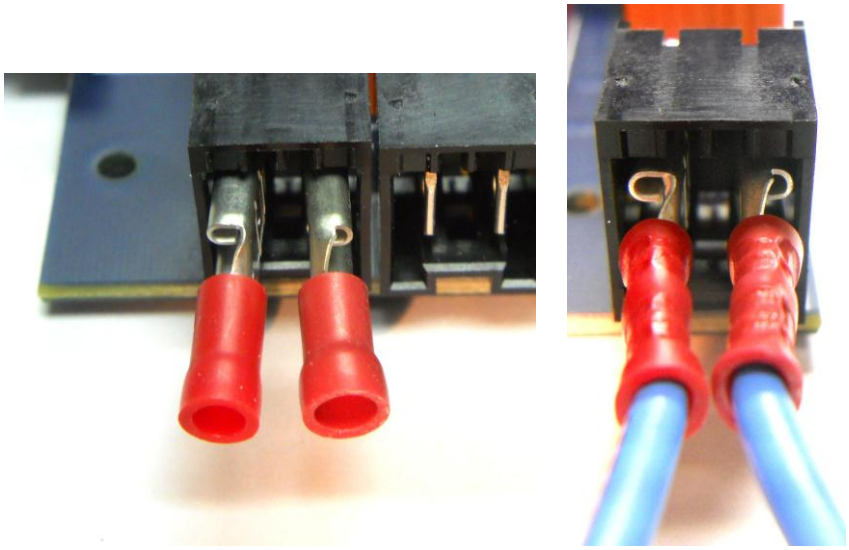


Figure 4A: Only partially shrouded terminals will fit onto the Analog Board's connectors. An assortment of suitable connectors and a crimp tool is supplied in Waltron's Terminal Kit, p/n 907-0000-00. Note that the orientation of the terminals is important to maintain maximum electrical separation. Position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