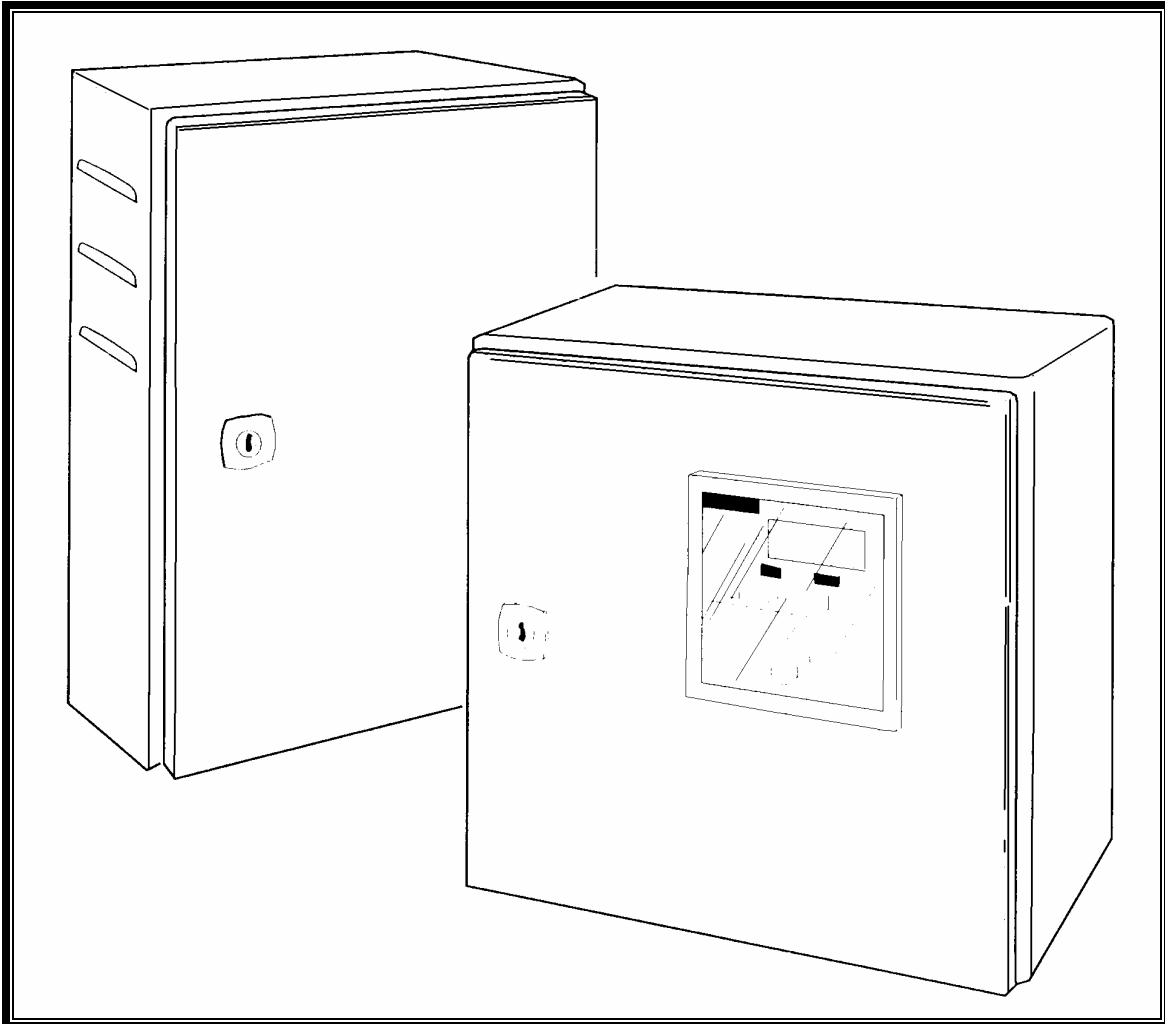


# Waltron LLC AQUALERT<sup>®</sup> DIVISION

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## Water Chemistry Measurement & Control



### $\mu$ AI-9070 SERIES HYDRAZINE MONITOR INSTRUCTION MANUAL

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**1 INTRODUCTION****1.1 GENERAL**

The  $\mu$ AI-9070 Hydrazine Analyzer is a continuous on-line monitor for direct measurement of Hydrazine in boiler feedwater. The 9070 features low maintenance, semi-automatic process or standard calibration; and high accuracy, auto ranging and external (“grab”) sample analysis.

**1.2 DESCRIPTION****1.2.1 SENSOR UNIT**

The sensor unit is in a metal case, which also houses the liquid handling equipment. Pipework carrying the sample is mounted on a panel, and bolted to the back of the unit with four M6 bolts.

Mounted on the sensor unit door are the Buffer container and the junction box. The junction box for the electrode’s connection is also mounted on the door. A user-controlled switch in the junction box allows for either calibration on a process sample, or a quality analysis/ quality control (QA/QC) test.

The liquid handling section contains a machined PVC head chamber. As sample flows to the vapor entrainment “T,” the head chamber controls its rate and pressure. (Pretreat the sample with an alkaline vapor to achieve the correct pH value.)

The sample is then collected in a standpipe that forces sample flow through the Hydrazine Sensor.

Use a standard solution of a known value under the control of the transmitter unit to calibrate the sample.

The drain cup collects used sample and overflow, allowing for a single drain connection.

**1.2.2 TRANSMITTER UNIT**

The transmitter unit is in a metal case similar to the construction of the sensor unit’s, with a chassis unit supporting circuit boards and other electrical sub-assemblies.

Microprocessor electronics control the functions of the transmitter. The three main functions of the Hydrazine Analyzer are:

- ✓ To interpret and to display a reading of hydrazine received from the sensor unit,
- ✓ To control the calibration sequence,
- ✓ To provide various outputs to the remote equipment.

Displays are three-digit, seven-segment, light emitting diodes (l.e.d.), which show the level of hydrazine and operational information as well. The operator can see when the instrument is in the calibration mode, and when the calibration has not been successful.

On the left-hand side of the transmitter unit are six access holes. These holes are sized to accept cable glands for the interconnect cable, alarm signals, current outputs and an alternating current (a/c.) power cable

## 2 INSTALLATION

### 2.1 MOUNTING OF UNIT

#### 2.1.1 LOCATION AND LAYOUT

Mount the sensor and transmitter units in a clean, vibration-free area, avoiding direct radiant heat, sunlight and drafts. Avoid areas containing chlorinating equipment.

Mount the sensor unit no more than 33 feet (10 meters) from its associated sample coolers.

Mount the sensor unit on the wall using four 5/16" or 1/4" bolts on 9.06" by 13.00" centers.

Refer to Figure 2.1 for the correct positioning of transmitter and sensor units.

FIGURE 2.1 MOUNTING ARRANGEMENTS

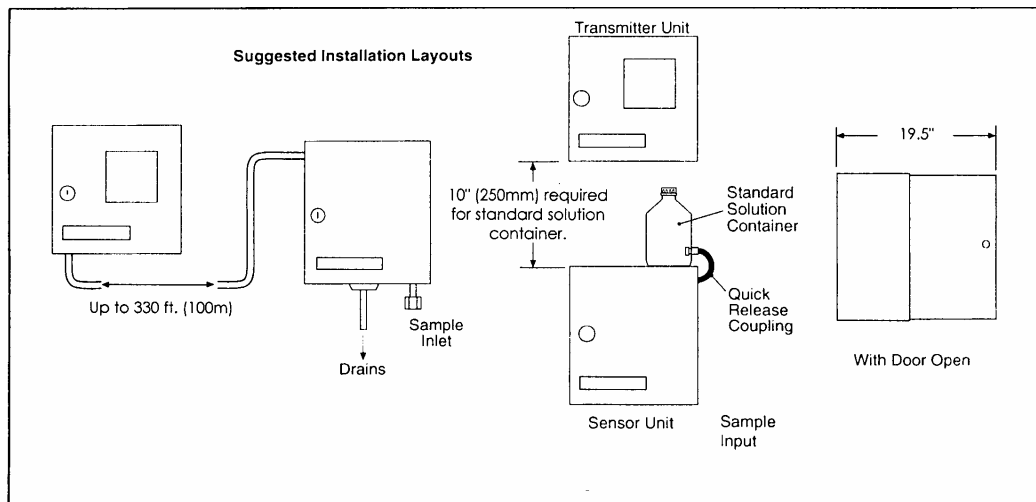
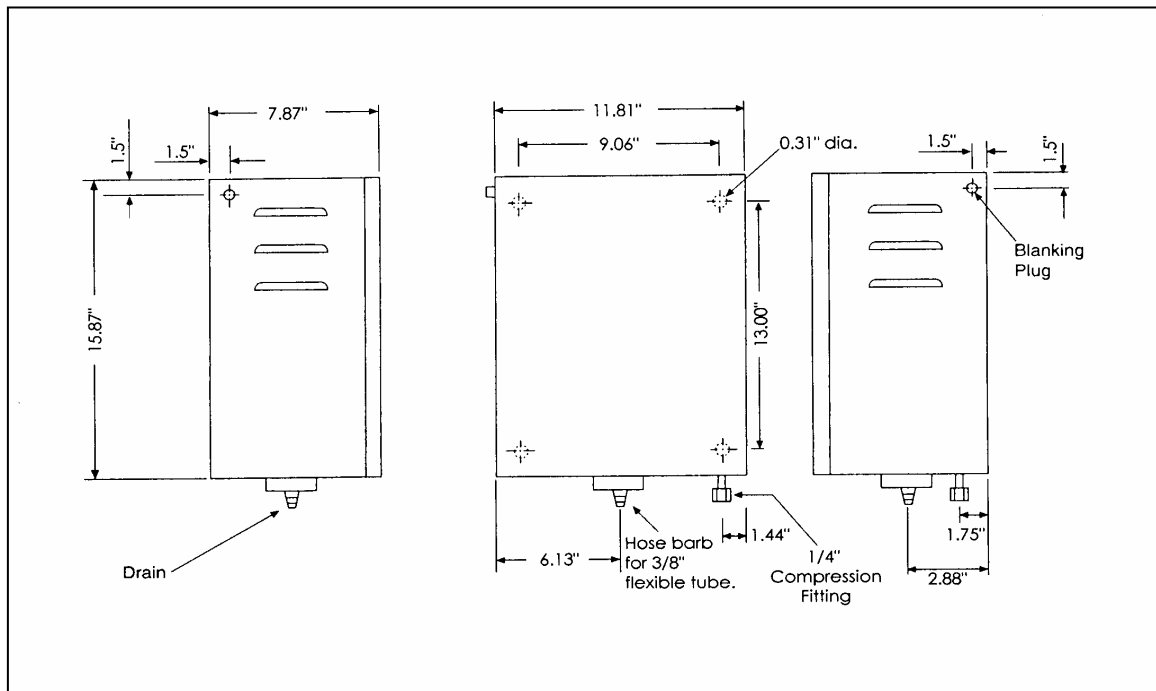


FIGURE 2.2 SENSOR UNIT DIMENSIONS AND INSTALLATION



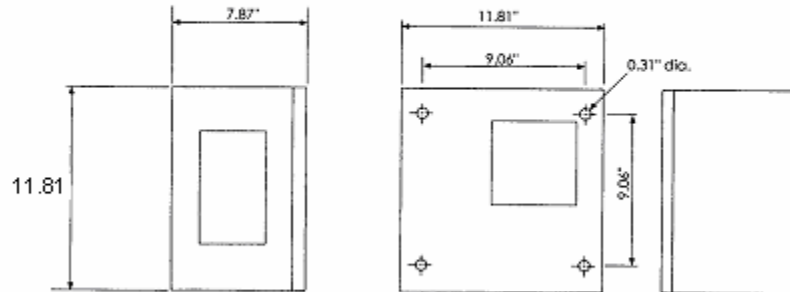
### 2.1.2 TRANSMITTER UNITS

Wall mount using four 5/16" or 1/4" bolts on 9.06" by 9.06" centers. Sufficient access space, as detailed previously, must be left for making cable connections to the transmitters and for the mounting of standard solution containers.

FIGURE 2.3 TRANSMITTER UNIT DIMENSIONS AND INSTALLATION

For access to wall mounting holes remove the chassis unit as follows:

- ① Unlock the door and open it fully.
- ② To release the front panel, with a small coin or similar tool, turn the four black fasteners 1/4 turn in either direction.
- ③ Hold the front panel with two fingers through the slot at the left side. Ease the front panel forward over the Range Switch knob.
- ④ Remove any safety earth (ground) bonding leads attached to the metal case.
- ⑤ Release the captive screws securing the chassis assembly to the back of the case and remove the chassis.



For access and fitting of the transmitter unit, proceed as follows:

- ✓ Unlock the door and open fully.
- ✓ To release the face panel, use a small coin or similar tool to turn the four plastic fasteners 1/4 turn in either direction.
- ✓ Remove the chassis.
- ✓ Secure the transmitter case to the wall by four 5/16" or 1/4" bolts.

**Note.** Before fitting the chassis unit and connecting it to the main power supply, check that the voltage selector is set to the correct value. Refer to **Section 3** for procedures required before start-up.

**Caution.** When replacing the connection terminal blocks, make sure that the blocks are aligned correctly to cover all of the associated connecting pins.



- ✓ With the transmitter case secured to a wall or panel, open the chassis to the case and wire the main power connection. Fit the connection blocks onto the circuit boards.
- ✓ Fit the chassis unit, secure it with the captive screws and replace any ground (earth) bonding leads.
- ✓ Position the face panel and secure it with the four plastic fasteners.

## 2.2 SAMPLE REQUIREMENTS

**⊗Warning:** Do not exceed the maximum pressures and temperatures specified. If you use pressure-reducing equipment, install a pressure relief valve between your equipment and the sample inlet to the monitor for safety purposes.

Bring the sample to the temperature and pressure suitable for measurement, using sample coolers and pressure-reducing equipment (see Section 8)

## 2.3 EXTERNAL PIPING CONNECTIONS

### 2.3.1 INLET

The sample should be connected to the sensor unit using ¼" o.d. tubing of stainless steel or rigid plastic. Connect this to the sample inlet coupling on the right hand side of the case's bottom piece.

The inlet tube should be of sufficient wall thickness to withstand the highest sample pressure, and pipe lengths should be kept short.

Where particulate matter is present (e.g. magnetite in boiler samples), fit a 60-micron sample filter to the sample line.

A shut-off valve (not supplied with the monitor) is necessary in the sample unit.

### 2.3.2 DRAIN

The drain from the cup at the bottom of the sensor unit case consists of a hose barb suitable for 3/8" bore plastic or rubber tubing. Alkaline

effluent from the monitor and overflowing sample drains through this single connection.

## 2.4 ELECTRICAL CONNECTIONS

### ⊗WARNING:

Although some instruments have internal fuse protection, you must use a suitably rated external protection device, such as a fuse or miniature circuit breaker (**MCB**).

Switch **off** the power supply and any high-voltage operated control circuits before making any connections.

The equipment operates on alternating current electricity. Always take suitable safety precautions to avoid the possibilities of an electric shock.

## 2.5 SENSOR UNIT

The prefabricated, eight-conductor cable connecting the sensor unit to the transmitter unit arrives in place from our factory. We've provided this service to assist you to avoid opening the junction box, which could admit moisture.

You may mount the transmitter either next to the sensor unit or up to 330 feet (100 meters) away. Also allow sufficient space on the transmitter unit's left-hand side. The access plate and holes on the left side allow room for the connection of cables to the unit.

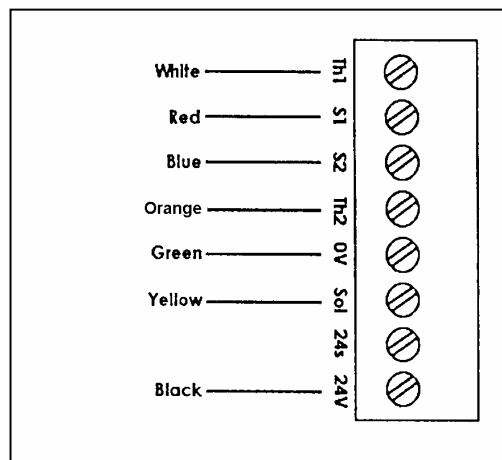
Extend the cable by placing a junction box adjacent to the sensor unit, and by using the required length of 8-conductor cable. You can specify the length of interconnect cable you'll need at the time of order.

### 2.5.1 TRANSMITTER UNIT

- ✓ Remove the four screws securing the access plate to the left-hand side of the transmitter case. Fit suitable cable glands through the 7/8" diameter holes. Insert the cables necessary for the power supply, output signals, alarms and the remote function, if used.
- ✓ Open the transmitter's door and remove the face panel.

- ✓ Make sure the interconnect cable from the sensor unit is long enough to reach the transmitter easily. The cable should terminate on terminal block TB3 on the analog board.
- ✓ Push the end of the cable through a gland in the left-hand side of the transmitter case.
- ✓ Noting that the shield drain wire terminates at Pin 10 of TB2 on the analog board, attach the remainder of the cable end to the terminal block TB3, following the wiring diagram shown in Fig. 2.4. You may pull the terminal block away from the pins on the board if required

FIGURE 2.4 WIRING THE INTERCONNECT CABLE TO TRANSMITTER



**⚠Caution:** The terminal block for the sensor unit connection has eight terminals, yet there are 12 pins on the board. Make sure that you choose the correct eight pins for the connection: These are marked on the PCB, with a separate silk-screened “box”.

### 2.5.2 WIRING OF BOARDS

Pass any remaining cables through the appropriate glands. Note that Pin 1 of each block is nearest the top of the case. Prepare the cable ends and attach them to the terminal blocks as follows:

**Digital Board** (nearest front panel): No Terminations

**Analog Board TB1**

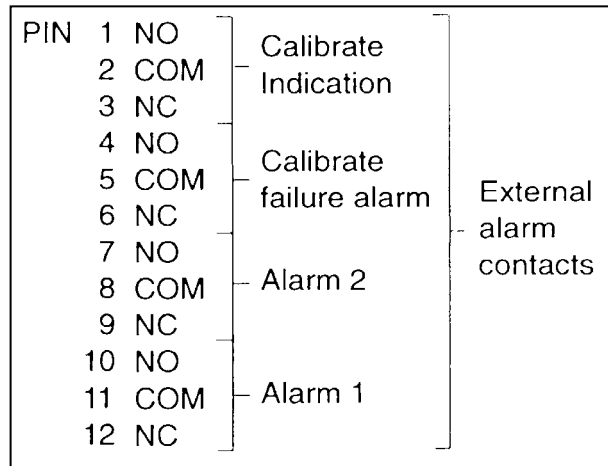
PIN	1	0V		
	2	NO	R4	Four sets of normally open contacts, one of which closes to show range of measurement remotely.
	3	COM		
	4	NO	R3	
	5	COM		
	6	NO	R2	
	7	COM		
	8	NO	R1	
	9	COM		
	10	0V		

**Analog Board TB2**

PIN	1	0V	
	2	Not used	
	3	+	} Isolated current outputs
	4	-	
	5	Not used	
	6	Not used	
	7	+	} Isolated current outputs
	8	-	
	9	Not used	
	10	<b>White/Green - Shield Drain Wire</b>	

**Analog Board TB3**

PIN	1	<b>White - Thermistor</b>
	2	<b>Red - Sensor (+)</b>
	3	<b>Blue - Sensor (-)</b>
	4	<b>Orange (or Violet) - Thermistor</b>
	5	<b>Green - 0V</b>
	6	<b>Yellow - Solenoid Valve</b>
	7	Not used
	8	<b>Black - 24V</b>
	9	Not used
	10	Not used
	11	Not used
	12	Not used

**PSU Board TB3****Chassis**

A voltage selector is next to the power supply terminal block. Set this voltage selector to the correct voltage **before** connecting the instrument to the power supply. Make sure that all of the gland nuts are tightened.

**⚠Warning:** Connecting the power supply ground (earth) ensures the safety of your personnel, the reduction of the effects of Radio Frequency Interference (RFI), and the correct operation of the power supply interference filter.

**2.6 REMOTE EQUIPMENT****2.6.1 RECORDERS**

The choice of two different isolated recorder output signals enables you to use the instrument with a wide variety of recording and data processing equipment. The load requirements are shown in Section 8, and the positions of the circuit board switches are given in Section 4.3.

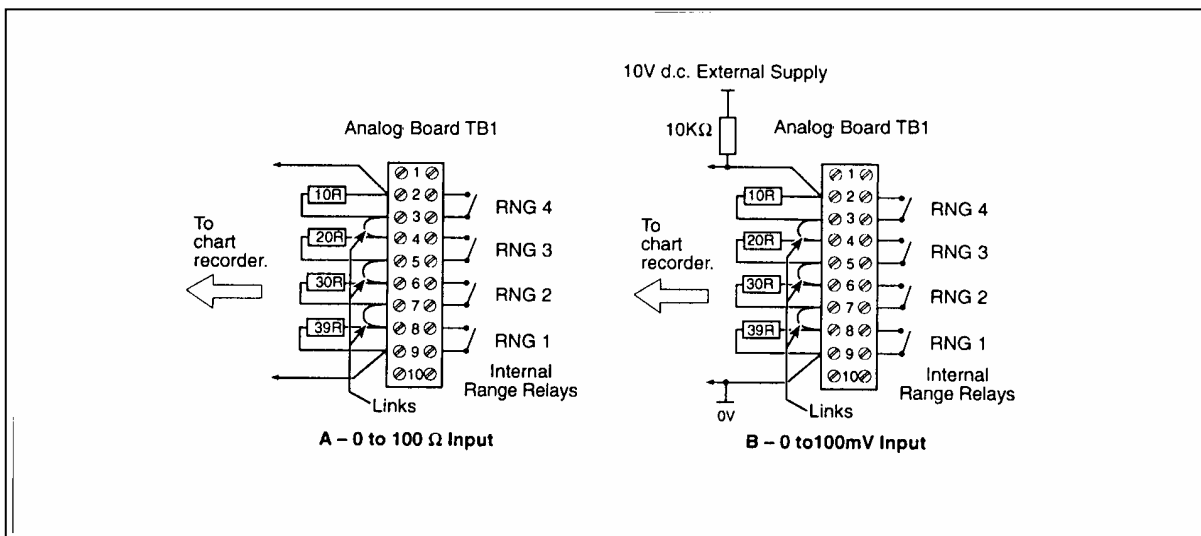
**2.6.2 RANGE INDICATION**

The remote range indication relays (TB1 connections) can be used in several different arrangements to suit the requirements of the installation. The relays can, for example, be wired directly into a PLC or data logger, but if you use a recorder, you'll need a method of indicating the set range. A two-pen recorder is necessary: Pen 1, to indicate the hydrazine concentration; and Pen 2, to record the instrument range.

Use a resistor network to achieve the suitable range recorder input. Connect the resistors as shown in the two examples in Fig. 2.5. (Our example consists of four ¼-watt resistors). A suitable resistor network kit is listed in Section 7.

Your external equipment should be set up using the manufacturers' instructions.

**FIGURE 2.5 RESISTOR NETWORK FOR 'AUTO' REMOTE RANGE INDICATION RECORDERS**



**3 START UP**

- ✓ Open the transmitter unit's door and remove the face panel. Verify that the switch next to the battery is set to "ON". Replace the face panel and secure it with the four plastic fasteners.
- ✓ Power up the monitor at the external source and set the Range Switch to "AUTO".
- ✓ Unpack the hydrazine electrode and carefully remove the hydrazine gel syringe and plunger.
- ✓ Verify that the clear outer jacket of the sensor is firmly in place. Locate the gel filling hole near the bottom of the jacket and the air vent hole near the top of the outer jacket.
- ✓ Use either a knife or a pair of scissors to remove the plugged tip of the gel-filled syringe. Be careful not to remove too much of the tip, as the syringe will no longer fit into the gel filling hole in the sensor outer jacket. Verify that the gel is an even, dark color. Discard gel that is brown, green, gray or dry.
- ✓ Place the syringe tip into the gel-filling hole. Make sure the air vent hole is unobstructed. Depress the plunger of the syringe to force gel into the round space between the sensor and outer jackets. Continue pressing until the entire jacket is filled with gel and gel starts to force out through the air vent hole. Remove the syringe and discard any remaining gel.
- ✓ Cover both filling and vent holes with Teflon pipe tape. Wrap each hole with three to four turns of tape.
- ✓ Snap the assembled sensor into the two mounting clips on the sample panel. The hose barb at the bottom of the sensor should point toward the lower left corner of the sample panel.
- ✓ Connect the "J" bend tube to the hose barb at the bottom of the sensor, but make sure that the sensor does not push out of the outer jacket.
- ✓ Fill the Buffer solution container with ammonium hydroxide—see Section 6.
- ✓ Open the shut-off valve **upstream** of the sensor unit and adjust the valve until the sample is overflowing from the constant head unit. See Section 8 for the maximum and minimum flow rates.
- ✓ Allow at least one hour before going on to the next step.

- ✓ Set up the transmitter as described in Section 4.2.
- ✓ Carry out a calibration as detailed in Section 5.
- ✓ The monitor is now in operation. The lamp adjacent to the number display indicates the hydrazine level (units of measurement in ppb) or the sample temperature (in degrees Celsius).
- ✓ If required, turn the range switch to one of the “Non-Auto” ranges.
- ✓ Press the “ALARM 1” button and use the “UP/DOWN” buttons to set the desired value. Repeat for “ALARM 2”.



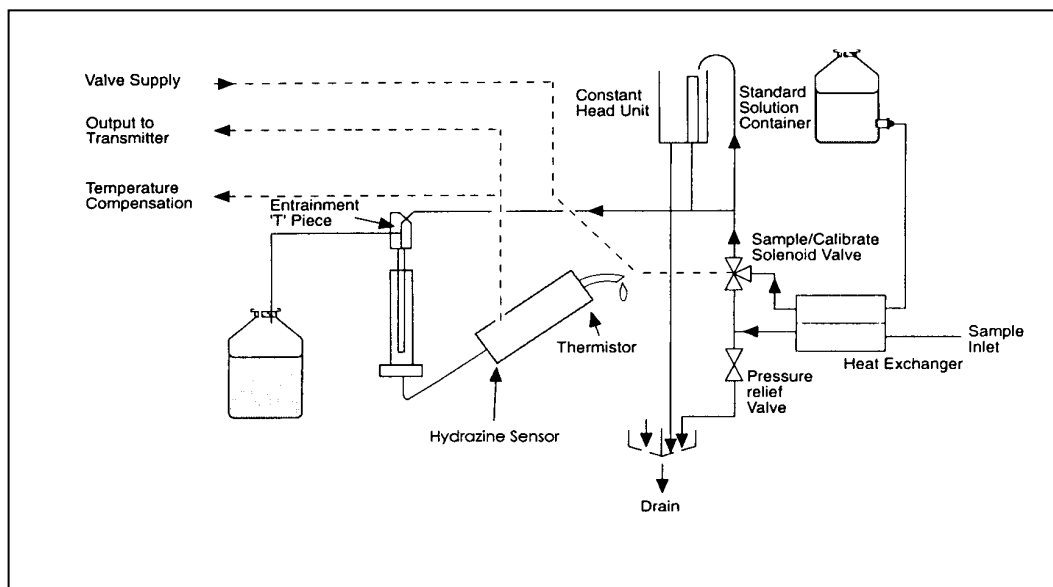
## 4 PRINCIPLE OF OPERATIONS

## 4.1 SENSOR UNIT

## 4.1.1 A flow schematic is shown in Fig. 4.1.

The sample enters the compression fitting at the bottom of the case and passes through one half of a heat exchanger. This heat exchanger, used during the calibration sequence to bring the standard solution temperature close to the temperature of the sample solution, minimizes calibration time.

FIGURE 4.1 SCHEMATIC FLOW DIAGRAM



From the heat exchanger, the sample passes through a solenoid valve to the constant head unit. Here, the head unit stabilizes the effect of changes in sample pressure and flow rate. When the monitor loses sample, a small tube overflowing into the constant head on one side ensures a self-start. This tube also permits the monitor to function over a wide range of sample flow rates.

The sample is then delivered to the Entrainment “T” and stainless steel entrainment tube. An alkaline vapor Buffer is added to the sample to raise its pH value before flowing through the hydrazine sensor. The sample leaves the sensor and drips into the drain at the bottom of the case.

The signal from the electrode pair travels to a junction box and hence, to the transmitter unit via the interconnection cable.

A temperature sensor, fitted into the hydrazine sensor, detects the sample's temperature. The sensor, connected to the transmitter unit, compensates for changes in output from the electrode pair over a range of 41°F to 131°F (5°C to 55°C).

The microprocessor controls the monitor's calibration. After you connect the calibration tube to the standard solution container, press the "CAL" button on the transmitter unit. This action energizes the solenoid valve on the liquid handling panel to change over from sample to standard solution. The standard solution first passes through the second half of the heat exchanger. Then the constant head unit and the vapor entrainment tube present the solution to the hydrazine sensor.

The solenoid valve is closed to the sample during a calibration sequence, but under sample pressure, the pressure relief valve will open. The valve will allow the sample to pass through the heat exchanger, thus bringing the **standard solution** to a **similar value** to the **sample solution**.

## 4.2 QA/QC JUNCTION BOX SWITCH

The junction box in the sample cabinet offers the ability to calibrate the analyzer on the sample process or to measure a QA/QC standard for system accuracy verification.

### 4.2.1 Normal Calibration

When an operator places the switch in this position, it allows normal calibration of the analyzer with a known standard solution.

### 4.2.2 Process Calibration

When an operator places the switch in this position, the solenoid valve is inhibited, allowing the system to be calibrated on a known value for the sample process water. Note that the minimum setting for the standard value is 20 ppb.

### 4.2.3 QA/QC

When the operator places the switch in this position, the system will draw sample from the external standard solution bottle without having to start a calibration. You can check and verify the system against a known standard solution.

4.3 TRANSMITTER UNIT

4.3.1 ELECTRONICS CHASSIS

The chassis contains three circuit boards:

- ✓ **Digital Board** - Behind the faceplate, containing the central processor unit, front panel controls and the display.
- ✓ **Analog Board** - Middle board, containing the analog input and current output circuitry.
- ✓ **PSU Board** - Rear board, containing the power supply and output relays.

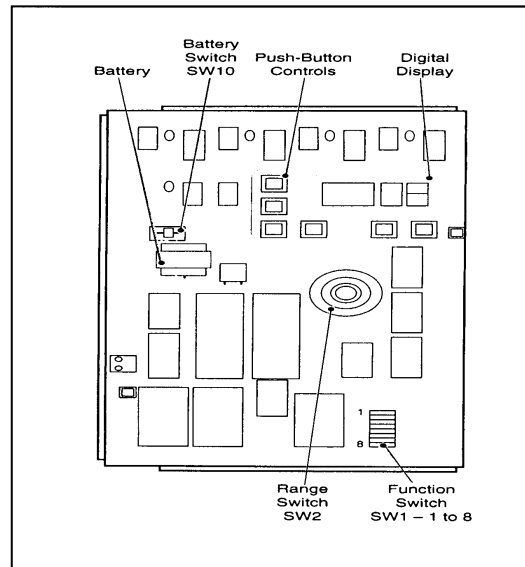
4.3.2 CIRCUIT BOARD FUNCTION

The microprocessor senses a series of eight “ON/OFF” switches in a dual-in-line package, and provides controlling functions for the alarms, output current and calibration - see Table 4.2.

FIGURE 4.2 CIRCUIT BOARD FUNCTION SWITCH

FUNCTION		SW1							
		1	2	3	4	5	6	7	8
Output Current (mA)	0-10	ON	ON						
	0-20	OFF	OFF						
	4-20	OFF	ON						
Preset Alarm	LOW 00.0			OFF	OFF	OFF	(NEVER ALARM)		
	HIGH 99.9			ON	OFF	OFF			
Conc in PPB	10.0			OFF	ON	OFF			
	30.0			ON	ON	OFF			
PPB	20.0			OFF	OFF	ON			
	50.0			ON	OFF	ON			
Calibration Sol'n Conc.	30 PPB						ON		
	80 PPB						OFF		
HIGH (2) Alarm	Normal							ON	
	Fail-safe							OFF	
LOW (1) Alarm	Normal								ON
	Fail-safe								OFF

FIGURE 4.3 LOCATION OF ITEMS ON DIGITAL BOARD

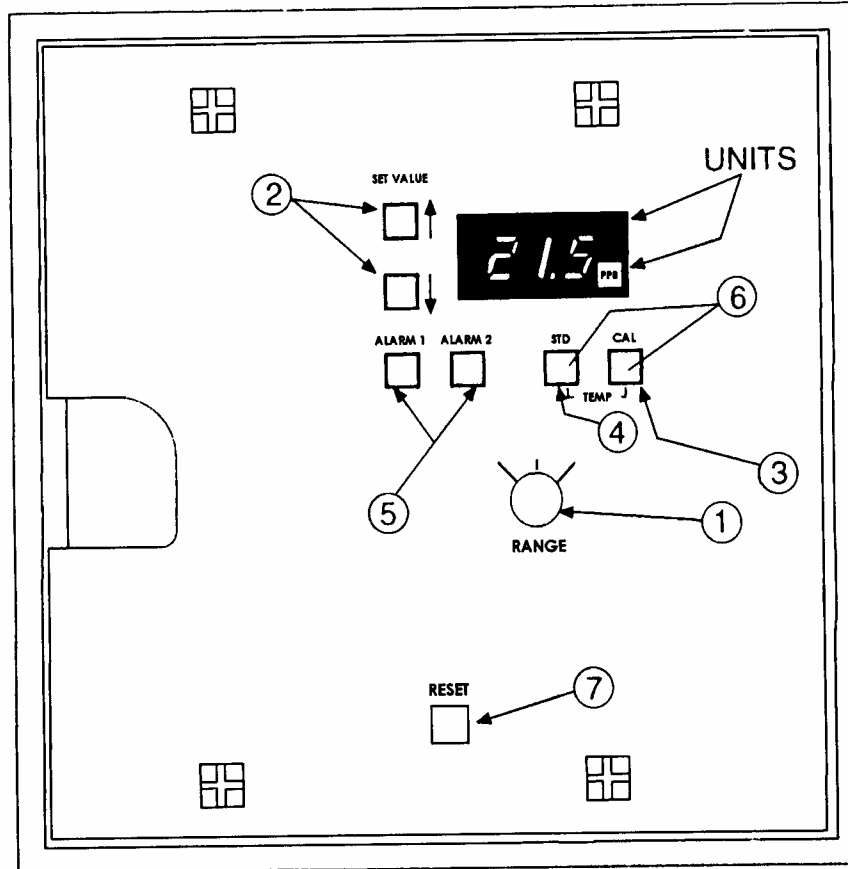


### 4.3.3 FRONT PANEL CONTROLS

The controls, mounted on the front circuit board in the chassis, protrude through holes in the faceplate. Four plastic fasteners secure the chassis to the faceplate.

A three-digit, red, l.e.d. display shows the hydrazine level in ppm or ppb as indicated by a lamp in the display. The controls have the following functions:

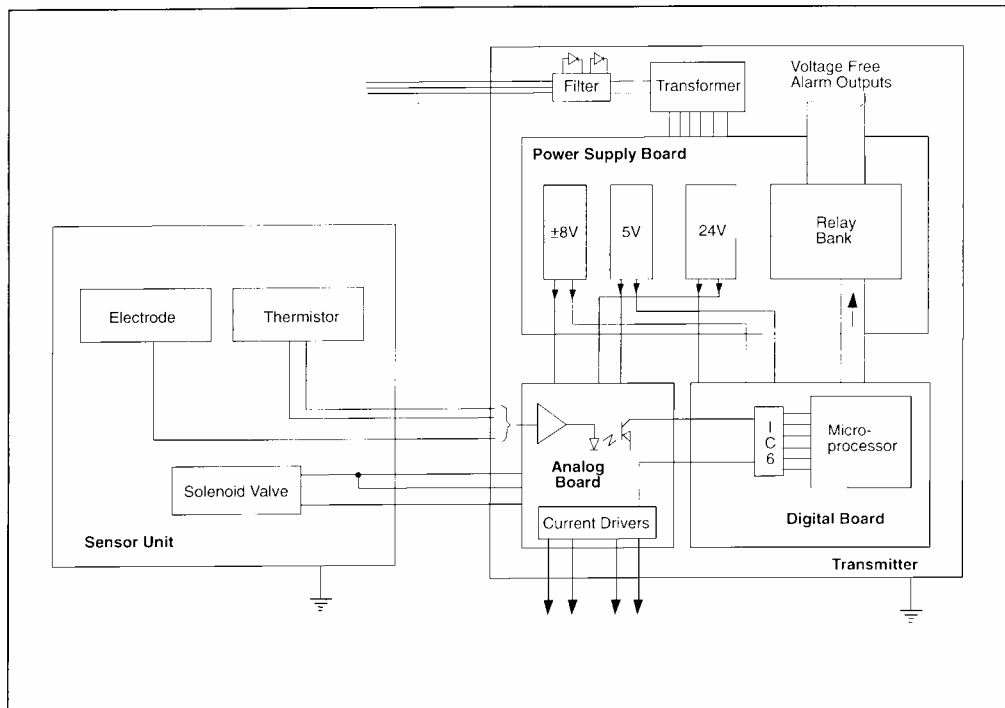
FIGURE 4.4 TRANSMITTER UNIT FRONT PANEL



1. **RANGE switch** ←: Positions “1” and “2” are the manual ranges within the three-decade analyzer range. Position 3 (AUTO) automatically switches to a range suitable for the hydrazine level being measured within the overall instrument range. Remote range indication is provided.
2. **SET VALUE** ↑: These buttons (↑ and ↓ arrows) increase or decrease the value displayed on the digital indicator; used for setting the alarms and standard solution values.
3. **CAL** →: When the button is pressed, a primary calibration sequence is initiated. Pressing CAL during a calibration for at least five seconds cancels the sequence, displaying “Abt”.

4. **STD** ↓: Use this control in conjunction with SET VALUE (↑ and ↓ arrows) buttons to set the value of the standard solution into the instrument. The minimum value that one can enter for a standard solution is 20ppb.
5. **ALARM 1/ALARM 2** °: Use in conjunction with the SET VALUE (↑ and ↓ arrows) buttons to set the values at which the alarm relays operate.
6. **TEMP** ±: Pressing STD and CAL together gives an indication of the sample temperature in °C
7. **RESET** "': Use this button to regain control of the instrument in the unlikely event of a malfunction. For instance, if a high power supply transient occurred. (One cannot see this button when the cabinet door is closed).

FIGURE 4.5 SIMPLIFIED BLOCK DIAGRAM



#### 4.3-4 ALARMS

**Note.** The alarms cannot be set during a calibration sequence.

Waltron, L.L.C. has provided two hydrazine concentration alarm control relays, each having one pair of changeover contacts rated at 2A, 250Vac (non-inductive). Alarms 1 and 2 are designated as low and high alarms respectively. Display these values by pressing the appropriate buttons on the front panel, and adjust by pressing the “SET VALUE” buttons.

Terminal connections for alarms are shown in Section 2.4. The switches “SW1.7” and “SW1.8” determine contacts that are closed in non-alarm conditions - see Section 4.2.

Functions are as follows:

- ✓ In “NORMAL” the relays are de-energized; i.e. NC contacts are closed.
- ✓ In “FAIL-SAFE” the relays are energized, i.e. NO contacts are closed. If the power source fails, both external alarms sound to indicate a malfunction.
- ✓ Two other sets of relay contacts are provided: One set changes over during a calibration sequence; and the other set changes over to indicate a failure to calibrate.

#### 4.4 ANALOG OUTPUTS

Two identical isolated current outputs are available. You may set both outputs to one of the three current ranges using switches “SW1.1” and “SW1.2”. In each case, the upper current limit corresponds to the full-scale reading of the range displayed on the front panel.

**Note.** If “SW1.1” is set to “ON” and “SW1.2” is set to “OFF,” no valid output is produced.

The two current outputs cover three decades of hydrazine concentration, divided into two overlapping ranges.

The “RANGE SWITCH” on the front panel manually selects RANGES 1 (0 to 999ppb) or 2 (0 to 99.9ppb), but in “AUTO” mode, the monitor

switches automatically between these ranges as the hydrazine concentration varies. Note the following points about ranges:

- ✓ The range selection only refers to the current output, as the digital display covers the full range capability of the monitor.
- ✓ If the concentration exceeds the selected range or instrument range, the digital display flashes - (reading) - “out” - (reading) - “out”. In every other way, the monitor functions normally.
- ✓ In “AUTO,” as the **concentration increases**, switching to the next range takes place at 100% of the current output, giving a 50% output on the upper range (10% in linear output). When the **concentration decreases**, switching takes place at 0% of the current output, giving a 50% output on the lower range (10% in linear output). This difference gives a range switching hysteresis of **one decade**.

At all times, the operator can either monitor or remotely record the current output range, using the two, active, remote “RANGE INDICATION RELAY” contacts.

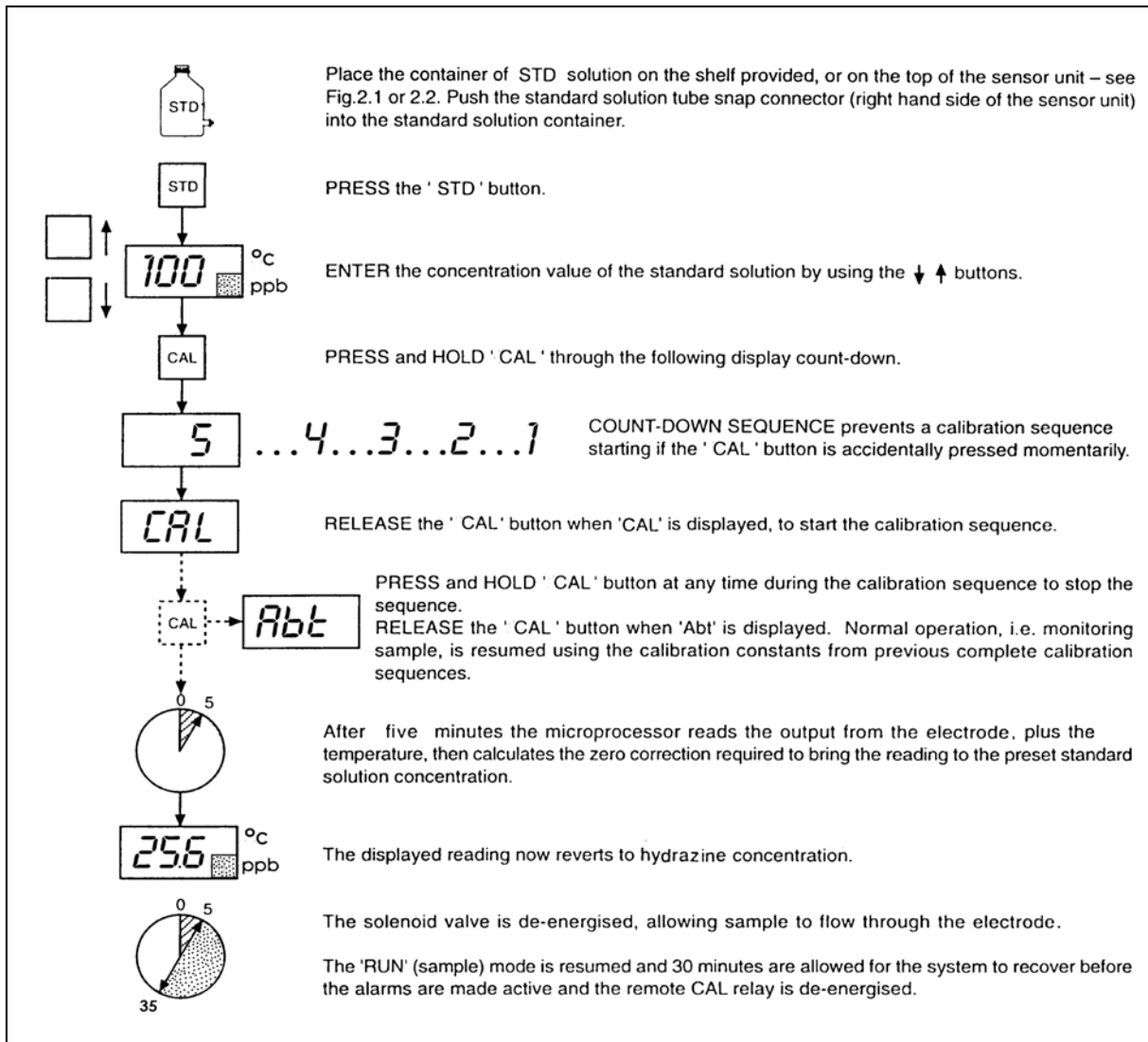


5 CALIBRATION PROCEDURE

Before starting an automatic calibration sequence, rinse the solution containers with high-purity water and fill them with fresh standard solution. Perform a calibration weekly. In cases where a weekly calibration is not necessary, determine a suitable schedule to suit the operation conditions.

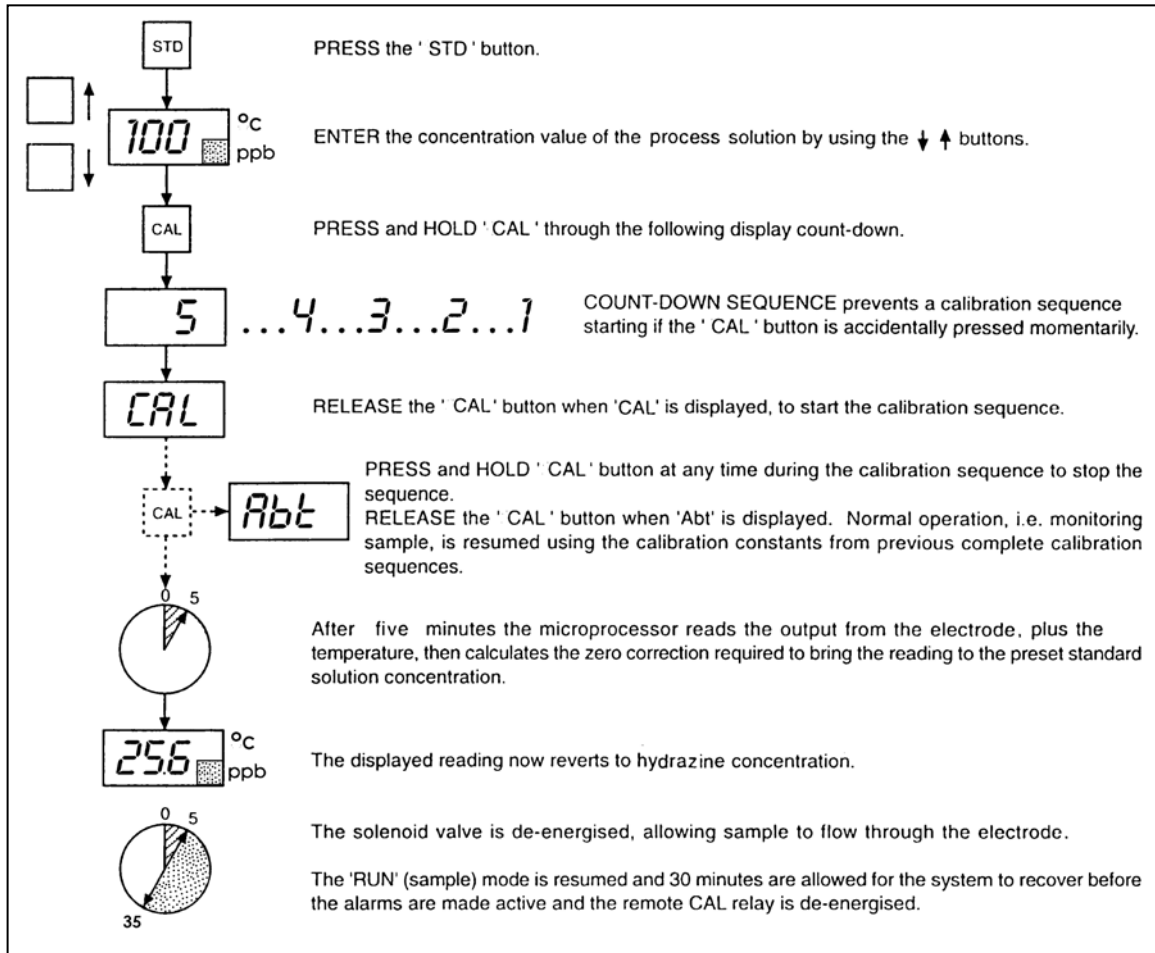
5.1 SINGLE POINT CALIBRATION USING STANDARD SOLUTION

- Place junction box selector switch to “NORM” position.



5.2 CALIBRATION USING PROCESS SAMPLE AS A STANDARD SOLUTION

- ✓ Place junction box selector switch to “PROC. CAL” position.



## 6 MAINTENANCE

### 6.1 CHEMICAL SOLUTIONS

The reagents and calibration solutions detailed in this section are required to keep the monitor operating. You should store solutions in plastic bottles and prepare these solutions just before use.

#### 6.1-1 BUFFER SOLUTION

⊗ **Warning:** This buffer is mildly toxic and hazardous: Handle with care.

Concentrated ammonia solution, suitable for measurements of hydrazine, provides adjustment of sample pH to 10.7.

#### 6.1.1 Concentrated ammonia solution - 2 liters

⊗ **Warning:** Handle this buffer **under a fume hood only**, as it causes burns and irritation to eyes, respiratory system and skin. **Wear rubber gloves and eye protection.** In warm weather, pressure increases in the bulk container of ammonia: **Release the cap carefully.**

Waltron L.L.C. recommends a **35% w/v solution** (0.88 s.g), but you can use concentrations to a **minimum of 30% w/v** (0.89 s.g.).

**Note:** Waltron L.L.C. offers Ammonium Hydroxide in a 2.5 liter container part number N1234-116.

#### 6.1-2 STANDARD SOLUTIONS

The following instructions refer to the preparation of a 1000ppm stock solution and a 100ppb standard solution respectively, but an operator can prepare any concentrations within the measuring range selected by diluting the stock solution appropriately.

Prepare a stock solution of 1000ppm Hydrazine as follows:

**Note:** Waltron L.L.C. offers Hydrazine Standard 1000 ppm in a 1 liter size part number H1234-060

Dissolve 4.058( $\pm$ 0.001)g of analytical reagent grade Hydrazine Sulfate ( $\text{N}_2\text{H}_4\text{H}_2\text{SO}_4$ ) in approximately 800ml high purity water. Transfer this solution to a one-liter volumetric flask and make up to the 1-liter mark with more high purity water to give a stock solution of 1000ppm Hydrazine. Store in a plastic container. Hydrazine Sulfate at this concentration is stable for one year.

Prepare a 100ppb Hydrazine Standard as follows:

**Note.** A two-step dilution is usually more accurate than a single dilution. The following dilution method produces more accurate results than those obtained by calorimetric laboratory analysis of the final diluted standard.

- ✓ Pipette 10ml of the 1000ppm stock solution to a one-liter volumetric flask. Make up to the 1-liter mark with high purity water to give an intermediate solution of 10ppm Hydrazine Sulfate.
- ✓ Pipette 20ml of the 10ppm intermediate stock solution to a 2-liter volumetric flask. Dilute with high purity water to give a final standard concentration of 100ppb.

**Note.** Do not prepare hydrazine solutions of less than 20ppb because low concentration solutions rapidly become contaminated and change in concentration.

**Note.** High purity water is water containing less than no Hydrazine and a specific conductivity of less than approximately 0.2 $\mu\text{S}/\text{cm}$ .

### 6.1-3 NITRIC ACID CLEANING SOLUTION

**Note:** Waltron L.L.C. offers Nitric Acid in a 2 ounce size part number H1234-556

Use this for refurbishing the sensor. This solution will clean the platinum anode and silver cathode. The cleaning solution is a 25% nitric acid aqueous solution.

⊗ **Warning:** Be sure to add the acid solution to the water. Do not add water to the acid solution.

Prepare the cleaning solution as follows:

Add 25ml of reagent grade Nitric Acid to 75ml of high purity water to yield a 100ml total final volume. Store in a plastic container.

⊗ **Warning:** Prepare the nitric acid solution under a fume hood and take the appropriate precautions when handling concentrated acids.

### 6.1-4 HYDRAZINE SENSOR RECHARGE GEL

This solution, required for refilling hydrazine sensor at extended intervals, is available in a syringe from Waltron L.L.C. (**Part number H3500-315A**). Store this gel in a refrigerated area until use.

## 6.2 SCHEDULED SERVICING

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

### 6.2-1 BI- WEEKLY

- ✓ Monitor the condition of the hydrazine filling gel and the level of the buffer reservoir.
- ✓ Perform calibration on standards.

**6.2-2 BI-MONTHLY**


- ✓ Replace the bottle of Buffer solution.
- ✓ Do not allow the level of solution to fall below about three-quarters full.
- ✓ On low, ambient temperature, the solution may require replacement more frequently.

**6.2-3 QUARTERLY**

- ✓ Check the condition of all plastic tubing; replace as required.
- ✓ Refurbish the sensor.

**6.2-4 REFURBISHING THE SENSOR**

- ✓ Close the valve upstream of the monitor and allow the constant head unit to drain.
- ✓ Pull the hydrazine sensor out of its mounting clips on the sample panel. Disconnect the electrical leads at the plug and socket.
- ✓ Pull off the sample inlet “J” tube and let the tube and sensor cell drain.
- ✓ Carefully pull the sensor apart, and wash the components thoroughly to remove all traces of gel.
- ✓ Withdraw the platinum electrode, taking care not to damage the electrode or the electrical connection. Insert the brush supplied with the sensor kit into the bore of the ceramic tube. Rotate it gently and withdraw the brush. Immerse the platinum anode in a test tube containing the 25% nitric acid cleaning solution for a few minutes.

 **Caution:** Do not let the acid cleaning solution touch the rubber plug.

- ✓ If the silver cathode is tarnished or blackened, dip a cotton wool bud in 50% nitric acid and run this over the wire to restore it to a matte silver finish. Rinse thoroughly with high purity water.
- ✓ Assemble the sensor and fill with gel as follows:
- ✓ Place the plastic plunger into position and cut off the blocked portion of the syringe tip.

**⚠Caution:** Do not remove too much of the syringe tip. The syringe tip will no longer fit into the outer-jacket-filling hole.

- ✓ Slowly inject the filling gel through the bottom hole in the outer jacket of the sensor until the gel reaches to top hole.
- ✓ Remove the syringe and set it aside.
- ✓ Teflon-tape the bottom and top holes in the outer jacket.
- ✓ Push the sensor into the clips of the sample panel.
- ✓ Connect the sample inlet “J” tube to the bottom of the sensor.

**Note.** Hold the sensor firmly at the top so that the center portion is not pushed out when the tubing is connected.

- ✓ Plug the electrical connection into the socket at the top of the liquid handling panel.
- ✓ Open the shut off valve upstream of the sensor unit and adjust until sample is overflowing from the constant head unit.
- ✓ Carry out a calibration sequence as described in Section 5.

### 6.3 SHUT DOWN PROCEDURE

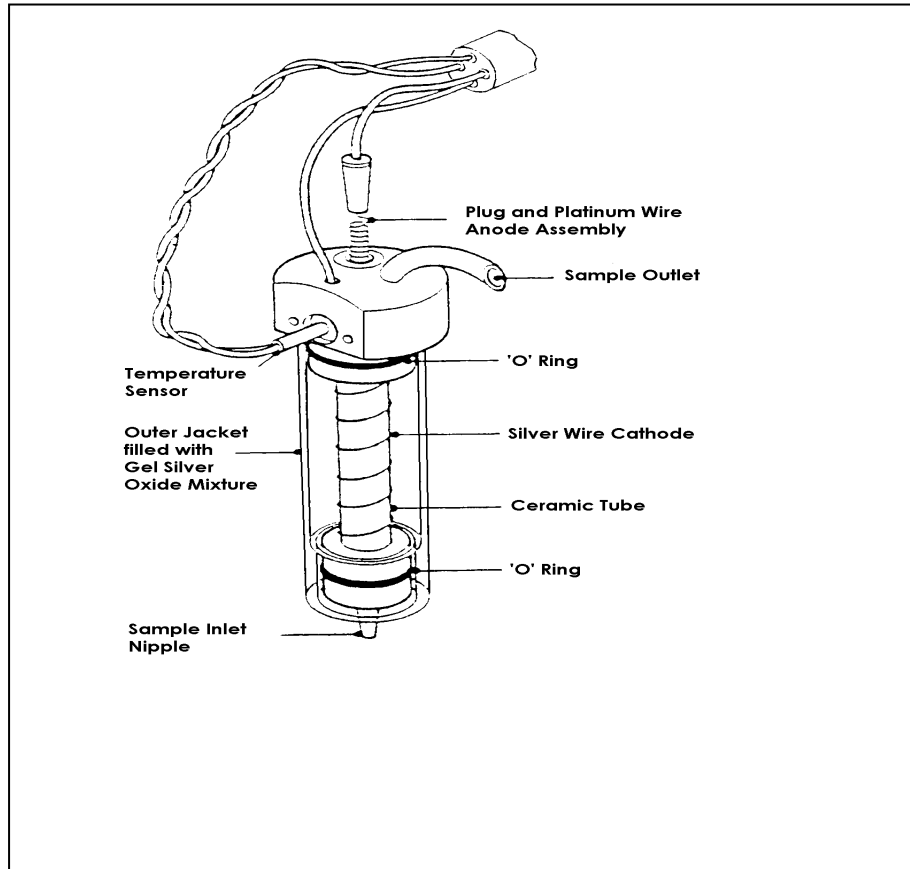
- ✓ Close the sample valve upstream of the monitor.
- ✓ Remove the Buffer container and safely dispose of the solution. Rinse the container thoroughly.

**⊗Warning:** For safe handling instructions of reagent solution refer to Section 6.1.

- ✓ Fill the calibration solution container with high purity water and do a single point calibration to flush the system.
- ✓ Remove the sensor and follow procedure in Section 6.2-4. Stop after rinsing thoroughly with high purity water.
- ✓ 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.

FIGURE 6.1 HYDRAZINE SENSORS



### 6.3.1 STORAGE OF THE SENSOR

- ✓ Remove the sensor from the sample panel.
- ✓ Disassemble sensor outer jacket from center ceramic assembly.
- ✓ Clean the sensor of any gel.
- ✓ The sensor can be stored as a dry item.

## 6.4 UNSCHEDULED SERVICING

Abnormal operation is shown on the l.e.d. display as follows:

### 6.4.1 Display shows "CAL":

- ✓ Normal display when calibration sequence is taking place.



**6.4.2 Display flashes (reading) - “out”:**

- ✓ Sample concentration exceeds the range group selected.

**6.4.3 Display shows “CF”:**

- ✓ “CF” stands for “Calibration Fail”: - the monitor was **NOT** able to calibrate.

**6.4.4 Display flashes “reading” continuously.**

- ✓ Cell output near calibration failure. System will require attention soon.

**6.4.5 Display shows “Hot”:**

- ✓ Sample temperature has risen above 55°C - check cause.

**6.4.6 CALIBRATION FAIL ALARM**

“Calibration Fail” condition occurs after a CALIBRATION, as the electronics fail to see sufficient output from the hydrazine sensor. A number of factors requiring investigation could cause this event.

- ✓ Check that vapor bubbles are emerging from the bottom of the stainless steel entrainment tube.
- ✓ Check the condition of the Buffer solution.
- ✓ Re-gel the hydrazine sensor.
- ✓ Check the operation of the solenoid valve.
- ✓ Check flow of standard solution through the constant head vessel.
- ✓ Check the condition of the gel in the hydrazine sensor.
- ✓ Check all of the electrical connections in the junction box and interconnect cable.

#### 6.4.7 MALFUNCTIONS OF THE MONITOR

These may produce many effects after calibration, some of which produce the following:

- ✓ Abnormal slope % values - see Section 4.2.
- ✓ Display alternates between (value) and “out”. A very large offset from the sensor takes the reading beyond the range of the monitor.

The standard or Buffer solutions may cause unpredictable problems. If you question the integrity of these solutions, replace them with freshly prepared solutions in the early stages of the faultfinding investigations. The conditions of all of the solutions involved, one or more of which could be incorrect, control the monitor’s accuracy.

**Note.** If the Buffer becomes completely exhausted, the reading may be very erratic due to the lack of ionic strength adjustment of the high purity sample.

Systematically check mechanical components involved with liquid handling for leaks or blockages—these problems change the chemical conditions around the sensor. Most problems are found in the solution chemistry and in the liquid handling section.

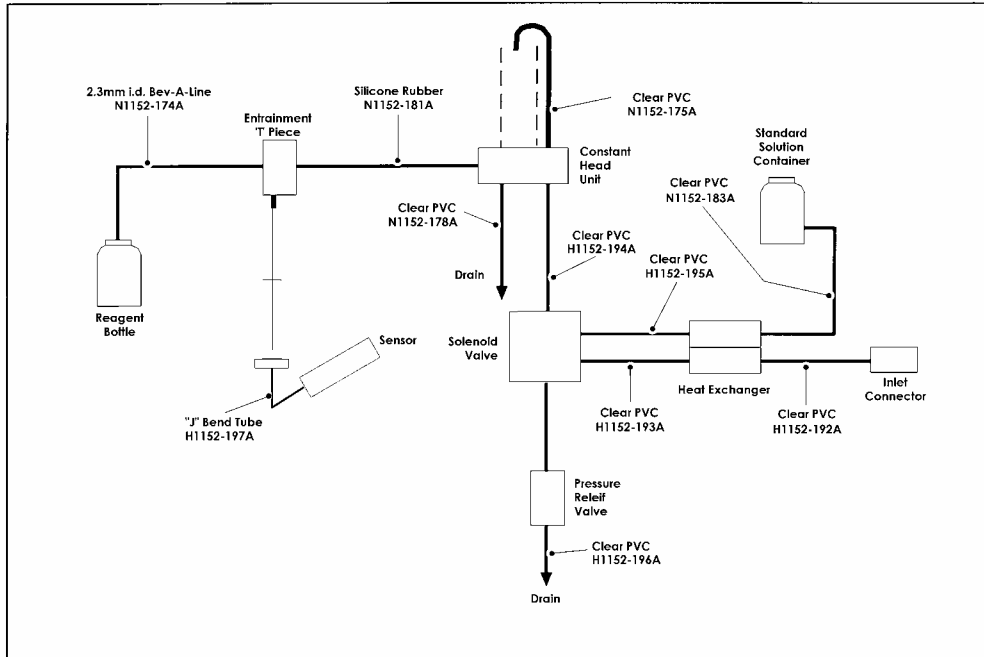
#### REPLACEMENT OF PLASTIC TUBING

Over time, certain sections of plastic tubing require replacement as leaks, blockages, or poor conditions occur. To avoid this occurrence, refurbish the liquid handling panel every twelve months including the replacement of all plastic tubing. Use only the correct size and type of tube.

Two specific sections of tubing **are critical**:

- ✓ The tube found between the constant head unit and the entrainment “T”. The tube should be taut; any changes to this tube interfere with the flow and self-starting characteristics.
- ✓ The tube found between Buffer container and entrainment “T”. It must be a polyethylene-lined tube, which has good chemical resistance to the Buffer.

FIGURE 6.2 PART NUMBERS OF PLASTIC TUBING



## 7 SPRARE PARTS

H3010-165	Hydrazine Detection Cell
H3500-315A	Refill Syringe of Gel
H3500-341	Internal Retubing Kit
K1092-025	Fuse, 2A Ceramic
H3500-338	Hydrazine Expendable Kit
K2014-419B	Digital Circuit Board complete with controls & display
K2014-401C	Analog Circuit Board
K2014-402B	Power Supply Circuit Board
K3500-201	Resistor Kit - Remote Range Indication
K3500-202	Resistor, Precision 49.9 ohms, 20mA/1VDC
K3500-203	Resistor, Precision 249 ohms, 20mA/5VDC
K3500-204	Resistor, Precision 499 ohms, 20mA/10VDC
K3400-008	Sentry 8-point Sample Sequencer
K1148-004	4-point Manifoldeed Sampling Valve
K1148-008	8-point Manifoldeed Sampling Valve
K1138-633	8-point Sample Inlet Connections (1/8" OD Swagelok)
K1138-634	8-point Sample Outlet Connections (1/8" x 1/8")
K3500-357	Kit, Sentry Sample Sequencer - 8 pt.
K3500-358	Kit, Sentry Sample Sequencer - 4 pt.
H1148-022	Solenoid Valve
N2554-065B	Constant Head Unit Ass'y
N1152-169	Pressure Relief Valve
K1152-200	Nupro Filter, Stainless Steel, 60 micron
H1142-151A	Calibration Bottle
N1142-096	Pipette, 10ml
N1142-095	Pipette, 1ml
N1142-164	Flask, 1000ml, volumetric, plastic
H1152-198A	Assembly Nipple
H1152-197A	"J" Tube
K2004-255	Power Cord Assembly (6 ft.)
K2004-242A	Intreconnect Cable Ass'y (6 ft)
K1086-160	8-way Cable (Specify Length)

## 8 SPECIFICATIONS

Ranges	0 to 99.9ppb or 0 to 999 ppb.
Accuracy	For concentrations under 500ppb: $\pm 5\%$ of reading or $\pm 2$ ppb, whichever is greater. For concentrations above 500ppb: Better than $\pm 10\%$ of reading.
Sensor Response Time	90% of a step change in less than 1 minute.
Stability	5% of reading or 2ppb per week, whichever is greater.
Calibration	Semi-automatic. Manually initiated automatic calibration recommended monthly. May be calculated on the process or with an external standard (20ppb minimum).
Calibration Time	5 minutes.
Ambient Temp.	32° to 131°F (0° to 55°C).
Enclosure Finish	Corrosion resistant polyurethane.
Battery Backup	10 years.

## 8.1 Installation Information

Sample Temp.	41°F to 131°F (5°C to 55°C).
Sample Flow	50 ml/min. to 500 ml/min.
Sample Press.	5-100 psig.
Dimensions of Sensor Unit	11.8" wide x 15.7" high x 7.9" deep
Mounting for Sensor Unit	Four Holes $\varnothing 0.34$ " each, 9.1" hor. X 13.0" vert.
Weight of Sensor Unit	24¼ lb. (11 kg.)
Connections to Sensor Unit	Sample Inlet – 1/4" compression fitting; Sample Outlet – 3/8" hose barb.
Dimensions of Transmitter Unit	11.8" wide x 11.8" high x 7.9" deep
Mounting for Transmitter Unit	Four Holes $\varnothing 0.34$ " each, 9.1" hor. X 9.1" vert.

Weight of Transmitter Unit	24¼ lb. (11 kg.)
Electrical Conn.	via access glands as required
Power Supply Requirements	100-120/200-240Vac, 50/60 Hz, 100VA.
Power Supply Tolerances	Voltage +10%/-20%; Frequency min. 47Hz, max.65Hz.
Case Protection Transmitter Unit	IP55.
Maximum Distance between Sensor & Transmitter Unit	330 ft. (100 meters).

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9 OPERATOR'S NOTES

9070

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9 OPERATOR'S NOTES

## 10 OUR COMMITMENT TO OUR CUSTOMERS

The instruction manual that you have received is a technical guide to aid you in the set-up and maintenance of your new Waltron measuring system.

Any technical product questions you may have after reading this tool should be addressed to our Technical Service Specialist:

(800) 242-7353  
[www.waltronltd.com](http://www.waltronltd.com)

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

We know that you will be satisfied with the quality, performance and cost of ownership of our product. If you are not, please contact me directly in Whitehouse, NJ at (800) 242-7353. I will address your concerns personally and promptly. Thank you for choosing Waltron L.L.C. as your Water Chemistry Managers.

email: [info@waltronltd.com](mailto:info@waltronltd.com)



**11 OBSERVING SAFETY**

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

- ✓ This instruction manual should be carefully read before proceeding.
- ✓ Warning labels on enclosures, containers, packages and chemicals must be abided by.
- ✓ Only qualified personnel that have been trained in accordance to the information provided should be involved in the installation, operation, and servicing of the analyzer.
- ✓ To avoid accidents from occurring, normal safety precautions must be followed when operating the analyzers in conditions of high pressure and/ or temperature.
- ✓ The chemicals that are used to operate this machine must be stored away from heat, protected from temperature extremes and powders kept dry.
- ✓ Follow all regulations and warning labels when disposing of chemicals. Do not mix the chemicals together.

To obtain safety advice concerning the use of the analyzer and reagents in this manual or any relevant Material Safety Data Sheets (MSDS) please contact Waltron L.L.C. Please note that Waltron L.L.C. mailing and UPS shipping addresses differ.

**DIRECT ALL CORRESPONDENCE TO:**

Waltron L.L.C.  
P.O. Box 70, 50 Tannery Rd.  
Whitehouse, NJ 08888

Phone: (800) 242-7353  
Fax: (908) 534-5546

Web Site: [www.waltron.net](http://www.waltron.net)

**DIRECT ALL UPS SHIPMENTS TO:**

Waltron L.L.C..  
50 Tannery Rd.  
Somerville, NJ 08876

## 12 WARRANTY AGREEMENT

If you experience any defects in materials or find fault in manufacture of the goods that you have received within one year from the date of shipment, Waltron L.L.C. will repair, or at its option, replace the defective part free of charge. This is providing that the part is returned to Waltron L.L.C. in Whitehouse, NJ. Shipping charges must be prepaid. At Waltron L.L.C.'s discretion, a Technical Service Specialist will repair/ replace the defective parts on location. It is at the customers expense to pay for traveling time and expenses of the Technical Service Specialist.

Instruments sent to Waltron L.L.C. must be appropriately packed and the following information must be provided prior to returning to Waltron L.L.C.:

- ✓ Waltron Ltd will assign a Return Authorization Number to you.
- ✓ The name and address of the company returning the items for repair.
- ✓ The department within the company returning the items for repair.
- ✓ The name, telephone number and extension of the individual in the company responsible for returning items for repair.
- ✓ A brief description of the fault.
- ✓ Ship to the Waltron L.L.C. Service Center

### VIA MAIL

Waltron L.L.C.  
P.O. Box 70, 50 Tannery Rd.  
Whitehouse, NJ 08888

### VIA UPS/FED-EX/MOTOR CARRIER

Waltron L.L.C.  
50 Tannery Rd.  
Somerville, NJ 08876

- ✓ Covers expendable sensors for one month after shipment and reusable electrodes for six months after shipment.
- ✓ Does not apply to damage sustained in transit
- ✓ Shall cease to have effect if the goods have been used for purposes other than those for which they are intended or not in accordance with Waltron L.L.C. instructions, or if any seal has been removed, broken or tampered with or if the Waltron L.L.C. trademark or serial number has been removed, defaced or altered.
- ✓ Does not cover expendable supply items such as reagents, tubing and electrolytes.
- ✓ Does not cover misuse or mistreatment by the user.
- ✓ Does not cover previous repair or alteration by unauthorized repairmen and/ or repair facility.

Waltron L.L.C. does not assume responsibility for contingent liability through alleged failure or failures of any of its products or their accessories.

**International**

All international orders will have a warranty period of one year after installation or 18 months after shipping date, whichever occurs first. All other domestic criteria applies.

## 13 CHECK LIST OF MATERIALS

Waltron L.L.C. concern does not stop when your instrument leaves our loading dock. We want to thank you for your confidence in Waltron L.L.C., our product and the service that we provide. We want to make sure that your experience with us will be one of total satisfaction starting with the condition in which you have received your product.

- ✓ Inspect all shipping containers upon receipt and record any visible damage. Count the number of packages, making sure that the number is in agreement with the shipping paperwork. If there are any outward signs of damage, please retain all containers and packages for inspection by carrier. It is generally good practice to retain the packing material and boxes as they make an excellent way to protect the instrument if you move it or ever need to ship the instrument.
- ✓ Make sure that all items received match the packing list. If you ordered chemicals, they are usually shipped in a separate package and will be itemized accordingly.
- ✓ Verify that the number of packages received agrees with the package list and shipping papers.
- ✓ Notify both Waltron L.L.C. and the carrier, if any problems occur.