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Instruction Manual
PN 51-1054BpH/rev.B
April 2003

Model 1054B pH/ORP

Microprocessor pH/ORP Analyzer



ROSEMOUNT® Analytical

EMERSON™ Process Management

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ESSENTIAL INSTRUCTIONS

READ THIS PAGE BEFORE PROCEEDING!

Rosemount Analytical designs, manufactures, and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use, and maintain them to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, using, and maintaining Rosemount Analytical products. Failure to follow the proper instructions may cause any one of the following situations to occur: Loss of life; personal injury; property damage; damage to this instrument; and warranty invalidation.

- Read all instructions prior to installing, operating, and servicing the product. If this Instruction Manual is not the correct manual, telephone 1-949-757-8500 and the requested manual will be provided. Save this Instruction Manual for future reference.
- If you do not understand any of the instructions, contact your Rosemount representative for clarification.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation, and maintenance of the product.
- Install your equipment as specified in the Installation Instructions of the appropriate Instruction Manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, use qualified personnel to install, operate, update, program, and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Rosemount. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look alike substitutions may result in fire, electrical hazards, or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.

WARNING
ELECTRICAL SHOCK HAZARD

Making cable connections to and servicing this instrument require access to shock hazard level voltages which can cause death or serious injury.

Relay contacts made to separate power sources must be disconnected before servicing.

Electrical installation must be in accordance with the National Electrical Code (ANSI/NFPA-70) and/or any other applicable national or local codes.

Unused cable conduit entries must be securely sealed by non-flammable closures to provide enclosure integrity in compliance with personal safety and environmental protection requirements.

For safety and proper performance this instrument must be connected to a properly grounded three-wire power source.

Proper relay use and configuration is the responsibility of the user.

Do not operate this instrument without front cover secured. Refer installation, operation and servicing to qualified personnel.

WARNING

This product is not intended for use in the light industrial, residential or commercial environment, per the instrument's certification to EN50081-2. Be sure to disconnect all hazardous voltage before opening.

The unused conduit openings need to be sealed with NEMA 4X or IP65 conduit plugs to maintain the ingress protection rating (IP65). No external connection to the instrument of more than 60VDC or 43V peak allowed with the exception of power and relay terminals. Any violation will impair the safety protection provided.

Emerson Process Management

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WARNING



HAZARDOUS VOLTAGE

Can cause severe injury or death. Disconnect power before servicing.

CAUTION

The analyzer has a metalized enclosure. Ground conduit to metal stiffener or to metal enclosure. Use non-flammable watertight conduit fittings/plugs to preserve rating.

VYSTRAHA



NEBEZPECNE NAPETI

Muze zpusobit vazne zraneni nebo smrt. Odpojte napajeni pred udrzbou

VAROVANI

Zemnici vodic musi byt vodive spojen s kostrou pristroje. Pouzivejte nehorlave vodotesne pruchodky, abyste zachovali stupen kryti pristroje.

AVISO



VOLTAJE PELIGROSO

Puede causar severas lesiones o muerte. Desconecte la alimentación antes del mantenimiento.

ATENCION

La toma a tierra debe hacerse a un contrafuerde metal o a la caja metálica.Utilice accesorios/enchufes no inflamables y estancos al agua para preservar las especificaciones de la caja.

ADVARSEL



FARLIG SPÆNDING

Kan forårsage alvorlige kvæstelser eller død.

Afbryd spænding før servicering

FORSIGTIG

Jordforbindelse til metal kapsel.

Brug uantændelig vandtæt forskruning som sikkerhed for bevaring af kapslings klasse.

ATTENTION



HAUTE TENSION

Peut provoquer des blessures graves ou la mort. Déconnecter l'alimentation avant manipulation.

ATTENTION

Raccorder le tube à la masse métallique d'une entretoise ou du coffret.Utiliser des raccords et des bouchons étanches ininflammables afin de preserver la classification du boîtier.

OSTRZEZENIE

NIEBEZPIECZNE NAPIECIE



Moze spowodowac uszkodzenie ciala lub smierc.Odlacz zasilanie przed przystapieniem do prac.

UWAGA

Uziemij przewod do metalowego plaskownika lub obudowy. Aby zachowac stopien szczelnosci obudowy stosuj niepalne, wodoszczelne dlawiki.

WARNUNG

GEFAEHRLICHE SPANNUNG



Am Geraet liegt eine gefaehrliche Spannung an. Schalten Sie immer vor dem Oeffnen des Geraetes alle Zuleitungen spannungsfrei.

ACHTUNG

Der Analysator ist vorschriftsmaessig zu erden. Um die Schutzart des Geraetes sicherzustellen ist es mit den entsprechenden Kabelverschraubungen und Blindkappen auszuruesten.

Waarschuwing

GEVAARLIJKE SPANNING



Kan ernstig of dodelijk letsel veroorzaken. Schakel de voeding uit voordat u onderhoudswerk zaamheden uitvoert.

Voorzichtig

Aardleiding naar metalen profiel of naar metalen behuizing. Gebruik onbrandbare, waterdichte wartels en pluggen orn de beschermingsklasse te handhaven.

Attenzione

ALTA TENSIONE

Può causare grave lesione o morte. Disattivare le tensioni prima di effettuare la manutenzione.

Attenzione

Tubo di protezione per messa a terra con elemento di ingresso in metallo o con custodia in metallo.

Utilizzare accessori/connettori del tubo di protezione a tenuta stagna, non infiammabili, per assicurare i limiti di resistenza della custodia

ADVARSEL

FARLIG SPENNING

Kan føre til alvorlige skader eller dødsulykker. Spenningstilførsel må frakobles før service utføres.

ADVARSEL

Kabelinnføring må jordes til metallavstiver eller til metallkapslingen. Bruk flammesikre og vanntette nipler\plugger slik at kapslingens tetthetsgrad opprettholdes.

VARNING

LIVSFARLIG SPÄNNING



Kan medföra allvarlig skada eller dödsfall.

Bryt spänning innan service utföres.

IAKTTAG FÖRSIKTIGHET

Anslutningspunkt är jordad till chassi. Använd brandsäker, vattentät kabelanslutning för att bevara klassificering av apparatskåp.

AVISO

TENSÃO PERIGOSA

Pode causar lesões graves ou a morte. Desligar a energia antes de proceder a trabalhos de manutenção.

ATENÇÃO

Ligar a conducta de cabos à terra através de suporte ou invólucro metálicos. Utilize bucins e acessórios ignífugos e estanques para preservação da estanquecidade.

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MODEL 1054B pH/ORP MICROPROCESSOR ANALYZER

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SECTION 1.0
DESCRIPTION AND SPECIFICATIONS

- *pH ELECTRODE DIAGNOSTICS warn user of the need for calibration or electrode replacement.*
- *AUTOMATIC BUFFER RECOGNITION with stored buffer-temperature curves (1054B pH only).*
- *NEMA 4X (IP65) WEATHERPROOF CORROSION-RESISTANT ENCLOSURE.*
- *NO BATTERY BACK-UP REQUIRED. Non-volatile EEPROM memory.*
- *SPECIFIC PROCESS TEMPERATURE COMPENSATION for pH changes due to temperature (1054B pH only).*

1.1 FEATURES AND APPLICATIONS

The Model 1054B Microprocessor Analyzers, with the appropriate sensor, are designed to continuously measure and control pH, ORP, conductivity, percent concentration, ratio, resistivity, ozone, dissolved oxygen and total free chlorine in industrial and municipal processes.

The Model 1054B is housed in a NEMA 4X (IP65) weatherproof corrosion-resistant, flame retardant enclosure suitable for panel, pipe or wall mounting. All functions are accessed through the front panel membrane keyboard which features tactile feedback. Measurement data may be read at any time; however, settings may be protected against accidental or unauthorized changes by a user selectable security code. The display indicates the measured value in engineering units as well as temperature, alarm status, hold output and fault conditions.

The analyzer transmits an isolated current output which is continuously expandable over the measurement range for either direct or reverse action. A hold output function is available for allowing manual control during routine sensor maintenance. During hold mode the output will be at a preset or last process value.

In the event of one of the following conditions, the analyzer will drive the output to a preset value in addition to displaying a fault code. The Model 1054B pH's continuous self diagnostics alert the user to the following:

- Broken or cracked electrode
- Worn out or non-immersed electrode
- Calibration or coated electrode warning
- Faulty slope value (off-line only)
- Open wiring
- Analyzer electronics failure
- Faulty temperature element or temperature value

With automatic buffer recognition, the analyzer recognizes the buffers, then calculates the electrode slope using stored pH-temperature curves for ten common buffers.

Dual alarms are a standard feature on the Model 1054B and are programmable for either high or low operation. Alarm 2 may be programmed to activate in event of a failure detected by the continuous diagnostics. Both alarms feature independent setpoints, adjustable hysteresis and time delay action. A dedicated interval timer with relay is also provided for chemical or ultrasonic cleaning.

The 1054B pH automatically compensates the pH reading for process temperature changes. Automatic or manual temperature compensation is keyboard selectable. Additional process temperature compensation is available.

The Analyzer includes a 0.7 inch digital display available in LCD or LED format.

The Model 1054B can display the process temperature in °F or °C.

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1.2 PHYSICAL SPECIFICATIONS

Enclosure: Black, ABS, NEMA 4X, IP65, CSA Enclosure 4
144 X 144 X 192 mm (5.7 X 5.7 X 7.6 in.)

Wall Mount Enclosure: NEMA 4X, Heavy duty fiberglass, reinforced thermoplastic.
356.4 X 450.1 X 180.2 mm* (14 X 17.7 X 7.1 in.*)

Front Panel: Membrane keyboard with tactile feedback and user selectable security

Digital Display: LCD, black on grey
Optional, red LED Character Height: 18 mm (0.7 in.)

Electrical Classification:
FM Class I, Div. 2, Group A thru D
28 Vdc relays - 5.0 amps resistive only
150 mA - Groups A & B; 400 mA - Group C ; 540 mA - Group D; Ci = 0; Li = 0
CSA Class I, Div. 2, Group A thru D.
28 Vdc, 110 Vac & 230 Vac relays
5.0 Amps resistive only
Wall Mount Enclosure: General Purpose

Power: 100 - 127 VAC, 50/60 Hz ±6%, 4.0 W
200 - 253 VAC, 50/60 Hz ±6%, 4.0 W

Current Output: Isolated, 0-20 mA or 4-20 mA into 600 ohms maximum load at 115/230 Vac *or* 550 ohms maximum load at 100/200 Vac, Direct or Reverse Output Dampening: 0-255 seconds.

Code -20 Wall Mount Enclosure does not meet CE requirements
*Includes latches and mounting feet

EMI/RFI: EN61326 CE

LVD: EN61010-1

Ambient Humidity: LED max 95% RH (LCD max 85% RH @ 50°C)

Ambient Temperature: -10 to 65°C (14 to 149°F)

Alarms: Dual, field selectable High/Low, High/High, Low/Low Alarm 2 configurable as a fault alarm
Time Delay 0 to 255 seconds
Dual Setpoints, continuously adjustable
Hysteresis is adjustable up to 2 pH units or 25% full scale for low side/High Alarm and high side/Low Alarm

Interval Timer: Interval: Minimum 10 minutes
On Counts: 1 to 60
On Duration: 1 to 299 seconds
Off Duration: 1 to 299 seconds
Wait Duration: 1 to 299 seconds
Controls dedicated relay

Relay Contacts: Epoxy Sealed Form A contacts, SPST, Normally Open.

	Resistive	Inductive
28 Vdc	5.0 Amps	3.0 Amps
115 Vac	5.0 Amps	3.0 Amps
230 Vac	5.0 Amps	1.5 Amps

Weight/Shipping Weight: 1.1 kg/1.6 kg (2.5 lb/3.5 lb)

1.3 INSTRUMENT SPECIFICATIONS

The **Model 1054B ORP Analyzer** measures over the full range of -1500 mV to +1500 mV full scale user selectable in either the American convention (Oxidation Reduction Potential), or the European convention (Reduction Oxidation-Redox). Although temperature compensation is not required for ORP measurements, the process temperature is measured and displayed. Temperature measurement is made by a Pt 100 RTD located in the sensor assembly.

INSTRUMENT SPECIFICATIONS @ 25°C
Measurement Range: -1500 to +1500 mV
Output Scale Expansion:
Zero suppression: up to ±1500 mV
Span: ±1500 mV
Accuracy: ±1.0 mV
Repeatability: ±1.0 mV
Stability: ±1.0 mV/month, non-cumulative
Temperature Coefficient: Input: ±0.2 mV/°C
Output: ±0.4 mV/°C
Temperature Measurement: -15 to 100°C (5 to 212°F)

*Model 1054B pH includes programmable temperature correction required for the presence of ammonia when used in treating high purity water.

The **Model 1054B pH Analyzer** requires a preamplifier to convert the high impedance pH glass electrode signal to a low impedance signal. The preamplifier may be located in one of three areas; in the pH sensor for best performance, in a remote junction box when process temperatures exceed 80°C (176°F) in submersion applications, or in the analyzer when the distance between the pH sensor and the analyzer is 4.5 meters (15 ft) or less. The result is that the pH signal may then be reliably transmitted from the sensor to the analyzer using standard shielded 4-wire instrument cable.

The Model 1054B pH measures over the full range of 0-14 pH. The current output may be calibrated to represent any 1 to 14 pH span.

A two-point calibration is made by immersing the sensor in two different buffer solutions and entering the pH values. When two buffers are used, the microprocessor automatically calculates the electrode slope which is used for self-diagnostics. This electrode slope can be read on the display and manually adjusted. A one point process standardization is also easily accomplished by entering the pH value of a grab sample.

INSTRUMENT SPECIFICATIONS @ 25°C
Measurement Range: 0 to 14 pH
Output Scale Expansion: Zero suppression: up to 13 pH units
Span: Any pH from 1 to 14
Accuracy: ±0.01 pH
Repeatability: ±0.01 pH
Stability: ±0.01 pH/month, non-cumulative
Temperature Coefficient: Input: ±0.003 pH/°C
Output: ±0.006 pH/°C
Temperature Compensation: Pt100 RTD, Automatic or Manual -15 to 100°C (5 to 212°F)

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SECTION 2.0
INSTALLATION

2.1 GENERAL. This analyzer's enclosure is suitable for outdoor use. However it should be located in an area where temperature extremes and vibrations are minimized or absent. Installation must be performed by a trained technician.

2.2 UNPACKING AND INSPECTION. Inspect the analyzer for shipping damage. If damaged, notify the carrier immediately. Confirm that all items shown on the packing list are present. Notify Rosemount Analytical if items are missing.

2.3 MECHANICAL INSTALLATION. Select an installation site that is at least one foot from any high voltage conduit, has easy access for operating personnel, and is not in direct sunlight. Mount the Model 1054B as follows:

1. Remove the four screws that secure the rear cover of the enclosure (not required for wall mounting, options 20 or 21). The latching hardware for panel and pipe mounting is located inside the rear cover.

2. For standard panel and pipe mounting, remove the four screws holding the front panel assembly of the enclosure and carefully pull the front panel and connected printed circuit boards straight out.

3. Follow the procedure for the appropriate mounting configuration: Section 2.3.1 for panel mounting, Section 2.3.2 for wall mounting, or Section 2.3.3 for pipe mounting.

2.3.1 Panel Mounting (Standard). The Model 1054B is designed to fit into a DIN standard 137.9 mm X 137.9 mm (5.43 in. X 5.43 in.) panel cutout (refer to Figures 2-1 and 2-2).

1. Prepare the analyzer as described in Section 2.3.

2. Install the mounting latches as shown in Figure 2-2 (latches are shown oversize for clarity). If the latches are not installed exactly as shown, they will not work correctly. The screws provided are self-tapping. Tap the screw the full depth of the mounting latch (refer to side view) leaving a gap greater than the thickness of the cutout panel.

3. Align the latches as shown and insert the analyzer enclosure through the front of the panel cutout. Tighten the screws for a firm fit. To avoid damaging the mounting latches, do not use excessive force.

4. Replace the front panel assembly. Circuit boards must align with the slots on the inside of the enclosure. Replace the door and four front panel screws.

2.3.2 Wall Mounting (P/N 23054-01). Refer to Figures 2-3 and 2-4. The integral preamp (P/N 23363-00) should not be used with this option.

1. Prepare the analyzer as described in Section 2.3.

2. Mount the junction box and bracket to the analyzer with the hardware provided. All wiring can be brought to the terminal strip prior to mounting the analyzer.

3. Place the metal stiffener on the inside of the analyzer and mount the two ¼-inch conduit fittings using two each weather seals as shown. Mount NEMA 4X conduit plug (included) into center conduit hole.

4. Mount the analyzer to the junction box using the 1/2-inch conduit fittings.

5. Complete wiring from the 1054B to the junction box (Figure 2-4).

2.3.3 Pipe Mounting (P/N 23053-00). The 2-inch pipe mounting bracket includes a metal plate with a cutout for the 1054B refer to Section 2.3 for mounting the analyzer into the plate. Mounting details are shown in Figure 2-5.

2.3.4 Wall Mounting Enclosure (Option -20). Refer to Figure 2-8. In this configuration, the analyzer is housed in NEMA 4X heavy duty enclosure and may be mounted on a wall or handrail. Sufficient clearance should be provided in front of the enclosure to permit opening the door, which is hinged on the left side.

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2.4 ELECTRICAL WIRING. The Model 1054B has three conduit openings in the bottom rear of the analyzer housing which will accommodate 1/2-inch conduit fittings. From a back view, the conduit opening on the left is for timer, alarm, and AC connections; the center is for signal output and the opening on the right is for sensor wiring. AC power wiring should be 14 gauge or greater.

The wall mount enclosure has three 3/4-inch conduit openings, two with 3/4-inch fittings and one with a NEMA 4X conduit plug. From the front view the conduit opening on the left is for sensor wiring; the center is for signal output, and the right is for timer, alarm and AC power supply connections. Sensor wiring should always be run in a separate conduit from power wiring.

NOTE

Wall mount: use opening on the left for sensor wiring (refer to Figure 2-4 for wiring).

NOTE

PN 23363-00 (integral preamplifier). Refer to Figure 2-7 for installation and wiring. PN 23508-00 (integral preamp is for wall mount enclosure). Refer to Figure 2-9.

NOTE

For maximum EMI/RFI protection the output cable should be shielded and enclosed in an earth grounded, rigid metal conduit. When wiring directly to the instrument connect the output cable's outer shield to the transmitter's earth ground via terminal 8 on TB3, Fig. 2-6. When wiring to the wall mounting junction box connect the output cable's outer shield to earth ground via terminal 6 of TB-A, Fig. 2-4.

The sensor cable should also be shielded. When wiring directly to the instrument connect the sensor cable's outer shield to the transmitter's earth ground via terminal 8 of TB2, Fig. 2-6. If the sensor cable's outer shield is braid an appropriate metal cable gland fitting may be used to connect the braid to earth ground via the instrument case. When wiring to the wall mounting junction box connect the cable's outer shield to earth ground via terminal 6 of TB-A, Fig. 2-4.

NOTE

The user must provide a means to disconnect the main power supply in the form of circuit breaker or switch. The circuit breaker or the switch must be located in close proximity to the instrument and identified as the disconnecting device for the instrument.

CAUTION

The sensitivity and stability of the analyzer will be impaired if the input wiring is not grounded. DO NOT apply power to the analyzer until all electrical connections are verified and secure. The following precautions are a guide using UL 508 as a safeguard for personnel and property.

2.4.1 Power Input Wiring. The Model 1054B can be configured for either 115 VAC or 230 VAC power.

Connect AC power to TB1-7 and -8 (230V), or TB1-8 and -9 (115 VAC) ground to the TB3-8 (refer to Figure 2-6).

1. AC connections and grounding must be in compliance with UL 508 and/or local electrical codes.
2. The metal stiffener is required to provide support and proper electrical continuity between conduit fittings.
3. This type 4/4X enclosure requires a conduit hub or equivalent that provides watertight connect, REF UL 508-26.10.
4. Watertight fittings/hubs that comply with the requirements of UL 514B are to be used.
5. Conduit hubs are to be connected to the conduit before the hub is connected to the enclosure, REF UL 508-26.10.
6. If the metal support plate is not used, plastic fittings must be used to prevent structural damage to the enclosure. Also, appropriate grounding lug and awg conductor must be used with the plastic fittings.

2.4.2 Output Wiring. The signal output and alarm connections are made to terminals 1 through 6 of TB1 and terminals 1 and 2 of TB3 (refer to Figure 2-6).

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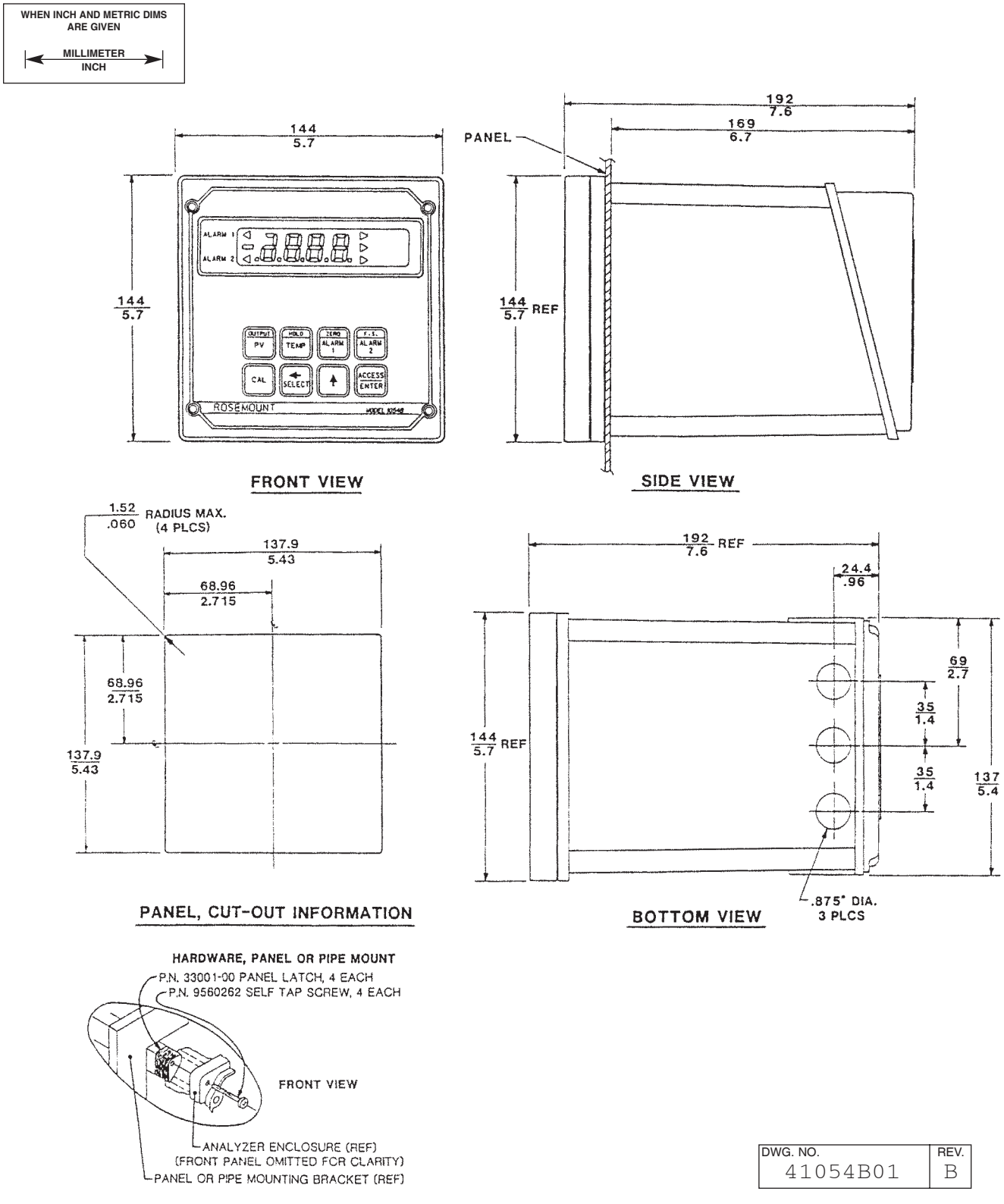
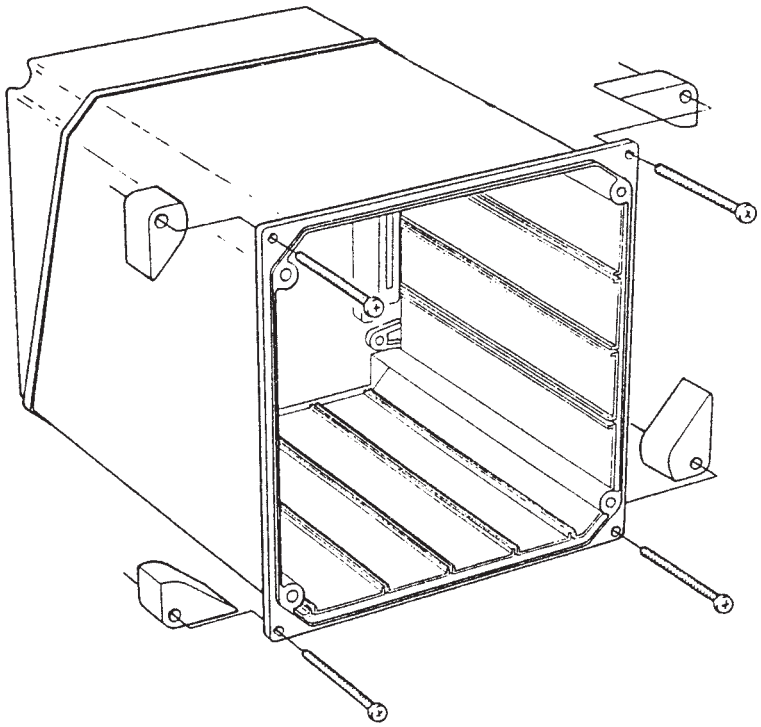
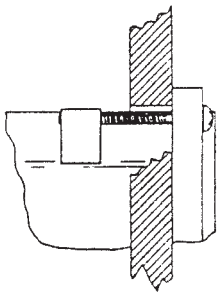


FIGURE 2-1. Panel Mounting Cutout

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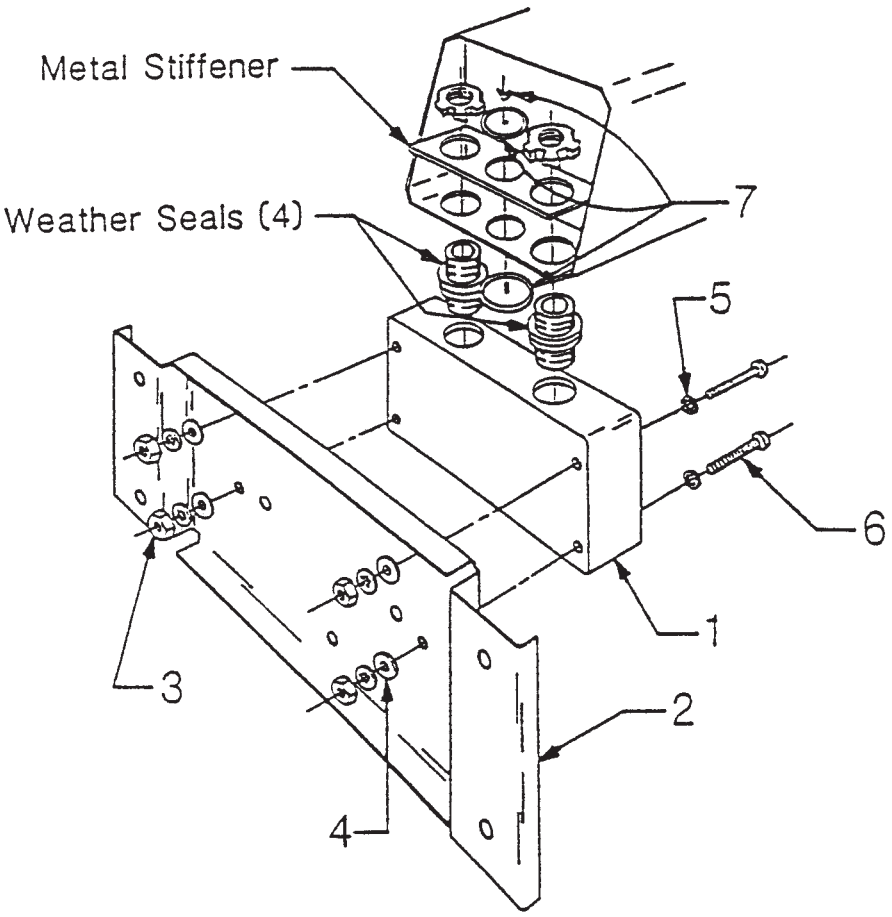




DWG. NO.	REV.
41054A26	A

FIGURE 2-2. Panel Mounting Tab Installation

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ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	23058-01	S Assy, J-Box	1
2	33030-00	Bracket, wall mtg	1
3	9900600	Nut, 6-32 Hex	4
4	9910600	Washer, Flat #6	4
5	9910610	Washer, Lock Int. #6	8
6	9600612	Screw, 6-32 X .75	4
7	9510048	Seal, Weathertight	1

DWG. NO.	REV.
41054A27	A

FIGURE 2-3. Wall Mounting J-Box Installation

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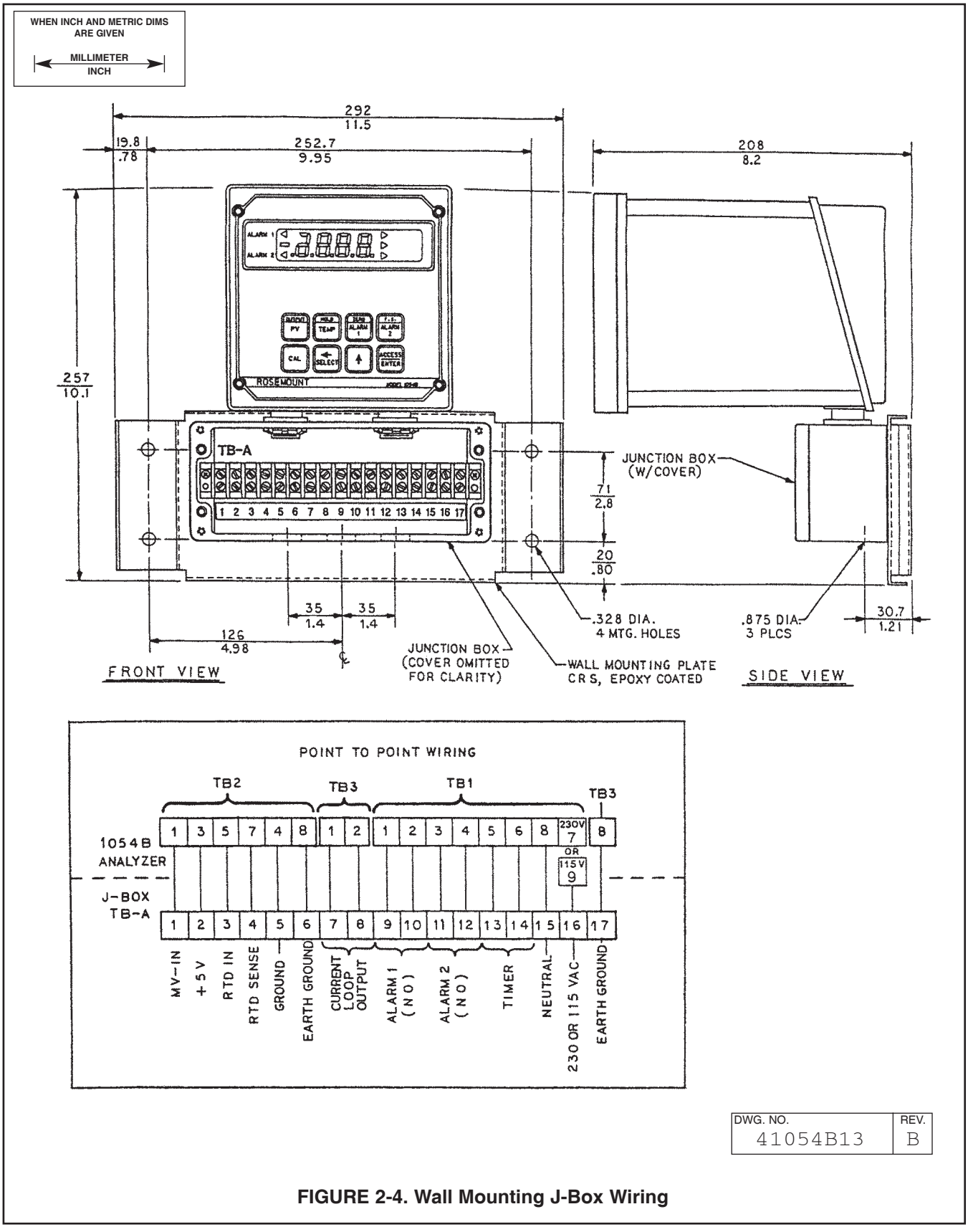


FIGURE 2-4. Wall Mounting J-Box Wiring

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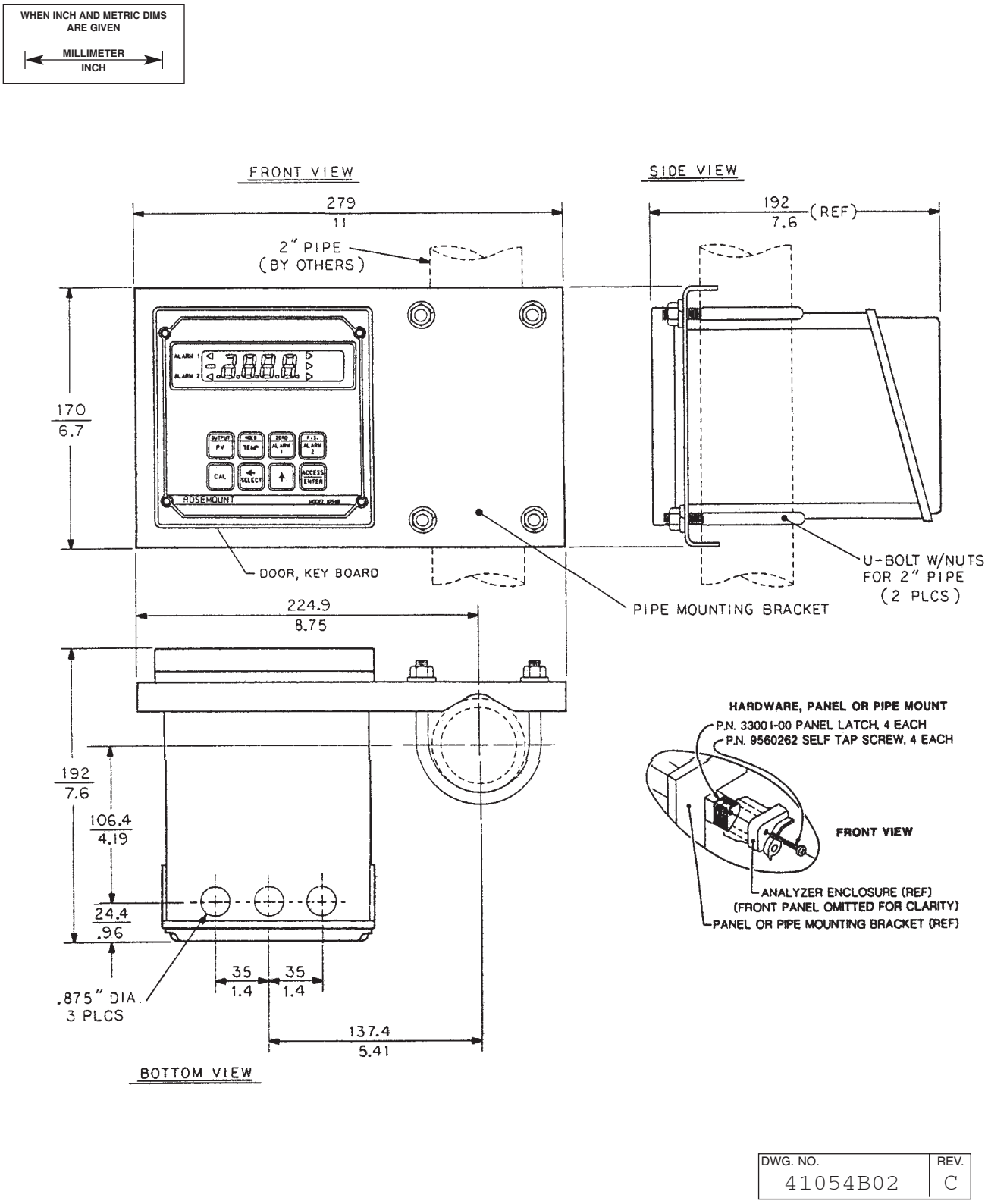
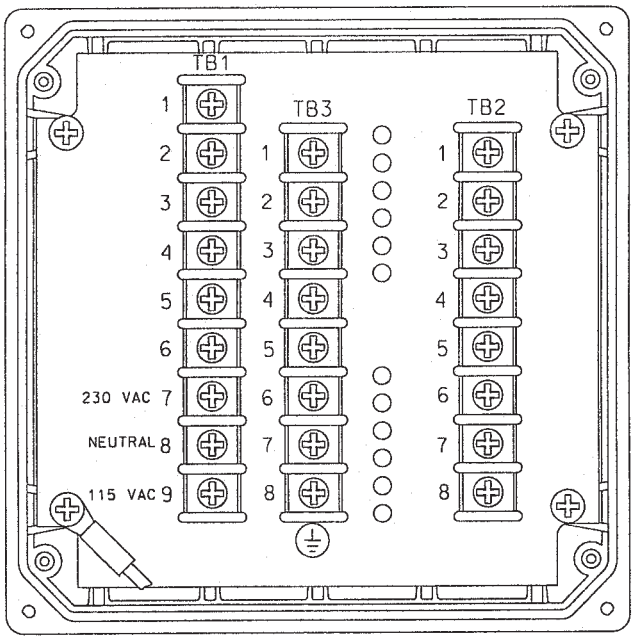
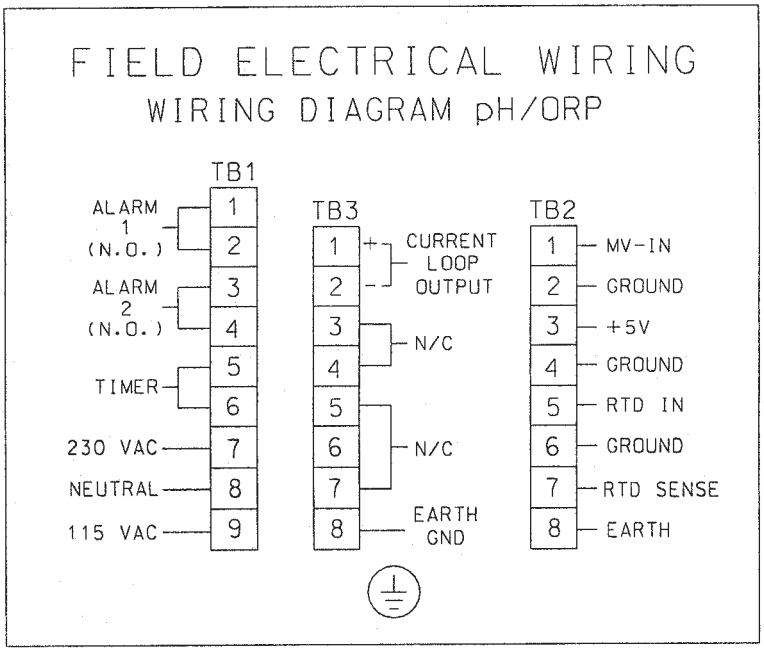


FIGURE 2-5. Pipe Mounting Installation

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BACK VIEW / COVER OMITTED



DWG. NO.	REV.
41054B03	C

FIGURE 2-6. Electrical Wiring

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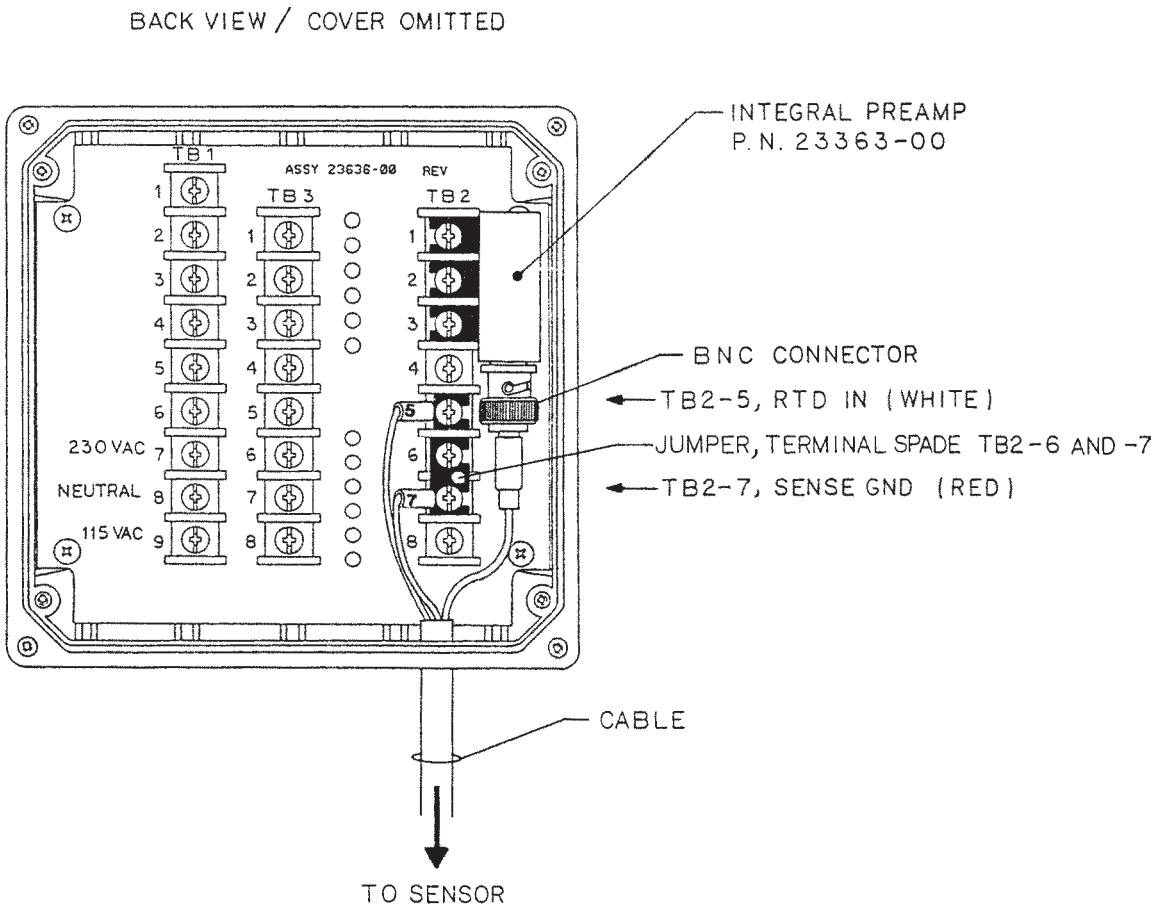


FIGURE 2-7. Integral Preamp Wiring

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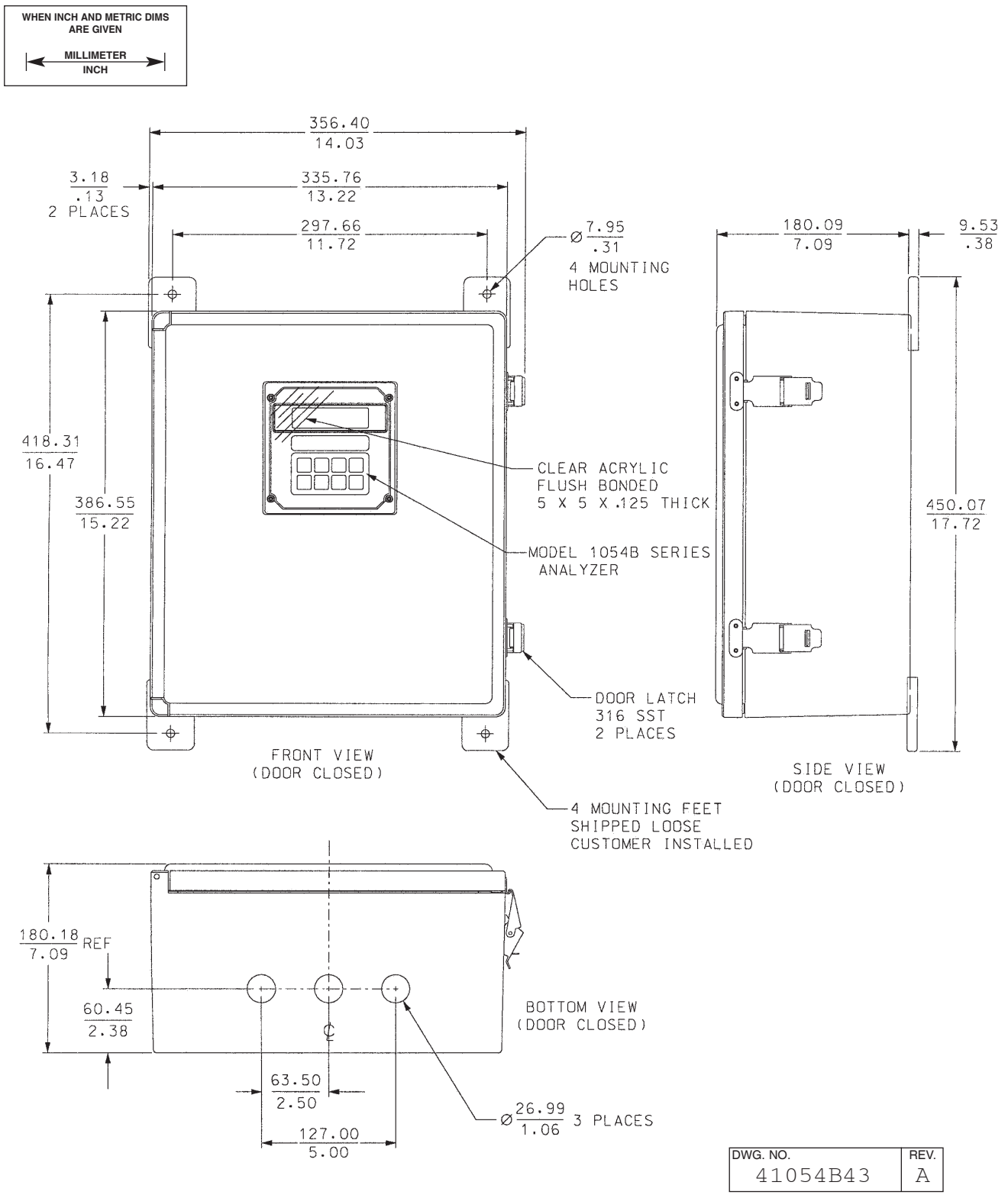
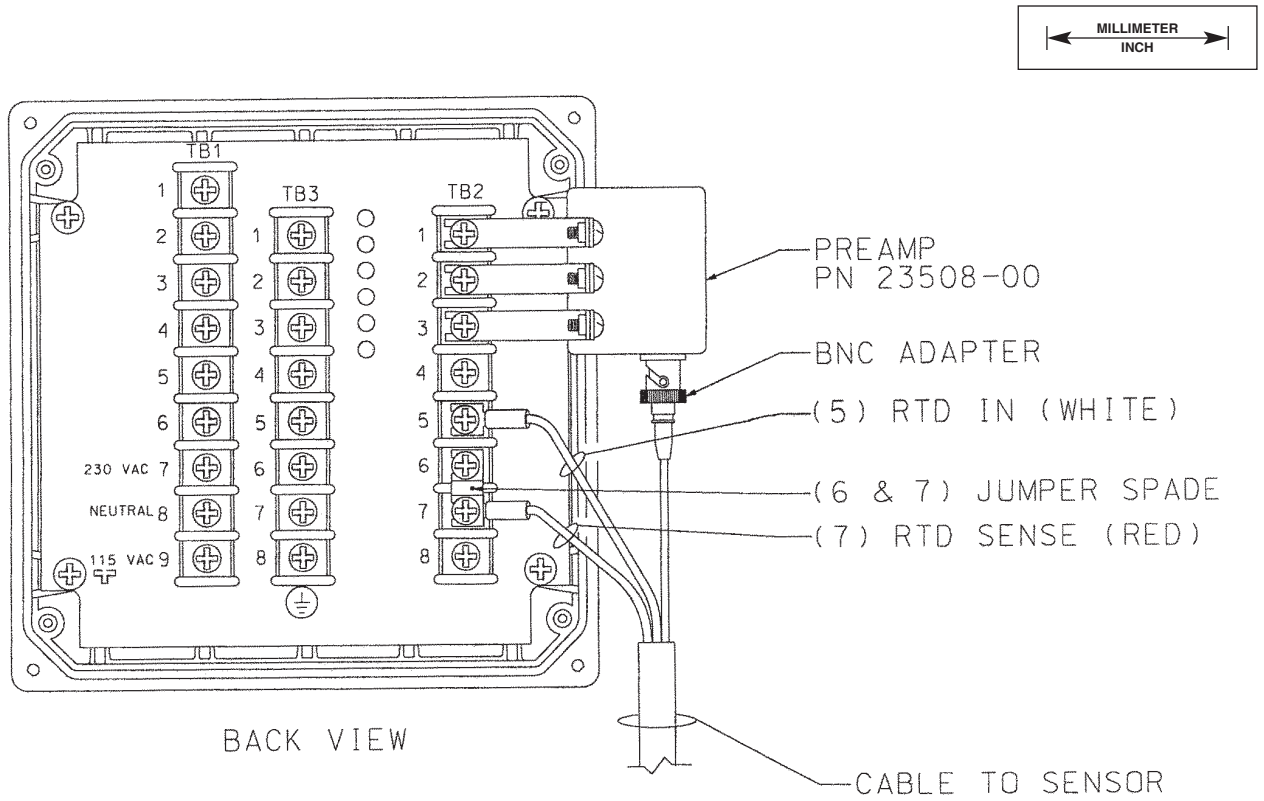
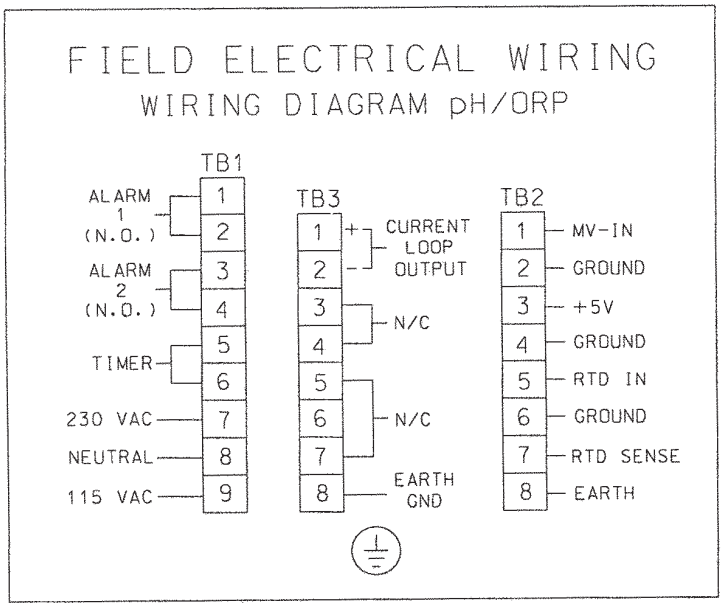


FIGURE 2-8. Wall Mount Enclosure (Option -20)

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DWG. NO.	REV.
41054B44	A

FIGURE 2-9. Integral Preamp Wiring for Group II Wall Mount Enclosure

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SECTION 3.0
DESCRIPTION OF CONTROLS

3.1 KEYBOARD FUNCTIONS.

All functions of the 1054B are accessed through keyboard entry routines. The analyzer uses no switches or potentiometers.

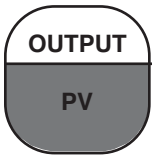
The four keys across the top row and the **CAL** (pH only) and **ENTER** keys are dual function. One press of the key will display the value of the function shown on the lower portion of the key. A quick double press of the key will display the value of the function shown on the upper portion of the key. Each of these keys have read functions that can be accessed without security code entry. Each key also has a calibration or set function when used with the **SELECT** key. This function requires entry of the security code when the security feature is active. (Refer to Section 6.0 for keyboard security.)

NOTE

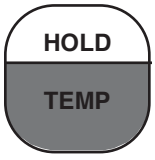
When no key is pressed for a period of 60 seconds the analyzer will default to reading pH.

CAUTION

The **HOLD** function and the **CAL** function are not read functions. Refer to Section 5.3.



A. Standardize pH/ORP. Standardization of the pH/ORP sensor is achieved by pressing the **PV** key once, followed immediately by pressing the **SELECT** key. StEd displays to acknowledge the standardize function, followed by the Numeric Display for user input. Entering the known pH/ORP of the measured solution will cause the analyzer to restandardize the sensor. The pH glass slope value will not be changed. Refer to Section 5.4.



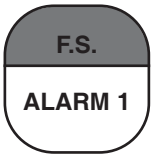
B. Standardize Temperature. Standardization of the temperature is achieved by pressing the **TEMP** key once, followed immediately by pressing the **SELECT** key. AdJ displays to acknowledge the standardization function, followed by the Numeric Display for user input. Entering the known temperature of the measured solution will cause the analyzer to restandardize the temperature reading. Refer to Section 5.2.



C. Alarm 1 and Alarm 2 Setpoint. The alarm setpoint may be adjusted by pressing the **ALARM 1** or **ALARM 2** key once, followed by pressing the **SELECT** key. AdJ displays, followed by the Numeric Display for user input. Refer to Section 4.10.



D. Current Output – Zero Setpoint. The zero point (0 or 4 mA) of the pH output range is adjusted by pressing the **ZERO** key twice, followed by pressing the **SELECT** key. AdJ displays, followed by the Numeric Display for user input. Refer to Section 4.11.



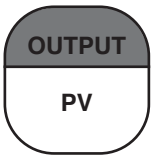
E. Current Output – F.S. Setpoint. The full scale point (20 mA) of the pH output range is adjusted by pressing the **F.S.** key twice, followed by pressing the **SELECT** key. AdJ displays, followed by the Numeric Display for user input. Refer to Section 4.11.



F. Two Buffer Calibration (pH). A two buffer calibration is initiated by pressing the **CAL** key once. Refer to Section 5.3. **Calibration (ORP)**. A calibration is initiated by pressing the **CAL** key once. Refer to Section 5.3.



G. pH Glass Slope. The millivolt output per pH unit is adjusted by pressing the **CAL** key twice, followed by pressing the **SELECT** key once. AdJ displays, followed by the Numeric Display for user input. Refer to Section 5.5.



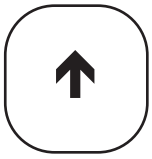
H. Simulate Current Output. The pH output can be simulated by pressing the **PV** key twice, followed by pressing the **SELECT** key. The Numeric Display appears for user input. Refer to Section 4.12.

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3.1.1 Item Selection and Value Adjustment Keys. The three keys located on the lower right side of the keypad are used for menu navigation, value adjustment and entry, and item selection. These keys perform the following functions:



A. SELECT/Shift (←) Key. This key is used to select the displayed menu, or for shifting to the next digit in the Numeric Display.



B. Scroll Key (↑). This key is used to scroll through menu when selected, or scroll through digits on the active (flashing) Numeric Display. Holding key down auto scrolls through the main menu and Numeric display.



C. ACCESS/ENTER Key. This key is used to **ACCESS** the Set Mode (Section 4.1.2) and to **ENTER** the displayed value into memory (from Numeric Display).

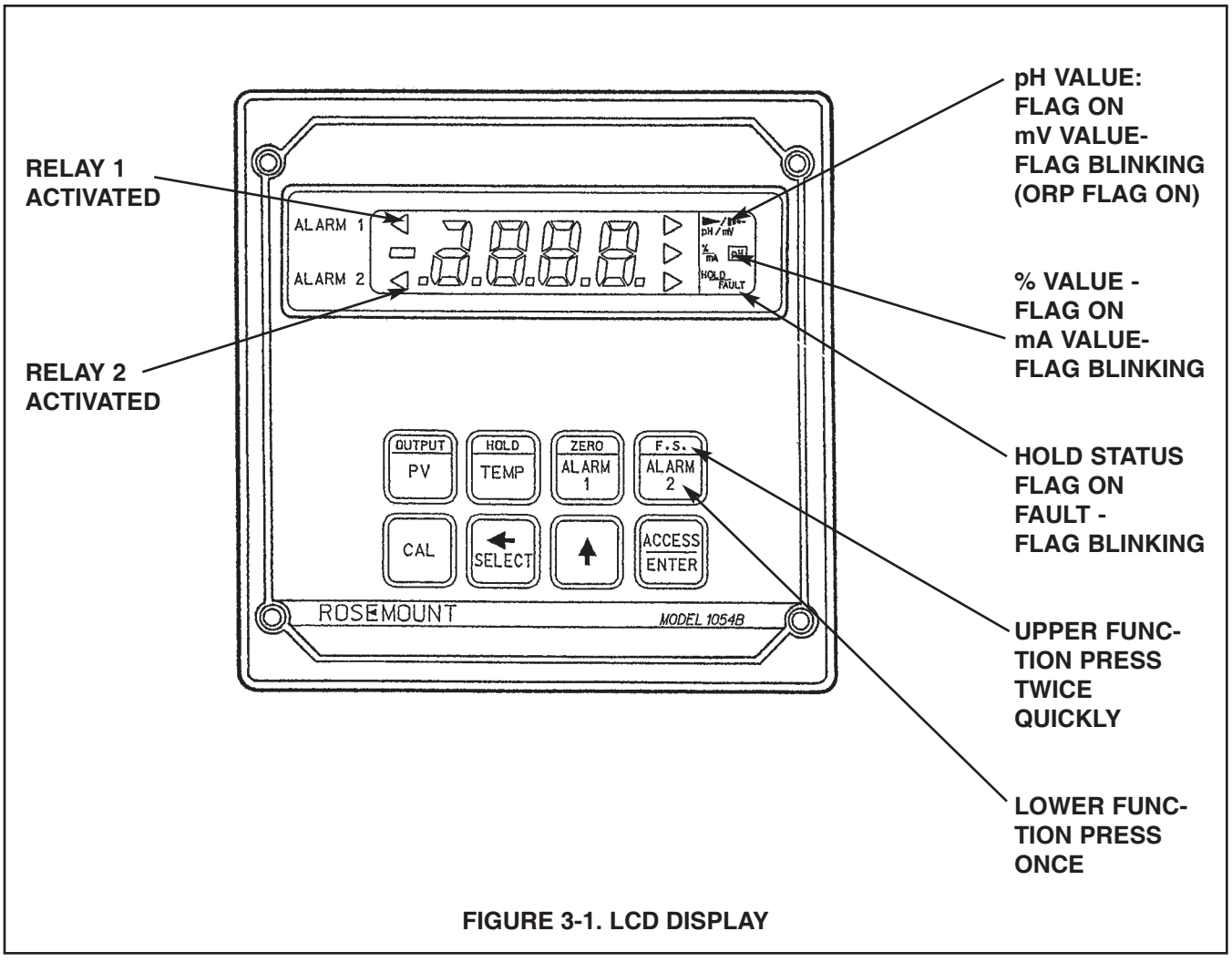


FIGURE 3-1. LCD DISPLAY

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TABLE 3-1. Key Description

	MAIN FUNCTION (PRESS ONCE)	SECOND FUNCTION (PRESS TWICE QUICKLY)
OUTPUT / PV	Displays - pH/ORP. Set Function (w/SELECT) - One point standardization of pH/ORP. PV=Primary Variable	Displays - current output (mA or % full scale). Set Function (w/SELECT) - Simulates current output.
HOLD / TEMP	Displays - process temperature (°C or °F). Set Function (w/SELECT) - One point standardization of temperature.	Initiates or removes analyzer from hold condition.
ZERO / ALARM 1	Displays - Alarm 1 setpoint. Set Function (w/SELECT) - Sets Alarm 1 setpoint.	Displays - low current setpoint (0 or 4 mA value). Set Function (w/SELECT) - Sets low current point (0 or 4 mA value).
F.S. / ALARM 2	Displays - Alarm 2 setpoint. Set Function (w/SELECT) - Sets Alarm 1 setpoint.	Displays - full scale output setpoint. Set Function (w/SELECT) - Sets full scale output point.
CAL	Two Point Calibration (pH). Calibration (ORP).	Displays - pH glass slope (efficiency). Set Function (w/SELECT) - manually sets pH glass slope (efficiency).

← SELECT	Select sub menu (mnemonic display). Shift to next digit (numeric display).
↑	Scroll through menu (mnemonic display). Scroll digits (numeric display). Holding key down autoscrolls digits or set menu items.
ACCESS / ENTER	Press twice to access set-up menu. Enter displayed value into memory. Enter displayed menu item (flashing) into memory.

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TABLE 3-2. Information Mnemonics

MNEMONIC	DESCRIPTION	MNEMONIC	DESCRIPTION
Ab1	Automatic Buffer 1	LOC	Access locked - enter security code
Ab2	Automatic Buffer 2	Pct	Displays pH/ORP output in percent
AdJ	Adjustment to value reading	PH	pH Display
bAd	Incorrect entry	OrP	ORP Display
bF1	Buffer 1	SEt	Set mode
bF2	Buffer 2	SiP	Simulates current output (percent)
doc	Displays output current in mA	SC1	Simulates current output (mA)
HLd	Analyzer in hold mode	SLP	Displays pH electrode slope
HI	Displays 20 mA setpoint (pH/ORP)	SP1	Displays alarm 1 setpoint
itr	Interval timer activated	SP2	Displays alarm 2 setpoint
LO	Displays 0 or 4 mA setpoint (pH/ORP)	Std	Standardize pH/ORP

TABLE 3-3. Set Function Mnemonics

AbF	Auto buffer mode	dtS	LCD/LED Display test	Old	Old electrode impedance limit
AL1	Alarm 1 setup	dur	Timer duration	Or	U.S. Convention
AL2	Alarm 2 setup	Din	Display mV input	OUt	Current output
Atc	Automatic temp. comp.	dF	Temperature °F	Pct	Display output in percent
dC	Temperature °C	FLt	Use alarm as fault alarm	rL1	Relay 1 fault setup
CAL	Calibration impedance setpoint	Hi	Relay action - high	rL2	Relay 2 fault setup
COd	Security Code	H-L	Alarm logic	rES	Impedance value
cnt	Timer count	hr	Hours	rPH	Normal process pH
CUr	Config. current output	HYS	Hysteresis	r0	European Convention
Cur	Config. fault output	int	Interval period	SEC	Seconds
cur	Default current setpoint	Int	Timer setup	SHt	Cracked glass impedance limit
dAY	Days	iPH	Isopotential pH	SHO	Show fault history
dFt	Fault Configuration	iSO	Isopotential point	t-C	Temperature config.
d-O	Display output	Lo	Relay action - low	tCO	Temperature coefficient
d-t	Display temperature	non	No action on fault	tiL	Timer - time remaining
diS	Display Convention	OFF	Alarm not used	tOn	Timer status
doc	Display output in mA	ont	Timer on time	UEr	User version
doF	Relay delay off time	oFF	Relay open on fault	uin	Minutes
don	Relay delay on time	On	Use alarm as process alarm	420	4mA to 20mA output
dPn	Dampen output	OFt	Timer off time	020	0mA to 20mA output

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SECTION 4.0
CONFIGURATION

4.1 CONFIGURATION. This section details all of the items available in the Set Mode to configure the analyzer to a specific application.

4.1.1 Configuration Work Sheet. The configuration work sheet on page 20 (or, in the case of ORP, the worksheet on page 22) should be filled out before proceeding with the analyzer's configuration. This sheet gives a brief parameter description, the factory setting, and a space for user setting.

4.1.2 Set Mode. Display mnemonic SEt. Most of the analyzer's configuration is done while in the Set Mode. Please refer to Figure 4-1 for the layout of all menu items for pH measurement. Refer to Figure 4-2 for the layout of all menu items for ORP measurement. All menu variables are written to the analyzer's EEPROM (memory) when selected and remain there until changed. As these variables remain in memory even after the analyzer's power is removed, the Model 1054B pH/ORP configuration may be performed prior to installing it.

1. Power up the analyzer. Only power input wiring is required for analyzer configuration (Refer to Section 2.4.1). The analyzer's display will begin showing values and/or fault mnemonics. All fault mnemonics will be suppressed while the analyzer is in Set Mode (the fault flag will continue to blink).

2. Enter Set Mode. Pressing the **ACCESS** key twice in rapid succession will place the analyzer in Set Mode. The display will show SEt to confirm that it is in Set Mode. It will then display the first item in the Set Menu Ein. The analyzer is now ready for user configuration.

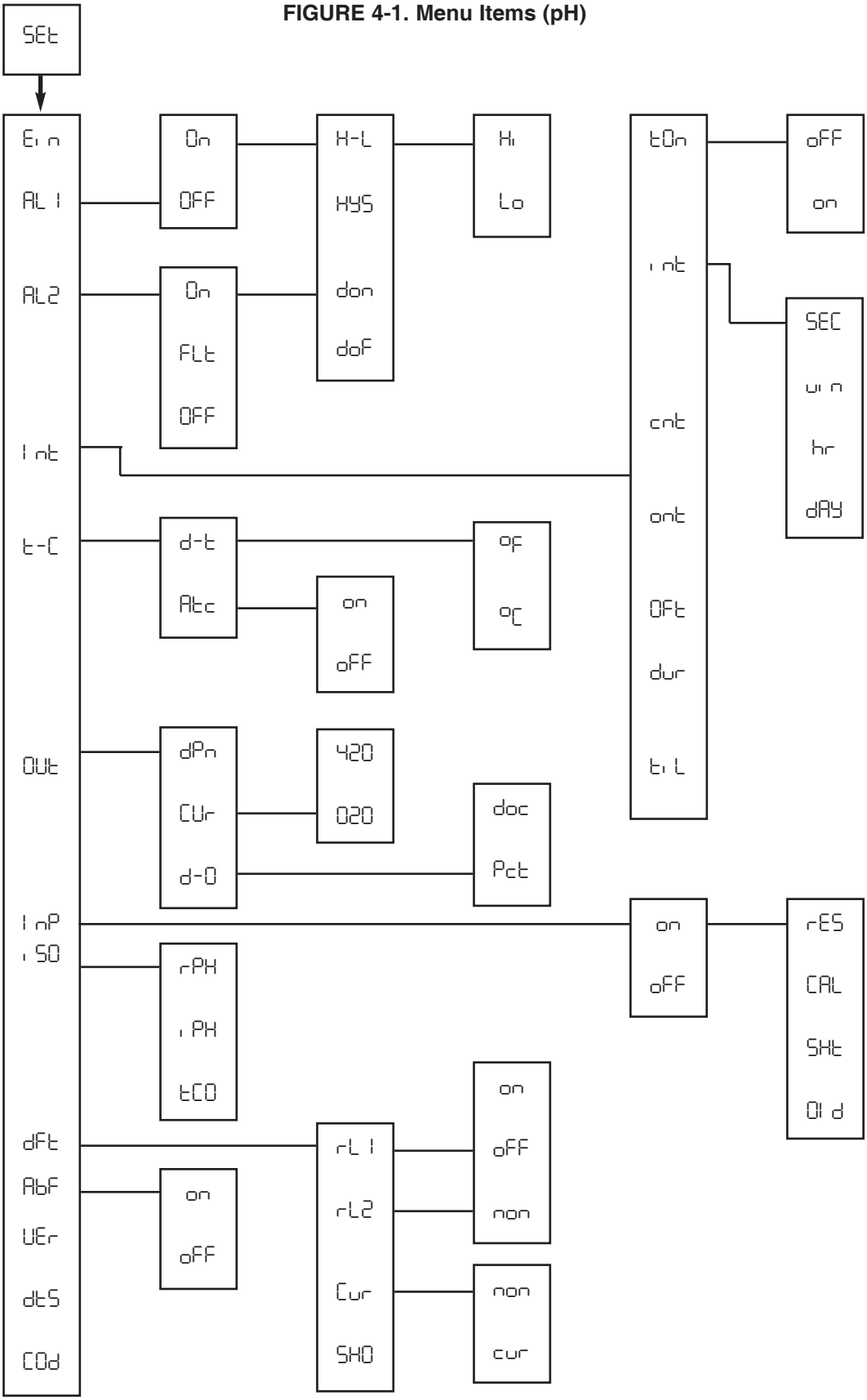
   NOTE

   If LOC displays, the Keyboard Security Code must be entered to access the Set Mode. (Refer to Section 6.0.)

3. Analyzer variables can be entered in any order. On initial configuration, however, it is recommended that the variables be entered in the order shown on the work sheet (page 20 - pH, page 22 - ORP). This will reduce the chance of accidentally omitting a needed variable.

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FIGURE 4-1. Menu Items (pH)



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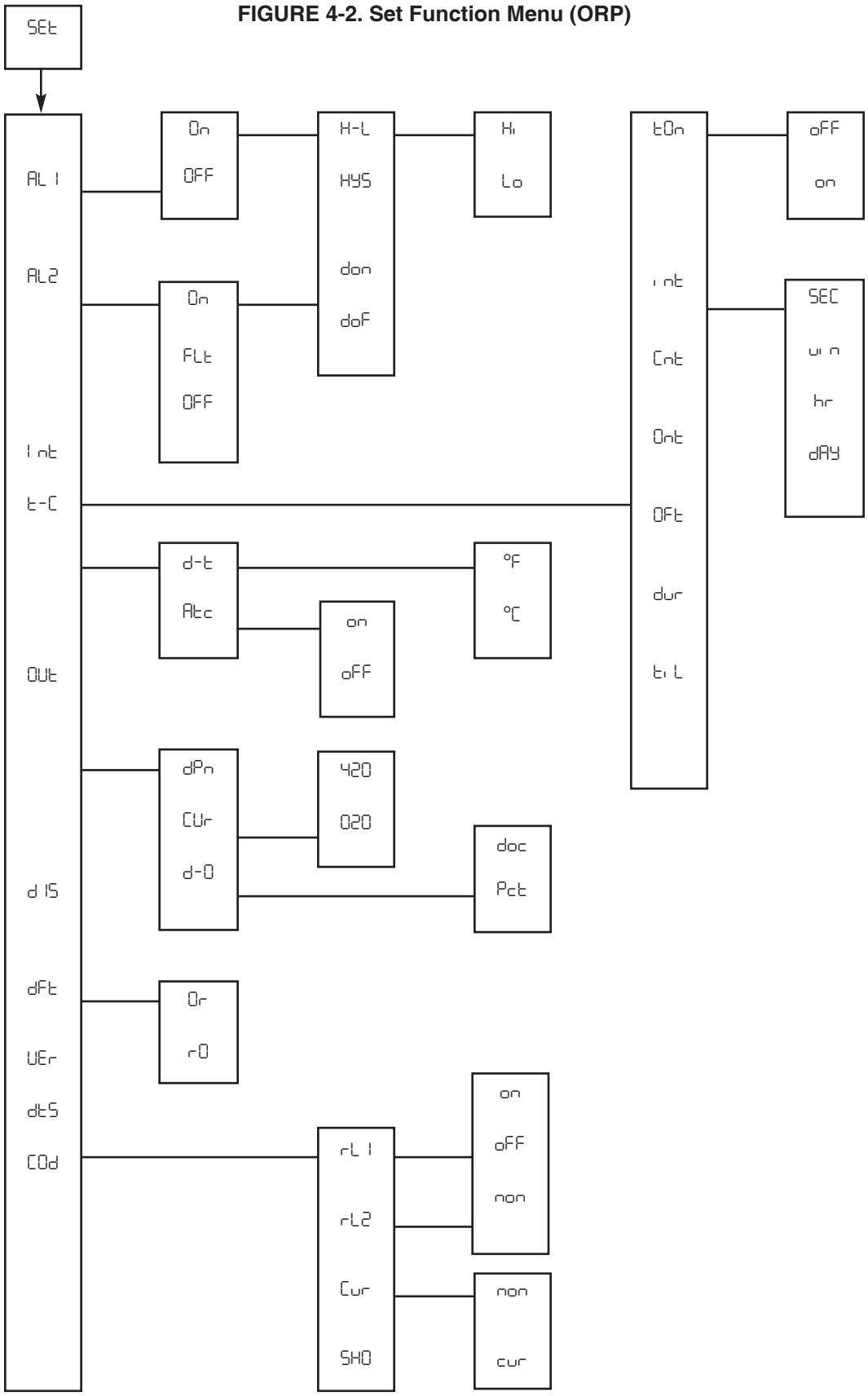
TABLE 4-1. Configuration Work Sheet (pH)

Use this work sheet to assist in the configuration of the analyzer. Date: _____

	RANGE	FACTORY SET	USER SET
A. Alarm 1 Setup (AL 1)			
1. Alarm Configuration (On/OFF)		On	_____
2. High or Low (H-L) (Hi /Lo)		Lo	_____
3. Hysteresis (HYS)	0-2.0 pH	0 pH	_____
4. Delay Time On (don)	0-255 sec.	000 Seconds	_____
5. Delay Time Off (doF)	0-255 sec.	000 Seconds	_____
B. Alarm 2 Setup (AL2)			
1. Alarm Configuration (On/FLt/OFF)		On	_____
2. High or Low (H-L) (Hi /Lo)		Hi	_____
3. Hysteresis (HYS)	0-2.0 pH	0 pH	_____
4. Delay Time On (don)	0-255 sec	000 Seconds	_____
5. Delay Time Off (doF)	0-255 sec	000 Seconds	_____
C. Interval Timer (I nt)			
1. Active Status (tOn) (oFF/on)		oFF	_____
2. Interval Time (i nt)	Minimum 10 Minutes	10 Seconds	_____
3. Count (cnt)	1 to 60	5	_____
4. On Time (ont)	0 to 299 sec	1 Second	_____
5. Off Time (OFt)	0 to 299 sec	1 Second	_____
6. Duration (dur)	0 to 299 sec	2 Seconds	_____
D. Temperature Setup (t-C)			
1. Display Temperature (d-t) (°C/°F)		°C	_____
2. Automatic Temperature Compensation (Atc) (on/oFF)		on	_____
a. Manual Temp. Value	-10°C to 125°C		_____
E. Current Output Setup (OUt)			
1. mA Output (CUr) (020/420)		420	_____
2. Display Current Output (d-O) (Pct/doc)		doc	_____
3. Dampen Current Output (dPn)	0-255 sec.	0.0 Seconds	_____
F. Electrode Diagnostics Setup (I nP)	(on oFF)	oFF	
1. Temp compensated impedance (rES)			
2. Impedance increase before calibration (CAL)	20-200%	20%	_____
3. Cracked glass impedance low limit (SHt)	5-600 megohms	20 megohms	_____
4. Aged electrode impedance high limit (OI d)	200-1999 megohms	1000 megohms	_____
G. Default Setup (dFt)			
1. Relay 1 Default (rL 1) (non/oFF/on)		non	_____
2. Relay 2 Default (rL2) (non/oFF/on)		non	_____
3. Current Output Default (Cur) (non/cur)		non	_____
H. Automatic Buffer Mode (AbF)			
1. Configuration (on oFF)		on	_____
I. Keyboard Security Setup (COd)			
1. Keyboard Security Required	001-999	–	_____
2. Keyboard Security Not Required	000	000	_____
Alarm Setpoints			
1. Alarm 1 (SP 1)	0-14 pH	0.00 pH	_____
2. Alarm 2 (SP 2)	0-14 pH	14.00 pH	_____
Current Output			
1. Zero (0 or 4 mA) (LO)	0-14 pH	0.00 pH	_____
2. F.S. (20 mA) (HI)	0-14 pH	14.00 pH	_____

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FIGURE 4-2. Set Function Menu (ORP)



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TABLE 4-2. Configuration Worksheet (ORP)

Use this work sheet to assist in the configuration of the analyzer. Date: _____

	RANGE	FACTORY SET	USER SET
A. Alarm 1 Setup (AL 1)			
1. Alarm Status (On OFF)		On	_____
2. High or Low (H-L) (Hi /Lo)		Lo	_____
3. Hysteresis (HYS)	0-25% of setpoint	0.0%	_____
4. Delay Time On (don)	0-255 sec.	000 Seconds	_____
5. Delay Time Off (doF)	0-255 sec.	000 Seconds	_____
B. Alarm 2 Setup (AL2)			
1. Alarm Status (On/FLt/OFF)		On	_____
2. High or Low (H-L) (Hi /Lo)		Hi	_____
3. Hysteresis (HYS)	0-25% of setpoint	0.0%	_____
4. Delay Time On (don)	0-255 sec.	000 Seconds	_____
5. Delay Time Off (doF)	0-255 sec.	000 Seconds	_____
C. Interval Timer (I nt)			
1. Active Status (tOn) (oFF/on)		oFF	_____
2. Interval Time (i nt)	minimum 10 minutes	1 Day	_____
3. Count (Cnt)	1 to 60	5	_____
4. On Time (Ont)	0 to 299.9 sec	1 Second	_____
5. Off Time (OFt)	0 to 299.9 sec	1 Second	_____
6. Duration (dur)	0 to 299.9 sec	2 Seconds	_____
D. Temperature Setup (t-c)			
1. Display Temperature (d-t) (°C/°F)		°C	_____
2. Automatic (t-C) (Atc) (on/oFF)		On	_____
E. Current Output Setup (OUt)			
1. mA Output (Cur) (020/420)		420	_____
2. Display Current Output (d-O) (Pct/doc)		doc	_____
3. Dampen Current Output (dPn)	0-255 sec.	0.0 Seconds	_____
F. Displays Convention			
1. U.S. (Or)/European (rO)		Or	_____
G. Default Setup (dFt)			
1. Relay 1 Default (rL 1) (non/oFF/on)		non	_____
2. Relay 2 Default (rL2) (non/oFF/on)		non	_____
3. Current Output Default (Cur) (non/cur)		non	_____
H. Keyboard Security Setup			
1. Keyboard Security Required	001-999	_	_____
2. Keyboard Security Not Required	000	000	_____
Alarm Set Points			
1. Alarm 1 (SP 1)	-1500 - +1500 mV	-1500 mV	_____
2. Alarm 2 (SP2)	-1500 - +1500 mV	+1500 mV	_____
Current Output			
1. Zero (0 or 4 mA)	-1500 - +1500 mV	-1500 mV	_____
2. F.S. (20 mA)	-1500 - +1500 mV	+1500 mV	_____

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4.2 ALARM 1 AND 2. Display Mnemonic AL 1 or AL2. Used to set alarm relay logic. The alarms may be configured to perform on-off process control. See note below.

A. On. Display Mnemonic On. Select this item if Alarm 1 or 2 is to be used as a process alarm. See Steps D thru G for further alarm configuration.

B. Off. Display Mnemonic OFF. Select this item if Alarm 1 or 2 will not be used as a process alarm or to temporarily disable either alarm. Alarm 1 or 2 setpoint will display oFF if this item is selected. Omit Steps C thru G.

C. Fault (Alarm 2 Only). Display Mnemonic FLt. Select to make Alarm 2 energized when the analyzer detects a fault condition. See Table 8-1 for a listing of the fault mnemonics and their descriptions. Alarm 2 setpoint will display FLt if this item is selected. Omit Steps D thru G.

D. Alarm Logic. Display Mnemonic H-L. Select this item for high or low alarm logic. High logic activates the alarm when the reading is greater than the set point value. Low logic activates the alarm when the reading is less than the setpoint value.

E. Relay Hysteresis. Display Mnemonic HyS. Sets the relay hysteresis (dead band) for deactivation after reading has passed the alarm setpoint. May be set from 0 to 2.0 pH. Use hysteresis when a specific pH should be reached before alarm deactivation.

F. Delay Time On. Display Mnemonic don. Sets time delay for relay activation after alarm setpoint is reached. May be set from 0 to 255 seconds.

G. Delay Time Off. Display Mnemonic doF. Sets time delay for relay deactivation after alarm setpoint is reached. May be set from 0 to 255 seconds. Alarm state restarts time from zero. Use when a fixed time should pass before relay deactivation occurs.

4.2.1 Alarm Setup (AL 1/AL2).

1. Enter Set Mode by pressing **ACCESS** key twice.
2. **SCROLL** (↑) until AL 1 or AL2 appears on the display.
3. **SELECT** to move to the next menu level. On, OFF or (AL2 only) FLt will display.
4. **SCROLL** (↑) to display desired item then **SELECT**.
5. If OFF is selected, display will show oFF to acknowledge. Press **ENTER** key to return to AL 1 or AL2, concluding routine. Skip to Step 11.

   If On is selected, display will show on to acknowledge, then display H-L. Proceed to Step 6.

   If FLt is selected, display will show FLt to acknowledge. Press **ENTER** key to return to AL2.
6. **SELECT** H-L. Hi or Lo will display (flashing).
7. **SCROLL** (↑) to the desired item and **ENTER** it into memory. Display will return to H-L. If changes to relay activation logic are desired, proceed to Step 8, otherwise Step 12.
8. **SCROLL** (↑) to display HyS, don or doF, then **SELECT** desired item. The Numeric Display will flash to indicate that a value is required.
9. Use **SCROLL** (↑) and **SHIFT** (←) to display the desired value.
10. **ENTER** value into memory. Analyzer will acknowledge and return to display of last item selected. Repeat Step 8 if further changes are desired, otherwise Step 12.
11. Repeat Step 3 for the other Alarm's settings as required.
12. To return to the first level of the Set Mode, press the **ACCESS** key.

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4.3 INTERVAL TIMER. Display Mnemonic int. This item is used to set the interval timer's relay logic. The timer can be used for sensor maintenance, such as wash cycle or ultrasonic cleaner activation. Refer to Figure 4-3.

A. Interval Timer Enable/Disable. Display Mnemonic tOn. Select this item to begin interval cycle on or disable interval cycle oFF.

B. Interval Period. Display Mnemonic int. Select this item to set the time period between control cycles. SEC for seconds, min for minutes, hr for hours, and dAY for days. May be set from a minimum of 10 minutes.

C. Relay Activations Per Cycle. Display Mnemonic cnt. Select this item to enter the number of times the relay will activate per cycle. May be set from 1 to 60.

D. Relay Activation Duration. Display Mnemonic ont. Select this item to enter the relay activation time for each cnt. May be set from 0 to 299 seconds.

E. Relay Deactivation Duration. Display Mnemonic OFt. Select this item to enter the relay deactivation time between each cnt during the control cycle. Valid when cnt is 2 or greater. May be set from 0 to 299 seconds.

F. Wait Duration. Display Mnemonic dur. Select this option to enter the electrode recovery time after the last cnt in a cycle. May be set from 0 to 299 seconds. The duration can be used for electrode recovery after a wash cycle.

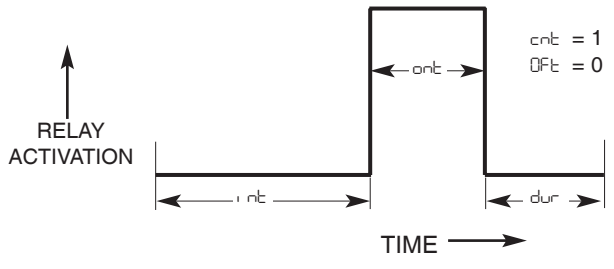
G. Interval Time Remaining. Display Mnemonic tiL. Select this item to display the time remaining until the next control cycle. If selected during the control cycle, the display will show ---.

NOTE

The Model 1054B pH is placed *on hold* during the control cycle (from first relay activation through the wait duration). The analyzer will simulate a fault condition and briefly show itr every eight seconds. The display will continue to show the measured value.

4.3.1 Interval Timer Set Up (int).

1. Enter Set Mode by pressing **ACCESS** key twice.
2. **SCROLL** (↑) until int appears on the display.
3. **SELECT** to move to the next menu level. tOn will display.
4. **SCROLL** (↑) to display on or oFF and **ENTER** it into memory. If interval configuration is required, proceed to Step 5, otherwise Step 10.
5. **SCROLL** (↑) to display desired menu item. If int is selected, proceed to Step 6, otherwise Step 10.
6. **SCROLL** (↑) to display desired interval period and **SELECT**. The Numeric Display will flash.
7. **SCROLL** (↑) and **SHIFT** (←) to display the desired value and **ENTER** it into memory. Display will return to interval period menu.
8. Repeat Steps 6 and 7 as needed.
9. Press the **ENTER** key to return to the main timer menu.
10. **SELECT** the desired item. The Numeric Display will flash.
11. **SCROLL** (↑) and **SHIFT** (←) to display the desired value and **ENTER** it into memory.
12. Repeat Steps 5, 10, and 11 as required.
13. Press the **ENTER** key to return to the Set Menu.



One Wash Cycle

FIGURE 4-3. Interval Timer Example

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4.4 TEMPERATURE. Display Mnemonic t-C. Select this item for temperature reading and compensation choices.

A. Temperature Display. Display Mnemonic d-t. Select this item to toggle between °F and °C temperature display. The 1054B will show all temperatures in units selected until the selection is changed.

B. Automatic Temperature Compensation (pH only). Display Mnemonic Atc. The Model 1054B pH will use the temperature input from the sensor for temperature compensation when on is selected. When oFF is selected, the analyzer will use the value entered by the user for temperature compensation. This manual temperature option is useful if the temperature sensor is faulty or not on line. Temperature specific faults (tcH and tcL) will be disabled (Refer to Table 8-1).

4.4.1 Temperature Setup (t-C).

1. Enter Set Mode by pressing **ACCESS** key twice.
2. **SCROLL** (↑) until t-C appears on the display.
3. **SELECT** to move to the next menu level. d-t will display.
4. **SCROLL** (↑) to display desired item, then **SELECT**.
5. If d-t is selected, display will show °C or °F.
   If Atc is selected, display will show on or oFF.
6. **SCROLL** (↑) then **ENTER** desired item into memory.
7. If °C, °F, or on are entered, display will return to the previous level (proceed to Step 9).

   If oFF is selected, the Numeric Display will flash indicating that a process temperature value is required (proceed to Step 8).
8. Use **SCROLL** (↑) and **SHIFT** (←) to display the desired value. **ENTER** value into memory.
9. Repeat Steps 4-8 as required for other item.
10. Press the **ENTER** key to return to Set Menu.

4.5 CURRENT OUTPUT. Display Mnemonic OUt. This item is used to configure the current output signal.

A. Output Dampening. Display Mnemonic dPn. Dampens the response of the signal output. This option is useful to minimize the effect of a noisy reading. The number entered is the sample time (in seconds) for an averaged output. Zero to 255 seconds may be entered.

B. mA Output Range. Display Mnemonic CUr. Selection of this item will allow choice of 0 to 20 mA or 4 to 20 mA output range.

C. Display Output. Display Mnemonic d-O. This item is used to select logic of output display. Selecting this item will allow the 1054B pH to display current output as mA doc or as a percent of full scale output range Pct.

4.5.1 Output Setup (OUt).

1. Enter Set Mode by pressing the **ACCESS** key twice .
2. **SCROLL** (↑) until OUt appears on the display.
3. **SELECT** to move to the next menu level. dPn will display.
4. **SCROLL** (↑) then **SELECT** desired item.
5. If dPn is selected, the Numeric Display will flash indicating that a value is required. Proceed to Step 6.

   If CUr or d-O is selected, proceed to Step 7.
6. **SCROLL** (↑) then **SHIFT** (←) to display the desired value. **ENTER** into memory.
7. **SCROLL** (↑) then **ENTER** desired item.
8. Repeat Steps 4-7 as required.
9. Press the **ENTER** key to return to the Set Menu.

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4.6 pH ELECTRODE DIAGNOSTICS (1054B pH only). Display Mnemonic I nP. Under this item are functions associated with glass electrode diagnostics. These diagnostics are possible through a continuous, temperature compensated measurement of the sensor impedance (resistance), rES, made from the preamp. **A software selectable on setting will activate these diagnostics. If oFF is the setting (factory setting) these diagnostics will all be disabled.**

A new electrode has an impedance of approximately 200 megohms, and as it ages the impedance increases because lithium ions (which carry current) in the glass slowly get depleted by the process. If an electrode cracks, the impedance drops sharply, usually to below 70% of the normal value.

The following are typical impedance values for **new** Rosemount Analytical electrodes (Electrodes stored over a period of time will have higher impedances). Upon installation you can read impedance in megohms under rES.

Sensor/Glass Type	Megohms @ 30°C (86°F) when new
• General purpose, HF, and high pH glass (GPLR)	30-100
• General Purpose High Temp (GPHT)	50-90
• Ruggedized glass	200-300

For more information on these diagnostics and troubleshooting, refer to Section 8.0.

NOTE

Impedance diagnostic faults are not activated until the setpoint is continuously exceeded for 30 seconds.

A. Calibration Warning. Display Mnemonic CAL. Under this mnemonic you can select the percent increase in impedance before a calibration warning fault appears. For example, if the impedance is 400 megohms and the setpoint is 20% (factory setting), a CAL warning will appear on the analyzer and it will go into a fault mode when the electrode ages to 480 megohms. This diagnostic will reset after a buffer calibration. Configurable range: 20-200%. A setting of zero disables this fault.

NOTE

The recommended process temperature range for the CAL diagnostic is 15-90°C (15-194°F.) (For low impedance glass it is 15-80°C (59-176°F). If ruggedized glass is used and the preamp is not in the sensor, the minimum recommended temperature is 35°C (95°F).

If you want to use this feature as a warning yet not upset your process, use Alarm 2 as a fault alarm (Refer to Section 4.2) and set the default current output to non (Refer to Section 4.8) to hold the output at the last process value.

You may also get this fault if:

1. The electrode or junction becomes excessively coated.
2. The electrode is not immersed in the process fluid. If the electrode continues to remain out of solution eventually the fault mnemonic OId will also appear on the display. See part C.

B. Cracked Glass Diagnostic. Display Mnemonic SHt. One way to tell that you have a broken or cracked glass electrode is that the analyzer will read a constant value (usually between 5.0-7.0 pH) in any process or buffer. The other way is to note the impedance value. When a crack occurs the mnemonic SHt will appear on the analyzer to indicate that the circuit is shorted, and the analyzer will go into a fault mode. Directions for SHt value determination:

SHt ~ 70% of normal rES

Configurable range: 5-600 megohms. A setting of zero disables this fault. Factory setting: 20 megohms.

NOTE

For low impedance glass, a broken electrode may not be detectable above 70-75°C (158-167°F).

C. Worn Out Electrode. Display Mnemonic OId. This mnemonic is used for programming the high impedance limit of the electrode. For example, if the setpoint is 1000 megohms (factory setting), and the impedance rises above this value, the mnemonic OId will appear on the analyzer and it will go into a fault mode. The electrode is either worn out, severely coated, or not immersed in the process fluid. Configurable range: 200-1999 megohms. A setting of zero disables this fault.

Recommended setpoints:

1. 1000 megohms for all glass except ruggedized
2. 1300 meghoms for ruggedized glass

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4.6.1 pH Electrode Diagnostics Setup

1. Enter the Set Menu by pressing the **ACCESS** key twice.
2. **SCROLL** (↑) until ı nP appears on the display and **SELECT**.
3. on or oFF will display. If necessary, **SCROLL** (↑) to the desired mnemonic then **ENTER**. on activates the diagnostics features.
4. If oFF is entered you can press the **ENTER** key to return to the main set menu or press the **pH** key to read pH.

   If on is entered, the display will show rES. Proceed to Step 5.
5. **SCROLL** (↑) to display rES, CAL, SHt, or OI d, then **SELECT** the desired item. rES is a read only function. If CAL, SHt, or OI d is selected, the right most digit of the Numeric Display will flash to indicate that the value can be changed.
6. Use the **SCROLL** (↑) and **SHIFT** (←) keys to change the value, if desired.
7. **ENTER** the value into memory.
8. Press **ENTER** to return to the main Set Menu.

4.7 SOLUTION TEMPERATURE COMPENSATION AND ISOPOTENTIAL POINT (Model 1054B pH only).

Display Mnemonic ı SO. Used for applications where the process' isopotential point (ı PH) and temperature coefficient (tCO) are not standard. For normal pH measurements these values should be: rPH = 7.00 (normal process pH), ı PH = 7.00 pH, tCO = 0.00 pH/°C. *These values should only be changed for special applications*.

Solution temperature compensation is designed to correct for changes in the actual pH of a solution caused by changes in dissociation with temperature. During standardization (Section 5.4), if the sample pH is greater than about 6.5 and the lab test is run at a substantially different temperature than the process, determine a value for tCO in pH/°C and enter that value. The tCO should be determined over as narrow a temperature operating range as possible.

The isopotential point is the pH value at which temperature changes do not affect the pH reading.

The analyzer method requires the user to enter the normal process pH (rPH) and the temperature coefficient (tCO), then the isopotential point (ı PH) will be calculated. Conversely, entering the normal process pH and the isopotential point causes the temperature coefficient to be calculated.

4.7.1 pH Measurement in High Purity Water with Ammonia Present.

The special characteristics of this measurement require changing isopotential pH value and temperature coefficient used by the Model 1054B pH. The reference pH (rPH) is the user's normal process pH. The isopotential pH value (ı PH) of high purity water with ammonia is 16.84 pH. The temperature coefficient tCO is – 0.033 pH/°C.

4.7.2 Isopotential Point Set Up (ı SO).

1. Enter Set Mode by pressing the **ACCESS** key twice.
2. **SCROLL** (↑) to display ı SO and **SELECT**.
3. **SCROLL** (↑) to the desired menu item and **SELECT.** The Numeric Display will flash.
4. **SCROLL** (↑) and **SHIFT** (←) to display the desired value and **ENTER** it into memory.
5. Repeat Steps 3 and 4 as required.
6. Press the **ENTER** key to return to the Set Menu.

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4.8 DEFAULTS. Display Mnemonic dFt. This item is used to set the configuration of relays and output default conditions during fault or hold status. See Table 8-1 for a listing of the possible fault conditions which can be diagnosed by the analyzer.

A. Relay 1 and 2. Display Mnemonic rL 1 and rL2. During a fault or hold condition the relays can be set to activate on, deactivate oFF, or remain in the state determined by the last process value non. See Table 4-3.

B. Current Output. Display Mnemonic Cur. The current output is held at the last process value non or goes to a specified value in mA cur during a fault or hold condition.

C. Fault History. Display Mnemonic SH0. **SELECT** this item will sequence the display through all faults detected in most recent fault mode. Press the **SCROLL** (↑) key once for previous fault mode list. Pressing **ACCESS** will clear SH0 history.

4.8.1 Default Setup (dFt).

1. Enter Set Mode by pressing the **ACCESS** key twice.
2. **SCROLL** (↑) until dFt appears on the display.
3. **SELECT** to move to the next menu level. rL 1 will display.
4. **SCROLL** (↑) then **SELECT** desired item.
5. Display will show next item selection. **SCROLL** (↑) and **ENTER** desired item.
6. Repeat Steps 4 and 5 as required for other default settings rL2 and Cur. If cur is selected for Cur, press **ENTER**, then use the **SCROLL** (↑) and **SHIFT** (←) keys to enter the desired current value for a fault or hold condition.
7. Press the **ENTER** key to return to Set Menu.

TABLE 4-3. Relay States for Various Analyzer Conditions and Alarm/Default Configurations

Set menu default (dFt) setting rL 1 rL2	ANALYZER CONDITION								
	NORMAL			HOLD			FAULT		
	Set men AL 1 AL2 setting			Set menu AL 1 AL2 setting			Set menu AL 1 AL2 setting		
	On	OFF	FLt (Alarm 2 only)	On	OFF	FLt (Alarm 2 only)	On	OFF	FLt (Alarm 2 only)
on	Proc. det.	–	–	+	–	–	+	–	+
oFF	Proc. det.	–	–	–	–	–	–	–	+
non	Proc. det.	–	–	Proc. det.	–	–	Proc. det.	–	+

Proc. det.: Alarm state is determined by the process value
- **+ :** Relay will activate
- **– :** Relay will not activate

Example: If you want the analyzer to activate relay 1 in hold mode during buffer calibration, set AL 1 to On in Section 4.2, and set rL 1 to on.

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4.9 AUTOMATIC BUFFER MODE (1054B pH only). Display Mnemonic AbF. Software selectable on or oFF. **Factory setting is** on. With the oFF setting, calibration is performed according to Section 5.3.2, without automatic recognition and temperature compensation of the buffers.

The automatic buffer calibration feature (on setting) provides automatic recognition of up to three of the buffers listed below (selectable in Section 5.3.1). In addition, each buffer selection incorporates a temperature curve from 0-50°C so that the user does not need to determine the correct buffer pH which corresponds to the buffer temperature (for best accuracy in extreme temperature environments).

The stored buffer-temperature curves were generated from reference data according to NBS (National Bureau of Standards - U.S.), DIN 19266 (Germany), BSM (British Standards Method), and JIS 8802 (Japan) standards. The buffers are supplied by a wide variety of vendors.

NOTE

If any buffers other than those listed here will be used (such as some Fisher or Ingold buffers), the AbF setting should be oFF and calibration instructions followed in Section 5.3.2.

4.9.1 Automatic Calibration Setup.

1. Enter the Set mode by pressing the **ACCESS** key twice.
2. **SCROLL** (↑) until AbF appears on the display.
3. Press **SELECT.** on or oFF will be displayed.
4. Press **SCROLL** (↑) if the desired item is not displayed. Then press **ENTER**. You will be returned to the set menu.

TABLE 4-4. Buffer Standards

Buffer Value at 25°C	Standards Referenced	Buffer Composition	Factory Selection
1.68	NBS, DIN 19266, JIS 8802	0.05M K tetroxalate	
3.56	NBS, BSM	KH tartrate (sat'd @ 25°C)	
3.78	NBS	0.05M KH_2 citrate	
4.01	NBS, DIN 19266, BSM, JIS 8802	0.05M KH Phthalate	*
4.64	BSM	0.1M HOAc 0.1M NaOAc	
6.86	NBS, DIN 19266, BSM, JIS 8802	0.025M KH_2PO_4 0.025M Na_2HPO_4	*
7.41	NBS, JIS, 8802	0.0087M KH_2PO_4 0.0302M KH_2HPO_4	
9.18	NBS, DIN 19266, BSM, JIS 8802	0.01M $Na_2B_4O_7$	*
10.01	NBS, BSM, JIS, 8802	0.025M $NaHCO_3$ 0.025M Na_2CO_3	
12.45	NBS, DIN 19266	Ca $(OH)_2$ (sat'd @ 25°C)	

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4.10 ALARM SETPOINT. The alarm setpoints should be adjusted after completing the configuration procedure as outlined in Sections 4.2 to 4.9.

1. Press the **PV** key to ensure that the analyzer is not in Set Mode.

2. Press the **ALARM 1** or **ALARM 2** key. SP 1 or SP2 will show briefly, followed by the Alarm 1 or Alarm 2 setpoint.

NOTE

If the alarm is set to OFF or FAULT (Alarm 2 only), the analyzer will display OFF or FLt respectively (Refer to Section 4.2.2, Alarm Setup).

NOTE

Alarm logic may be changed from normally open (N.O.) to normally closed (N.C.) by cutting circuits on the power supply PCB (W-5, W-7, W-9) and adding jumpers (W-4, W-6, W-8).

3. **SELECT** to adjust the value. The display will acknowledge briefly with AdJ followed by the Numeric Display with digit flashing.

4. **SCROLL** (↑) and **SHIFT** (←) to display the desired value.

5. **ENTER** value into memory.

6. Repeat Steps 2 to 5 for the second setpoint.

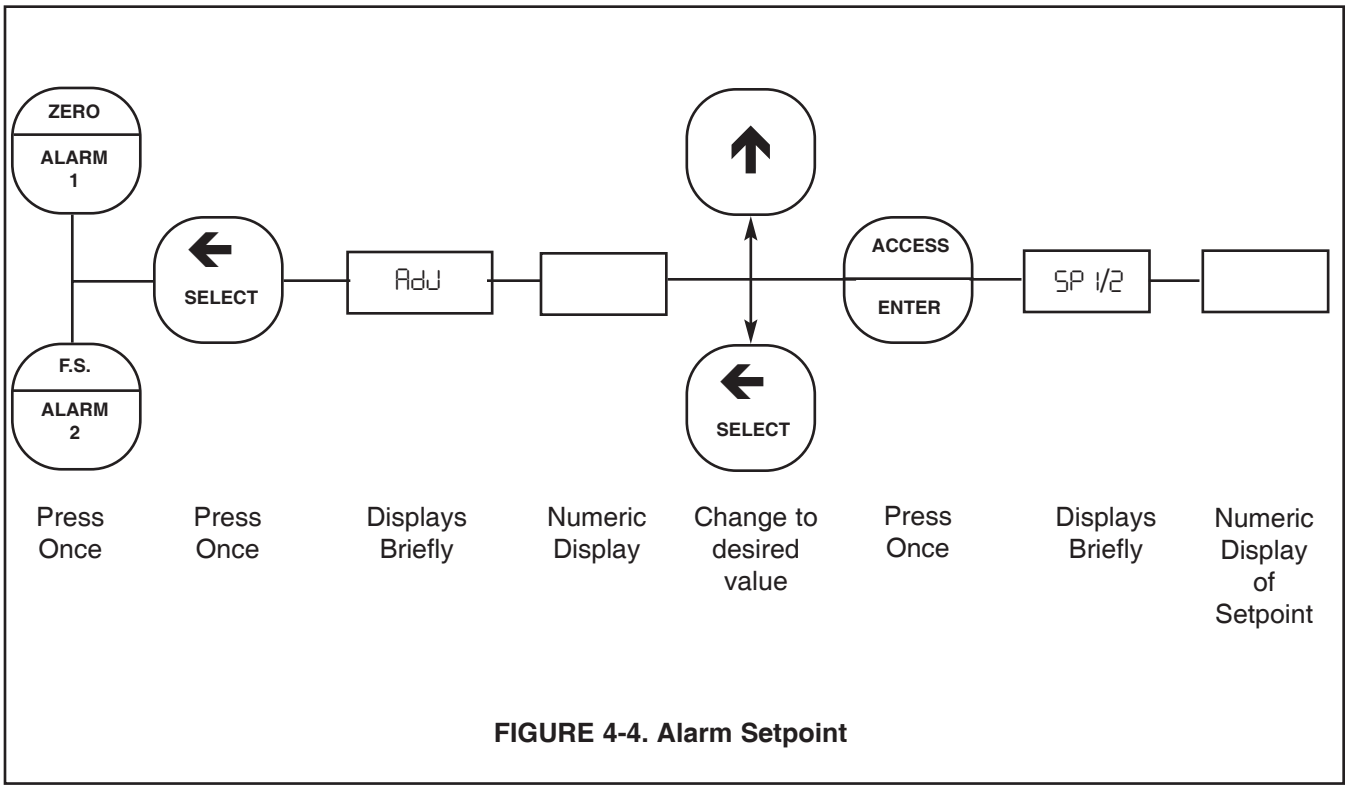


FIGURE 4-4. Alarm Setpoint

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4.11 OUTPUT SCALE EXPANSION. This section should be followed if it is desired to scale the current output to an operating range other than the factory setting of 0-14 pH full scale. The output zero and full scale value should be adjusted after completing the configuration procedure as outlined in Sections 4.2 to 4.9.

A. Zero Point (0 mA or 4 mA)

1. Press the **PV** key to ensure that the analyzer is not in Set Mode.
2. Press the **ALARM 1** key twice. The display will show LO briefly then display ZERO point.
3. **SELECT** to adjust the value. The display will acknowledge briefly with AdJ followed by the Numeric Display with digit flashing.
4. **SCROLL** (↑) and **SHIFT** (←) to display the desired value.
5. **ENTER** value into memory. The display will show LO and display the entered value.

B. Full Scale (F.S.) Point (20 mA)

1. Press the **PV** key to ensure that the analyzer is not in Set Mode.
2. Press the **ALARM 2** key twice. The display will show HI briefly then display FULL SCALE point.
3. **SELECT** to adjust the value. The display will acknowledge briefly with AdJ followed by the Numeric Display with digit flashing.
4. **SCROLL** (↑) and **SHIFT** (←) to display the desired value.
5. **ENTER** value into memory. The display will show HI and display the entered value.

NOTE

For a reverse output, enter the higher value for zero, and the lower value for the Full Scale.

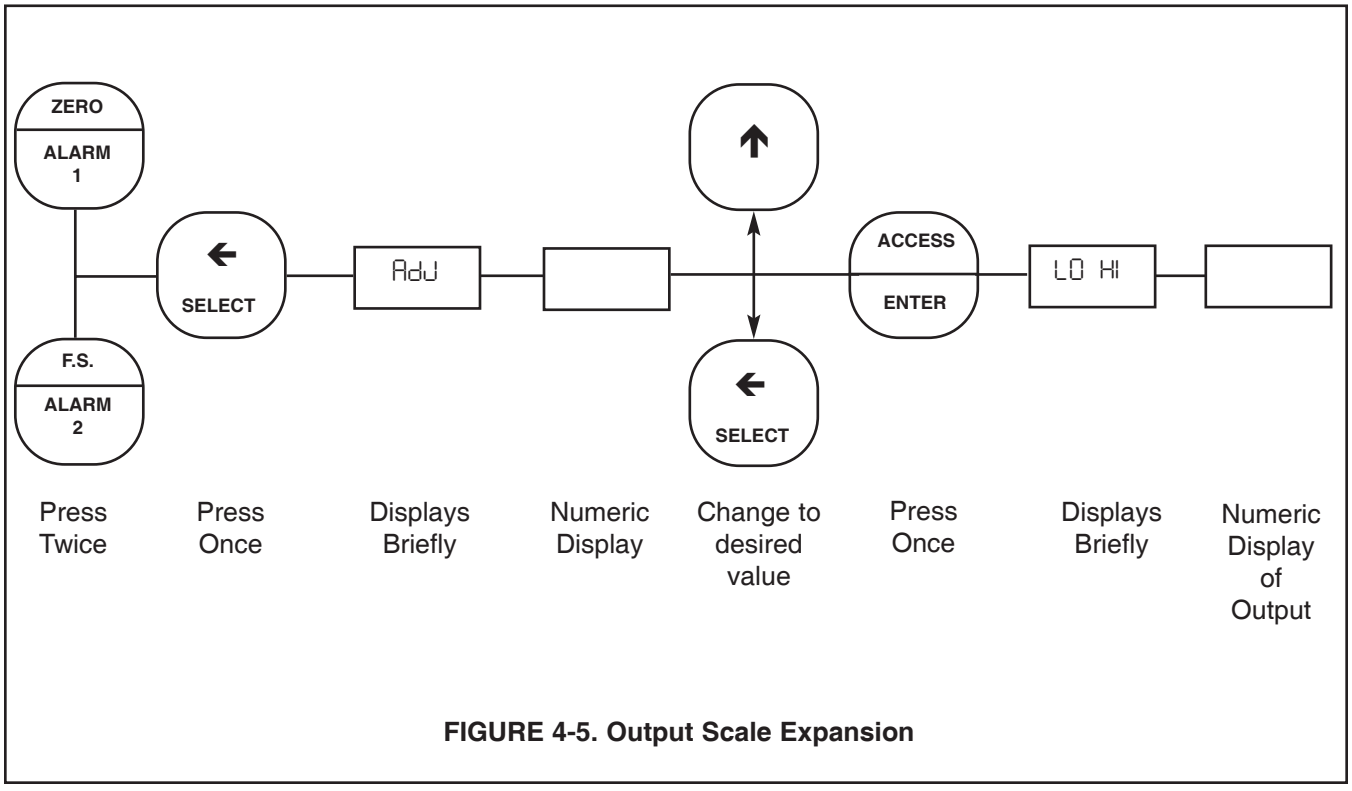


FIGURE 4-5. Output Scale Expansion

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4.12 SIMULATE CURRENT OUTPUT. The output can be simulated to check the operation of devices such as valves, pumps, or recorders. The output can be simulated in either current (mA) or percent of full scale, depending on how the output display, d-O, was configured in Section 4.5 (Refer to Figure 4-6).

A. Simulate Output in Percent SiP. The output can be simulated in percent if d-O in Section 4.5 was configured to display percent Pct.

1. Press the **PV** key once to insure that the analyzer is not in the Set Mode.
2. Press **OUTPUT** key twice. The display will show Pct briefly, then display the output value in percent of full scale.
3. Press the **SELECT** to simulate the output. The display will briefly acknowledge with SiP followed by the Numeric Display with digit flashing.
4. **SCROLL** (↑) and **SHIFT** (←) to display the desired value.
5. **ENTER** value into memory. The display will show Pct and display the entered value. Also, the display will flash to acknowledge that the analyzer is placed on hold HLd.
6. To remove the analyzer from hold, press the **HOLD** key twice. The hold flag on the display will be removed and the display will stop flashing.

B. Simulate Output in Current SiC. The output can be simulated in mA units if d-O in Section 4.5 was configured to display current doc.

1. Press the **PV** key once to ensure that the analyzer is not in the Set Mode.
2. Press the **OUTPUT** key twice. The display will show doc briefly, then display the output value in mA.
3. Press **SELECT** to simulate the output. The display will briefly acknowledge with SiC followed by the Numeric Display with digit flashing.
4. **SCROLL** (↑) and **SHIFT** (←) to display the desired value.
5. **ENTER** value into memory. The display will show doc and display the entered value. Also, the display will flash to acknowledge that the analyzer is placed on hold HLd.
6. To remove the analyzer from hold, press the **HOLD** key twice. The hold flag on the display will be removed and the display will stop flashing.

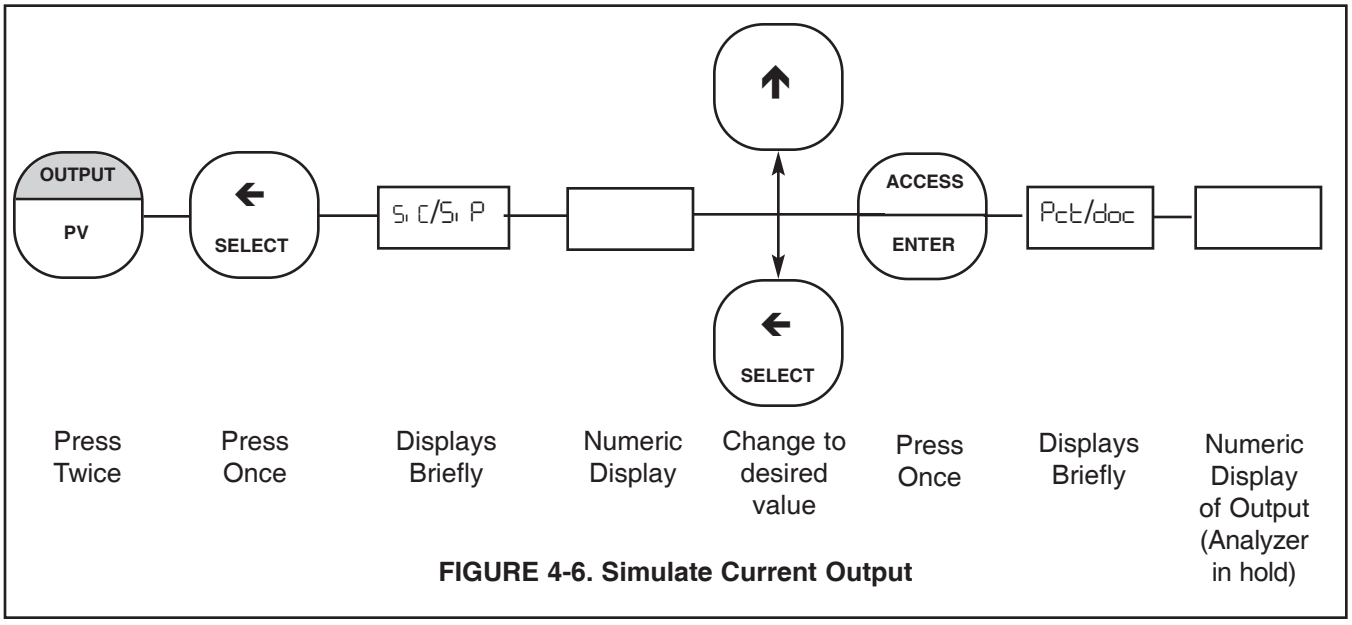


FIGURE 4-6. Simulate Current Output

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SECTION 5.0
START-UP AND CALIBRATION

5.1 START-UP AND CALIBRATION. Calibration and operation of the Model 1054B should begin only after completion of configuration of the analyzer. The sensor must be wired to the Model 1054B for calibration.

5.2 TEMPERATURE CALIBRATION. For accurate temperature correction, the temperature reading may need adjusting. The following steps should be performed with the sensor in a grab sample or in the process. For the best accuracy, the standardization should be performed at or near the process temperature.

1. Observe the analyzer temperature reading by pressing the **TEMP** key. Allow the reading to stabilize to insure that the sensor has acclimated to the process temperature.

2. Compare the reading to a calibrated temperature reading device. If the reading requires adjusting, proceed to Step 3.

3. Press the **TEMP** key then the **SELECT** key to correct the temperature display. The analyzer will display AdJ briefly, then the Numeric Display will show with digit flashing.

4. **SCROLL** (↑) and **SHIFT** (←) to key in the correct value and **ENTER** it into memory. Proceed to Section 5.3.

5.3 BUFFER CALIBRATION (1054B pH only). The two buffer calibration will calculate the slope (efficiency) of the pH sensor and standardize the reading on the second buffer (computed slope limits: 47.3 to 59.9 mV/pH). The analyzer has been set at the factory for automatic calibration. If the software setting has been changed to disable this feature in Section 4.9 proceed to Section 5.3.2. Otherwise, proceed to Section 5.3.1.

5.3.1 Automatic Calibration

1. Press the **HOLD** key twice to place the analyzer in hold.
2. Obtain two buffer solutions with values at least two pH units apart. Unopened buffers have a shelf life of about a year and once opened should generally not be reused because of possible contamination.
3. Shake the sensor down to remove entrapped air bubbles from the glass electrode tip.
4. Place the sensing portion of the pH sensor into a beaker containing the first buffer solution. Allow the pH reading to stabilize. This may take several minutes, as the pH sensor may need to cool down to the buffer temperature. If you don't wait long enough you may get a slope error.
5. Press the **CAL** key. Ab1 will flash briefly, followed by a flashing pH buffer value at 25°C (If Ab2 appears, press the **CAL** key again for Ab1).
6. If the value displayed is not the value of your buffer at 25°C (see Section 4.9) press the **SCROLL** (↑) key until your choice appears. **ENTER** the value.
7. Remove the sensor from the buffer, then rinse and dry it. Place it in the second buffer. Allow the pH reading to stabilize. This may take several minutes, as the pH sensor may need to cool down to the buffer temperature. If you don't wait long enough you may get a slope error.
8. Press the **CAL** key again. Ab2 will display briefly, followed by a flashing pH buffer value at 25°C. (If Ab1 appears, press the **CAL** key again for Ab2).
9. If the value displayed is not the value of your buffer @ 25°C, press the **SCROLL** (↑) key until your choice appears. **ENTER** the value.
10. Press the **HOLD** key twice again to remove the analyzer from hold.
11. In the future the selected buffers will be recognized by the analyzer and can be used for either Ab1 or Ab2.
12. For maximum accuracy, perform a process standardization after a buffer calibration (see Section 5.4). Also, you can track your electrode slope value after a buffer calibration to see how the electrode is aging (see Section 5.5).

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5.3.2 Calibration With Automatic Features Disabled.

1. Press the **HOLD** key twice to place the analyzer in hold.
2. Obtain two pH buffer solutions with values at least two pH units apart. Unopened buffers have a shelf life of about a year and once opened they should generally not be reused because of possible contamination.
3. Shake the sensor down to remove entrapped air bubbles from the pH glass electrode tip.
4. Place the sensing portion of the pH sensor into a beaker containing the first buffer solution.
5. Allow the pH reading to stabilize. Allow the pH reading to stabilize. This may take several minutes, as the pH sensor may need to cool down to the buffer temperature. If you don't wait long enough you may get a slope error. Then note the temperature and find the buffer value at that temperature. Buffer values at various temperatures are located on the label of most buffer bottles.
6. Press the **CAL** key once. bF1 will display briefly, followed by the Numeric Display with digit flashing. If bF2 displays, press the **CAL** key again.
7. **SCROLL** (↑) and **SHIFT** (←) to key in the buffer solution value, then **ENTER** it into memory.
8. Remove the sensor from the buffer, rinse and dry it.
9. Place the sensing portion of the pH sensor into a beaker containing the second buffer solution.
10. Allow the pH reading to stabilize. See note in step 5.
11. Press the **CAL** key once. bF2 will display briefly, followed by the Numeric Display with digit flashing. If bF1 displays, press the **CAL** key again.
12. **SCROLL** (↑) and **SHIFT** (←) to key in the buffer solution value, then **ENTER** it into memory.
13. Press the **HOLD** key twice to remove the analyzer from hold.
14. For maximum accuracy, perform a process standardization after a buffer calibration (see Section 5.4). Also, you can track your electrode slope value after a buffer calibration to see how the electrode is aging (see Section 5.5).

5.4 pH STANDARDIZATION (1054B pH only). For maximum accuracy, the sensor should be standardized on-line or in a process grab sample after a buffer calibration to account for the sensor junction potential. Sensor standardization will not calculate the sensor's slope.

1. Take a grab sample which is as close to the sensor as possible. Write down the value the analyzer is reading at this time.
2. Using a calibrated pH instrument with automatic temperature compensation, determine the pH of the process or grab sample. The calibration is best performed at the process temperature. Write down this value. (If the sample pH is greater than about 6.5 and the lab sample is run at a substantially different temperature than the process, see Section 4.7).
3. Before entering the standardized value, compare the value the analyzer is reading now to the value in Step 1. Add this change to the reference value obtained in Step 2. This accounts for the change while the grab sample is being measured.
4. Press the **pH** key once, then press the **SELECT** key. Std will show followed by the Numeric Display with digit flashing.
5. **SCROLL** (↑) and **SHIFT** (←) to key in the corrected reference pH value determined in Step 3 then **ENTER** it into memory.

5.5 pH GLASS SLOPE. The slope/efficiency of the glass electrode can be displayed or entered directly (if known) without buffer calibrating (A new electrode has a slope of about 59 mV/pH. As electrode ages the slope will decrease to about 47-49 mV/pH).

1. Press the **CAL** key twice, then the **SELECT** key once.
2. **SCROLL** (↑) and **SHIFT** (←) to key in the correct value then **ENTER** it into memory.

5.6 SENSOR MAINTENANCE. Before performing buffer checks or maintenance of the sensor, the analyzer should be placed in hold. This will place the current output and relays in the state set in the default setup (Section 4-8). Press the **HOLD** key twice. The hold flag will show to indicate the hold condition. Always calibrate after cleaning or repair of the pH sensor. (Refer to Sections 5.1.2 and 5.1.3.) After installing the sensor back in the process, press the **HOLD** key twice again to remove the analyzer from hold.

NOTE

To clean the electrode, rinse with distilled water or diluted acid/base, then gently dry with a clean tissue. The electrode should not be rubbed or abraded because this increases the electrostatic forces and thus the response time of the electrode, and it also rapidly ages the delicate electrode gel layer. If possible, increase the stirring or flow velocity past the electrode rather than rubbing or brushing it.

For any additional instructions, please refer to the appropriate sensor instruction manual.

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5.7. STANDARD ORP SOLUTION (1054B ORP only). Procedures are given below for making (2) types of standard ORP solutions with known oxidation reduction potentials. Either one will be used to calibrate the ORP system following the steps at the end of the section.

CAUTION

The following recipes contain chemical components that require protective measures and precautions- Wear protective eye gear and clothing while working with these solutions.

A. QUINHYDRONE SOLUTION. Saturated quinhydrone is a commonly used ORP standard solution. It is made by adding a few crystals of quinhydrone to either pH 4 or pH 7 buffer. Quinhydrone is only slightly soluble, so a few crystals are all that are needed. The resulting solution will be yellow-colored. The millivolt potentials, measured with a clean platinum electrode, should be within ± 20 millivolts of the values shown. Solution temperature must be noted to assure accurate interpretation of results. The ORP value of saturated quinhydrone solution is not stable over long periods of time; therefore, these solutions should be made up fresh each time they are used.

TABLE 5-1

ORP of Saturated Quinhydrone Solution (in Millivolts)

	pH 4			pH 7		
Temperature °C	**20**	**25**	**30**	**20**	**25**	**30**
Millivolt Potential	**268**	**264**	**260**	**94**	**87**	**80**

B. FERRIC-FERROUS AMMONIUM SULFATE SOLUTION. This standard ORP solution is not as easy as the quinhydrone solution to prepare, but is much more stable and will maintain its millivolt value for approximately one year when stored in a glass container.

To prepare the solution, dissolve 39.2 grams of reagent grade ferrous ammonium sulfate

$$[Fe\ (NH_4)_2(SO_4)_2 \bullet 6H_2O]$$

and 48.2 grams or reagent ferrous ammonium sulfate

$$[FeNH_4(SO_4)_2 \bullet 12H_2O]$$

in approximately 700 milliliters of water (distilled water is preferred, but tap water is acceptable). Slowly and carefully add 56.2 milliliters of concentrated sulfuric acid. Add sufficient water to bring the total solution volume up to 1000 milliliters.

This solution (ferric-ferrous ammonium sulfate) will produce a nominal ORP of 476 ± 20 mV at 25°C when used with a saturated KCl/AgCl reference electrode and a platinum measuring electrode. Some variance in mV values is to be expected due to the large liquid reference junction potentials which can arise when measuring this strongly acidic (and concentrated) solution. However, if the measuring electrodes are kept clean calibrations can be achieved.

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5.8. ORP STANDARDIZATION (1054B ORP only). For maximum accuracy, the sensor should be standardized in the ORP standard process or process grab sample.

Step 1: Ensure that the Model 1054B is in hold (Hold flag showing). If not, Press the **HOLD** key twice.

Step 2: Using a ORP standard, determine the ORP of the solution.

Step 3: Ensure that the sensor's measurement portion is in the process or grab sample.

Step 4: Allow the reading to stabilize.

Step 5: Press the **PV** or **CAL** key once, then Press the **SELECT** key. Std will show followed by the Numeric Display with digit flashing.
Step 6: SCROLL (↑) and **SHIFT** (←) to display the proper ORP value then **ENTER** it into memory.

Step 7: Press the **HOLD** key twice to remove the Model 1054B from hold. The 1054B ORP is now ready for operation.

5.9. SENSOR MAINTENANCE. Before preforming maintenance or repair of the sensor, the Model 1054B should be placed in hold. This will place the current output and relays in the state set in the default setup. Press the **HOLD** key twice. The hold flag will show to indicate the hold condition. Always calibrate (Section 5.5) after cleaning or repair of the pH sensor.

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SECTION 6.0
KEYBOARD SECURITY

6.1 KEYBOARD SECURITY. Display Mnemonic COd. Select this feature to display the user defined security code. Any three digit number may be used for this code. 000 will disable the security feature. This item is used to prevent accidental changes to the calibration and configuration of the analyzer. When activated, the analyzer will allow all read functions to read normally. If an attempt is made to change a value, LOC will display followed by the Numeric Display ready for the code to be entered. A proper code will unlock the analyzer and will return to the last function attempted. Any incorrect value will result in bAd briefly displaying. The analyzer will then return to numeric display and await the entry of the code. Once unlocked, the analyzer will allow access to all functions until the analyzer is either powered down or no keystrokes are made for a period of 2 minutes. If the code should be forgotten, pressing and holding the **ACCESS** key for 5 seconds will result in display of the code. Releasing the **ACCESS** key, then pressing **ENTER** will unlock the analyzer.

6.1.2 Keyboard Security (COd).

1. Enter Set Mode by pressing **ACCESS** key twice.
2. **SCROLL** (↑) until COd appears on the display.
3. **SELECT**.
4. **SCROLL** (↑) and **SHIFT** (←) to display the desired value, then **ENTER** it into memory.

NOTE

Entering 000 disables the keyboard security.

NOTE

Security feature will not activate until 2 minutes without keyboard activity or power is removed from the analyzer then restored.

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SECTION 7.0
THEORY OF OPERATION

7.1 THEORY OF OPERATION (pH). This section is a general description of how the Model 1054B pH operates. This section is for those users who desire a greater understanding of the analyzer's operation.

The measurement of the process' pH is accomplished by the use of two electrodes within the sensor. The glass electrode is pH sensitive and generates a high impedance millivolt potential directly proportional to the process pH. The reference electrode is a second half cell that completes the circuit via a liquid junction. The high impedance signal is preamplified at the sensor to allow a stable noise-free signal that can be transmitted up to 1,000 feet.

The Model 1054B pH also measures the process temperature via a platinum 100 ohm RTD imbedded in the sensor. Advanced circuitry is used to eliminate errors due to changes in cable resistance. The analyzer uses this temperature measurement to compensate for changes in the sensor millivolt output caused by temperature change.

7.2 THEORY OF OPERATION (ORP). This section is a general description of how the 1054B ORP operates. The selected sensor generates a voltage dependent on the oxidation reduction potential (ORP) measured in the process. This voltage signal is fed into a high-impedance amplifier (preamp) prior to transmission to the Model 1054A ORP. The high impedance and low voltage of the sensor make a preamplifier necessary for a reliable ORP signal to reach the transmitter.

The analog signal from the preamp is digitized by the signal conditioning circuit, becoming a digital signal (proportional to the ORP) that can be read by the CPU. This digital signal is then used to calculate an ORP value.

The CPU also contains an on board electrically erasable and programmable read-only memory (EEPROM) which maintains memory during power outages. The CPU is supported by read-only memory (ROM) containing the operating instructions for the CPU.

The CPU controls the operation of the liquid crystal display, Alarm 1, Alarm 2 and also creates a pulse width modulated (PWM) signal. The PWM signal is converted by the isolated output circuit (located on the power board) to a selectable current output (0 to 20mA or 4 to 20mA).

The keyboard is a matrix of on/off switch positions that the CPU scans periodically to determine if a button is depressed. The CPU reacts when a key is depressed to display a different parameter or to modify its function in some manner. Even though the ORP measurement is not temperature sensitive, process temperature is accurately measured at the ORP sensor through the use of a PT-100 RTD and is displayed by the 1054A ORP over the range of -15 to135°C. For a more accurate temperature reading the analyzer temperature indication may be standardized to the process temperature by pressing the **TEMP** key and adjusting the indicated value.

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SECTION 8.0
DIAGNOSTICS AND TROUBLESHOOTING

8.1 DIAGNOSTICS. The Model 1054B has a diagnostic feature which automatically searches for fault conditions that would cause an error in the measured pH/ORP value. If such a condition occurs, the current output and relays will act as configured in Section 4.8 and the fault flag and display will flash. A fault code mnemonic will display at frequent intervals. If more than one fault condition exists, the display will sequence the faults at one second intervals. This will continue until the cause of the fault has been corrected. Display of fault mnemonics is suppressed when in Set Mode. Selecting the SHO item will display a history of the two most recent fault conditions unless SHO was cleared. Refer to Section 4.8C.

NOTE

If the analyzer is in hold and a fault occurs, the mnemonic HLd will display during the fault sequence.

8.1.1 Fault Mnemonics. Table 8-1 lists the fault mnemonics and describes the meaning of each.

8.1.2 Temperature Compensation. Table 8-2 is a ready reference of RTD resistance values at various temperatures. These are used for test and evaluation of the sensor.

NOTE

Ohmic values are read across the RTD element and are based on the manufacturer's stated values (±1%). Allow enough time for the RTD element to stabilize to the surrounding temperature.

TABLE 8-1. Fault Mnemonics

Display	Description	Display	Description
CAL	**Warning to calibrate or clean sensor.**	Old	**Electrode worn out, coated, or non-immersed.**
CHS	**ROM failure (check sum error) (bad ROM chip).**	SEn	**Sensor line error or wire length error.**
COP	**Computer not operating properly.**	SHt	**Glass electrode cracked or broken.**
EEP	**EEPROM write error (bad EEPROM chip).**	SLP	**Slope variance error.**
FAC	**Factory calibration required.**	tcH/trH	**High temperature compensation error.**
inH	**Input shorted.**	tcL/trL	**Low temperature or shorted RTD.**
inL	**Sensor miswired.**	Std	**Standardization error.**

TABLE 8-2. RTD Resistance Values

Temperature	Resistance
0 °C	100.00 ohms
10 °C	103.90 ohms
20 °C	107.79 ohms
30 °C	111.67 ohms
40 °C	115.54 ohms
50 °C	119.40 ohms
60 °C	123.24 ohms
70 °C	127.07 ohms
80 °C	130.89 ohms
90 °C	134.70 ohms
100 °C	138.50 ohms

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TABLE 8-3. Troubleshooting Guide 1054B pH

SYMPTOM	PROBLEM	ACTION
Fault code CAL.	1. Warning to calibrate sensor with buffers. Electrode is aging or coated. 2. Electrode is not in solution.	1. Calibrate with buffers (First clean if necessary.). 2. Immerse electrode in solution.
Fault code SHt. pH is a constant value in any buffer.rES value less than 70% of normal.	1. Glass electrode broken.	1. Replace electrode.
Fault code Old.	1. Electrode is worn out or coated. If electrode is worn out, SLP will also be low and the electrode sluggish. 2. Electrode is not in solution.	1. Replace or clean electrode as soon as possible. 2. Immerse electrode in solution.
E.n increasingly greater or less than zero mV at 7pH, with increased poisoning.	1. Reference becoming poisoned.	1. Replace reference or sensor. 2. Request a special triple junction sensor if necessary.
pH value locks up (no change of solutions in buffers).	1. Glass electrode cracked. 2. Coated glass electrode. 3. Junction plugged.	1. Replace glass electrode. 2. Clean glass electrode. 3. Replace junction.
1054B pH value not the same as grab sample of process.	1. Grab sample incorrect. 2. Unclear what is correct. 3. Analyzer out of calibration.	1. Re-evaluate sample technique and equipment. 2. Test with buffer solution. 3. Recalibrate per start-up and calibration section.
Fault code tcH/tcL.	1. Miswired or temperature out of range. 2. Open or shorted RTD.	1. Check wiring between the sensor and analyzer. Check process temp. 2. Replace RTD with new one.
Fault code i.nH or i.nL.	1. Open wire from preamplifier. 2. Bad preamplifier. 3. Defective CPU.	1. Check wiring between preamplifier and analyzer. 2. Replace preamplifier. 3. Replace CPU PCB.
Fault code SLP.	1. Defective electrode. 2. Improper buffer calibration. 3. Coated electrode. 4. Plugged liquid junction.	1. Replace electrode. 2. Recheck buffer accuracies. 3. Clean or replace electrode. 4. Replace junction.
Fault code SEn.	1. Open wire between sensor and analyzer . 2. Cable length has been exceeded Maximum length: 1000 ft. after preamp.	1. Repair wire. 2. Check wiring.
Fault code EEP.	1. Defective EEPROM.	1. Replace CPU PCB.
Fault code CHS.	1. Defective CPU.	1. Replace CPU PCB.
No alarm relay closure.	1. Defective power board. 2. Defective CPU.	1. Replace power PCB. 2. Replace CPU PCB.
No output current.	1. Defective output board. 2. Miswire.	1. Replace power PCB. 2. Check for short.
Low output current.	1. Circuit loading with excessive resistance on output.	1. Consult output loading limits 1054B pH specifications (600 ohms max load).

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TABLE 8-4. Troubleshooting Guide 1054B ORP

SYMPTOM	PROBLEM	ACTION
Change in ORP reading (value shrinking)	1. Old or coated glass electrode	1. Clean or replace glass electrode
ORP value locks up (no charge in reading)	1. Coated electrode	1. Replace electrode 2. Clean electrode
1054B ORP value not the same as grab sample of process	1. Grab sample incorrect 2. Unclear what is correct 3. 1054B out of calibration	1. Re-evaluate sample technique and equipment 2. Test with Quinhydrone or known solution 3. Recalibrate per start-up and calibration section
Fault code tcH/tcL	1. Miswire 2. Open or shorted RTD	1. Check wiring between the sensor and 1054B 2. Replace RTD with new one
Fault code ınH or ınL	1. Open wire from preamplifier 2. Bad preamplifier 3. Defective CPU	1. Check wiring between amplifier and 1054B 2. Replace preamplifier 3. Replace CPU PCB
Fault code Std	1. Ground loop offset (in process) 2. Voltage on the 1000 ft after preamp process	1. Check all input wiring 2. Recheck buffer accuracy
Fault code SEn	1. Open wire between sensor and 1054B 2. Maximum Cable length has been exceeded	1. Repair wire 2. Check wiring
Fault code EEP	1. Defective EEPROM	1. Replace CPU PCB
Fault code CHS	1. Defective CPU	1. Replace CPU PCB
No alarm relay closure	1. Defective power card 2. Defective CPU	1. Replace power PCB 2. Replace CPU PCB
No output current	1. Defective output board 2. Miswire	1. Replace power PCB 2. Check for short
Low output current	1. Circuit loading with excessive resistance on output	1. Consult output loading limits 1054B specs (600 ohms max)

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8.2 TROUBLESHOOTING. The Model 1054B Analyzer is designed with state-of-the-art microprocessor circuitry, making troubleshooting simple and direct. Subassembly replacement, i.e. printed circuit board replacement, is all that is usually required.

8.2.1 Installation Failure. If failure does occur, complete the following steps:

1. Check for a fault flag. If a fault condition exists, refer to Table 8-1 for the fault mnemonic explanation.
2. Check wiring connections for proper installation.
3. Refer to Troubleshooting Table 8-3 (pH) or Table 8-4 (ORP). The table is arranged with the most common problems listed first.

8.2.2 LCD/LED Display Test. Display Mnemonic dtS. Selecting this option will activate all the display segments. This item is used if a faulty display is suspected. Refer to Figure 3-1.

1. Enter Set Mode by pressing **ACCESS** key twice.
2. **SCROLL** (↑) until dtS appears on the display.
3. **SELECT.**

8.2.3 Software Version. Display Mnemonic UEr. Selection of this item will display the software revision level of the CPU. This number may be requested by factory service personnel if troubleshooting is required.

1. Enter Set Mode by pressing **ACCESS** key twice.
2. **SCROLL** (↑) until UEr appears on the display.
3. **SELECT.** (i.e., 2.0.6 displayed.)

8.2.4 Sensor Troubleshooting. In addition to the fault mnemonics that relate to a possible sensor problem (Tables 8-1 and 8-3), the 1054B pH can display the input in millivolts generated from the sensor. See Table 8-5 for how the millivolt input relates to pH. If the analyzer values do not agree within about 40 to 60 mV of those in the table, the analyzer has been incorrectly standardized for pH, the reference may be significantly poisoned, or some other significant problem exists. To read the millivolt input, go to Section 8.2.5.

For an additional diagnostics tool you can look at the rES impedance value as described in Section 4.6.

8.2.5 Electrode Input (1054B pH). Display Mnemonic Ei n. When selected, the analyzer displays the millivolt input from the sensor. The displayed value is not temperature corrected.

1. Press the **ACCESS** key twice. SEt will briefly display followed by Ei n. Not required if already in set menu.
2. **SELECT** this item to read the mV input.
3. Press the **PV** key to return to normal operation.

8.2.6 CPU Board Replacement. If there is a problem with the CPU board resulting in its replacement, specific procedures (included with the order) for calibrating the new board must be followed exactly or the microprocessor will be improperly programmed. Should this occur, it will be necessary to return the analyzer to the factory for reprogramming.

8.2.7 Power Board Replacement. If it becomes necessary to replace the power board, the CPU board will need to be recalibrated following specific procedures that are included with the power board. Failure to follow these procedures exactly will cause the microprocessor to be improperly programmed and require the return of the analyzer to the factory for reprogramming.

8.3 INSTRUMENT MAINTENANCE. To maintain the appearance and extend the life of the enclosure, it should be cleaned on a regular basis using a mild soap and water solution followed by a clean water rinse.

TABLE 8-5
Sensor Input to Analyzer Verses pH at Four Temperatures*

pH	Input to Analyzer in Millivolts			
	15°C (59°F)	25°C (77°F)	50°C (122°F)	80°C (176°F)
0	396	410	444	486
1	340	351	381	416
2	283	293	317	347
3	226	234	254	277
4	170	176	190	208
5	113.2	117.1	127.0	138.7
6	56.6	58.6	63.5	69.4
7	0	0	0	0
8	– 56.6	– 58.6	– 63.5	– 69.4
9	– 113.2	– 117.1	– 127.0	– 138.7
10	– 170	– 176	– 190	– 208
11	– 226	– 234	– 254	– 277
12	– 283	– 293	– 317	– 347
13	– 340	– 351	– 381	– 416
14	– 396	– 410	– 444	– 486

* These values do not apply for non-glass electrodes.

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TABLE 8-6. Replacement Parts

P/N	DESCRIPTION
22966-00	PCB, LCD Digital Display
23025-01	Panel Mounting Kit
23739-00	PCB Power Supply
23245-01	PCB, LED Digital Display
23740-00	PCB, Motherboard
23695-00	Keyboard Overlay, LCD Version, pH
23695-01	Keyboard Overlay, LED Version, pH
23665-00	PCB, CPU, pH, with electrode diagnostics
33469-00	Enclosure Body
33470-00	Enclosure, Rear Cover
32937-00	Gasket, Rear Cover
32938-00	Gasket, Panel
9100157	Fuse, .10A 250V, 3AB, Slo-Blow
9100160	Fuse, .250A 125V
9100189	Fuse, .750A 125V

TABLE 8-7. Accessories

P/N	DESCRIPTION
2001492	Stainless Steel Tag
23053-00	Mounting Bracket, 2-inch Pipe
23054-01	Mounting Bracket, Wall, with Junction box
23268-01	Heater, 115 VAC, 50/60 Hz, 1054B (Code 20 Only)
23268-02	Heater, 230 VAC, 50/60 Hz, 1054B (Code 20 Only)
23363-00	Preamplifier, Pt 100
23508-00	Preamplifier, Integral Pt100, For Wall Mount Enclosure

TABLE 8-8. Ordering Information

The Model 1054B Microprocessor Analyzer: Housed in a corrosion resistant, weatherproof enclosure and operates on either 115 or 230 VAC, 50/60 Hz power. Standard features include digital display, isolated current output, dual alarms, and automatic or manual temperature compensation.

Model	Description
1054B	Microprocessor Analyzer (3.5 lb/1.5kg)
Code	Measurement
pH	pH
ORP	Oxidation Reduction Potential
Code	Display
01	LCD Display
02	LED Display
Code	Options
20	Wall Mount Enclosure

RECOMMENDED SENSORS FOR ORP:

Model 300 Retractable
Model 330B Flow Through
Model 381 Insertion/Submersion/Flow
Model 385 Retractable
Models 389/399 Disposable
Model 396P TUpH Disposable
Model 396R TUpH Retractable

RECOMMENDED SENSORS FOR pH:

Model 300 Retractable
Model 320B Flow Through
Model 320HP High Purity
Model 328A Steam Sterilizable
Model 371 EuroSenz
Model 381 Insertion/Submersion/Flow
Model 385 Retractable
Models 389/399 Disposable
Models 396/396P TUpH Disposable
Model 396R TUpH Retractable
Model 397 Quik-Loc

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SECTION 9.0
RETURN OF MATERIALS

9.1 GENERAL. To expedite the repair and return of instruments, proper communication between the customer and the factory is important. A return material authorization number is required. Call (949) 757-8500. The Return of Materials Request form is provided for you to copy and use in case the situation arises. The accuracy and completeness of this form will affect the processing time of your materials.

9.2 WARRANTY REPAIR. The following is the procedure for returning products still under warranty.

1. Contact the factory for authorization.
2. Complete a copy of the Return of Materials Request form as completely and accurately as possible.
3. To verify warranty, supply the factory sales order number or the original purchase order number. In the case of individual parts or sub-assemblies, the serial number on the mother unit must be supplied.
4. Carefully package the materials and enclose your Letter of Transmittal and the completed copy of the Return of Materials Request form. If possible, pack the materials in the same manner as it was received.

IMPORTANT

Please see second section of Return of Materials Request Form. Compliance to the OSHA requirements is mandatory for the safety of all personnel. MSDS forms and a certification that the instruments have been disinfected or detoxified are required.

5. Send the package prepaid to:

   Rosemount Analytical Inc.
   2400 Barranca Parkway
   Irvine, CA 92606

   Attn: Factory Repair

   Mark the package:

   Returned for Repair RMA No. _____

   Model No. _____

9.3 NON WARRANTY REPAIR.

1. Contact the factory for authorization.
2. Fill out a copy of the Return of Materials Request form as completely and accurately as possible.
3. Include a purchase order number and make sure to include the name and telephone number of the right individual to be contacted should additional information be needed.
4. Do Steps 4 and 5 of Section 9.2.

NOTE

Consult the factory for additional information regarding service or repair.

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WARRANTY

Seller warrants that the firmware will execute the programming instructions provided by Seller, and that the Goods manufactured or Services provided by Seller will be free from defects in materials or workmanship under normal use and care until the expiration of the applicable warranty period. Goods are warranted for twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller, whichever period expires first. **Consumables, such as glass electrodes, membranes, liquid junctions, electrolyte, o-rings, catalytic beads, etc., and Services are warranted for a period of 90 days from the date of shipment or provision.**

Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. Buyer agrees that Seller has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products.

If Buyer discovers any warranty defects and notifies Seller thereof in writing during the applicable warranty period, Seller shall, at its option, promptly correct any errors that are found by Seller in the firmware or Services, or repair or replace F.O.B. point of manufacture that portion of the Goods or firmware found by Seller to be defective, or refund the purchase price of the defective portion of the Goods/Services.

All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources, unsuitable environmental conditions, accident, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense. Seller shall not be obligated to pay any costs or charges incurred by Buyer or any other party except as may be agreed upon in writing in advance by an authorized Seller representative. All costs of dismantling, reinstallation and freight and the time and expenses of Seller's personnel for site travel and diagnosis under this warranty clause shall be borne by Buyer unless accepted in writing by Seller.

Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by an authorized representative of Seller. Except as otherwise expressly provided in the Agreement, THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE GOODS OR SERVICES.

RETURN OF MATERIAL

Material returned for repair, whether in or out of warranty, should be shipped prepaid to:

Emerson Process Management
Liquid Division
2400 Barranca Parkway
Irvine, CA 92606

The shipping container should be marked:

Return for Repair
Model _____

The returned material should be accompanied by a letter of transmittal which should include the following information (make a copy of the "Return of Materials Request" found on the last page of the Manual and provide the following thereon):

1. Location type of service, and length of time of service of the device.
2. Description of the faulty operation of the device and the circumstances of the failure.
3. Name and telephone number of the person to contact if there are questions about the returned material.
4. Statement as to whether warranty or non-warranty service is requested.
5. Complete shipping instructions for return of the material.

Adherence to these procedures will expedite handling of the returned material and will prevent unnecessary additional charges for inspection and testing to determine the problem with the device.

If the material is returned for out-of-warranty repairs, a purchase order for repairs should be enclosed.

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