

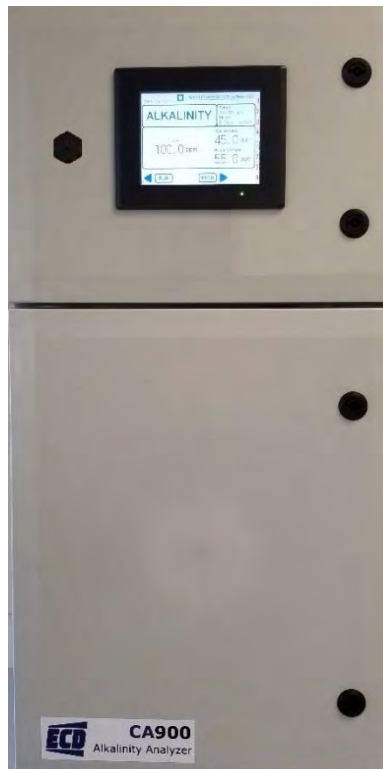


**ELECTRO-CHEMICAL DEVICES**

# Instruction Manual

## Model CA900 Analyzer

### Alkalinity



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Part No. IM

CA900

Rev: D – 12/19

## PREFACE

Purchasing products from Electro-Chemical Devices, Inc. provides you with the finest liquid analytical instrumentation available. If this is your first purchase from ECD, please read this manual before installing and commissioning your new equipment.

If there are any questions concerning this equipment, please contact your local ECD representative, or the factory directly at:

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## TERMS AND CONDITIONS OF SALE

**1. ACCEPTANCE.** If this writing differs in any way from the terms and conditions of Buyer's order or if this writing is construed as an acceptance or as a confirmation acting as an acceptance, then Seller's acceptance is **EXPRESSLY MADE CONDITIONAL ON BUYER'S ASSENT TO ANY TERMS AND CONDITIONS CONTAINED HEREIN THAT ARE DIFFERENT FROM OR ADDITIONAL TO THOSE CONTAINED IN BUYER'S WRITING.** Further, this writing shall be deemed notice of objection to such terms and conditions of Buyer. If this writing is construed as the offer, acceptance hereof is **EXPRESSLY LIMITED TO THE TERMS AND CONDITIONS CONTAINED HEREIN.** In any event, Buyer's acceptance of the goods shall manifest Buyer's assent to Seller's terms and conditions. No addition to or modification of these terms will be effective, unless set forth in writing and agreed to by Seller.

### 2. WARRANTIES AND REMEDIES

**a. Warranty.** Seller warrants to Buyer that it holds and will pass marketable title to the goods sold hereunder. Seller warrants to Buyer that the items and components manufactured by Seller will be free from defects in material and workmanship (subject, however, to tolerances and variances permitted by the trade hereunder) for a period one (1) year for non-consumable products. Consumable electrodes and sensors have a conditional warranty based shelf life and process conditions and is determined by Seller.

**b. Exclusion and Conditions.** Seller's obligations with respect to the express warranties and remedies contained herein are conditioned on the following: (i) Buyer's return of the non-conforming goods, if authorized by Seller; (ii) Buyer shall not assign its rights under these express warranties and any attempted assignment shall render such warranties, but not any disclaimers or limitations, void and the goods sold shall be sold **AS IS**; and (iii) all products shall be carefully inspected for damage by Buyer upon receipt, be properly calibrated for Buyer's particular use, and be used, repaired, and maintained by Buyer in accordance with the instructions set forth in Seller's product literature. Repair and maintenance by non-qualified personnel, product subjected to misuse or negligence, and/or damaged during shipment will invalidate the warranty, as will the use of non-approved consumables or spare parts. As with any other sophisticated product, it is essential, and a condition of Seller's warranty, that all personnel using the product be fully acquainted with its use, capabilities and limitations as set forth in the applicable product literature.

**3. DISCLAIMER OF IMPLIED WARRANTIES.** Seller gives no warranties except those expressly contained herein. Seller **disclaims** all other warranties implied by law usage of the trade, course of dealing or course of performance including, but not limited to, **the implied warranties of MERCHANTABILITY and fitness for a particular purpose.**

**4. LIMITATIONS OF LIABILITY.** The following limitations of Seller's liability are acknowledged by the parties to be fair and reasonable and shall apply to any act or omission hereunder, and to any breach of this contract of which these terms and conditions form a part:

**a. Disclaimer of Damage.** In no event shall Seller be liable for special, indirect, consequential or incidental damages whether arising under contract, warranty, tort, strict liability or any other theory

of liability. Such damages include but are not limited to loss of profits, loss of use of goods, damage to property, and claims of third parties.

**b. Suitability.** Buyer acknowledges that it alone has determined the intended purpose and suitability of the goods sold hereunder. It is expressly agreed by the parties that any technical or other advice given by the Seller with respect to the use of the goods or services is given without charge and at Buyer's risk; therefore Seller assumes no obligation or liability for the advice given or results obtained.

**c. Notice and Time of Claims.**

i. Buyer agrees to check and inspect all products against shipping papers and for damage or shortage upon receipt of goods at destination.

ii. Every claim for shortage, damage in transit, or other cause visible upon inspection shall be deemed waived by the Buyer, or the Buyer's customer in the case of resale, unless delivered in writing to Seller by Buyer thirty (30) days from the tender of delivery of the goods to Buyer, provided, however, that claims for shortage must be made within seven (7) days of receipt.

iii. The parties expressly waive the statute of limitations and agree that any legal proceeding for any breach of this contract shall be waived unless filed within one (1) year after the accrual of the cause of action thereof.

**5. FORCE MAJEURE.** Seller shall not be liable for any delay in delivery, or failure to deliver, due to any cause beyond the Seller's control including but not limited to fires, floods, or other forces of the elements; strikes, or other labor disputes; accidents to machinery; acts of sabotage; riots; precedence or priorities granted at the request or for the benefit, directly or indirectly of the federal or any state government or any subdivision or agency thereof; delay in transportation or lack of transportation facilities; restrictions imposed by federal, state or other governmental legislation or rules or regulations thereof. If Seller, in its sole discretion, determines that Seller's performance hereunder would result in a loss to Seller's on this sale as computed under Seller's normal accounting procedures because of causes beyond Seller's control, then the Seller may terminate this agreement in whole or in part without liability for any delay in the delivery of, or failure to deliver, the goods sold hereunder

**6. TAXES AND OTHER CHARGES.** The Buyer will pay, or reimburse Seller if it pays, any and all taxes or tariffs or any other similar charges imposed upon this contract, the goods covered hereby or the delivery or use or resale thereof.

**7. FREIGHT CHARGES.** If the sale hereunder is other than F.O.B. Seller's facility, this acknowledgement is based upon the freight charges now in effect. In the event of an increase or decrease in applicable freight charges before the goods are shipped, such charge in freight will be for the Buyer's account.

**8. PRICES AND DELIVERY.** Prices quoted herein are F.O.B. shipping point. Deliveries specified are only our best estimate and are subject to change. This quotation is based upon freight charges now in effect. Buyer will be invoiced at the freight charge prevailing at the date of shipment. Prices are firm for orders meeting Seller's normal shipping schedules. If shipments are held or postponed for any reason other than Seller's fault, and a price increase becomes effective during the period of such hold or



postponement, the increase will apply to all shipments that are held or postponed thirty (30) days or more from the effective date of the increase.

**9. PAYMENTS.** If in the judgment of Seller the financial condition of Buyer at any time prior to shipment does not justify the terms of payment specified, Seller may cancel the order, withhold shipment, and/or require full or partial payment in advance. If payment is not made when due, Seller may suspend all future delivery or other performance with respect to Buyer without liability or penalty and, in addition to all other sums payable hereunder, Buyer shall pay to Seller (i) the reasonable costs and expenses incurred by Seller in connection with all actions taken to enforce collection or to preserve and protect Seller's rights hereunder, whether by legal proceedings or otherwise, including without limitation reasonable attorneys' fees, court costs and other expenses and (ii) interest on all amounts unpaid after 30 days charged at the monthly rate of 1-1/2% or the highest rate permitted by law, whichever is lower.

**10. CANCELLATION OR ALTERATION.** Buyer may not alter or cancel any order without Seller's written consent. For any order altered or cancelled with Seller's consent, Buyer must pay for all expenses and labor incurred up to the time of Seller's consent, plus a reasonable percentage for profit. Any order delayed or deferred by Buyer will be subject to price escalation for increased costs of production, and any other expenses caused by the delay. Material on such orders will be stored at Buyer's risk. Seller reserves the right to invoice Buyer and require payment before shipment of any delayed or deferred order.

**11. TITLE AND RISK OF LOSS.** Title and risk of loss shall pass to buyer at Irvine, California, unless otherwise specified in the contract. If delivery is made by common carrier, risk of loss shall pass upon delivery to the carrier. Claims for loss or damage in transit must be made by Buyer to the carrier. Seller accepts no responsibility for loss or damage to product in transit.

**12. PATENT OR TRADEMARK INFRINGEMENT.** If the goods sold hereunder are to be prepared for manufacture according to Buyers specification, Buyer shall indemnify Seller against any claim or liability for patent, trademark, service mark or trade name infringement on account of preparation, manufacture and/or sale.

**13. NON-WAIVER.** If Government Contract Regulations require the addition, deletion, or modification of these terms and conditions upon prior notification to Seller and Seller's written acceptance thereof, such changes shall become a part of these terms and conditions. Seller shall not be bound by any Government Contract Regulations applicable to Buyer's contracts with the U.S. Government unless Buyer has expressly acknowledged, on the face of this document, the applicability of such Regulations to the transaction between Buyer and Seller contemplated herein. Absent such acknowledgement, Seller is making the assumption in issuing this document that no such Regulations apply.

**14. JURISDICTION.** All such disputes shall be resolved in a court of competent jurisdiction in Orange County, California. Buyer hereby consents to the jurisdiction of the State and Federal Courts sitting in Orange County. Notwithstanding the above, should either party contest the jurisdiction of such courts, the other party may institute its suit in any court of competent jurisdiction.

**15. APPLICABLE LAW.** All questions arising hereunder or in connection with the quotations or any order submitted in connection therewith and/or the performance of the parties hereunder shall be

interpreted and resolved in accordance with the laws of the state of California without regard to its conflict of law provisions and excluding the United Nations Convention on the International Sale of Goods.

Revision A

## RETURNED GOODS POLICY

All requests for returned goods must be initiated through our Customer Service Department. Please call our phone number (714) 695-0051 with the specifics of your request. The following conditions must be satisfied for consideration of applicable credit for the return of products purchased from Electro-Chemical Devices:

- 1) The item is unused and in the original package.
- 2) The item was shipped directly from Electro-Chemical Devices.
- 3) The item has not been damaged in shipment to Electro-Chemical Devices.
- 4) The item is saleable:
  - a) Items containing date-sensitive parts such as electrodes, must be returned within 1 month of the invoiced date.
  - b) Items without date-sensitive parts must be returned within 3 months of the invoiced date.

A Return Authorization Number must be obtained from Customer Service and provided on all paperwork and packaging. To obtain a Return Authorization Number, please provide the reason for return, the date of purchase, your original purchase order number, and either our order number (on the packing slip or invoice) or our invoice number. The issuance of a Return Authorization Number is a verbal approval for return only and does not guarantee credit or allowance. Returned goods must be received within 30 days of the issuance date of the Return Authorization Number or it will become null and void.

Necessary physical and mechanical inspection is completed upon receipt of the item. Applicable credit or equivalent allowance is determined after inspection of the returned item. If all of the above conditions are met, and the item has been approved to return to our stock, a restocking charge of 25% of the purchase price is deducted from the applicable credit.

## IMPORTANT SERVICE INFORMATION

Use only factory authorized components for repair. Tampering or unauthorized substitution of components may adversely affect the operation of this product and may void the warranty.

If service or repair is required, please obtain the serial number(s) or sales order number of the product(s) in question and contact ECD's Service Department at:

+1-800-729-1333 (USA/Canada) or +1-714-695-0051

or email [Service@ecdi.com](mailto:Service@ecdi.com)

**A Return Material Authorization (RMA) number must be obtained** from the service department before returning any material to ECD. All material returned to ECD shall be shipped prepaid to the factory.

## UNPACKING THE INSTRUMENT

Your Electro-Chemical Devices instrument has been carefully packaged to protect it from damage during shipment and dry storage. Upon receipt please follow the procedure outlined below.

1. Before unpacking, inspect the condition of the shipping container to verify proper handling by the carrier. If damage is noted, save the shipping container as proof of mishandling for the carrier.
2. Check the contents of the shipping container with the items and quantities shown on the packing list. Immediately report any discrepancies to ECD.
3. Save the original packing material until you are satisfied with the contents. In the event the product(s) must be returned to ECD, the packing material will allow you to properly ship it to ECD.
4. Familiarize yourself with the instrument before installation, and follow proper installation and wiring procedures.

# 1.0 OVERVIEW

Thank you for purchasing our Model CA900 Analyzer.

The CA900-Analyzer was designed and manufactured to be an easy-to-use, high-sensitivity and low-cost measuring instrument. This Analyzer should give you many years of reliable and hassle-free operation with regular care and maintenance.

This document is the Operating Manual for the Analyzer. We recommend that you enter the information below the first opportunity you get.


Product Name	CA900 Analyzer
Product Model	CA900 Alkalinity
Purchase Date	XXX XX 201X
Serial No	XXXXXX
Warranty Period, Begin-End Dates	1 year from date of shipment
Password	
Contact Details, Your Distributor	XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX
	Phone:
	Internet:
Contact Details	Electro-Chemical Devices Phone: +1-714-695-0051 Fax: +1-714-695-0057 Email: <a href="mailto:sales@ecdi.com">sales@ecdi.com</a> Internet: <a href="http://www.ecdi.com">www.ecdi.com</a>

## CONTENTS:

1. CA900 Alkalinity Analyzer
2. Tubing Kit, Door Key
3. 1 Reagent Bottle
4. CA900 Instruction Manual

1.0.1 CA900 Technical Specifications	
Analysis:	Alkalinity
Method:	Titration using pH Sensor
Measuring range:	Measurement Specific (See Chapter 11 for Analyzer performance)
Response time:	10 minute cycle plus any user entered wait time
Repeatability:	+/- 2% or +/- 2 ppm, whichever is greater, on the measurement
Drift:	+/- 2% per month on the measurement
Power supply:	110-220Vac, 50-60 Hz 80 VA
Mounting:	Wall mounting or with optional bench support
Operating temperature:	5°C to 50°C
Cabinet:	Plastic Shell
Dimensions:	16"W x 36"H x 8.5"D (406 mm W x 915mm H x 216mm D)
Weight:	Approx. 40 lbs (18 kg)
Reagent consumption:	Dependent on Sample
Analog output:	(4) 4-20 mA
Alarms:	(4) configurable relays
Sample	
Inlet sample pressure:	Atmospheric
Outlet sample pressure:	Atmospheric

## 1.1 Safety Precautions, Instructions and Hazards

	<p>This Manual contains important information required to install, start up and operate the Model CA900 Analyzer. Please read the entire manual carefully before installing or placing the analyzer into service!</p>
---	---

### 1.1.1 General information

Pay attention to all Caution and Danger labels present on the analyzer and all Caution and Danger statements written in this manual.

Electro-Chemical Devices shall not be liable for errors contained herein and/or for the incorrect use of the analyzer. The analyzer's users must read the User's Manual before placing the CA900 analyzer into service. Observe the instructions and follow all national and local regulations and laws regarding workers health and safety.

The use, maintenance and service of this analyzer is restricted to qualified personnel, fully trained in the analyzer's operations. These personnel are intended to be physically and mentally fit and not under the influence of drugs or alcohol.

When the analyzer is not in use, it should be protected from intentional or unintentional powering up, using a proper power switch.

Failure to do so or non-observance of hazards or dangers warnings could result in death or serious injury to the operators or damage to the analyzer.


Before using the analyzer it is necessary to visually check for damage to the safety devices and to report them to your supervisor even if they don't cause analyzer stop or malfunction.





All of the analyzer's components are installed inside a metallic enclosure; a special key is required to open the door, only qualified maintenance personnel should have access to the key.

### 1.1.2 List of warnings and potential dangers

The table below is a list of Hazard and Danger Warning Labels found on the analyzer and/or in this manual. Damaged or illegible labels should be replaced with new ones by the analyzer owner.

*Table 1-1: List of Hazards and Dangers*

	<p>Poisonous Substances: Very hazardous to health when inhaled, swallowed or when they come in contact with the skin. May even lead to death. Danger! Avoid contact with the human body and immediately contact a physician in case of contact.</p>	<p>Involved parts:</p> <ul style="list-style-type: none"> <li>• fluids section</li> <li>• reagent containers</li> </ul>
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	<p>Hazard of electrical shock</p> <p>This symbol is used to represent a hazard of severe electric shock or electrocution. All adjustments and maintenance on electrical devices labeled with this symbol should be made by qualified personnel in accordance with national or local regulations. Qualified Personnel means a person who has been fully trained and has professional experience to avoid electrical hazards and dangers. To avoid potentially fatal electrical shock and/or analyzer damage always disconnect input power to analyzer before servicing.</p>	<p>Involved parts:</p> <ul style="list-style-type: none"> <li>• main power supply</li> <li>• peristaltic pump motor</li> <li>• input terminal</li> </ul>
	<p>Hazard of chemical burns</p> <p>This symbol is used to represent a hazard of severe burns or injury due to handling of dangerous chemicals. All handling, maintenance and filling operations of chemicals labeled with this symbol should be made by qualified personnel in accordance with national or local regulations. Qualified Personnel means a person who has been fully trained and has the professional experience to avoid chemical hazards and dangers. Before handling the chemicals or proceeding with service operations, read the material safety data sheets supplied with each chemical and follow all necessary precautions when handling.</p>	<p>Involved parts:</p> <ul style="list-style-type: none"> <li>• Fluids section</li> <li>• Reagent containers</li> </ul>
	<p>Harmful</p> <p>Specific warning depending on the parameter analyzed and the amount of reagents.</p>	<p>Involved parts:</p> <ul style="list-style-type: none"> <li>• Fluids section</li> <li>• Reagent containers</li> </ul>
	<p>Warning of general hazard</p> <p>This symbol means that is necessary read the manual before proceeding to any service operation in order to properly perform the operation. Only qualified personnel, fully trained on the analyzers use and maintenance are allowed to proceed with service operations on the unit.</p>	

### 1.1.3 Reagents

The Model CA900 Analyzer is based on titration analysis methods, using acids. For the dangers and hazards regarding the chemicals used for the analysis, refer to Chapter 5 for reagent preparation.

Make sure that proper safety precautions are taken (e.g. using safety gloves and glasses) during handling the chemical solutions and the reagents containers / bottles.

Read carefully the Material Safety Data Sheets of each chemical.

All bottles of the reagents must be labeled with the specific hazards and dangers labels.

### 1.1.4 Sample Stream

Take appropriate precautions to avoid direct contact with sample stream. It is the responsibility of the user to collect all the information and take all the precautions regarding physical, chemical, radiation and/or biological hazards and dangers coming from sample stream and/or sample vapors. It is also responsibility of the user to collect all the information and potential hazards regarding the chemical and physical compatibility of sample stream with the analyzer materials.

*Table 1-2: List of materials used in the Model CA900 Analyzer*

Pump tubing	Silicon or Norprene®
Fittings	PP
Connection tubing	Norprene®/ Silicon
Reaction cell	PVC
Pinch valve	Norprene®/ Silicon tubing

### 1.1.5 Waste disposal of the liquid reagents for the reaction

The liquid from the drain of the reaction cell may need to be collected in a separate canister. For guidelines on disposal consult the requirements of the Local Authority for chemical waste regulation. Arrange removal by a Disposal Company.

### 1.1.6 Analyzer General Hazards

#### *1.1.6.1 Electrical precautions and hazards*

Power to the CA900 Analyzer must be routed through an ON/OFF power switch.

Mind the electrical shock and/or electrocution labels placed on the analyzer.

All electrical devices powered by 110/220 VAC present the hazard of electrical shock or electrocution.

The analyzer enclosure is equipped with a door that requires a special key for opening to protect all the personnel involved in analyzer use and maintenance.

Only Qualified Service Personnel should have access to the key that opens the analyzer.



Before servicing the analyzer or any parts that are electrically powered, turn off the power to avoid the risk of electrocution.

Inside the analyzer's lower level, the electrical protection is IP2X. Analyzer's enclosure is IP54.

Protection against electrical shock is guaranteed by the grounding of all isolated metal surfaces. Grounding terminal/screw is located inside the electrical enclosure, in Upper Left position.

It is the user's responsibility to periodically check the efficacy of analyzer's electrical ground.

In case of loss of power, the analyzer stops and automatically restarts as soon as power is returned.

#### *1.1.6.2 Operating precautions and hazards*

**HAZARD:** Mechanical hazards caused by moving parts such as the peristaltic pump, the motor...

##### **PREVENTIVE ACTIONS:**

To avoid risks the analyzer's moving parts have been designed, built and located in an enclosure with a special key. When present inside the enclosure, these parts have protection covers to avoid any contact and physical injuries to users.

**HAZARD:** Hazard of burns and poisoning caused by contact with dangerous chemicals

##### **PREVENTIVE ACTIONS:**

To avoid risks, the analyzer's parts that can cause contact with chemicals have been designed, built and located in closed enclosure with a special opening key. Before servicing the liquids section, read the material safety data sheets supplied with each chemical to take all the necessary precautions when handling. Wear eye protections, gloves, mask and protective clothing if necessary.

**HAZARD:** Hazard of poisoning caused by waste gas leaking from the hydraulic parts or waste collector.

##### **PREVENTIVE ACTIONS:**

Install the analyzer in location of adequate dimensions and in a well ventilated area.

**HAZARD:** Hazard of electric shock and/or electrocution inside the electrical enclosure.

##### **PREVENTIVE ACTIONS:**

The analyzer's electric equipment complies with EN 60204 requirements.

To avoid risks, the analyzer's parts that can cause hazard of electric shock and/or electrocution have been designed, built and located in an enclosure with a special key. When working inside the enclosure, these parts have protective covers and warning labels to avoid any contact and serious injuries or death to users.

**Note:** Electrical equipment, input power and grounding must comply with all national and local regulations and laws.

Check that the source voltage to be used corresponds with that requested by the analyzer.

Check periodically the power cord as well as the analyzer grounding.

#### *1.1.6.3 Chemical and waste gas hazards*

The analyzer has been designed, built and equipped to avoid risks caused by physical and chemical factors such as noise, vibrations, radiations, dust, waste gas etc.

## 2.0 INTRODUCTION – ANALYZER DESCRIPTION

This manual provides general information regarding the principles of operation, the proper installation and operation of the CA900 Analyzer.

The Model CA900 is an on-line sequential sampling analyzer (a sequence of sampling, analysis and result processing), using titration methods.

The analyzer is assembled with two separated sections with two lockable doors. The bottom section is the LIQUIDS section. It includes all of the components involved in the flow, mixing and reaction stages of the sample and reagents (sampling pump, titration reaction cell...). The top section is the ELECTRICAL enclosure. It includes the main power supply, the controller PCB assembly and the touch screen interface.



### 2.1 Applications

The measurement is a titration analysis using a pH sensor to determine Total Alkalinity. Maintaining water quality with the proper balance of pH and alkalinity levels is essential in many different processes—everything from drinking water to wastewater processes, as well as in irrigation water, water-based beverages and pharmaceuticals, electronics manufacturing and more. Alkalinity is a measure of the capacity of water to neutralize acids and affects pH levels in water. It occurs naturally in ground water and its levels are influenced by rocks and soils, salts, certain plant activities and in some cases by industrial wastewater discharges.

ECD's advanced CA900 Titration Analyzer for alkalinity measurement is so easy to install and start up that a technician can do it in less than 15 minutes. All that is necessary is to perform simple connections of the sample, waste and reagent lines and then power up the factory pre-calibrated analyzer. Wall mounting hardware comes standard with each analyzer, but an optional bench top stand with reagent holder also is available.

## 2.2 Working principle: Titration using pH Electrode

To determine and maintain water quality, accurately measuring the alkalinity of the water is critical to assess its relationship and impact on pH levels. Titration analysis with the CA900 Analyzer calculates alkalinity by dispensing known doses of a titrant fluid into a reaction cell while monitoring the pH level to two end points. The analyzer then uses the titrant concentration and amount dispensed to calculate the Carbonate and bi-carbonate alkalinity measurement.

Calculation of alkalinity or ANC is a simple accounting of the amount of acid used to neutralize the sample to the bicarbonate equivalence point:

$$(meq/L) = (mL) \times (meq/mL) \times CF / (mL) \times (1 L / 1000 mL) = (1000 \times (B) \times (Ca) \times (CF)) / Vs$$

and

$$(mg/L \text{ as } CaCO_3) = (meq/L) \times (1 \text{ mmol } CaCO_3 / 2 \text{ meq}) \times (100.087 \text{ mg } CaCO_3 / 1 \text{ mmol } CaCO_3) \\ = (50044 \times (B) \times (Ca) \times (CF)) / Vs$$

where

Alk is the alkalinity or ANC of the sample.

B is the volume of acid titrant added from the initial pH to the bicarbonate equivalence point (near pH 4.5), in milliliters.

Ca is the concentration of acid titrant, in milliequivalents (meq) per milliliter (same as equivalents per liter, or normality N).

CF is a correction factor (see below).

Vs is the volume of sample, in milliliters. mmol is millimoles, in this case for calcium carbonate.

## 2.3 Analysis Cycle

The CA900 Titration Analyzer typically performs a single alkalinity measurement per analysis cycle. Its standard program sequence consists of a cleaning cycle, sample acquisition, monitoring of pH, the addition of the titrant fluid, mixing the fluid, calculation of results and data storage. The desired frequency of analysis between cycles can be easily modified to the requirements of the user's process.

### 2.3.1 Typical Run Sequence:

#### **Rinsing and sampling**

*Drain, rinse and sample functions*

First the reaction cell is drained and rinsed (these steps can also be programmed at the end of the run). The hydraulic lines and the reaction cell are rinsed prior to taking the actual sample. Then the sample is taken.

#### **Addition of reagent(s)/Titrant(s)**

*Add reagent function/ Add Shots*

Depending on the method one or more reagents are added or titrated to a specified pH value. Titrants are administered by the amount of shots.

#### **Mixing**

*Mix functions*

The mixing stir bar is activated once the titration sequence begins. The liquid is mixed after every shot administered to the solution.

#### **Data log**

*Data logging*

Data logging is used to determine the Total alkalinity of the sample. It counts the number of Shots being titrated and the pH concentration of the sample while the titration.

#### **Concentration calculation**

*Calculation*

The analyzer will record the number of shots titrated, then a calculation is performed

#### **Drain, conditioning, rinsing, sampling**

*Drain, rinse and sample functions*

Drain and rinse of the hydraulic lines and the reaction cell.

#### **Waiting time (analysis frequency)**

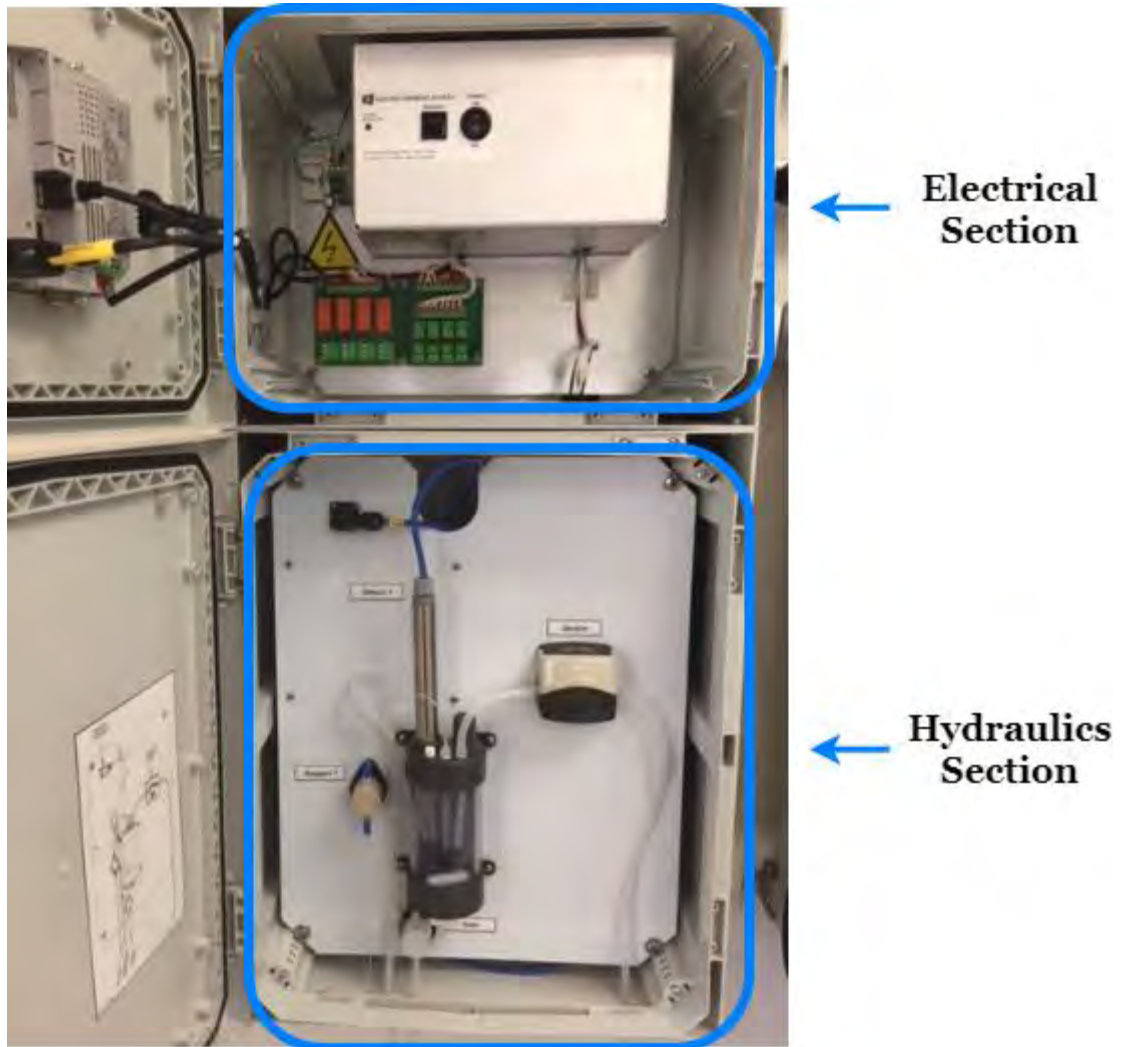
*Wait function*

The wait function allows the frequency of the analysis to set.

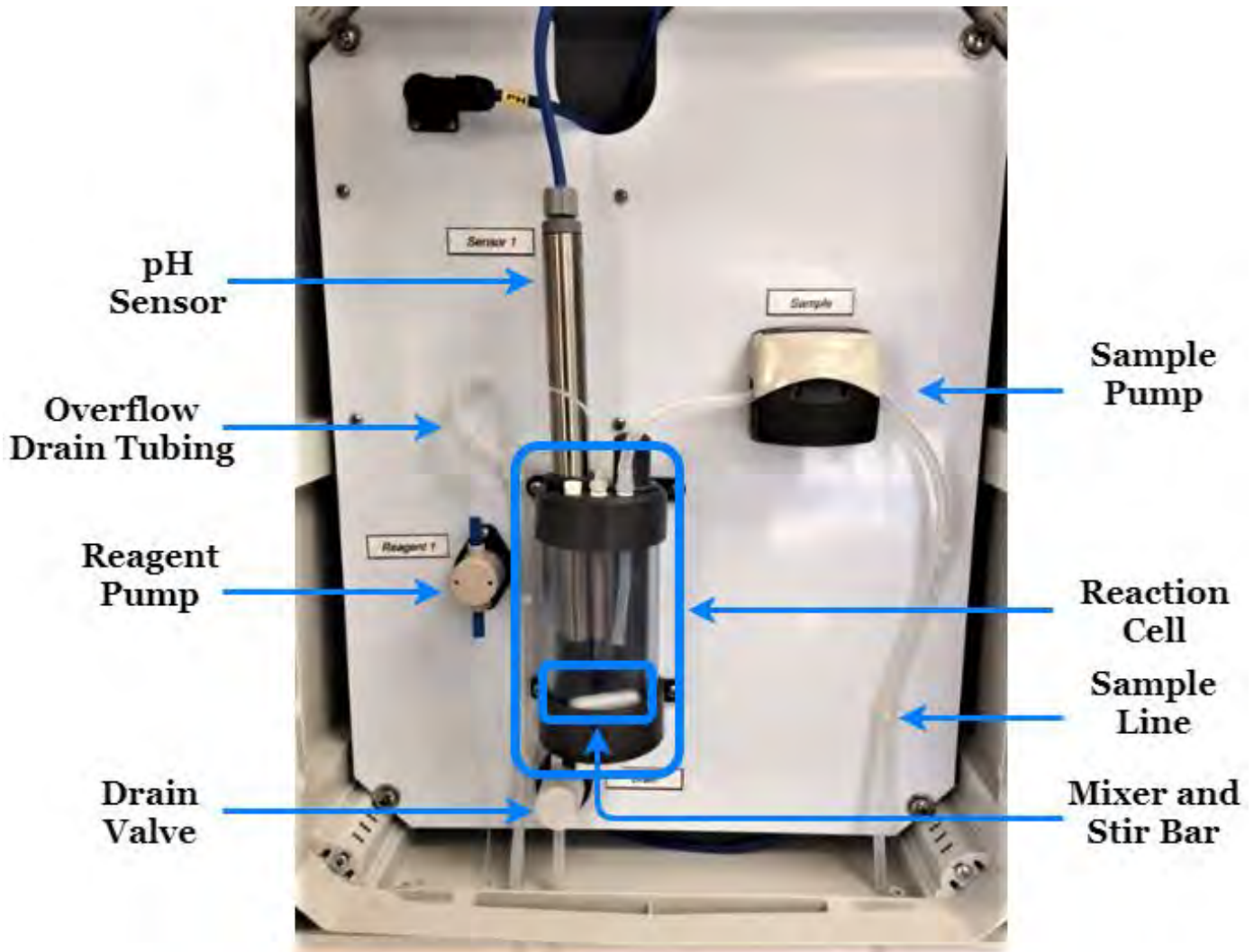
### 3.0 COMPONENTS

The CA900 Analyzer has two distinct sections:

1. The **Liquids Section** which includes all of the liquid handling equipment. This is located in the Lower Compartment, highlighted below.
2. The **Electrical Section** including power supply, PLC controller, I/O and touch screen interface are located in the Upper Compartment, highlighted below.



### 3.1 Liquids Section



#### 3.1.1 Sample Pump

Model CA900 uses a Watson Marlow peristaltic pump for sampling. Proper diameter and material of the tubing must be used for proper functioning of the CA900 Analyzer, use only ECD replacement tubing and parts. The pump is located in the liquid enclosure.

#### 3.1.2 Drain Valve

The normally-closed pinch valve is used to control the draining or rinsing of the reaction cell. When the valve is actuated it opens and drains the cell. The pinching jaws are sized for 1/8" I.D. Silicon or Viton tubing. The size and material of the tubing is VERY IMPORTANT, use only ECDA spares. The pinch valve is located in the liquid enclosure. This tubing should be checked regularly for proper sealing.

### 3.1.3 Reaction Cell

The reaction cell is the vessel where the sample and titrant are added and mixed. The pH sensor is inserted through an opening on the top of the reaction cell where the sensor electrode is submerged in the sample/titrant mixture and reads the solution pH. Inside the reaction cell is a magnetic rod that is spun on its center axis by the stirring motor immediately below the reaction cell. The assembly is like a laboratory stirring plate.

### 3.1.4 pH Sensor

The pH sensor has two parts: the sensor body with electronics in a 10-inch stainless steel tube and the pH sensor electrode (screwed in to the open end of the sensor body). The sensor uses the pH electrode to monitor the change in pH when the titrant is added. When not in use, the electrode (can be still attached to the sensor) should be kept wet with the 4 buffer (best) or at a minimum tap water.

**DO NOT USE DE-IONIZED WATER TO STORE THE SENSOR ELECTRODE.** De-ionized water will cause damage to the sensor electrode and will require replacement. The sensor's pH electrode is shipped with a black boot that covers the electrode tip and, inside, contains a small quantity of 4 pH buffer solution. As mentioned before, 4 pH buffer or at a minimum tap water can be used to refill the black boot to ensure that the sensor is not damaged over time.

### 3.1.5 Reagent Pump

The Titrant or reagent pump is a pump that dispenses an accurate volume of liquid into the reaction cell. It is located in the liquids enclosure section.

### 3.1.6 Mixer and Stir Rod

The mixer is located on the bottom of the reaction cell. It is a magnetic stirrer and used with the Stir rod to mix the Reaction Cell contents. These are located in the liquids enclosure section.

### 3.1.7 Sample Line/Tubing

The sample should be connected to the far right tubing line. The Tubing is sized for 1/8" I.D. Silicon or Viton tubing.

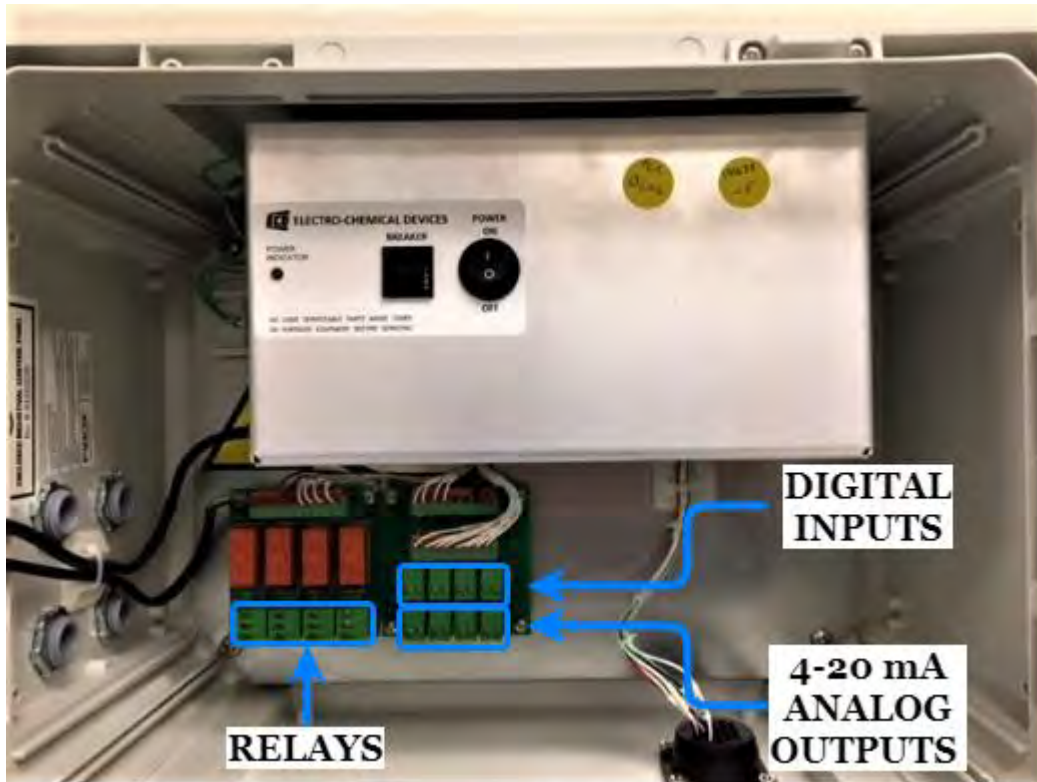
### 3.1.8 Overflow Drain Tubing

The Overflow Drain Tubing is connected to the top of the Reaction Cell and drains out the excess fluid that may collected inside the vessel.



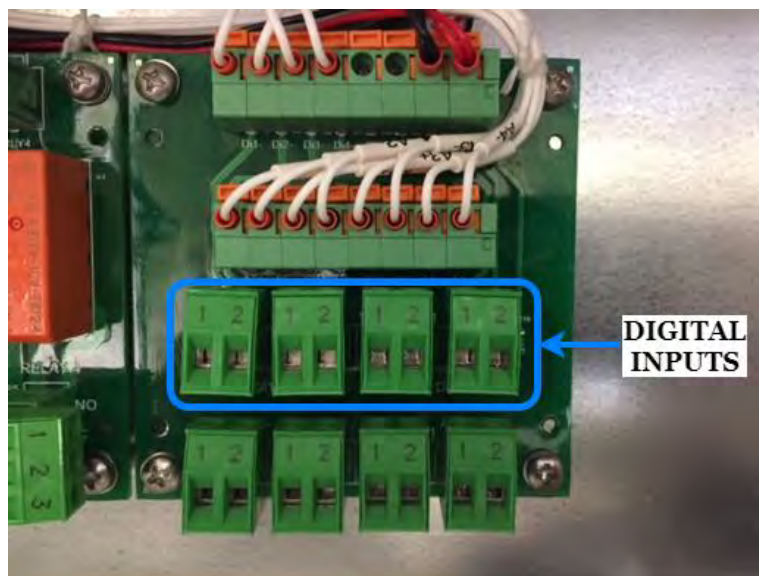
### 3.2 Electronic Components

The PLC based controller and its PCB assembly are located in the electronic section. The controller handles all analyzer operations. It collects all the information and data coming from the different analyzer devices and controls all I/O dialogue with the user touch screen interface and data transfer equipment.



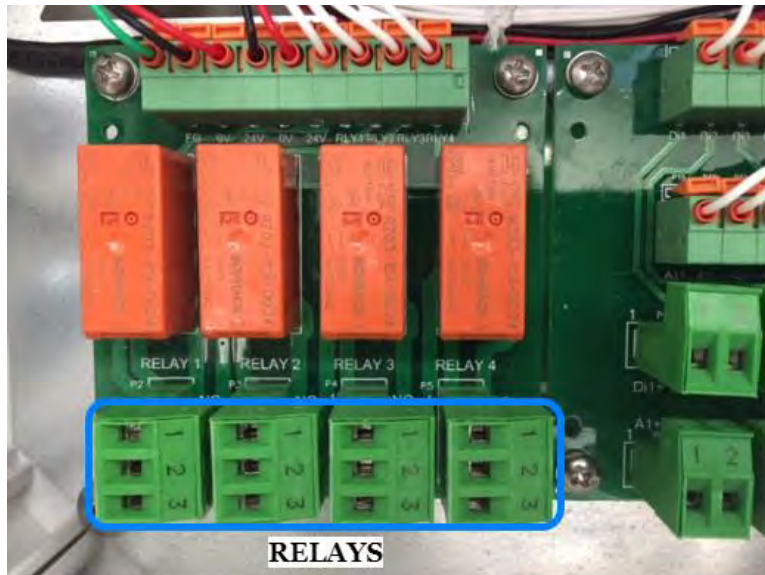
#### 3.2.1 Digital Inputs

There are four Digital Inputs.



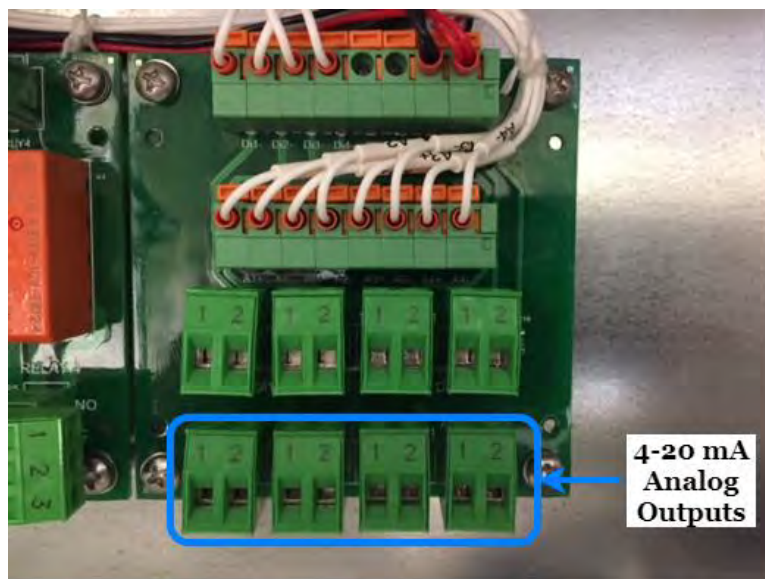
### 3.2.2 Relays

The CA900 is equipped with 4 relays. Each relay is SPDT 15A 250VAC



### 3.2.3 4-20 mA Output

There are four 4-20 mA outputs.



## 4.0 INSTALLATION

### 4.1 Unpacking and Inspecting

The CA900 Analyzer is fully assembled and was tested for proper performance at the factory before packaging and shipping. Before proceeding with installation of the analyzer, it is recommended that you carefully inspect the box and analyzer for damage that may have occurred during shipping.

Use care when unpacking and moving the analyzer. Refer to the Packing List when unpacking the CA900 Analyzer and be careful not to misplace any of the accessories.

### 4.2 Analyzer Handling

Use extreme care when lifting or moving the analyzer. If the analyzer has been in service, empty all liquids from the hydraulic parts before moving the analyzer.

### 4.3 Location and Mounting Instructions

Install the CA900 Analyzer in a clean, dry and dust free environment or in an enclosure with good ventilation.

Environmental Operating conditions are:

- Temperature: 5° to 50°C (41° - 121°F)
- Relative humidity: 80% maximum

If the temperature is below 5°C (41°F), the analyzer should be installed in a heated cabinet.

Due to the possible generation of chemical or waste gases, choose a well ventilated location for the analyzer.

The Model CA900 analyzer is supplied with four mounting brackets for wall mounting or stainless steel support rack installation. To Wall or Rack mount the CA900 analyzer use (4) ¼-20 screws or larger.

The Reagent bottles are supplied with the analyzer. The relative position of the reagent bottle(s) to the reagent pump(s) is very important. The maximum distance between the bottom of the reagent bottle(s) and the lowest edge of the analyzer panel shall be no more than 40 cm (15.75”).

### 4.4 Pre-Installation

Considerations for the proper Location of the CA900 Analyzer:

- Place the analyzer close to the sample point in order to minimize the response time.
- The sample point should provide a homogenous and representative sample to the CA900.
- Plumb sample line to analyzer. If the sample line is under pressure use an adjustable shut-off valve (needle or ball valve) to feed the Fast Flow Reservoir. If drawing from a tank or pond then minimize the tubing length. If longer than 10 feet add time to the initial Rinse times in the Analysis Cycle and the Extra Cycle. (+5 seconds per 10 ft section)
- Position the CA900 Analyzer near a suitable drain, with sufficient capacity to handle the gravity fed waste discharge and the bypass overflow from the Fast Loop Reservoir (if used).
- **WARNING:** The sample drain from the analyzer must drain at ambient pressure with no restrictions or counter pressure.

- Clearance requirements for the analyzer should be 8 inches (20 cm) on either side of the analyzer and 40 inches (100 cm) on the front.
- Sufficient space for the reagent containers should be provided beside or beneath the analyzer.
- The reagent containers should be placed in a suitable collection basin in case of spills.

**Note:** 2" maximum height between the reagent's bottle(s) and the reagent's pump(s).

## 4.5 Electrical Connections

### 4.5.1 General information

The electrical installation should be carried out by qualified personnel in accordance with all national and local regulations. Qualified Personnel refers to a person who has the professional training and experience to avoid electrical hazards and dangers.

Only Qualified Personnel should have access to the key that opens the analyzer enclosure.

Power to the CA900 Analyzer should be routed through an ON/OFF switch.

Turn off the power before beginning any service on the CA900 Analyzer.

The CA900 must be properly grounded to prevent the possibility of electrical shock. All metal surfaces are connected to the Ground terminal. The Grounding Terminal/Screw is located inside the electrical enclosure in the upper left position.



It is the user's responsibility to periodically check the efficacy of analyzer's electrical ground.



The analyzer stops when power is lost or disrupted and automatically restarts when the power is restored.



Users and qualified maintenance personnel must proceed as follows:

- Always turn off the power before servicing the analyzer
- Take notice of all Electrical Shock and/or Electrocutions labels placed on the analyzer



**DANGER:**

No Service should be carried out on the instrument without first switching off the power.

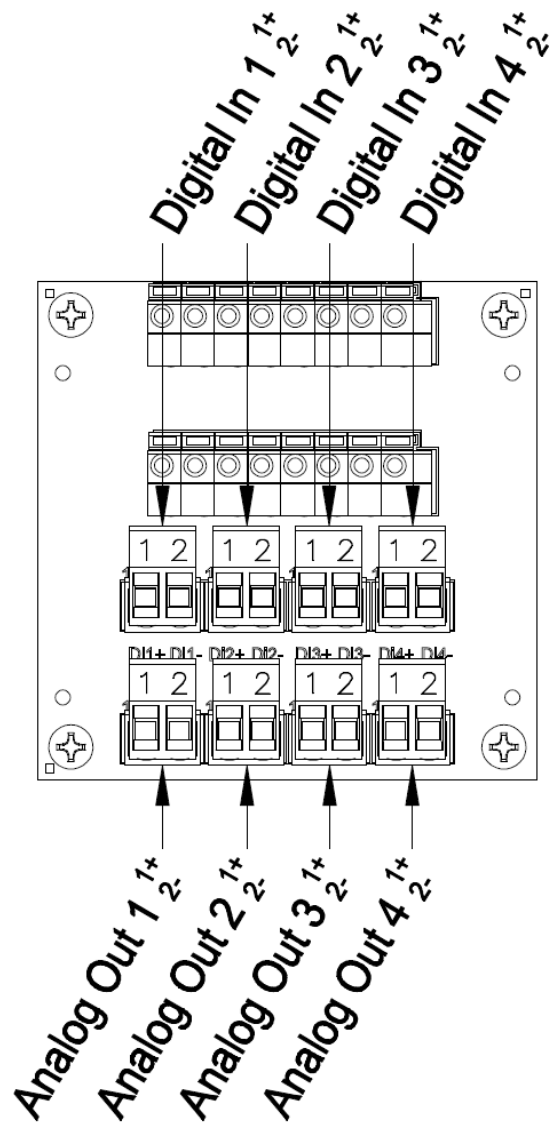
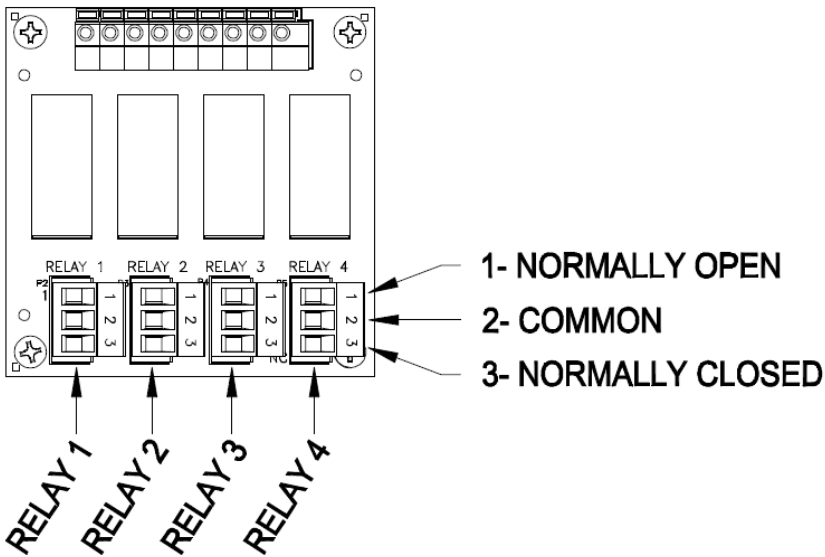
### 4.5.2 AC Power Connections

The CA900 Analyzer is designed for operation with 110-220Vac, 50-60 Hz power. The supplied AC power cord exits through a port on the left side of the electrical compartment. All the connections must be made in accordance with national or local regulations. The analyzer is equipped with a Breaker (main power switch). It is recommended that the CA900 analyzer is connected to power via a circuit breaker or an ON/OFF switch installed near the unit.

### 4.5.3 Signal Output Connections – (Relays, Digital Inputs, and 4-20 mA Output)

CA900 Analyzer provides various output signals all from the TB terminal pictured below.

- (4) Configurable Relays
- (4) Digital Inputs (-Input; + Input) for an external device (start extra cycle)
- (4) 4-20 mA Outputs



## 5.0 REAGENTS AND BUFFERS

It is recommended that 0.16N Sulfuric acid is used as the titrant reagent for 0-200 ppm Alkalinity. Other Normality concentrations can be used for different alkalinity concentrations outside the 0-200 ppm range.

pH 7 and pH 4 Buffer is needed to calibrate the pH sensor. You can purchase these buffers directly at ECD or you can purchase them from other vendors.

Read all MSDS data sheets before preparing the reagents.

Use good laboratory technique. Wear safety goggles, gloves and protective clothing when preparing the reagents, calibration solutions or cleaning solutions.

Mind all Hazard and Poison labels.

Pre-made reagents and solutions are available from ECD. The part #s for the reagents can be found in the recipe next to the reagent name and in section 9.3 Accessories and Spare Parts. Several of the reagents are listed as Hazardous Shipping Materials; these materials are only available for shipment domestically inside the USA.

## 6.0 USER INTERFACE

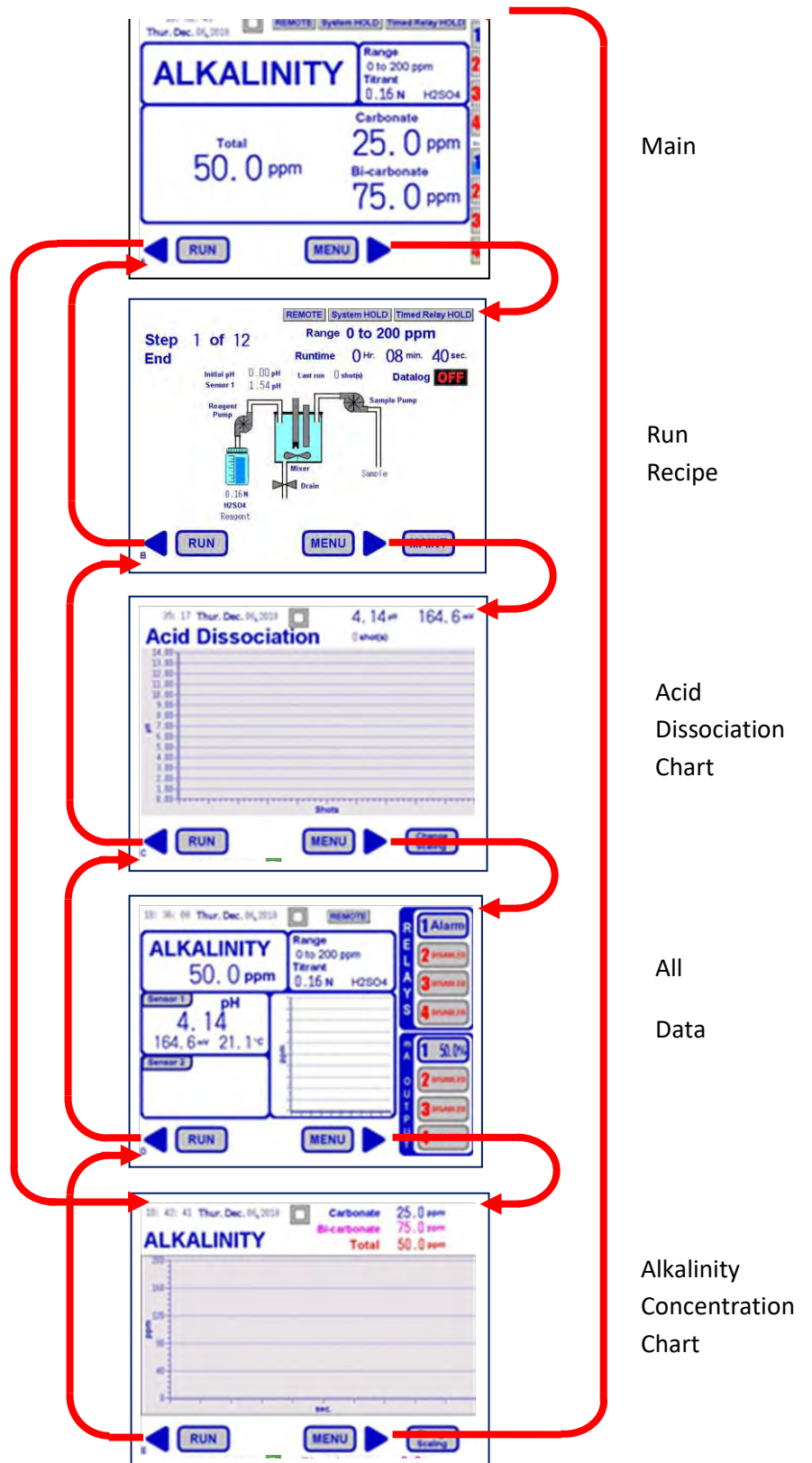
### 6.1 Touch Screen Display

The user interface consists of the Touch Screen Display located on the front panel of the analyzer enclosure. All input/output data, information, alarms and fault conditions are shown on the display while all commands and settings may be transferred to the analyzer simply pressing the touch screen.

## 6.2 Base Screens

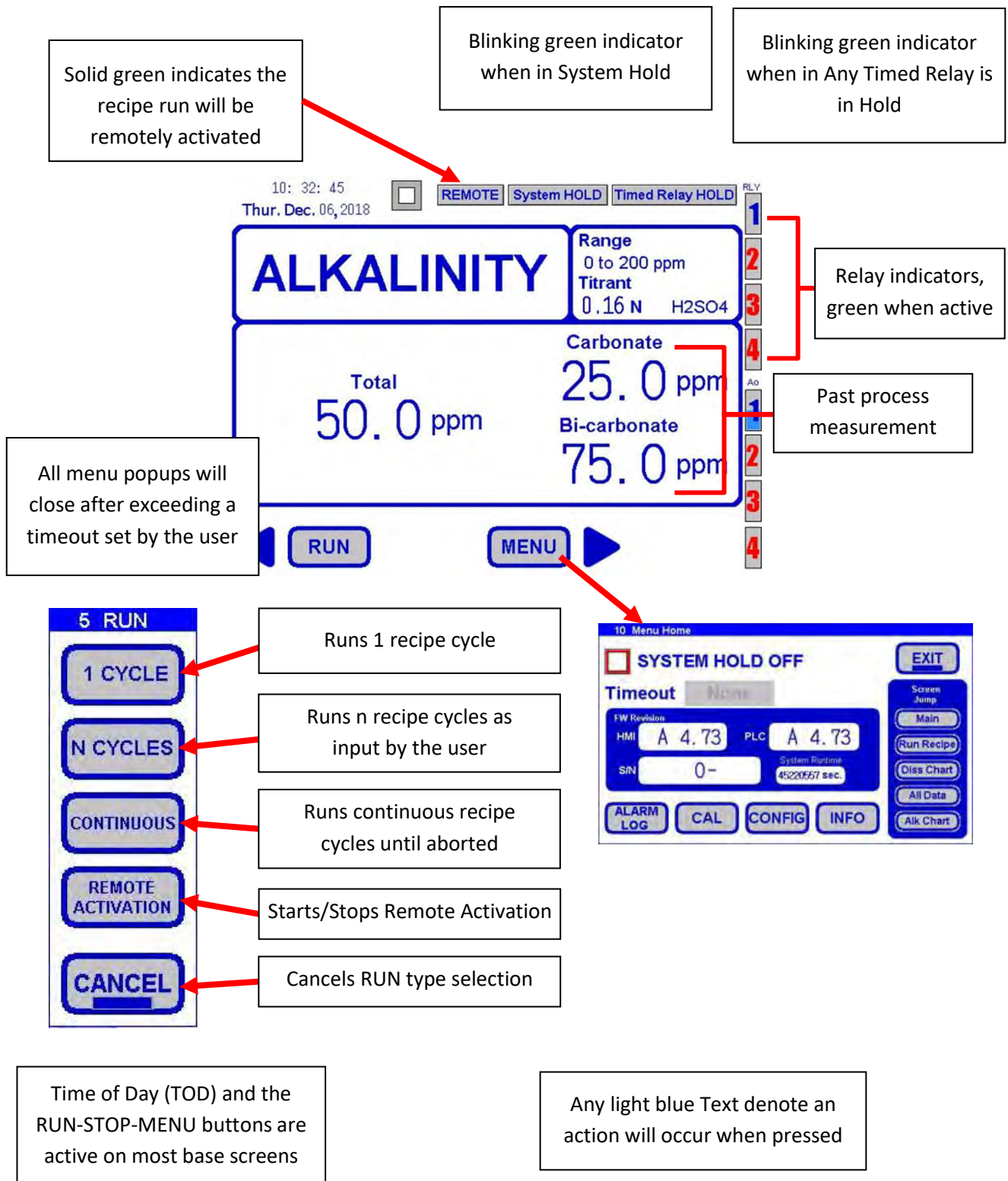
5 inch, 640 x 480 pixel screen

Base Screen letter designations are located at the left bottom of the screen

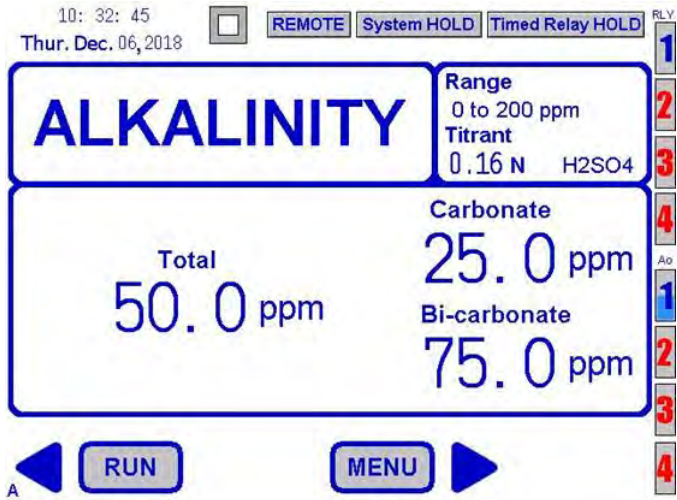
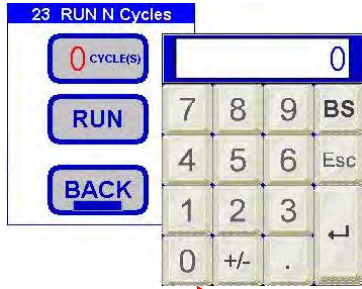




### 6.3 Main Screen



### 6.3.1 Run command



Remote Activation allows the operator to use Input 1 for activating a recipe run from another location or a button outside the housing.

Input 1 can still be employed with a relay for local indication, for example



Start  
Stop



All pull-down menus will close in 2 seconds without

13: 42: 13  
Thur. Dec. 06, 2018



REMOTE

System HOLD

Timed Relay HOLD

RLY

**ALKALINITY**

Range: 0 to 200 ppm  
Titrant: 0.16 N H2SO4

Total	Carbonate	25.0 ppm
50.0 ppm	Bi-carbonate	75.0 ppm

1 Cycle      4 STOP      Time 0 Hr. 00 min. 06 sec.

Step 1 of 12      **ABORT**      Rinse

**CANCEL**

- 1
- 2
- 3
- 4
- 1
- 2
- 3
- 4

Run Type → 1 Cycle  
Recipe Steps → Step 1 of 12

Past process measurement  
Runtime of the Recipe run  
Current Recipe Operation

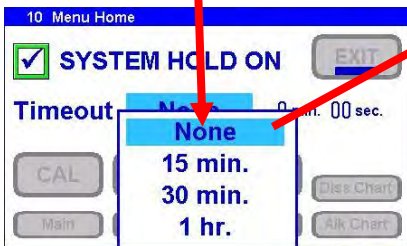
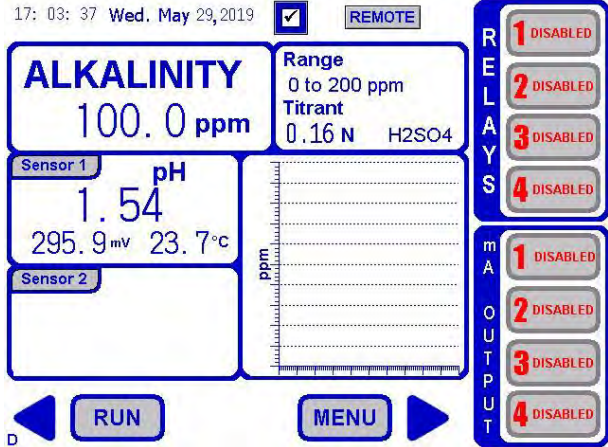
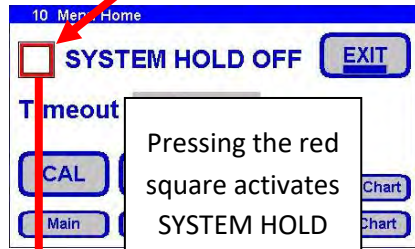
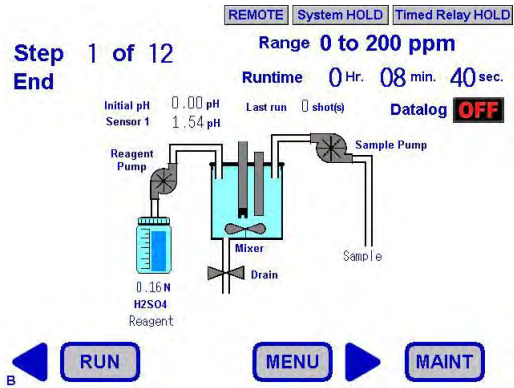
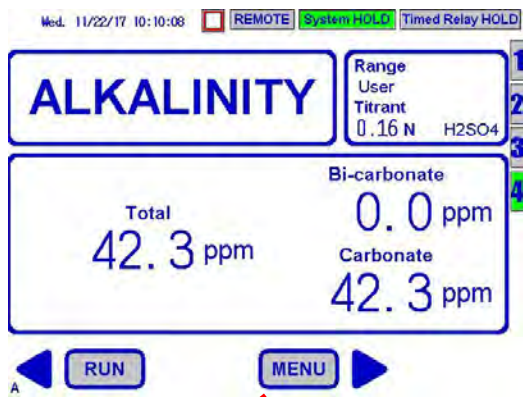
De-activated buttons are grayed out

The STOP button appears during a recipe run

The MENU and RUN buttons are de-activated during a recipe run

Stops the process and sets up the next

### 6.3.2 System Hold Indications



### 6.3.3 Timed Relay Hold Indications

16: 35: 11  
Thur. Dec. 06, 2018

REMOTE System HOLD **Timed Relay HOLD**

**ALKALINITY**

Range 0 to 200 ppm  
Titrant 0.16 N H2SO4

Total 50.0 ppm

Carbonate 25.0 ppm  
Bi-carbonate 75.0 ppm

RLY 1 2 3 4  
Ao 1 2 3 4

← RUN MENU →

A

REMOTE System HOLD Timed Relay HOLD

Step 1 of 12  
End

Range 0 to 200 ppm  
Runtime 0 Hr. 08 min. 40 sec.

Initial pH 0.00 pH  
Sensor 1 1.54 pH

Last run 0 shot(s) Datalog OFF

Reagent Pump 0.16 N H2SO4 Reagent

Mixer

Drain

Sample Pump

← RUN MENU → MAINT

B

Selecting a Hold Time de-activates the outputs and the sensor. However; PV indicators are unaffected

49 Configure Relay - TIMED

Relay 3

ALARM TIMED FAULT DISABLE

EXIT

Period 15 min.  
0 hr. 14 min. 53 sec.

Duration 5 min.  
0 min. 8 sec.

Hold +1 min.  
0 min. 0 sec.

SAVE

Simulate

ONC

OC

ONO

OFF

YES Synchronize all Timed Relays to activate at the same time?

17: 03: 37 Wed. May 29, 2019

REMOTE

**ALKALINITY**

100.0 ppm

Range 0 to 200 ppm  
Titrant 0.16 N H2SO4

Sensor 1 1.54 pH  
295.9 mV 23.7°C

Sensor 2

ppm

RELAYS 1 DISABLED 2 DISABLED 3 DISABLED 4 DISABLED

MAINT 1 DISABLED 2 DISABLED 3 DISABLED 4 DISABLED

← RUN MENU →

ID

### 6.3.4 Time of Day

13: 46: 03  
Thur. Dec. 06, 2018

REMOTE System HOLD Timed Relay HOLD

13 Configure Display

Screen Saver OFF EXIT

Timeout 20 min.

Beep OFF

Brightness

Menu Timeout 2 min.

13:46:03  
Thur. Dec. 06, 2018

Time Date

1 2 3 4

Time Of Day (TOD) is changed by pressing the TOD display entering values in the Change Time / Date popup.

Note: time is in 24-hour format.

TOD can only be changed where the TOD is displayed.

13: 46: 32  
Thur. Dec. 06, 2018

REMOTE System HOLD Timed Relay HOLD

ALKALINITY

Range 0 to 200 ppm

20 Change Time / Date

HH:MM:SS  
13:46:30

MM/DD/YY  
12/06/18

EXIT

SAVE

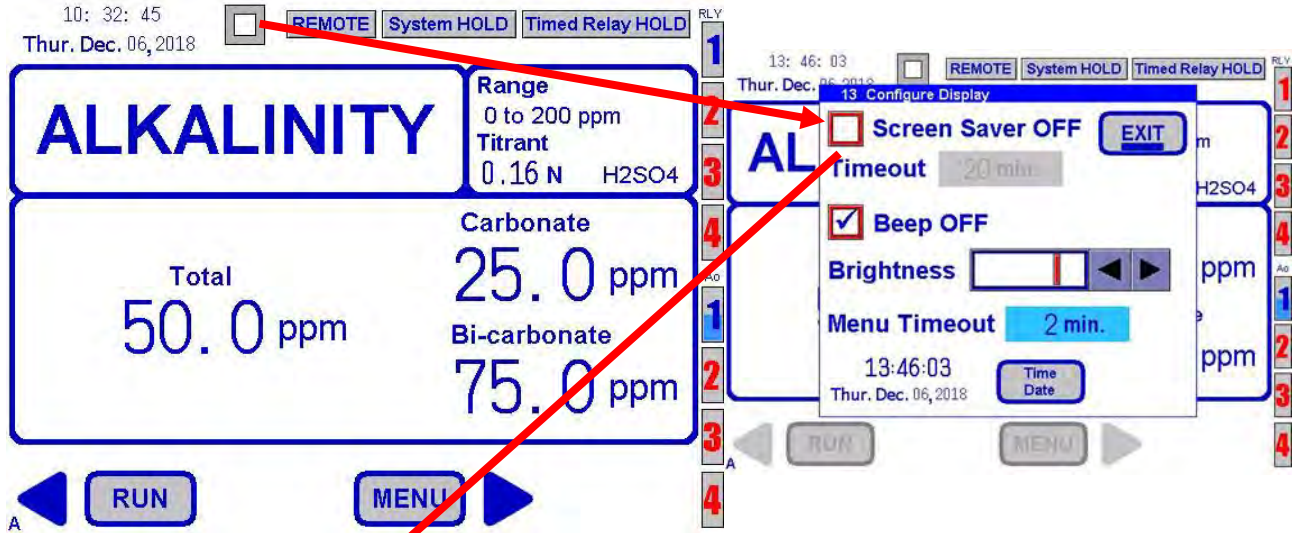
50

0 ppm

75.0 ppm

1 2 3 4

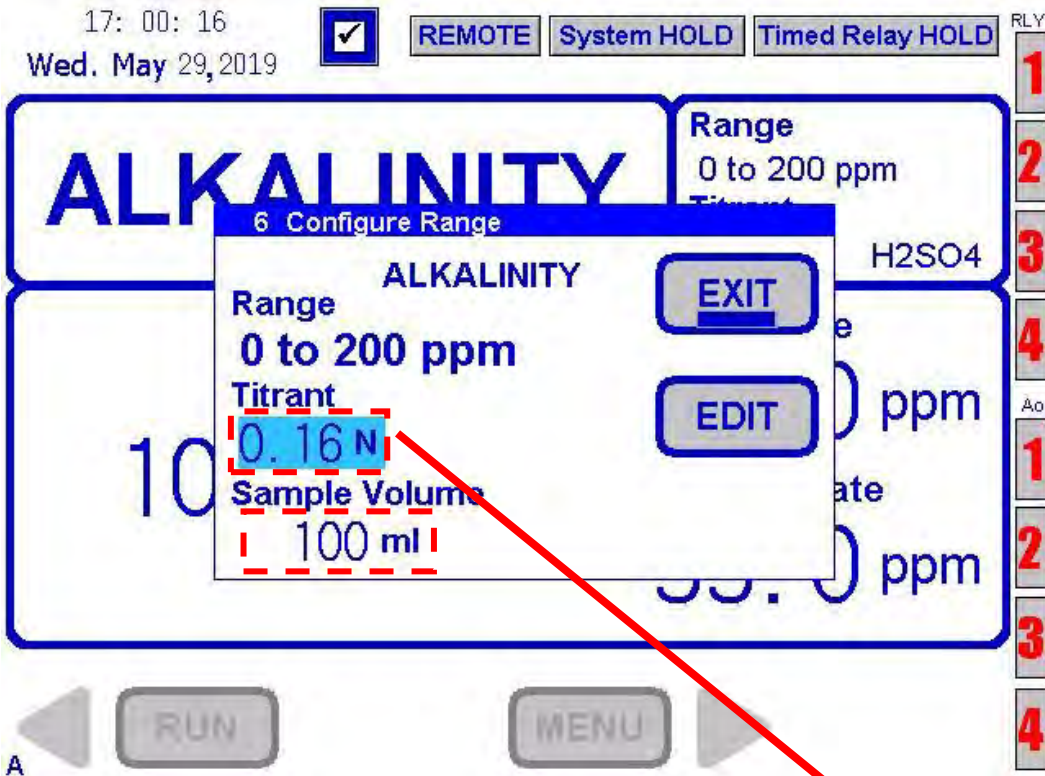
### 6.3.5 Screen Saver



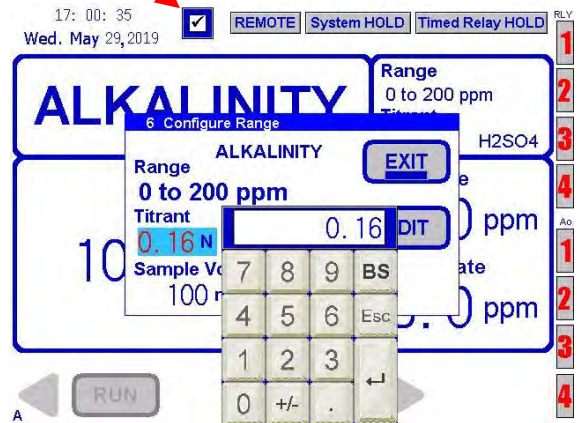
Pressing the red square (without the check mark) turns on the screen saver

Pressing the green square (with the check mark) turns off the screen saver

### 6.3.6 Range

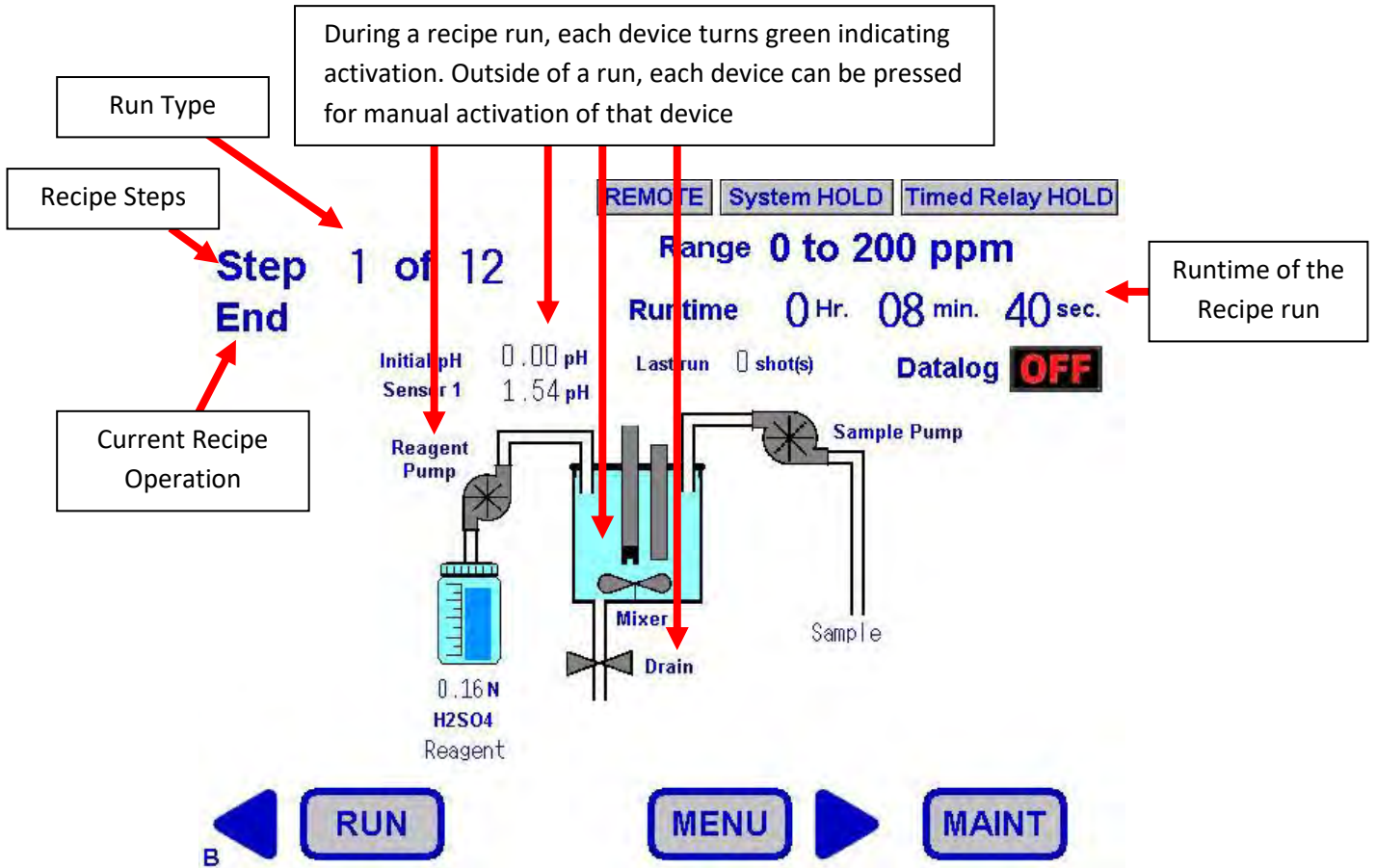


The Titrant and Sample Volume can be changed by pressing the range display on either the Main or All Data Screens





### 6.3.7 Run Recipe



### 6.3.8 Prime Reagent/Titrant

REMOTE System HOLD Timed Relay HOLD  
**Step 1 of 12**  
**End**  
 Range **0 to 200 ppm**  
 Runtime **0 Hr. 08 min. 40 sec.**  
 Last run **0 shot(s)** Datalog **OFF**

Initial pH **0.00 pH**  
 Sensor 1 **1.54 pH**  
 Reagent Pump  
**0.16N H<sub>2</sub>SO<sub>4</sub> Reagent**  
 Mixer  
 Drain  
 Sample Pump  
 Sample

← RUN MENU ▶ MAINT

21 Prime Reagent

Reagent 1 EXIT

Deliver	Delivered
100 shot(s)	0 shot(s) 0.000 ml

RUN STOP SINGLE

21 Prime Reagent

Reagent 1 EXIT

Deliver	Delivered
100 shot(s)	100 00 ml

RUN S

7	8	9	BS
4	5	6	Esc
1	2	3	↵
0	+/-	.	↵

### 6.3.9 Bottle Maintenance

Step 1 of 12  
End

REMOTE System HOLD Timed Relay HOLD

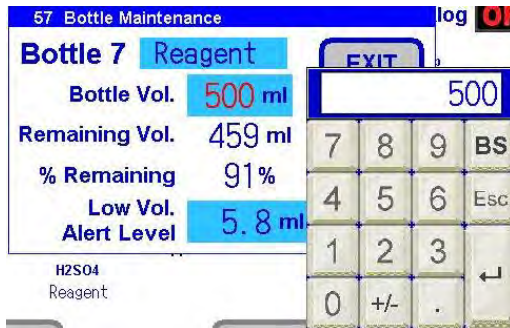
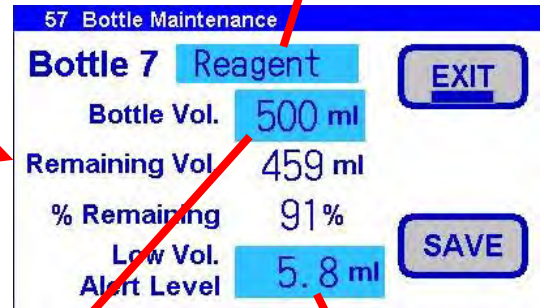
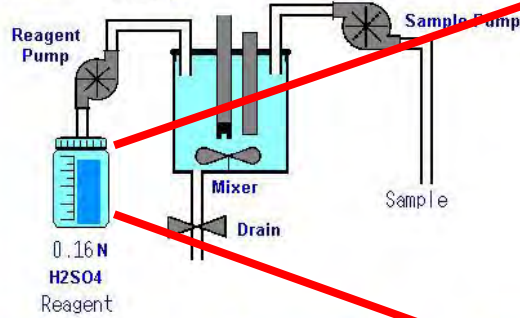
Range 0 to 200 ppm

Runtime 0 Hr. 08 min. 40 sec.

Initial pH 0.00 pH  
Sensor 1 1.54 pH

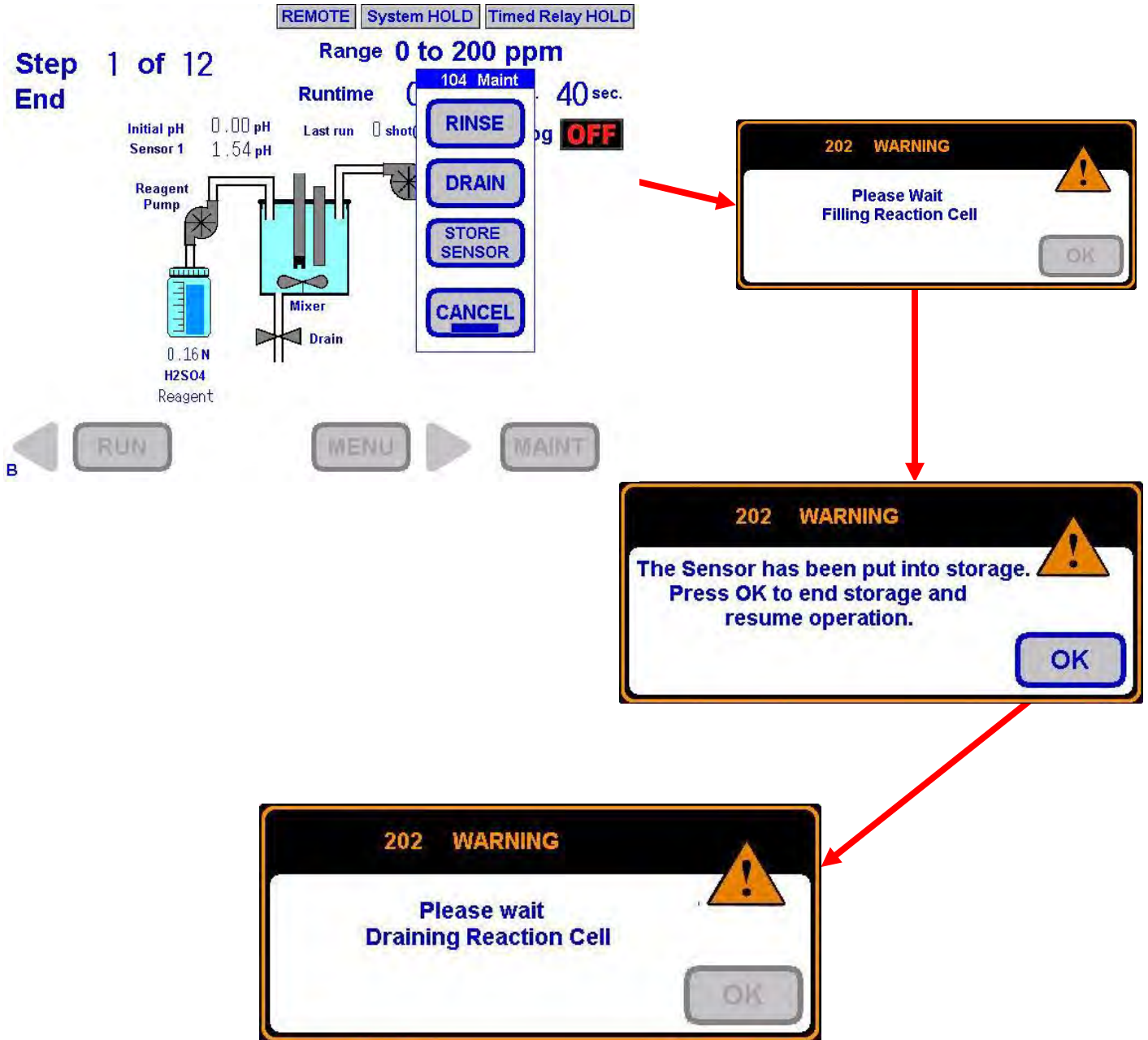
Last run 0 shot(s)

Datalog OFF

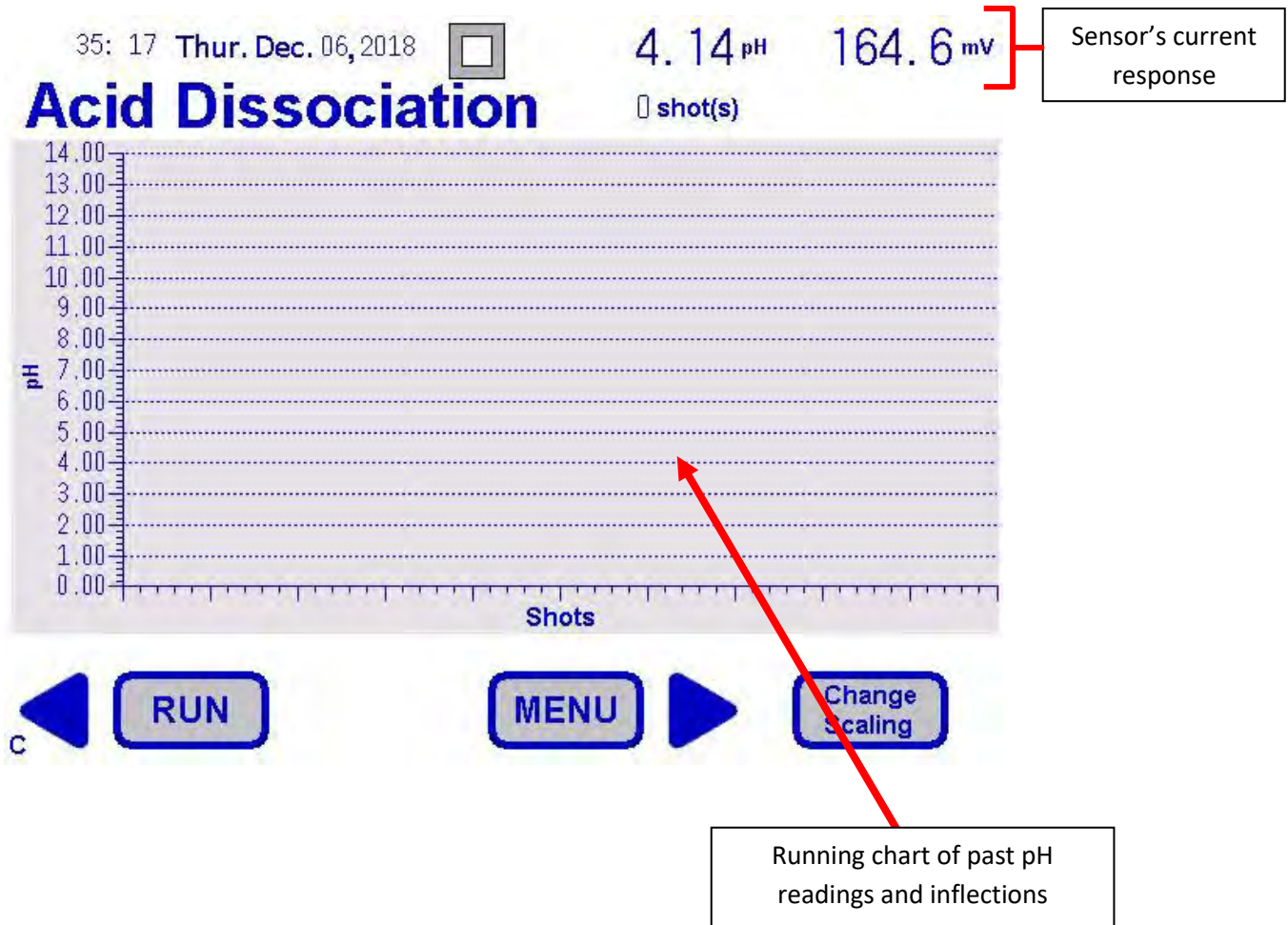


### 6.3.10 Store Sensor

When the Analyzer is not running an analysis, it is recommended that the sensor be stored in pH 4 Buffer. The reaction cell will automatically fill up with the correct buffer. Follow the sequence below to store sensor.

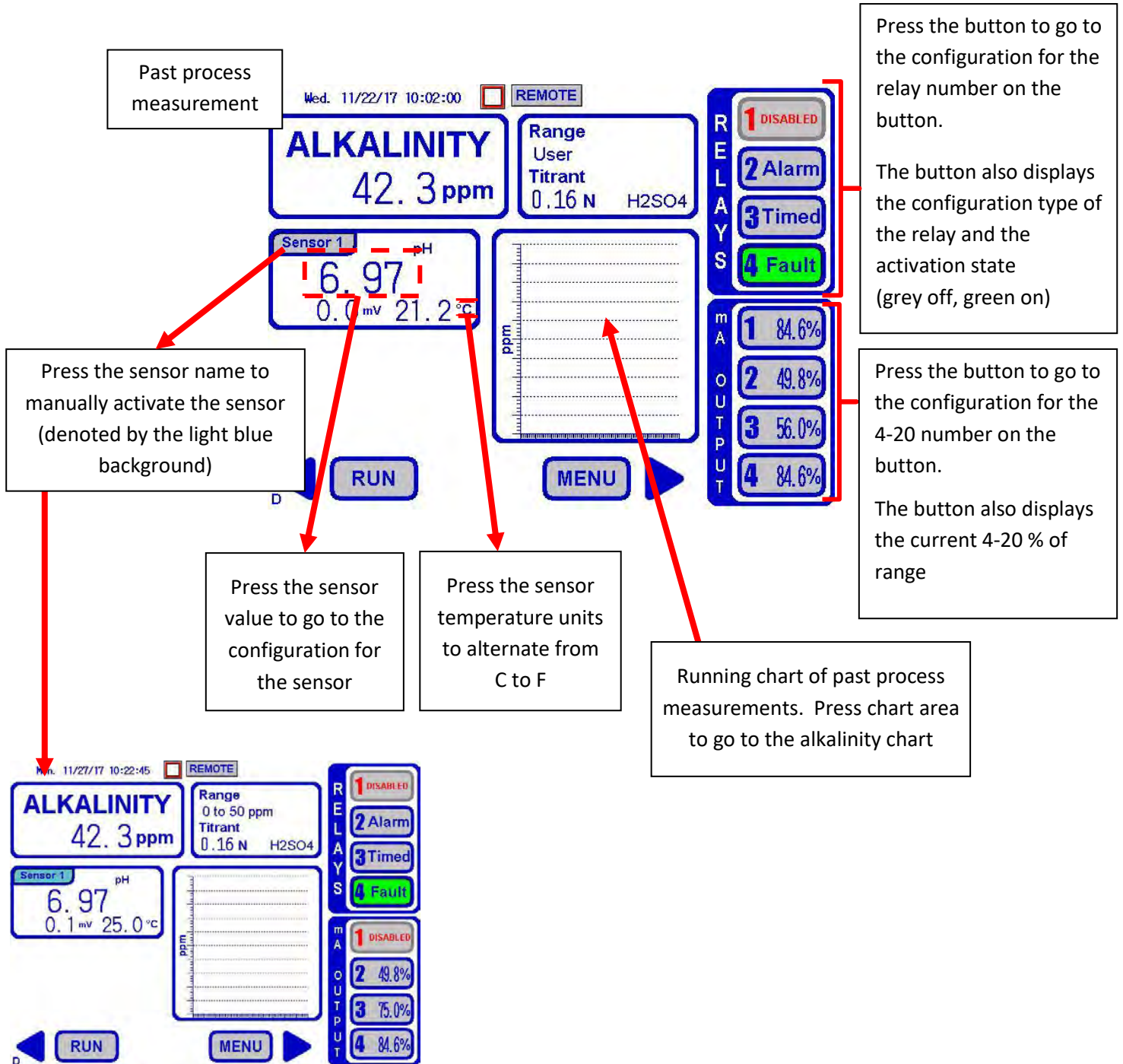


### 6.3.11 Acid Dissociation Chart



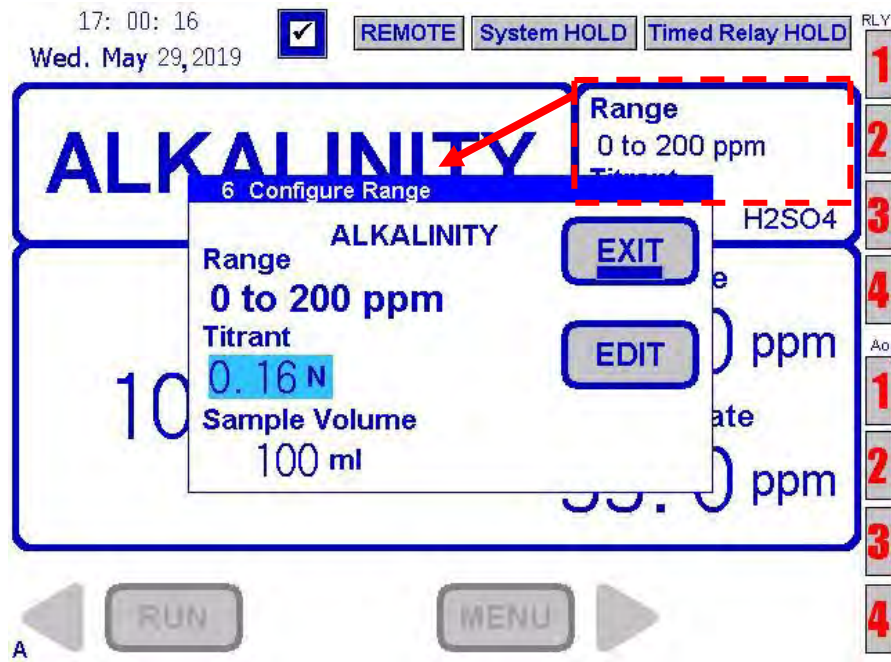
This chart allows you to visualize the pH concentration as the acid is titrated into the sample.

### 6.3.12 All Data Screen



### 6.3.13 Range

The Range setup is the same as shown for the Main screen



### 6.3.14 Range

Isopotential and/or Temperature Compensation are only shown for sensor elements with those properties

Wed. 11/22/17 13:52:46  REMOTE

**ALKALINITY**  
42.3 ppm

Range: 0 to 50 ppm  
Titrant: 0.16 N H<sub>2</sub>SO<sub>4</sub>

Sensor 1  
6.97 pH  
0.0 mV 25.7 °C

RELAYS  
1 DISABLED  
2 Alarm  
3 Timed  
4 Fault

MAINTENANCE  
1 84.6%  
2 49.8%  
3 78.5%  
4 84.6%

3 Configure Sensor

Sensor 1  
pH

Isopotential 0.00V  
Temperature Compensation 0.330%

STORE SENSOR

RUN MENU

### 6.3.15 Sensor Configuration

Wed. 11/22/17 13:52:54  REMOTE

**ALKALINITY**  
42.3 ppm

Range: 0 to 50 ppm  
Titrant

Sensor 1  
6.97 pH  
0.0 mV 25.7 °C

RELAYS  
1 DISABLED  
2 Alarm  
3 Timed  
4 Fault

MAINTENANCE  
1 84.6%  
2 49.8%  
3 78.5%  
4 84.6%

3 Configure Sensor

Sensor 1  
pH

Isopotential 0.00V  
Temperature Compensation 0.330%

STORE SENSOR

RUN MENU

Wed. 11/22/17 13:53:00  REMOTE

**ALKALINITY**  
42.3 ppm

Range: 0 to 50 ppm  
Titrant

Sensor 1  
6.97 pH  
0.0 mV 25.7 °C

RELAYS  
1 DISABLED  
2 Alarm  
3 Timed  
4 Fault

MAINTENANCE  
1 84.6%  
2 49.8%  
3 78.5%  
4 84.6%

3 Configure Sensor

Sensor 1  
pH

Isopotential 0.00V  
Temperature Compensation 0.330%

STORE SENSOR

RUN MENU

7 8 9 BS  
4 5 6 Esc  
1 2 3  
0 +/- .

Wed. 11/22/17 13:53:04  REMOTE

**ALKALINITY**  
42.3 ppm

Range: 0 to 50 ppm  
Titrant

Sensor 1  
6.97 pH  
0.0 mV 25.7 °C

RELAYS  
1 DISABLED  
2 Alarm  
3 Timed  
4 Fault

MAINTENANCE  
1 84.6%  
2 49.8%  
3 78.5%  
4 84.6%

3 Configure Sensor

Sensor 1  
pH

Isopotential 0.00V  
Temperature Compensation 0.330%

STORE SENSOR

RUN MENU

7 8 9 BS  
4 5 6 Esc  
1 2 3  
0 +/- .



### 6.3.16 Relay Configuration

Mon. 11/27/17 08:24:31  REMOTE

**ALKALINITY**  
42.3 ppm

Range  
0 to 50 ppm  
Titrant  
0.16 N H<sub>2</sub>SO<sub>4</sub>

Sensor 1 pH  
6.97  
0.0 mV 25.7 °C

RELAYS  
1 DISABLED  
2 Alarm  
3 Timed  
4 Fault

MA OUTPUT  
1 DISABLED  
2 49.8%  
3 78.5%  
4 84.6%

62 Configure Relay - DISABLE  
Relay 1  
ALARM TIMED FAULT **DISABLE**  
EXIT  
SAVE  
Simulate  
OFF

Press the Relay Type button to switch between the 4 types

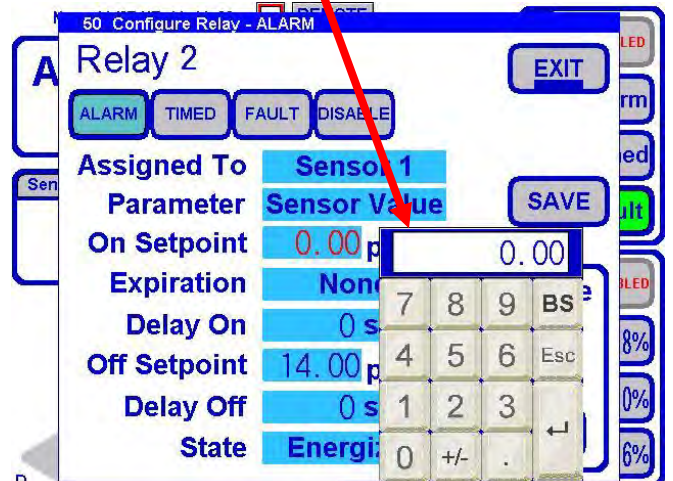
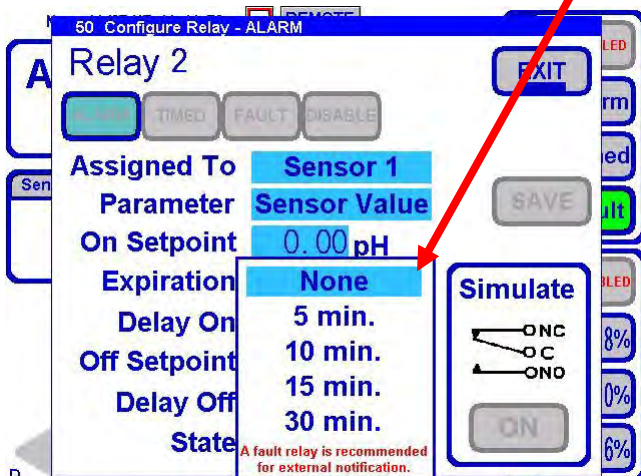
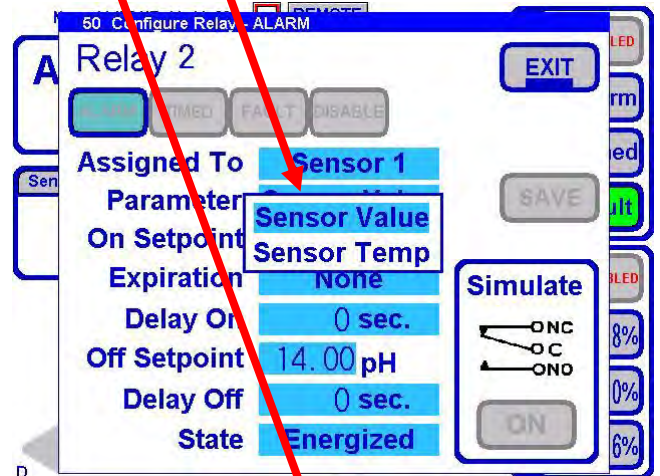
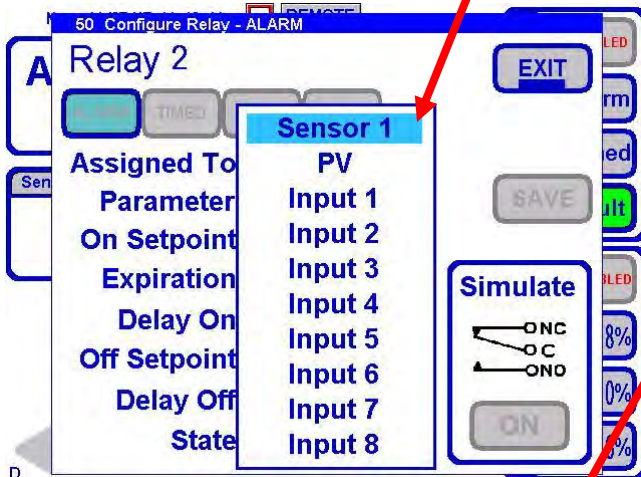
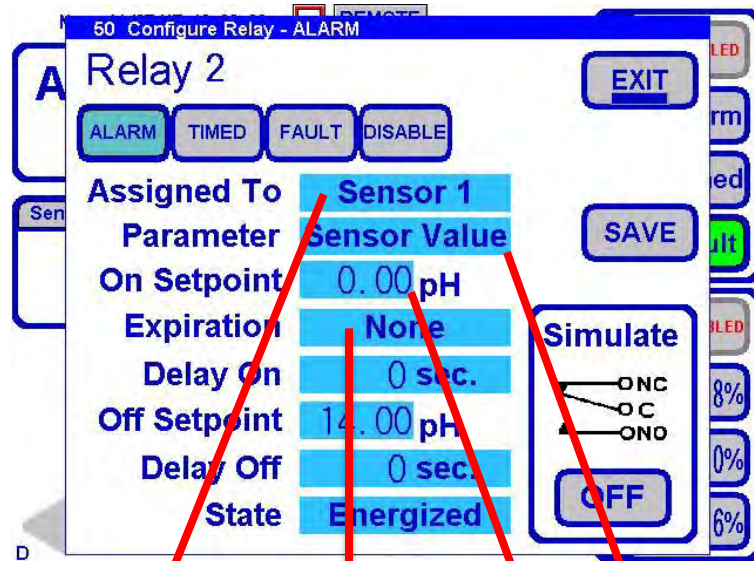
60 Configure Relay - ALARM  
Relay 2  
ALARM **TIMED** FAULT DISABLE  
EXIT  
Assigned To Sensor 1  
Parameter Sensor Value  
On Setpoint 0.00 pH  
Expiration None  
Delay On 0 sec.  
Off Setpoint 14.00 pH  
Delay Off 0 sec.  
State Energized  
SAVE  
Simulate  
OFF

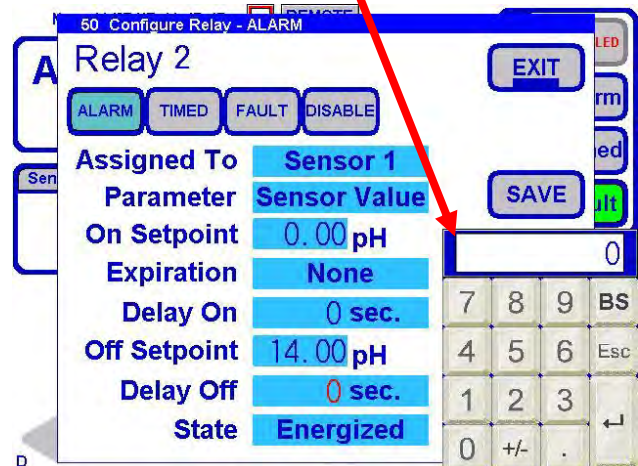
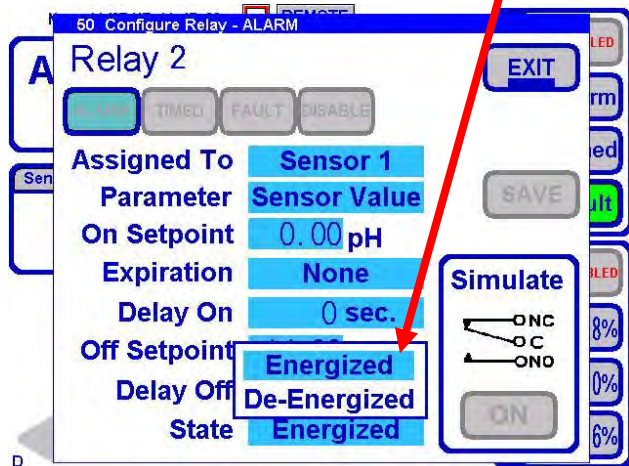
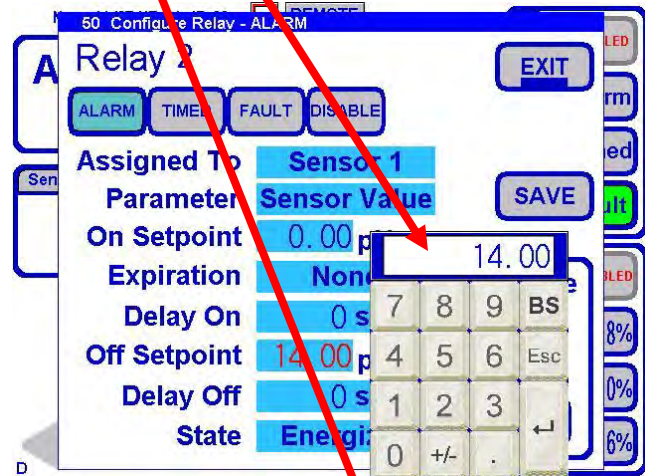
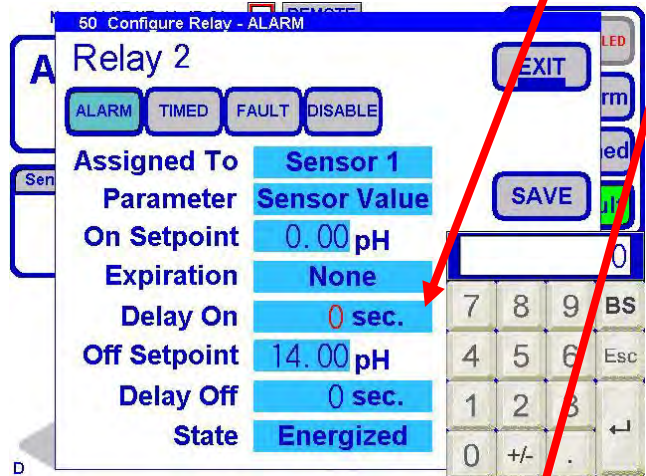
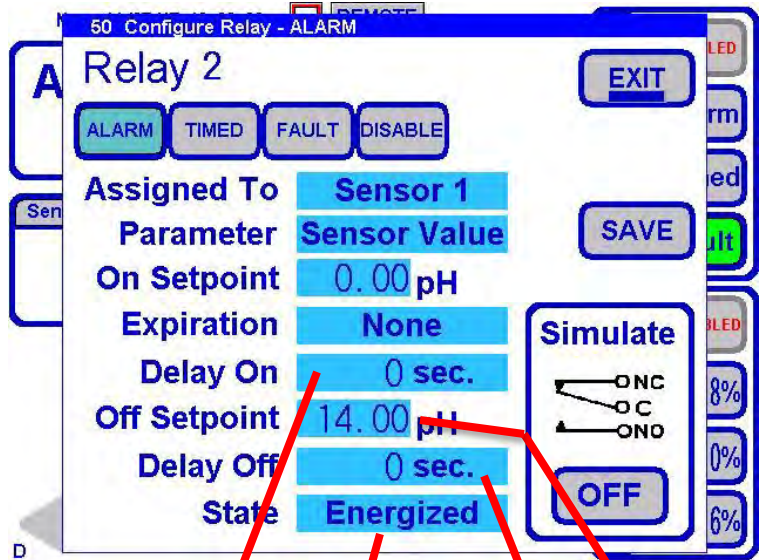
61 Configure Relay - FAULT  
Relay 4  
ALARM TIMED **FAULT** DISABLE  
EXIT  
SAVE  
Relay Deactivates on a System Fault  
Simulate  
OFF

49 Configure Relay - TIMED  
Relay 3  
ALARM **TIMED** FAULT DISABLE  
EXIT  
Period 15 min.  
0 hr. 0 min. 6 sec.  
Duration 15 sec.  
0 min. 0 sec.  
Hold OFF  
0 min. 00 sec.  
YES Synchronize all Timed Relays to activate at the same time?  
SAVE  
Simulate  
OFF

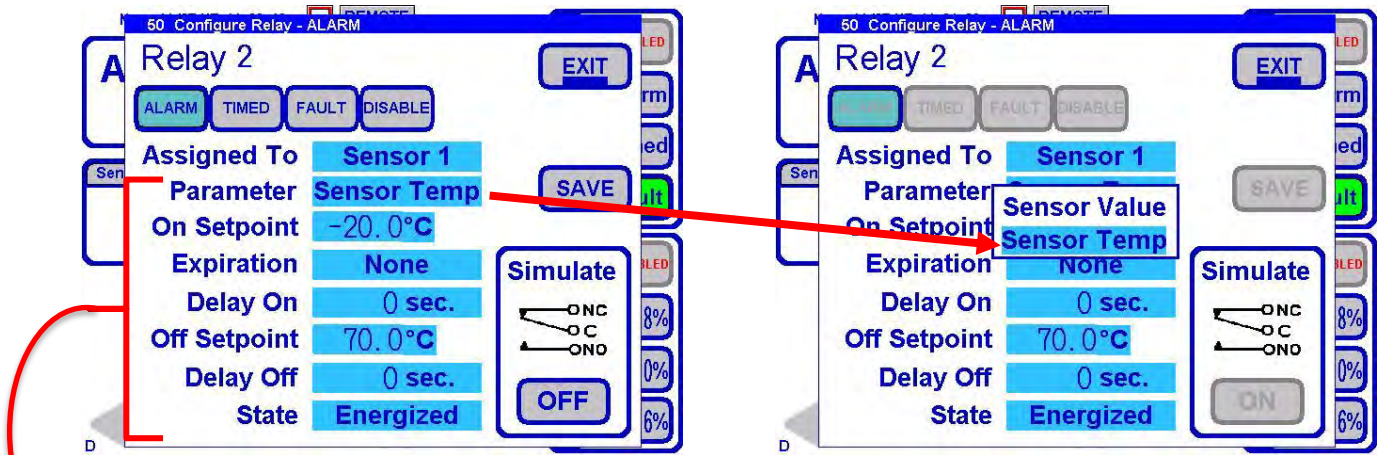
Relay simulation (each relay)

### 6.3.17 Relay Configuration- Alarm- Sensor Value





### 6.3.18 Relay Configuration- Alarm- Sensor Temperature



The setup for the rest of the parameters are the same as shown previously

### 6.3.19 Relay Configuration- Alarm- Process

50 Configure Relay - ALARM

**Relay 2**

ALARM TIMED FAULT DISABLE

Assigned To PV

Parameter Total

On Setpoint 0 ppm

Expiration None

Delay On 0 sec.

Off Setpoint 50 ppm

Delay Off 0 sec.

State Energized

EXIT SAVE Simulate OFF

8% 0% 6%

The setup for the rest of the parameters are the same as shown previously

50 Configure Relay - ALARM

**Relay 2**

ALARM TIMED FAULT DISABLE

Assigned To PV

Parameter Total

On Setpoint 0 ppm

Expiration Bi-carbonate

Delay On 0 sec.

Off Setpoint 50 ppm

Delay Off 0 sec.

State Energized

EXIT SAVE Simulate OFF

8% 0% 6%

50 Configure Relay - ALARM

**Relay 2**

ALARM TIMED FAULT DISABLE

Assigned To PV

Parameter Carbonate

On Setpoint 0 ppm

Expiration None

Delay On 0 sec.

Off Setpoint 50 ppm

Delay Off 0 sec.

State Energized

EXIT SAVE Simulate OFF

8% 0% 6%

50 Configure Relay - ALARM

**Relay 2**

ALARM TIMED FAULT DISABLE

Assigned To PV

Parameter Total

On Setpoint 0 ppm

Expiration None

Delay On 0 sec.

Off Setpoint 50 ppm

Delay Off 0 sec.

State Energized

EXIT SAVE Simulate OFF

8% 0% 6%

50 Configure Relay - ALARM

**Relay 2**

ALARM TIMED FAULT DISABLE

Assigned To PV

Parameter Bi-carbonate

On Setpoint 0 ppm

Expiration None

Delay On 0 sec.

Off Setpoint 50 ppm

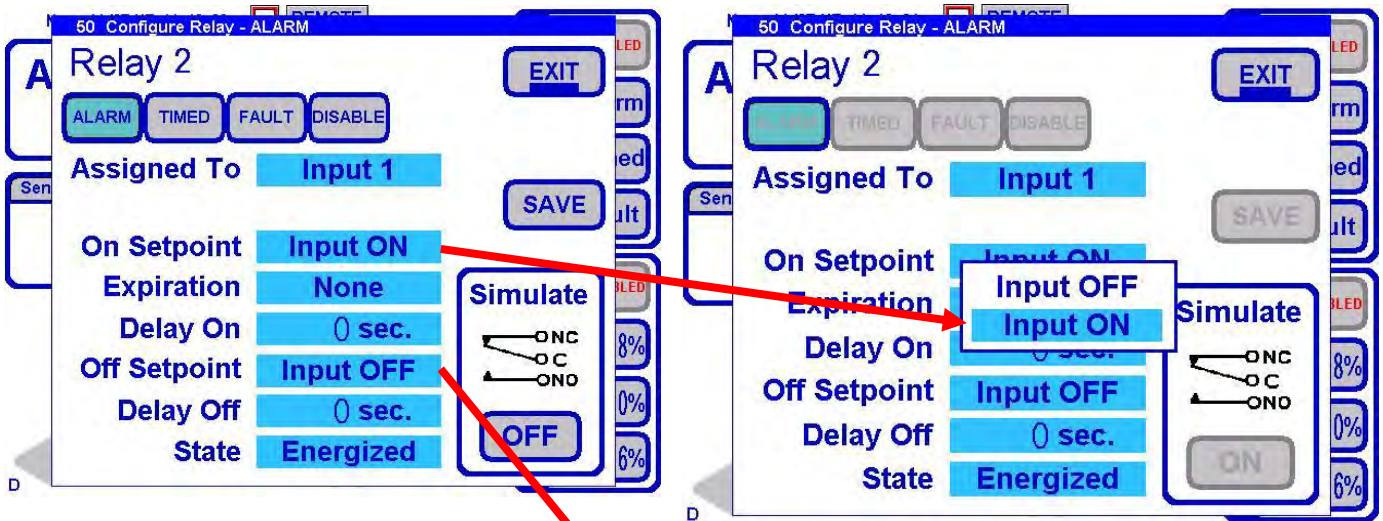
Delay Off 0 sec.

State Energized

EXIT SAVE Simulate OFF

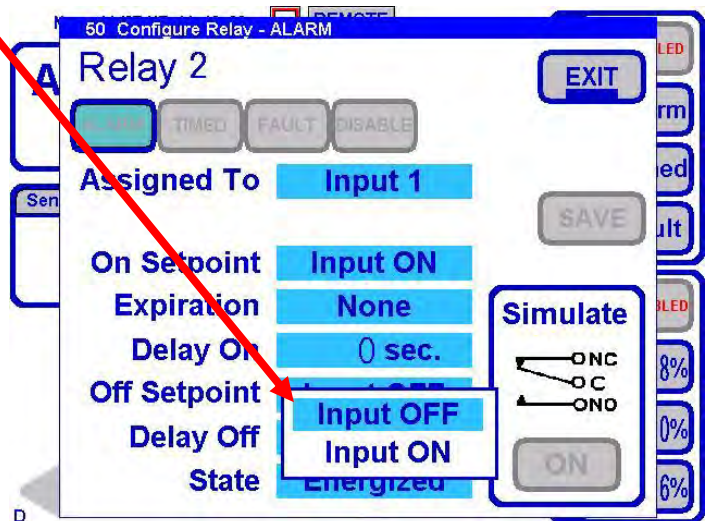
8% 0% 6%

### 6.3.20 Relay Configuration- Alarm- Inputs



The setup for Delay On, Delay Off and State are the same as shown previously

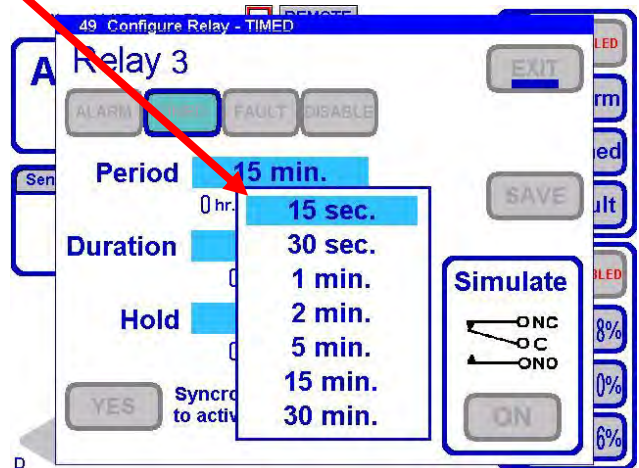
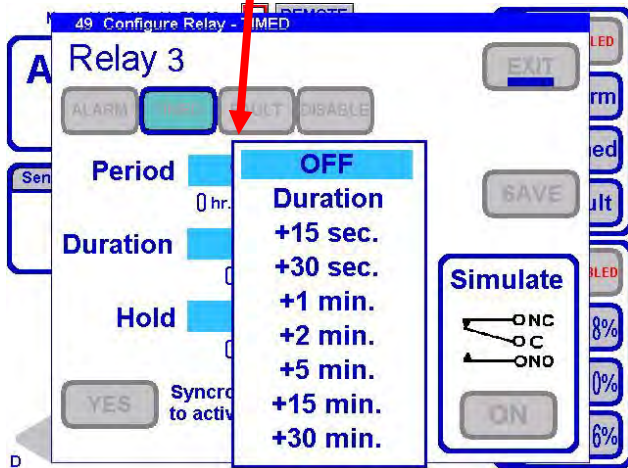
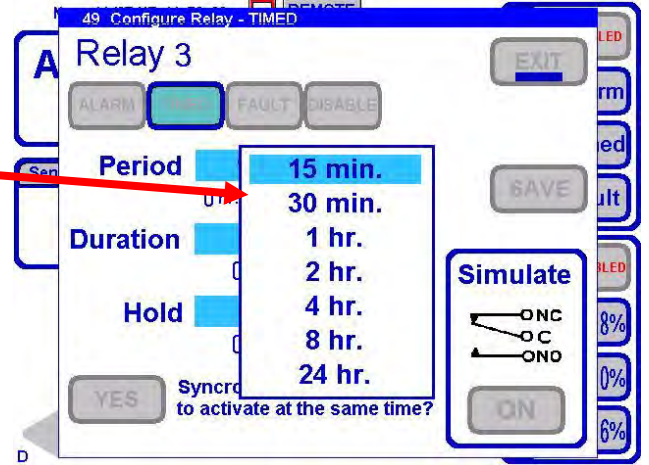
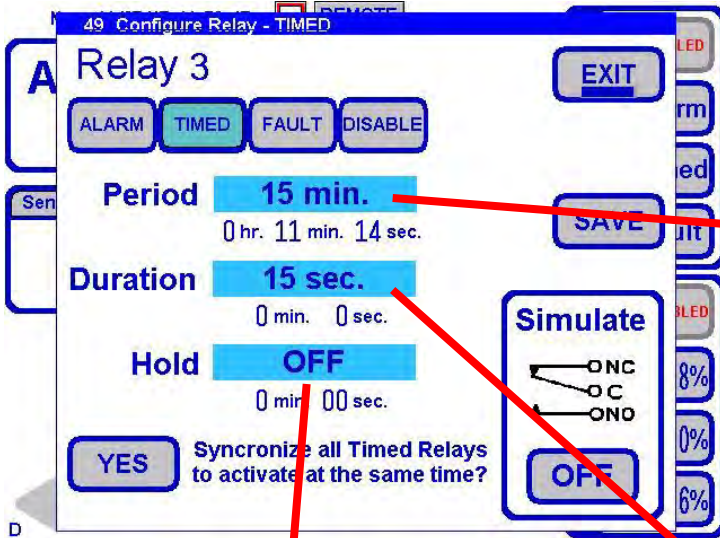
The On Setpoint and Off Setpoint are always opposite of each other



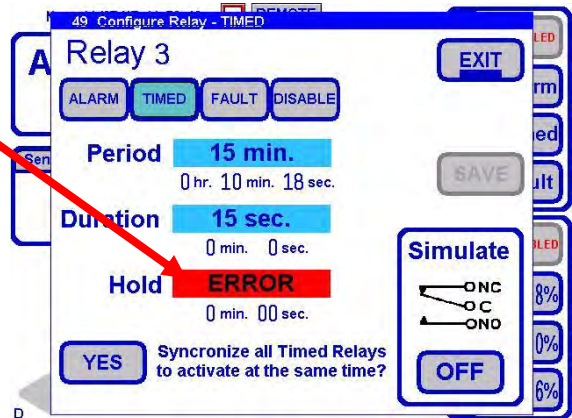
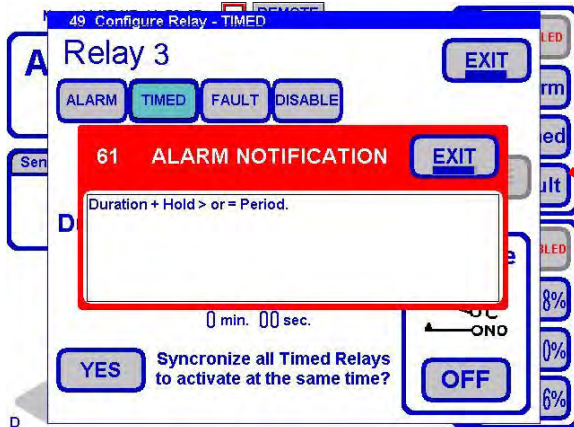
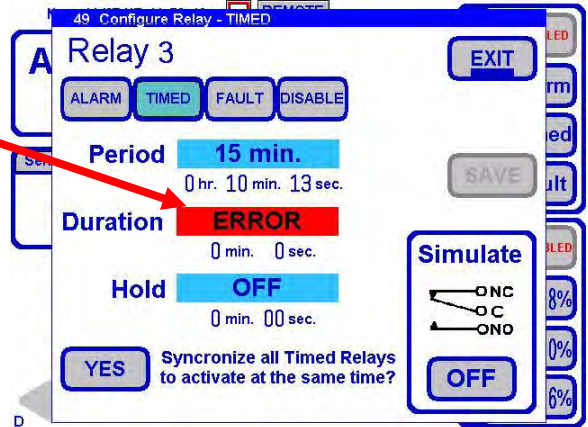
Run recipe configured as Remote Activation uses Input 1 for activating a recipe run from another location or a button outside the housing.

Input 1 can still be employed with a relay for local indication, for example

### 6.3.21 Relay Configuration- Alarm- Timed



A Fault is generated if the duration  $\geq$  period or the duration + hold time  $\geq$  period. The Fault condition will persist until corrected.

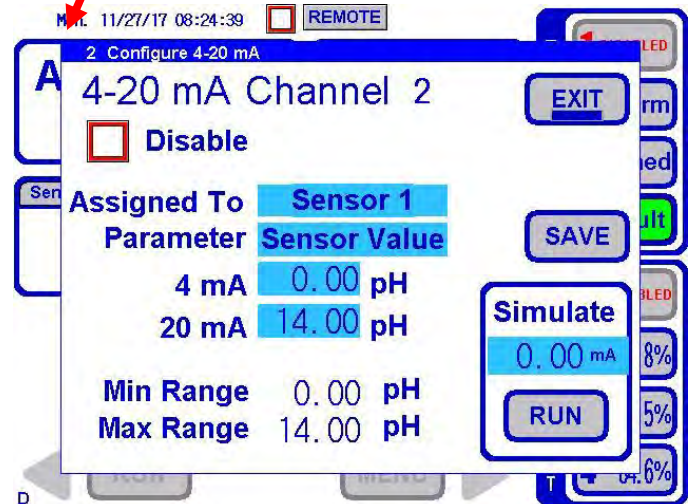
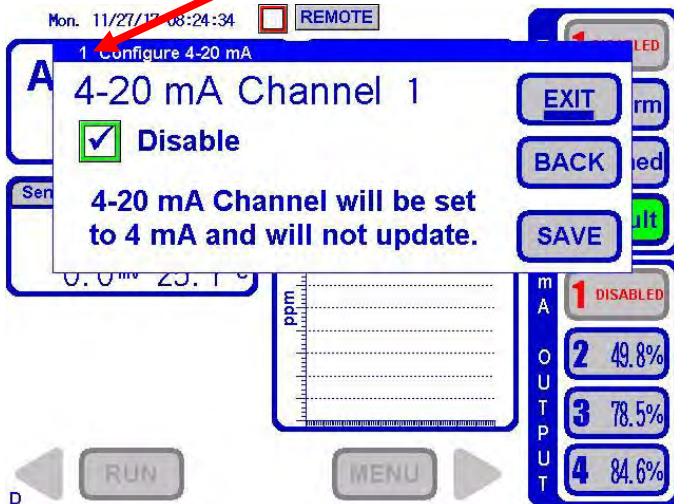
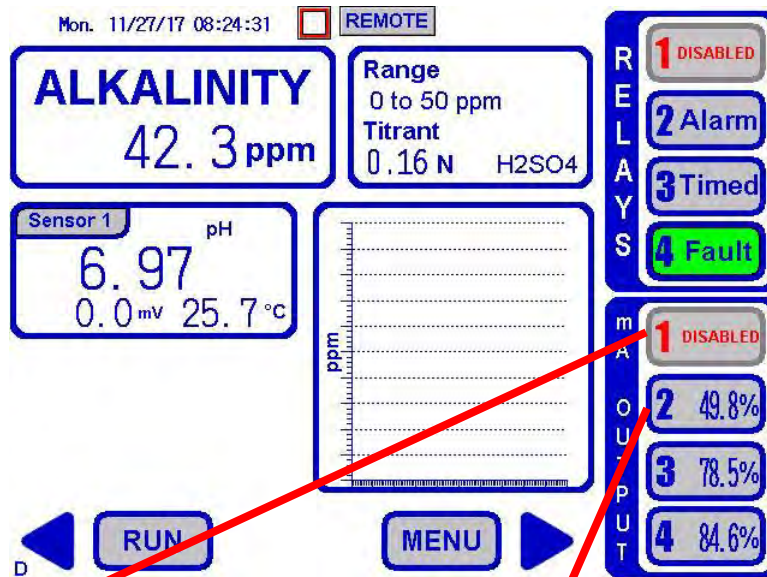




## 6.4 4-20 mA

The CA900 has Four 4-20 mA outputs

### 6.4.1 4-20 mA Configuration



## 6.4.2 4-20 mA Configuration – Sensor Value

Mon. 11/27/17 08:24:39  REMOTE

2 Configure 4-20 mA

4-20 mA Channel 2

Disable

Assigned To **Sensor 1**

Parameter **Sensor Value**

4 mA 0.00 pH

20 mA 14.00 pH

Min Range 0.00 pH

Max Range 14.00 pH

Simulate

0.00 mA

RUN

EXIT

SAVE

8%

5%

6%

Mon. 11/27/17 08:25:16  REMOTE

2 Configure 4-20 mA

4-20 mA Channel 2

Disable

Assigned To **Sensor 1**

Parameter **Sensor Value**

4 mA 0.00 pH

20 mA 14.00 pH

Min Range 0.00 pH

Max Range 14.00 pH

Simulate

0.00 mA

EXIT

SAVE

8%

5%

6%

Mon. 11/27/17 08:25:25  REMOTE

Configure 4-20 mA

4-20 mA Channel 2

Disable

Assigned To **Sensor Value**

Parameter **Sensor value**

4 mA 0.00 pH

20 mA 14.00 pH

Min Range 0.00 pH

Max Range 14.00 pH

Simulate

0.00 mA

EXIT

SAVE

8%

5%

6%

Mon. 11/27/17 08:25:44  REMOTE

2 Configure 4-20 mA

4-20 mA Channel 2

Disable

Assigned To **Sensor 1**

Parameter **Sensor Value**

4 mA 0.00 14.00

20 mA 14.00

Min Range 0.00

Max Range 14.00

Simulate

0.00 mA

EXIT

SAVE

8%

5%

6%

7 8 9 BS

4 5 6 Esc

1 2 3

0 +/- . ←

Mon. 11/27/17 08:25:36  REMOTE

2 Configure 4-20 mA

4-20 mA Channel 2

Disable

Assigned To **Sensor 1**

Parameter **Sensor Value**

4 mA 0.00 0.00

20 mA 14.00

Min Range 0.00

Max Range 14.00

Simulate

0.00 mA

EXIT

SAVE

8%

5%

6%

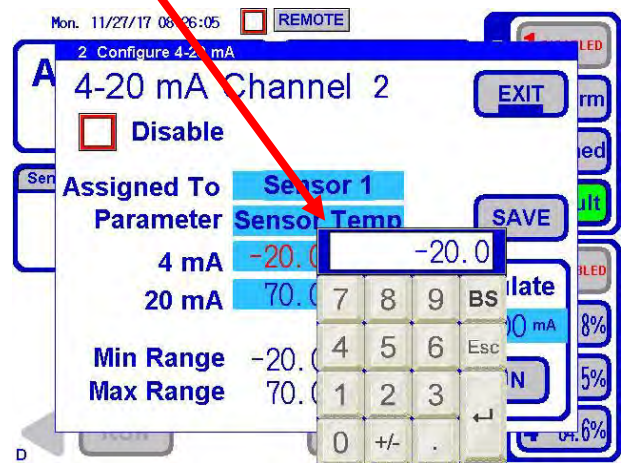
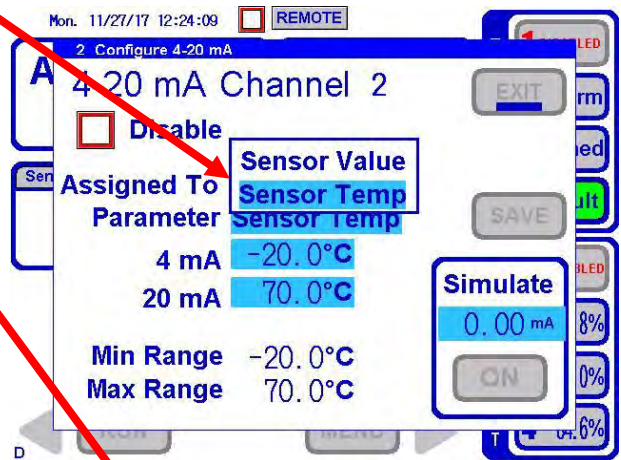
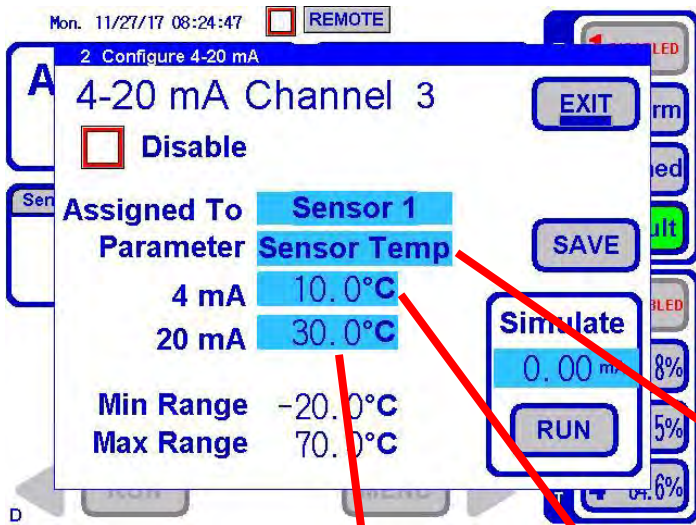
7 8 9 BS

4 5 6 Esc

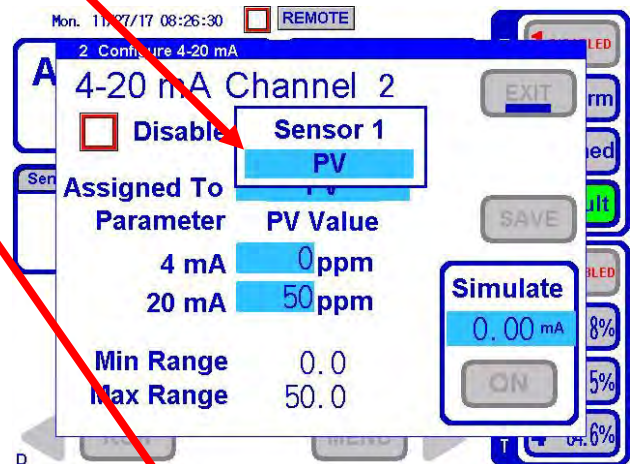
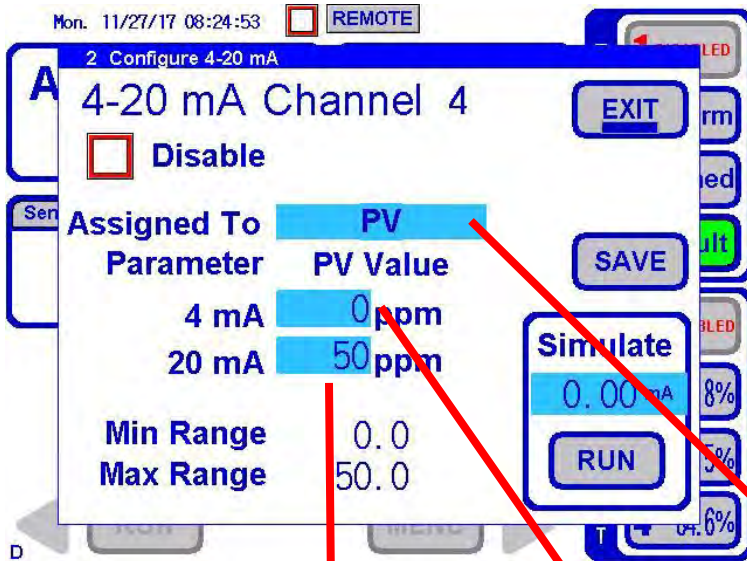
1 2 3

0 +/- . ←

### 6.4.3 4-20 mA Configuration – Sensor Temp



### 6.4.4 4-20 mA Configuration – Process Variable



### 6.4.5 4-20 mA Configuration – Simulate

Mon. 11/27/17 08:27:00  REMOTE

2 Configure 4-20 mA

**A** 4-20 mA Channel 2

Disable

Assigned To **PV**

Parameter **PV Value**

4 mA **0.00**

20 mA

Min Range

Max Range

7 8 9 BS

4 5 6 Esc

1 2 3

0 +/- .

EXIT

SAVE

**Simulate**

0.00 mA

RUN

4-20 simulation (each channel)

### 6.5 Alkalinity Concentration Chart

15: 06: 51 Thur. Dec. 06, 2018  Carbonate 25.0 ppm

**ALKALINITY**  Bi-carbonate 75.0 ppm

Total 50.0 ppm

Past process measurement

ppm

200

160

120

80

40

0

sec.

RUN

MENU

Change Scaling

Running chart of past process measurements

## 6.6 Menu Home Screen

The image displays the HMI interface for a water treatment system, showing the '10 Menu Home' screen and its navigation to three other screens: 'Acid Dissociation', 'Alkalinity', and 'Step End'.

**10 Menu Home Screen:**

- Time: 17: 04: 15, Date: Wed. May 29, 2019
- System Status:  REMOTE, System HOLD, Timed Relay HOLD
- Buttons: SYSTEM HOLD OFF, EXIT, ALARM LOG, CAL, CONFIG, INFO
- Timeout: None
- FW Revision: HMI A 4.74, PLC A 4.74
- S/N: 19530-A, System Runtime: 45220557 sec.
- Screen Jump: Main, Run Recipe, Diss Chart, All Data, Alk Chart

**Acid Dissociation Screen (A):**

- Time: 17: 03: 16, Date: Wed. May 29, 2019
- Current pH: 1.54 pH, 295.9 mV
- Graph: pH vs. Shots
- Buttons: RUN, MENU, Change Scaling

**Step End Screen (B):**

- Time: 17: 03: 16, Date: Wed. May 29, 2019
- Range: 0 to 200 ppm
- Runtime: 0 Hr. 08 min. 40 sec.
- Initial pH: 0.00 pH, Sensor 1: 1.54 pH
- Buttons: RUN, MENU, MAINT

**Alkalinity Screen (C):**

- Time: 17: 05: 19, Date: Wed. May 29, 2019
- Carbonate: 45.0 ppm, Bi-carbonate: 55.0 ppm, Total: 100.0 ppm
- Graph: ppm vs. sec.
- Buttons: RUN, MENU, Change Scaling

**Step End Screen (D):**

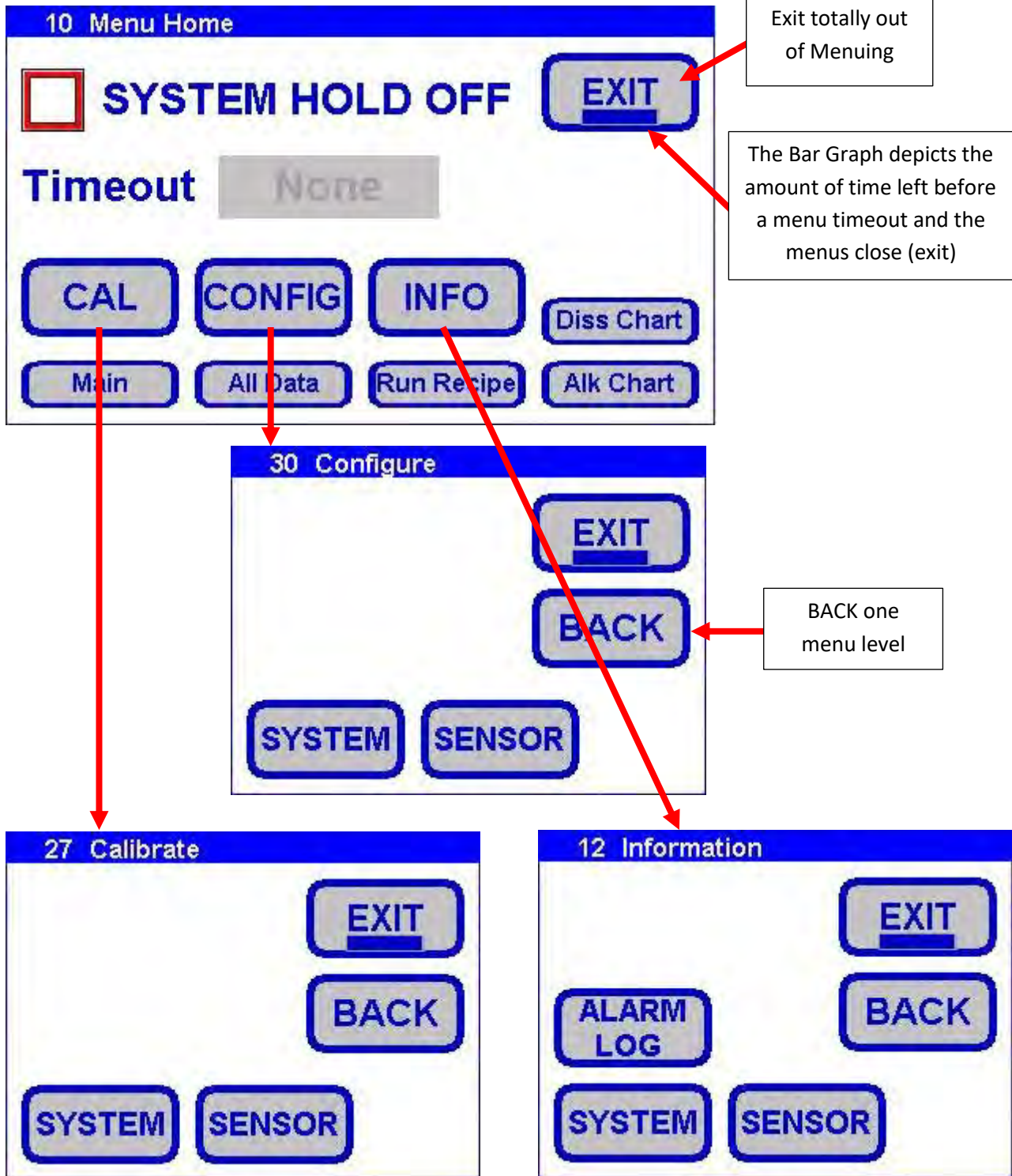
- Time: Mon. 11/27/17 13:18:34
- Range: 0 to 50 ppm, Titrant: 0.16 N H2SO4
- Alkalinity: 42.3 ppm
- Sensor 1: 6.97 pH, 0.1 mV, 25.0 °C
- Buttons: RUN, MENU

**Navigation:** Red arrows indicate the flow from the '10 Menu Home' screen to the 'Acid Dissociation', 'Alkalinity', and 'Step End' screens. A vertical column of buttons (1-4) on the right side of the '10 Menu Home' screen is labeled 'Base Screen Jump Buttons'.

6.6.1 Menu Home – System Hold



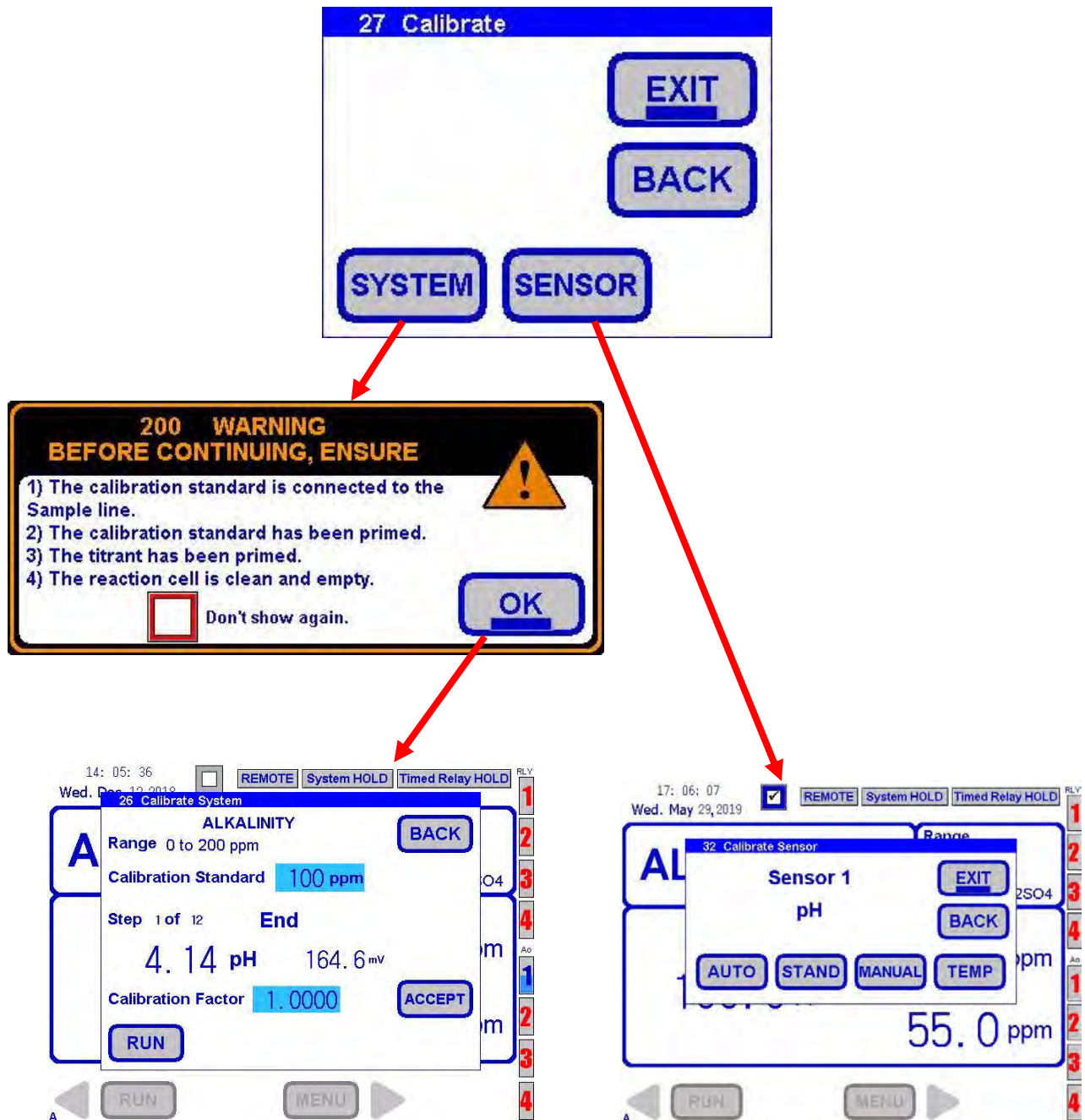
## 6.6.2 Menu Buttons





## 6.7 Calibration

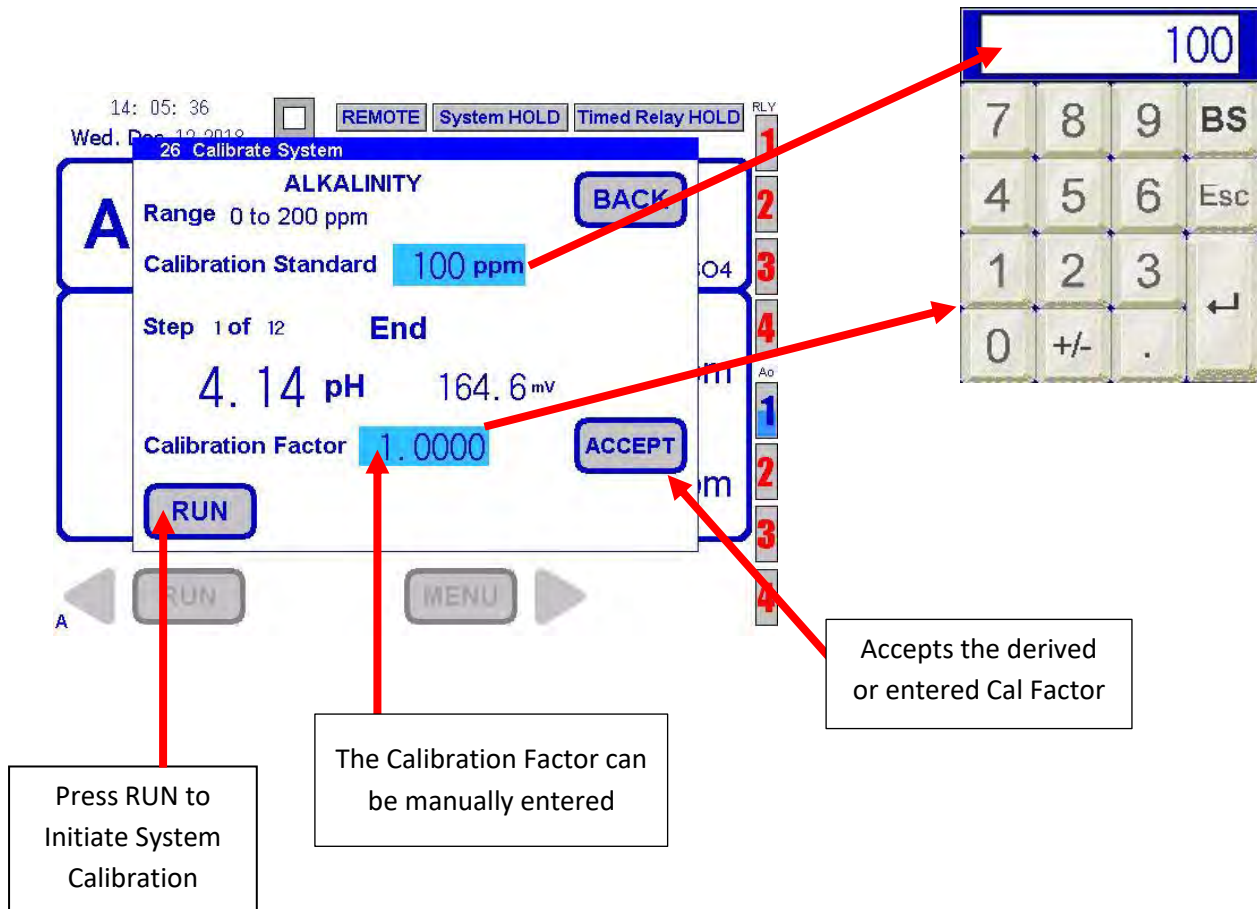
When Calibrating the analyzer you are given two tabs: System and Sensor. Alkalinity should be calibrated using the System Tab, and the pH sensor should be calibrated using the Sensor Tab.



### 6.7.1 Calibrate System

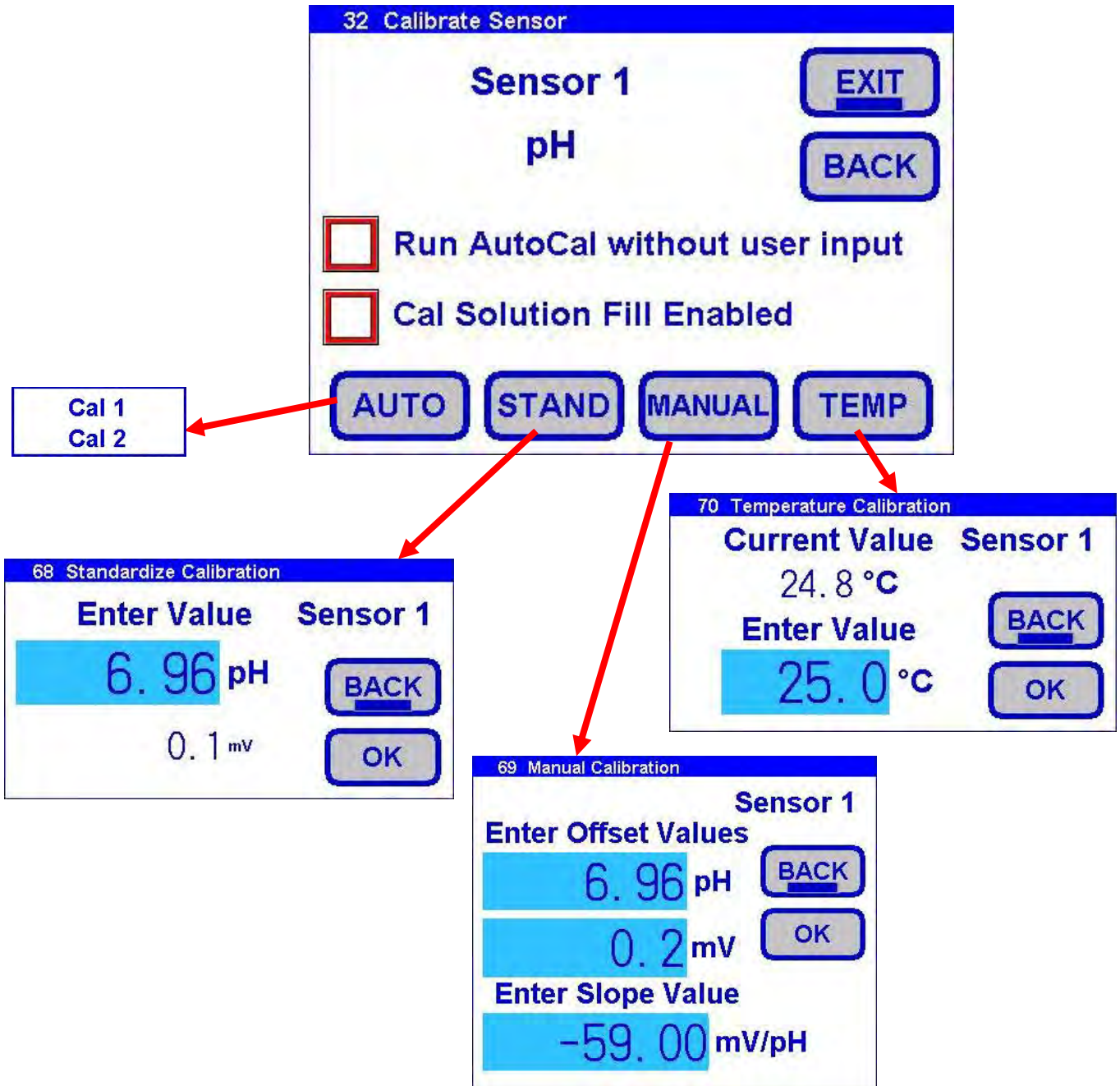
Calibrate System is the Primary Calibration for Alkalinity. When you press the Systems key on the Calibrate Screen, the Calibrate Systems screen will appear. A standard or known sample should be used. When calibrating, the Sample line should be connected to the appropriate standard solution or known process sample.

You must select the value of the Calibration Standard when doing this function. Press Run on the bottom of the screen to initiate Calibration. When the Calibration System Run is finished, the Calibration Factor will update, press Accept to Finish. Press EXIT to return to the home screen.



### 6.7.2 Calibrate Sensor

To calibrate the pH Sensor you must press the Sensor Key on the Calibrate Screen. Calibration of the pH sensor is very important as it contributes to the calculation of Alkalinity. There are 4 tabs that can be used to Calibrate: AUTO, STAND, Manual, and Temp.

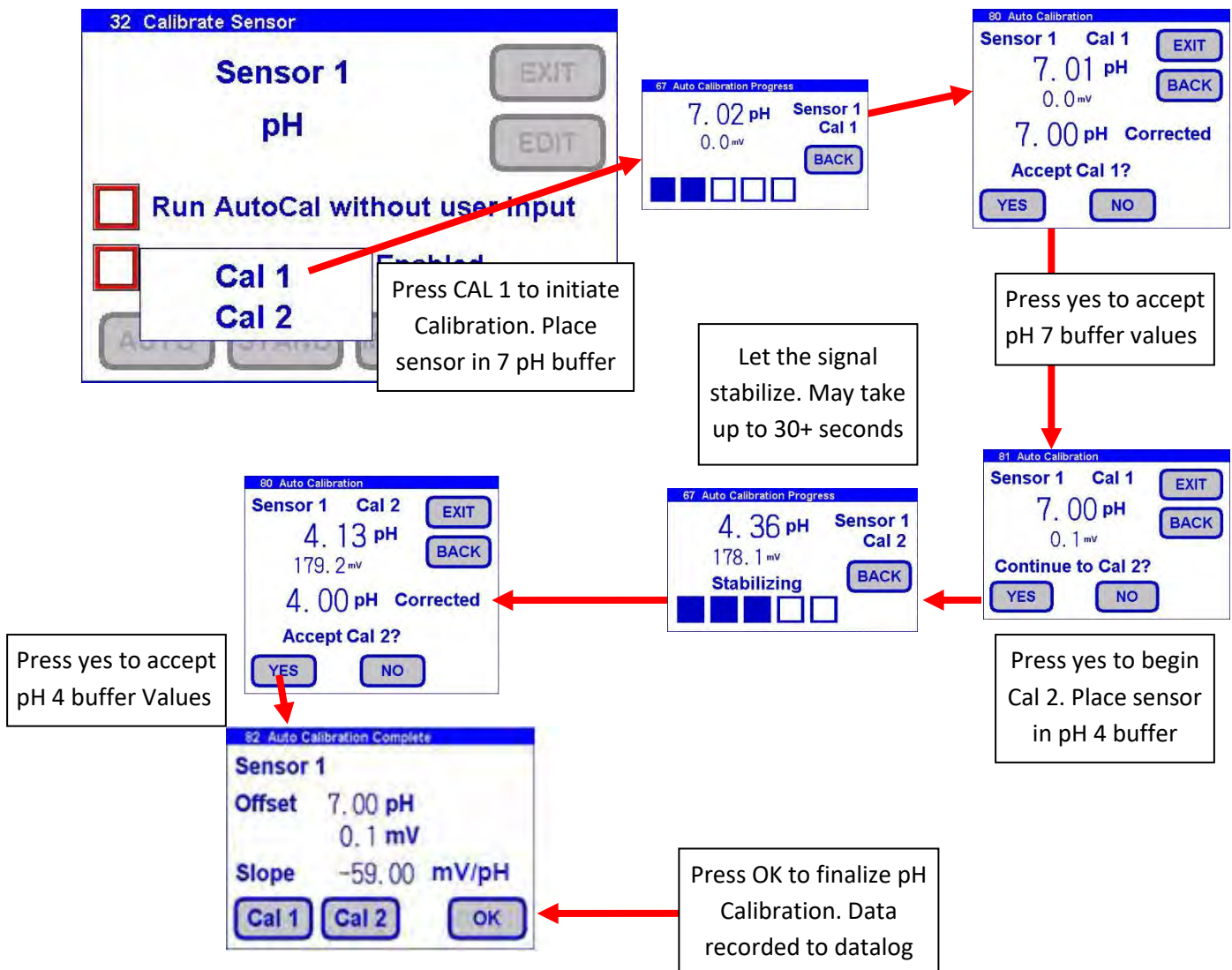


### 6.7.3 Calibrate Sensor – Auto Calibration

Auto calibration is the primary calibration method for pH. AUTO calibration automatically recognizes the calibration solution the sensor is in and proposes the actual temperature compensated value for acceptance. AUTO calibration can be a single point or two point calibration. A single point calibration sets the zero point or offset value of the sensor. The second calibration sets the slope or span of the sensor.

When the AUTO key is pressed the transmitter displays the pH and the associated mV signal from the sensor. When the reading has stabilized a calibration value is automatically proposed, i.e. 7.00 pH. The user is prompted to accept the proposed calibration value or enter and accept another value. Once Cal 1 is accepted the user is ask to continue to Cal 2, yes/no. If yes, then a second calibration value is proposed when the sensor has stabilized in the second calibration solution. Accept the value and the calibration is complete.

At the end of each calibration the Offset and Slope are displayed in pH. The acceptable Slope should be  $-55\text{mV/pH} \pm 5\text{mV/ppm}$

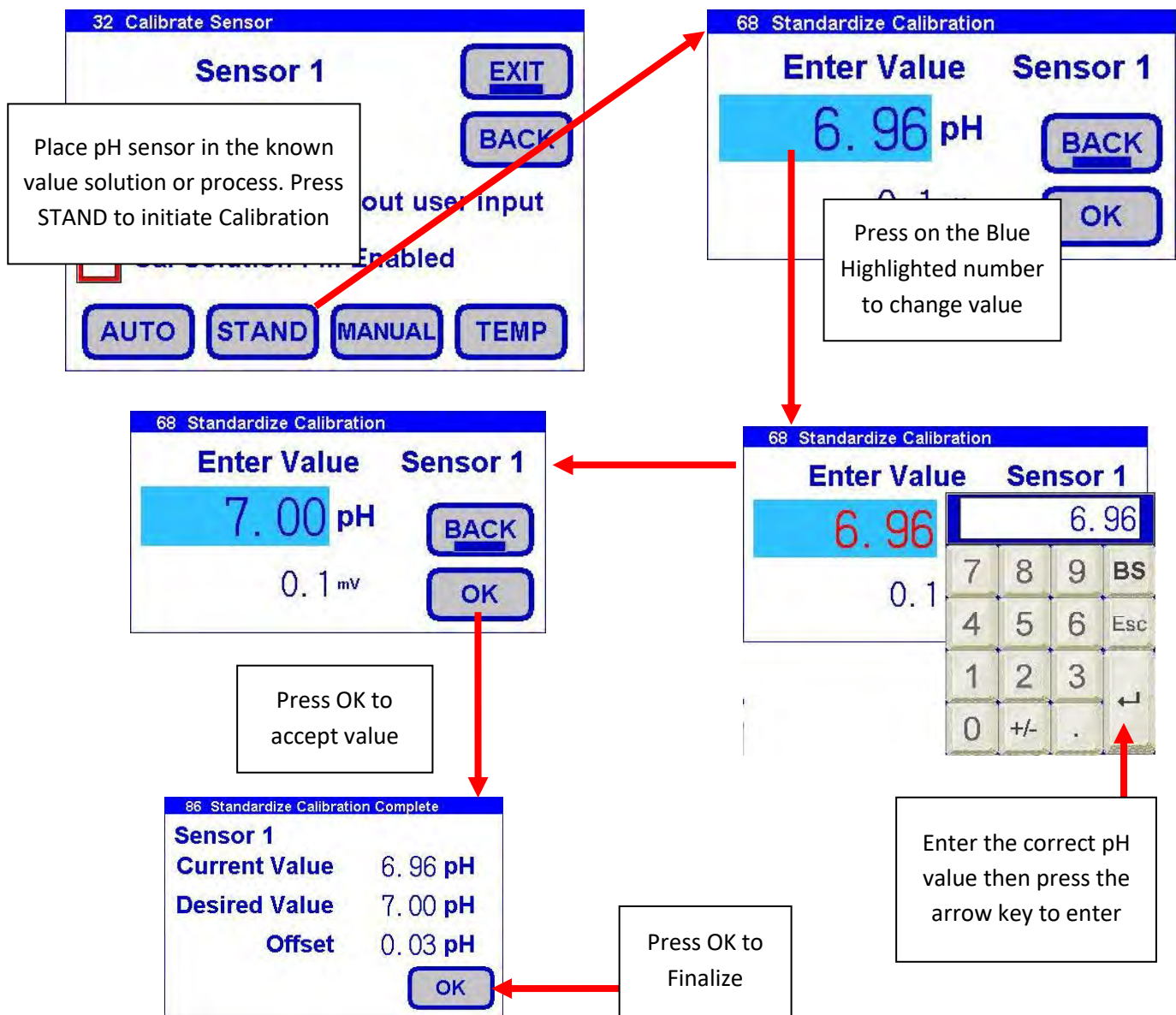


### 6.7.4 Calibrate Sensor – Standardize Calibration

A Standardize Calibration is a single point calibration where the transmitter's reading is adjusted to agree with a solution of known value, either a calibration standard, a grab sample or laboratory determined value. In many cases the constituents and the pressure and temperature of the process solution are very different from the calibration solution. In these cases, once the sensor has equilibrated, the Zero Point or Offset value may have shifted from the original calibration point. Standardization allows for correction of this type of offset.

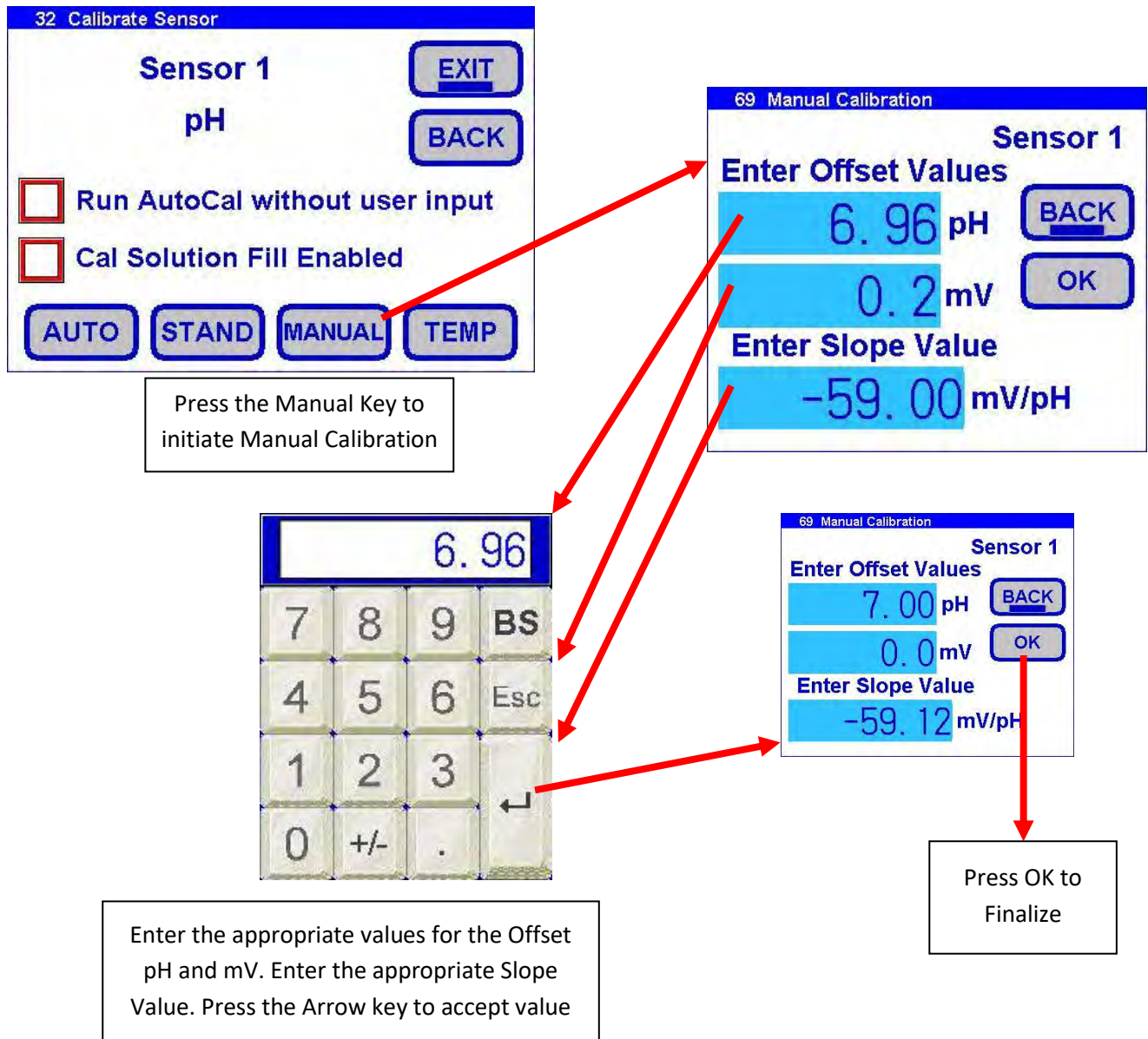
When the STAND key is pressed, the user is prompted to ENTER VALUE. The user enters the value they want the transmitter to read and press OK. The user is then prompted to accept the value, yes/no, and the calibration is complete. Standardizations are single point calibrations.

At the end of each calibration the Offset and Slope are displayed in pH.



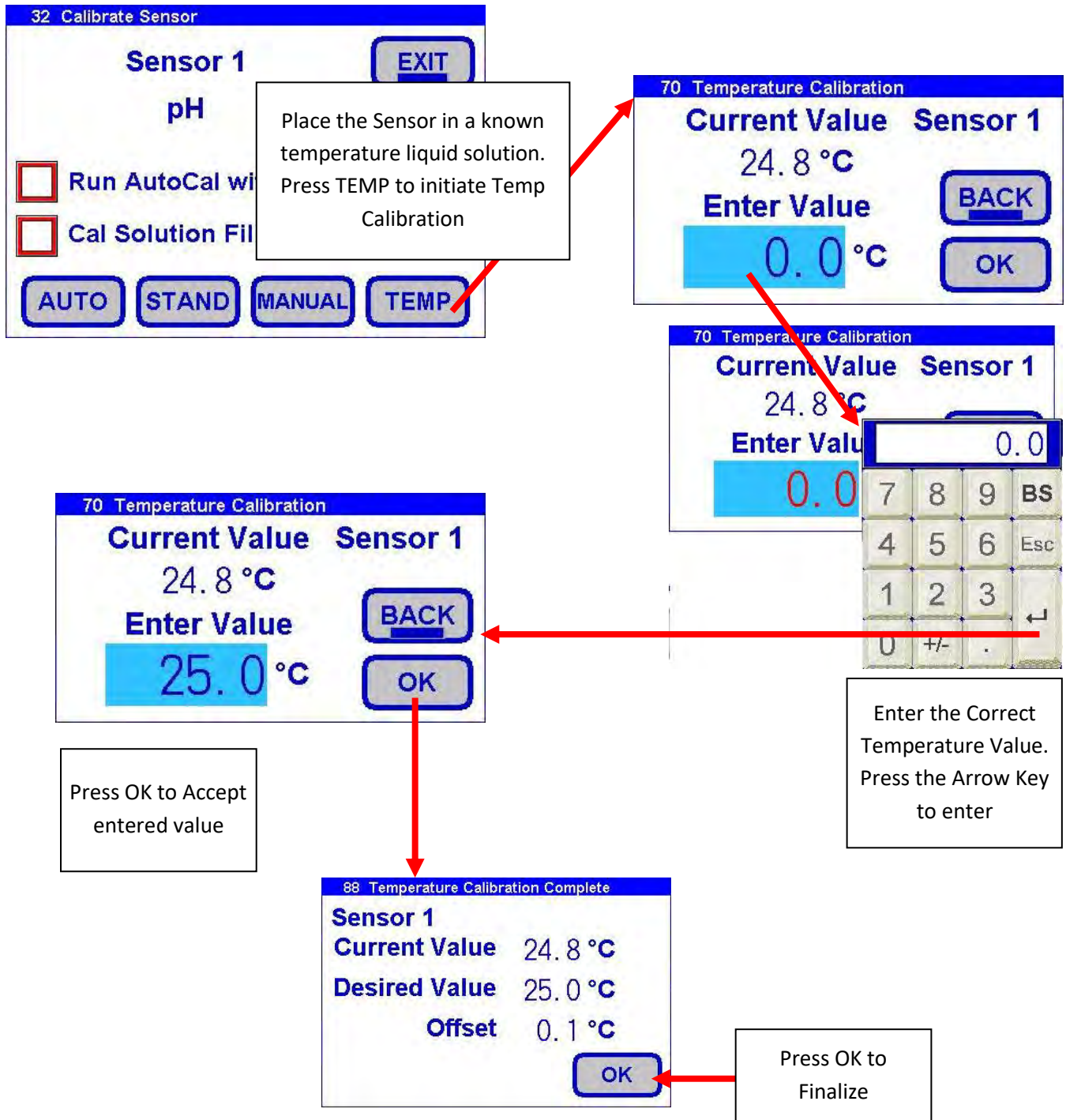
### 6.7.5 Calibrate Sensor – Manual Calibration

Manual calibration allows the user to enter calibration data for an electrode into the transmitter without performing a calibration. A MANUAL Calibration requires the entry of three pieces of data: (1) A concentration with the (2) corresponding mV value and (3) a slope for the electrode. This allows laboratory generated calibration data for an electrode to be entered in a remote analyzer where calibration is difficult or impractical.



### 6.7.6 Calibrate Sensor – Temperature Calibration

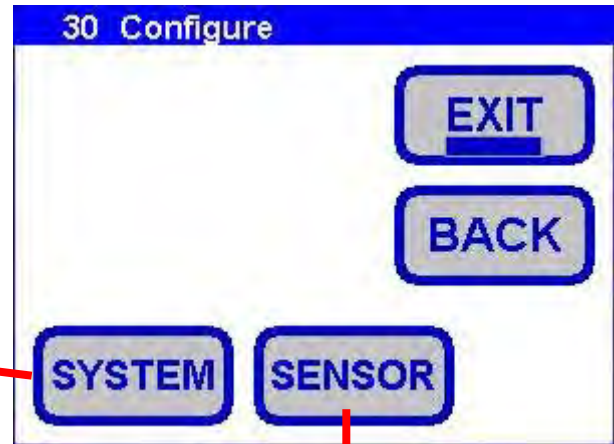
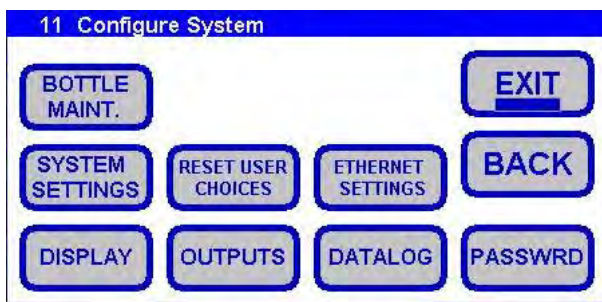
TEMP Key allows the displayed temperature to be trimmed to agree with actual process temperature.



## 6.8 Configure

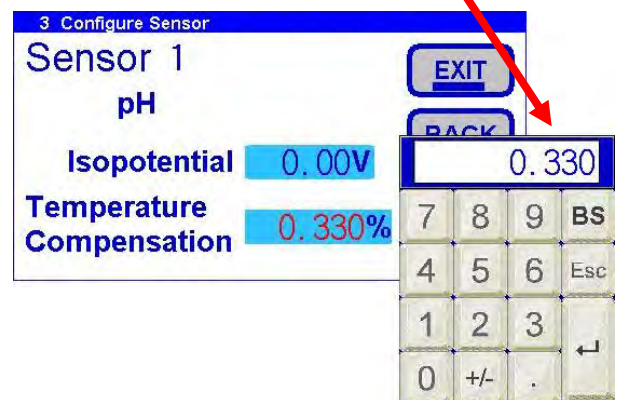
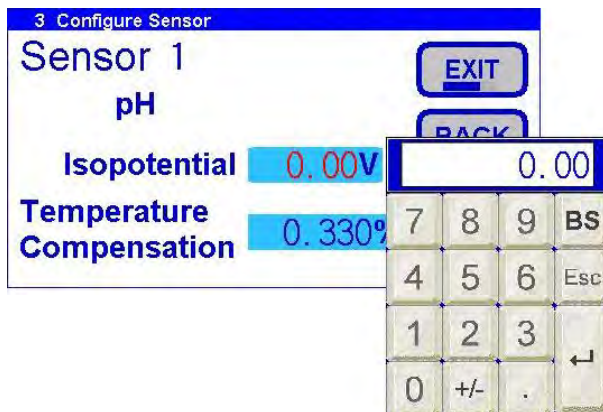
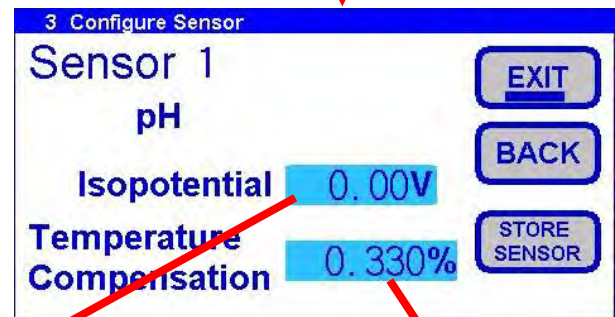
Two options are available under the CONFIG key: System and Sensor. By pressing the SYSTEM key, you are able to Configure:

1. Bottle Maintenance
2. System Settings
3. Display
4. Reset User choices
5. Outputs
6. Ethernet Settings
7. Catalog
8. Password



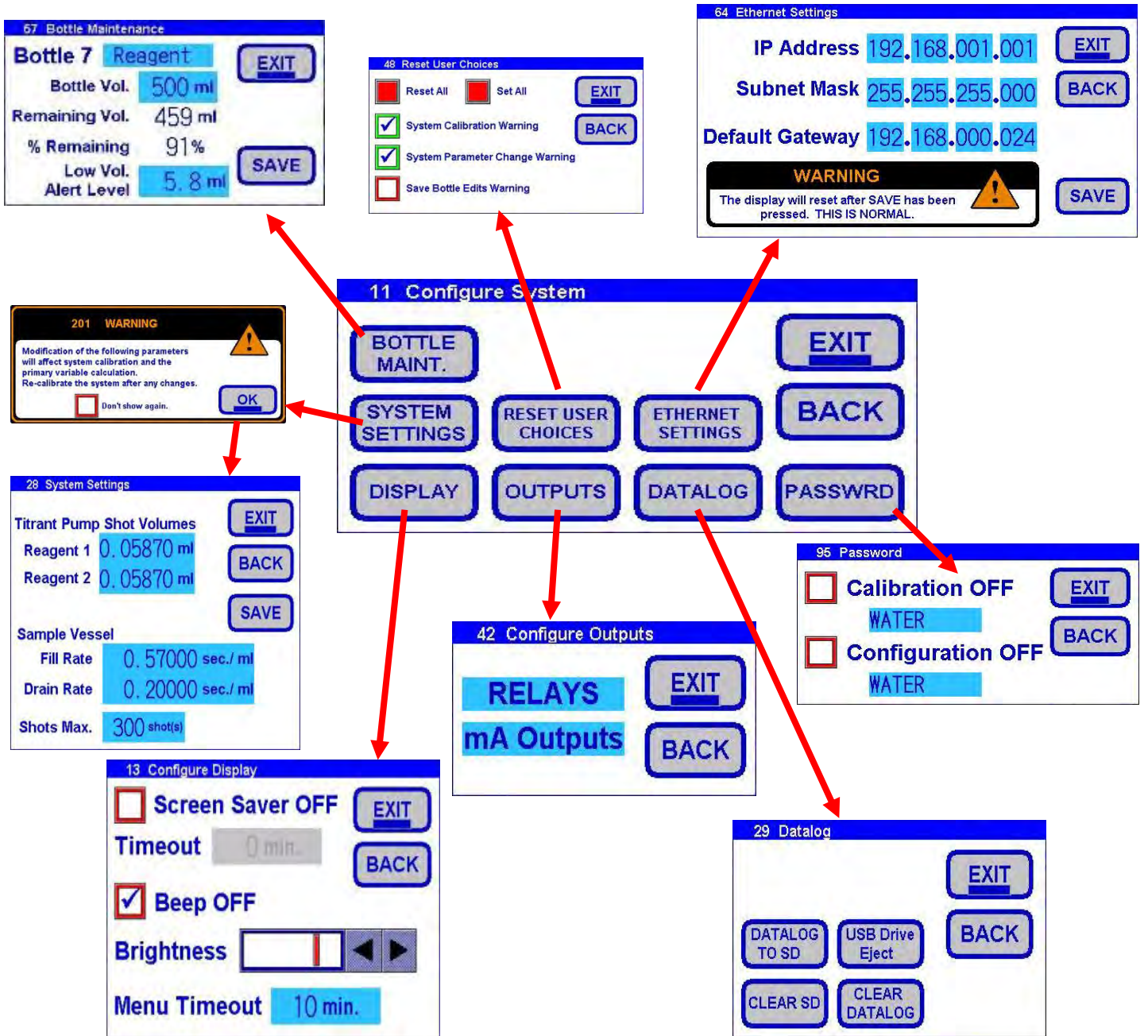
By pressing the SENSOR Key, You are able to configure:

1. Isopotential Value
2. Temperature Compensation





## 6.8.1 Configure – System Screens



### 6.8.1.1 Configure – System – Bottle Maintenance

Bottle Maintenance Key lets you Name the Bottles, input the bottle volume, and provide a low volume alert level.

Press on the highlighted blue to edit bottle name

57 Bottle Maintenance

**Bottle 4** 7 Buffer

Bottle Vol. 500 ml

Remaining Vol. 500 ml

% Remaining 100%

Low Vol. Alert Level 150.0 ml

EXIT

SAVE

57 Bottle Maintenance

**Bottle 4** 7 Buffer

Bottle Vol. 500 ml

500

Press on the highlighted blue to edit bottle volume

57 Bottle Maintenance

**Bottle 4** 7 Buffer

Bottle Vol. 500 ml

Low Vol. Alert Level 150.0 ml

150.0

Press on the highlighted blue to edit

57 Bottle Maintenance

**Bottle 4** 7 Buffer

Bottle Vol. 500 ml

Remaining Vol. 500 ml

% Remaining 100%

Low Vol. Alert Level 150.0 ml

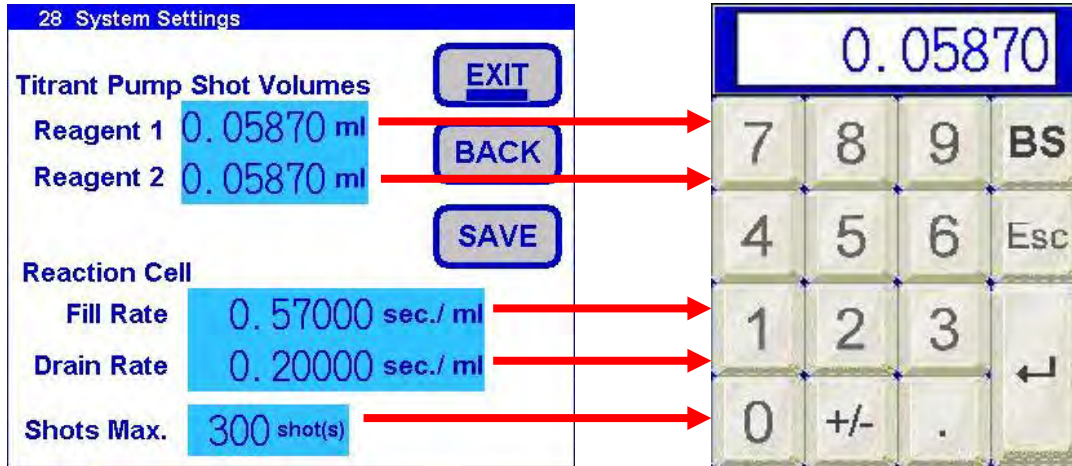
EXIT

Press SAVE to Finalize

The Low Volume Alert Level is the volume at which a warning will be displayed. Typically, this volume should be 1 to 2 times the expected volume that will be used. Press the highlighted blue to edit

### 6.8.1.2 Configure – System – System Settings

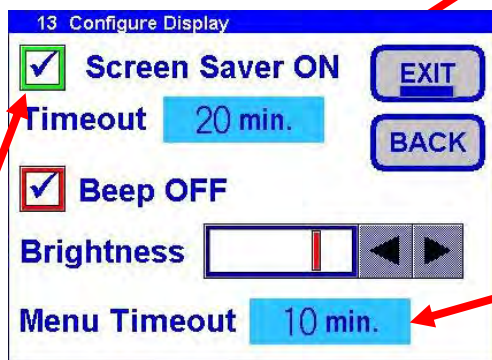
System Settings Key lets the user input the titrant pump shot volumes, reaction cells fill and drain rates, and Shot max. These Settings are configured at the ECD factory. These settings should only be done by qualified personnel.



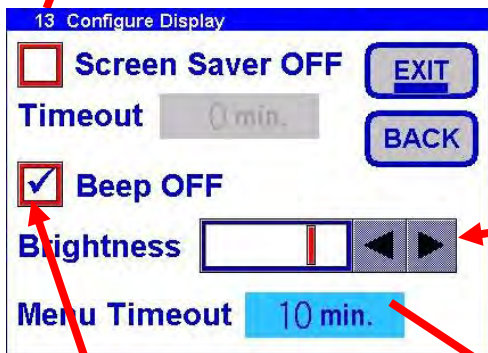
Enter correct amount  
for each entry. Press  
save to finalize

### 6.8.1.3 Configure – System – Display

Pressing the red square (without checkmark) will turn the Screen Saver On (green square with checkmark), pressing again will turn it Off



The screen saver turns off the display backlight (dark screen) but the HMI's power LED is still on. Pressing anywhere in the display area will turn back on the backlight



Brightness adjusts the display intensity from dark to light

The Beep switch turns on and off the key press beep



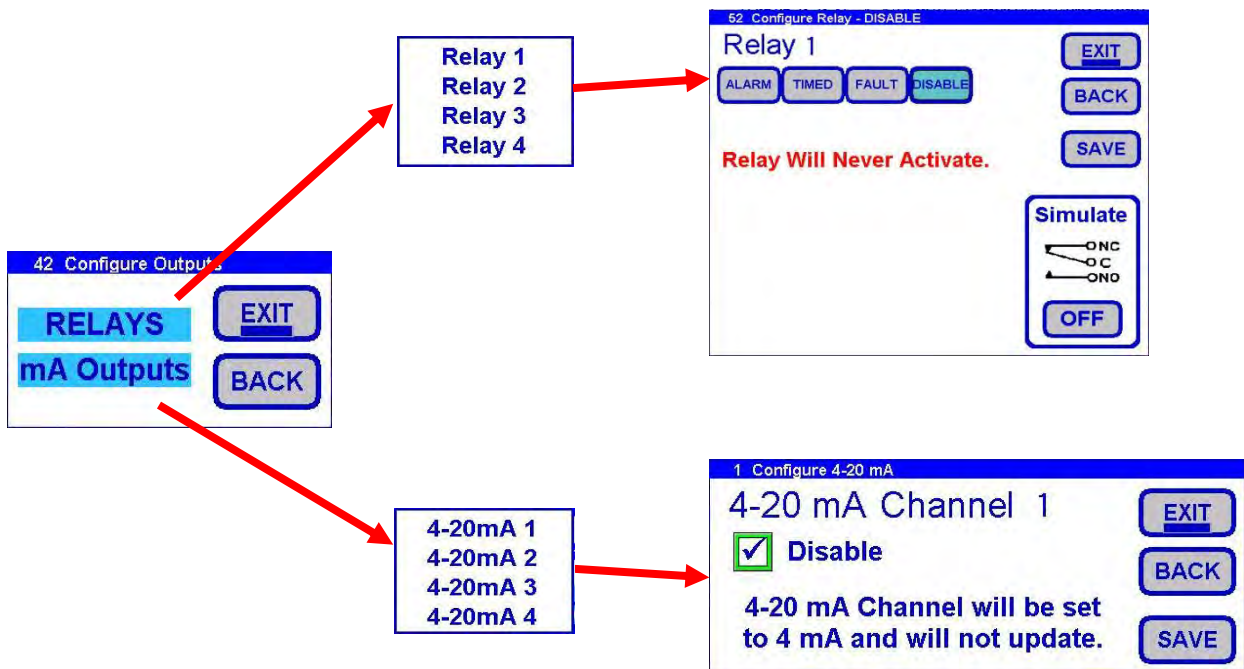
### 6.8.1.4 Configure – System – Reset User Choices

The reset user choices screen allows the user to set or reset previous choices made about viewing the warning screens again. The red square without check mark means the warning will be displayed, whereas, the green square with check mark means the warning will not be displayed.

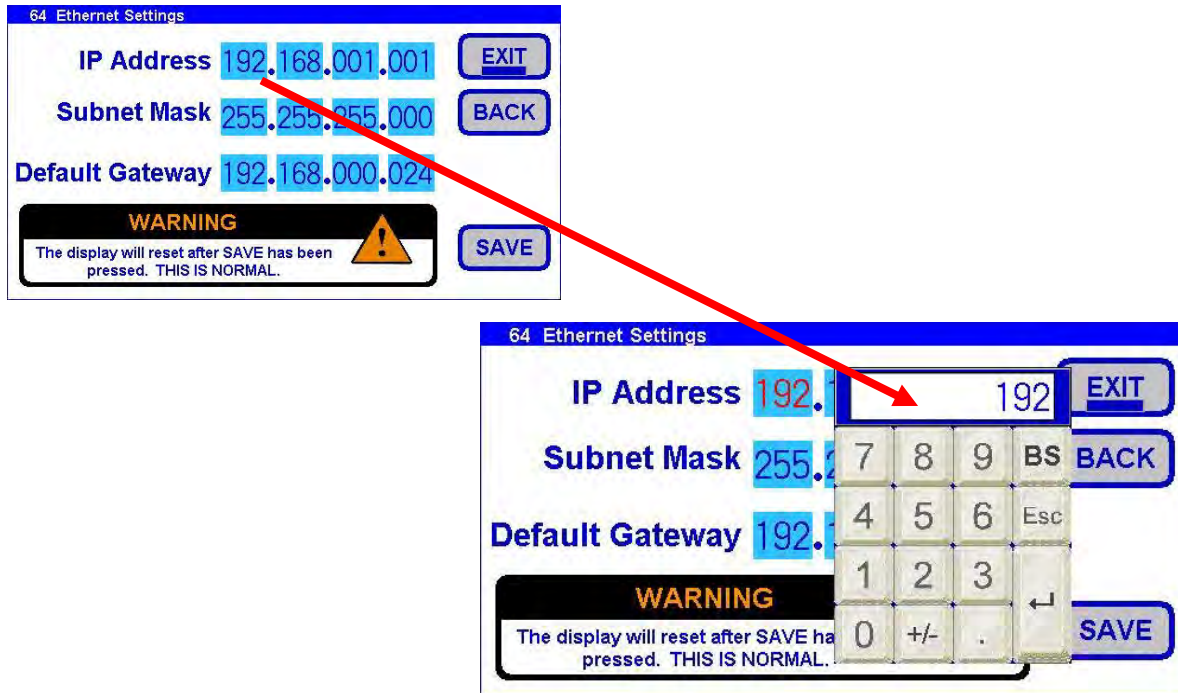


### 6.8.1.4 Configure – System – Outputs

Pressing the Outputs key in configuration you can set the 4 relays and 4 4-20 outputs.

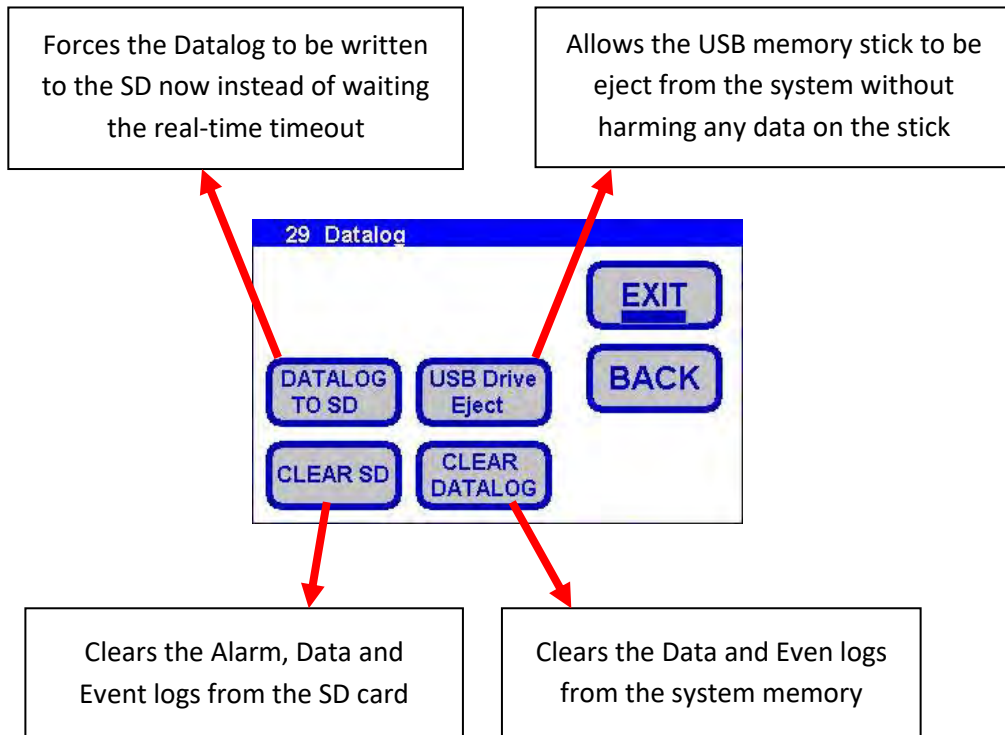


### 6.8.1.5 Configure – System – Ethernet settings



Pressing the Ethernet settings allows changes to the external web page Ethernet web page addressing.

### 6.8.1.6 Configure – System – Data log



6.8.1.7 6.8.1.7 Configure – System – Password

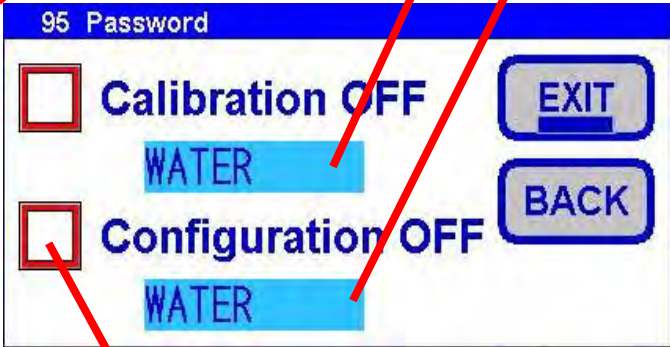
Pressing the red square (without checkmark) will turn on both the Calibration (green square with checkmark) and Configuration passwords. The gray square with check mark denotes the Configuration password **cannot** be turned off



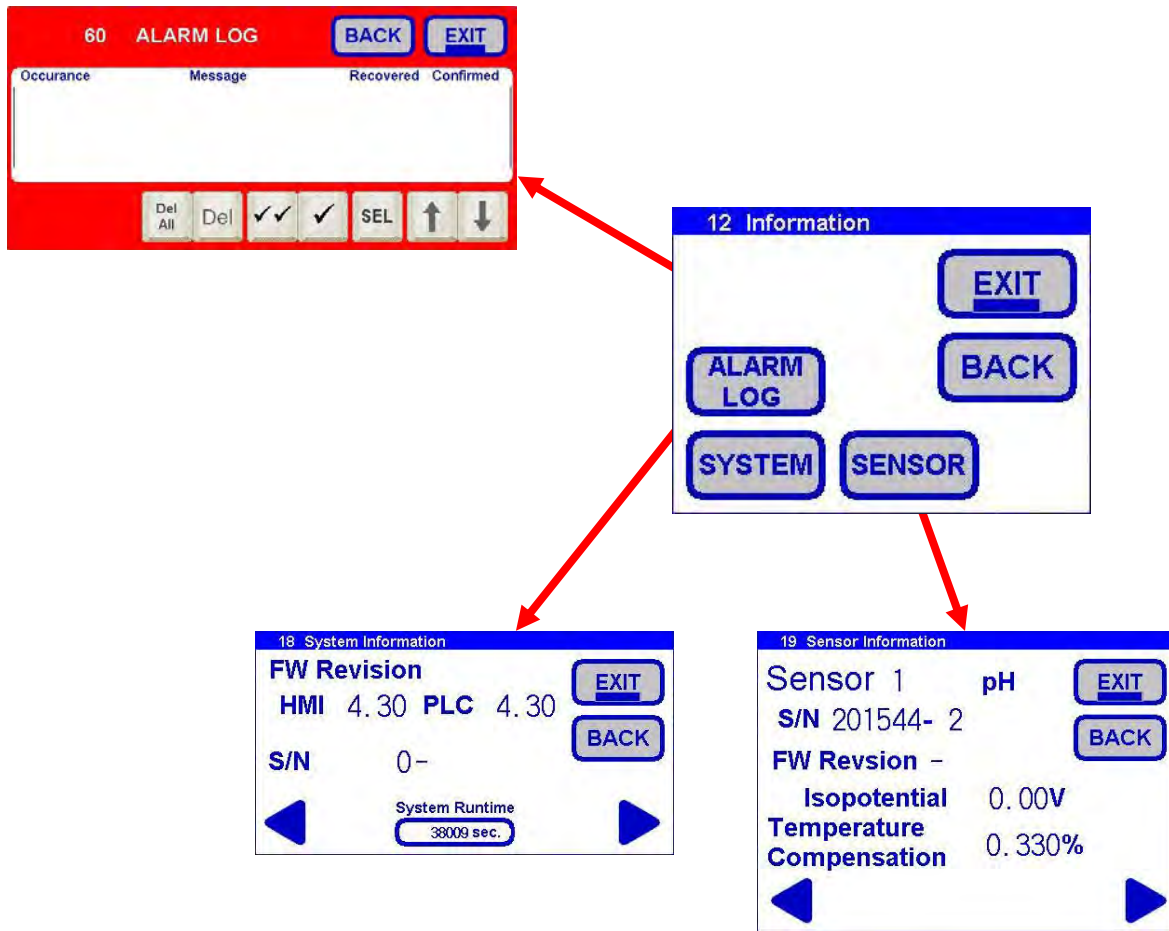
Both passwords are the same by default but are user modifiable. The back-up password for both is not modifiable, please contact manufacturer if needed.

The Configuration password can be turned on independent of the calibration password

The respective password will be active on the next entry into the Calibrate or Configure screens

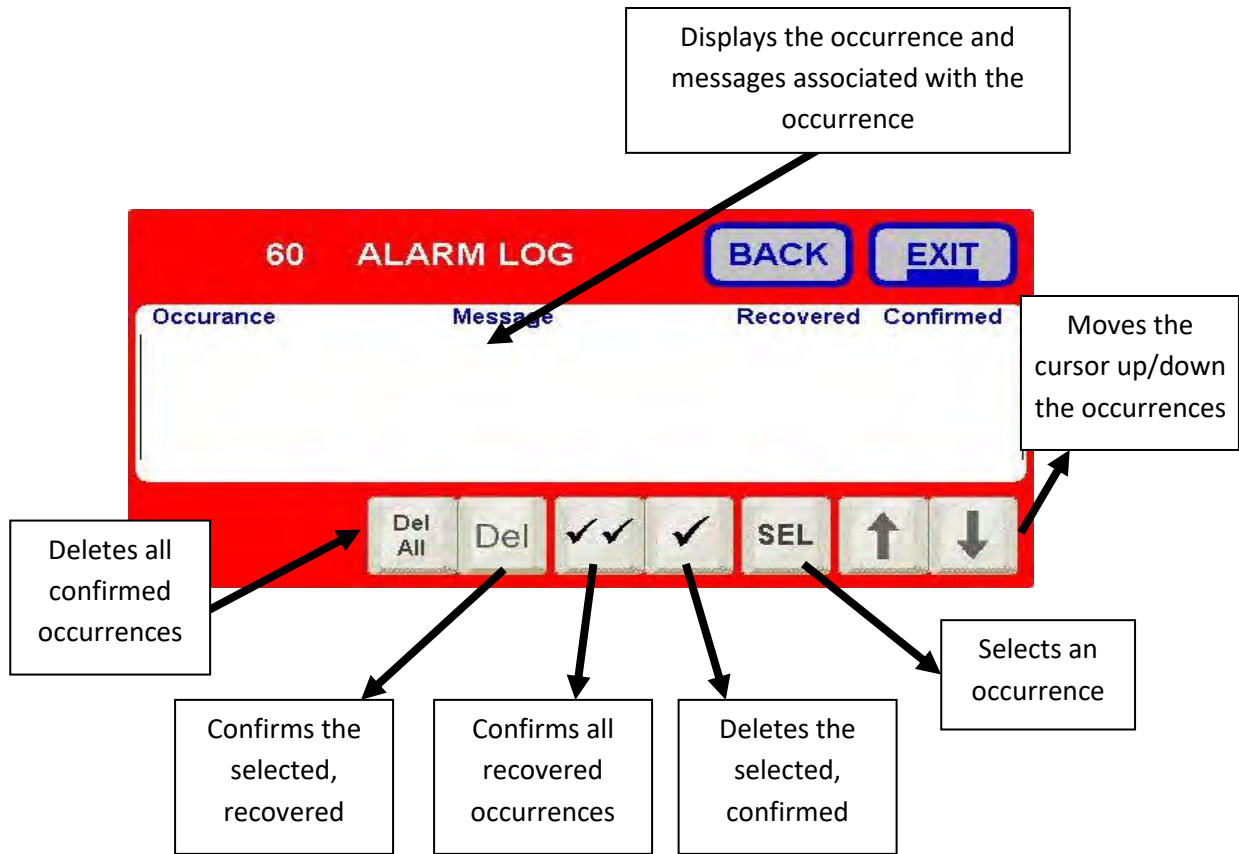


## 6.8.2 Information



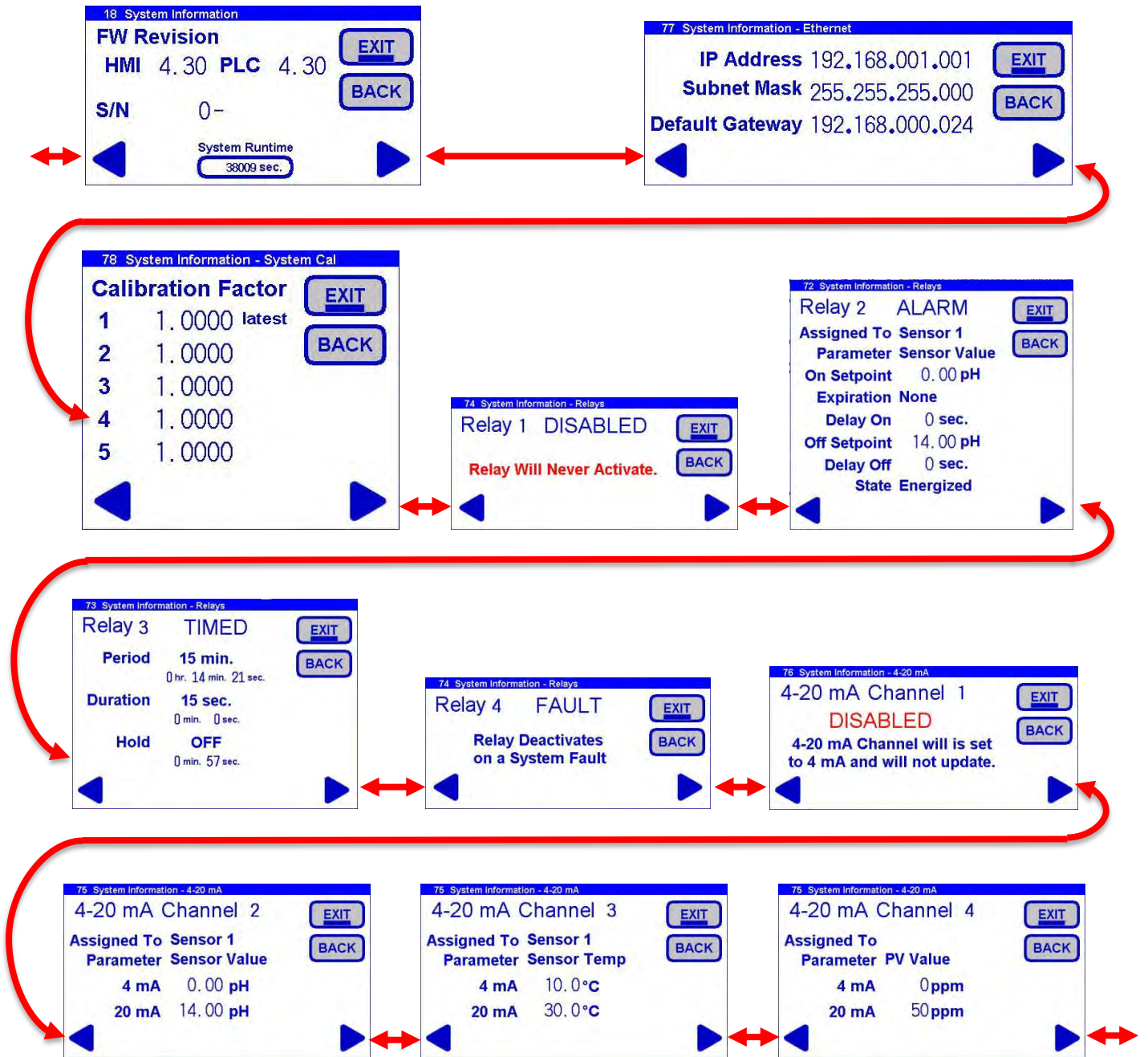


### 6.8.3 Information – Alarm Logs



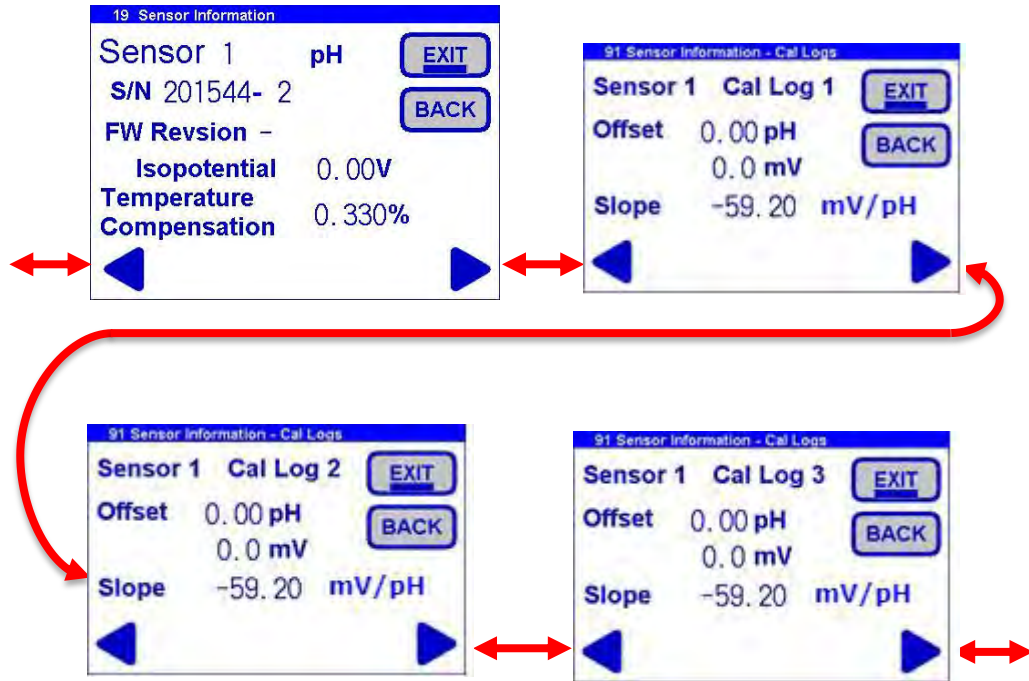
### 6.8.4 Information – System

The information Systems Key will display key systems information: Revisions, Ethernet information, Calibration factor logs, Relays and output information.



### 6.8.5 Information – Sensor

The Information Sensors key will provide important information regarding the pH sensor: Revisions, Cal Logs 1, 2, and 3.



## 7.0 MAINTENANCE

Basic maintenance on the CA900 Analyzer requires refilling or replacing reagent containers and cleaning the Reaction cell on a regular basis.

In addition we advise that you perform an overall visual check of the wetted parts for any leakage. If any leaks are detected, take immediate corrective action. Cleaning of the analyzer cabinet is best performed using a soft, non-aggressive cleaner.

The use of a logbook for registering reagent refilling, corrective measures and performed scheduled maintenance is strongly recommended.

Switch off the power to the analyzer prior to the performance of the basic maintenance work, the CA900 Analyzer cannot be operational during maintenance. Prior to any maintenance work, take into consideration all necessary precautions regarding personal safety (protective clothing, safety glasses etc.).

Always label and rinse all connected tubing with water prior to removal.

### Caution



CA900 Analyzer is based on Titration method using Acid as a titrant.

Make sure proper safety precautions are taken (e.g. using safety gloves and glasses) when handling chemical solutions.

List of maintenance operations:

### 7.1 Visual check

Visually check the following items whenever possible:

- Liquid leakage
- Cell sample level (during cycle)
- Reaction cell cleanliness and condition
- % Reagent levels

### 7.2 Monthly

Visual Check (as above)

Replace Pinch Valve tubing

Clean the Reaction Cell

Replace Reagent(s) and reset reagent counters

Run Calibrations:

- System calibration

### 7.3 Every 4-6 months (depending on applications)

Replace Peristaltic Pump tubing

Hydraulics tubing replacement

Clean / Replace Fittings

### 7.4 Annual

Analyzer general inspection (for qualified personnel only)

### 7.5 Parts and accessories

Model CA900 Analyzer: Spare Parts	
Part#	Description
2010125-1	KIT, 4pH & 7pH BUFFERS (1L EA), CLEANER (2L), REAGENT(S) 500ML *RECOMMENDED SPARE PART
2010100-1L	4pH BUFFER (1L)
2010101-1L	7pH BUFFER (1L)
2010069-1	CLEANER 5% HCL (2L) *DANGEROUS GOODS – EXCEPTED QTY
2010069-2	CLEANER 5% HCL (2.5 GAL CARBOY) *DANGEROUS GOODS – LIMITED QTY
2010126-1	KIT, REAGENT (1 OR 2) 500ML
2010089-1	CAL SOLUTION 1000 ALKALINITY 500ML *RECOMMENDED SPARE PART
2000201	BOTTLE W/ HOLE (500ML)
2000203	BOTTLE W/ HOLE (1L)
2000204	BOTTLE W/ HOLE (2L)
2000206	CARBOY W/ HOLE (2.5 GAL)
2000175	KIT, TUBING & FITTINGS, ANNUAL MAINTENANCE *RECOMMENDED SPARE
2000169	KIT, FITTINGS, LIQUID SIDE
2000171	KIT, TUBING, ANNUAL MAINTENANCE + QUARTERLY SAMPLE & PINCH VALVE TUBING
2000153	ASSY, TUBING, REAGENT PUMP TO REACTION CELL
2000154-1	ASSY, TUBING, REAGENT PUMP TO REAGENT BOTTLE
2000158	ASSY, TUBING, SAMPLE PUMP * CHANGE QUARTERLY
2000159	ASSY, TUBING, PINCH VALVE TO BOTTLE/DRAIN *CHANGE QUARTERLY
2000168	ASSY, TUBING, SAMPLE PUMP TO REACTION CELL
2000186	ASSY, TUBING OVERFLOW
3400017	RAIN CANOPY SET
1000270-2	FAST FLOW RESERVOIR
2000142-1	FLOWCELL MOTOR ASSY
2100333-1	RELAY BOARD
2000137-1	REAGENT MICROPUMP

	*MUST PROGRAM DOSAGE VALVE
2005111.VIT	ELECTRODE *RECOMMENDED SPARE PART
DS80-000C67-4B00-013	SENSOR W/ ELECTRODE
2000155-7	PINCH VALVE ASSY
9580006	KEY ENCLOSURE
9600072	MAGNETIC STIRRER
2000151-1	SAMPLE PUMP

## 8.0 ANALYZER SHUT DOWN

If the CA900 Analyzer will be out of service for a period of two weeks or greater, proceed as follows:

1. Empty all reagent containers.
2. Rinse and refill all reagent containers with distilled water.
3. Prime all of the pumps with DI water.
4. Disconnect the sample feed line and fill the fast-loop reservoir (if present) with distilled water.
5. With the sample inlet tubing attached to a container of distilled water, run the analyzer for at least 2 cycles.
6. Empty the water from all lines.
7. Put the analyzer in stand-by condition.
8. Turn OFF the power to the analyzer and disconnect the plug from the wall socket.
9. Place the pH sensor electrode (sensing end) into 4 buffer for storage.



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