ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Emerson / Rosemount Analytical 1055-01-10-S1-DM* at our website: *Click HERE*

Instruction Manual
PN 51-1055pHC/rev.K
February 2006

Model Solu Comp® II

Dual Input pH/Conductivity Analyzer



ROSEMOUNT® Analytical

EMERSON™ Process Management

ESSENTIAL INSTRUCTIONS

READ THIS PAGE BEFORE PROCEEDING!

Your purchase from Rosemount Analytical, Inc. has resulted in one of the finest instruments available for your particular application. These instruments have been designed, and tested to meet many national and international standards. Experience indicates that its performance is directly related to the quality of the installation and knowledge of the user in operating and maintaining the instrument. To ensure their continued operation to the design specifications, personnel should read this manual thoroughly before proceeding with installation, commissioning, operation, and maintenance of this instrument. If this equipment is used in a manner not specified by the manufacturer, the protection provided by it against hazards may be impaired.

- 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.
- Ensure that you have received the correct model and options from your purchase order. Verify that this manual covers your model and options. If not, call 1-800-854-8257 or 949-757-8500 to request correct manual.
- For clarification of instructions, contact your Rosemount representative.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Use only qualified personnel to install, operate, update, program and maintain the product.
- Educate your personnel in the proper installation, operation, and maintenance of the product.
- Install equipment as specified in the Installation section of this manual. Follow appropriate local and national codes. Only connect the product to electrical and pressure sources specified in this manual.
- Use only factory documented components for repair. Tampering or unauthorized substitution of parts and procedures can affect the performance and cause unsafe operation of your process.
- All equipment doors must be closed and protective covers must be in place unless qualified personnel are performing maintenance.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by it against hazards may be impaired.

WARNINGS

RISK OF ELECTRICAL SHOCK

⧈ Equipment protected throughout by double insulation.

- Installation of cable connections and servicing of this product require access to shock hazard voltage levels.
- Main power and relay contacts wired to separate power source must be disconnected before servicing.
- Do not operate or energize instrument with case open!
- Signal wiring connected in this box must be rated at least 240 V.
- Non-metallic cable strain reliefs do not provide grounding between conduit connections! Use grounding type bushings and jumper wires.
- 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. Unused conduit openings must be sealed with NEMA 4X or IP65 conduit plugs to maintain the ingress protection rating (NEMA 4X).
- Electrical installation must be in accordance with the National Electrical Code (ANSI/NFPA-70) and/or any other applicable national or local codes.
- Operate only with front and rear panels fastened and in place over terminal area.
- Safety and performance require that this instrument be connected and properly grounded through a three-wire power source.
- Proper relay use and configuration is the responsibility of the user.

CAUTION

This product generates, uses, and can radiate radio frequency energy and thus can cause radio communication interference. Improper installation, or operation, may increase such interference. As temporarily permitted by regulation, this unit has not been tested for compliance within the limits of Class A computing devices, pursuant to Subpart J of Part 15, of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area may cause interference, in which case the user at his own expense, will be required to take whatever measures may be required to correct the interference.

WARNING

This product is not intended for use in the light industrial, residential or commercial environments per the instrument's certification to EN50081-2.

Emerson Process Management

Rosemount Analytical Inc.
2400 Barranca Parkway
Irvine, CA 92606 USA
Tel: (949) 757-8500
Fax: (949) 474-7250

http://www.raihome.com

© Rosemount Analytical Inc. 2005

EMERSON™
Process Management

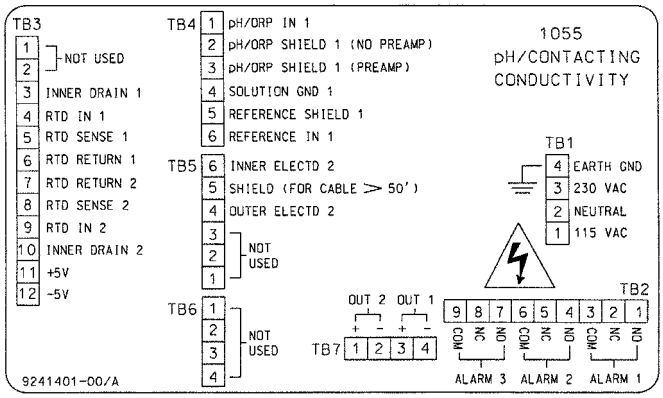
QUICK START GUIDE

FOR MODEL SOLU COMP II pH/CONDUCTIVITY ANALYZER
(Model Option 1055-22-30)

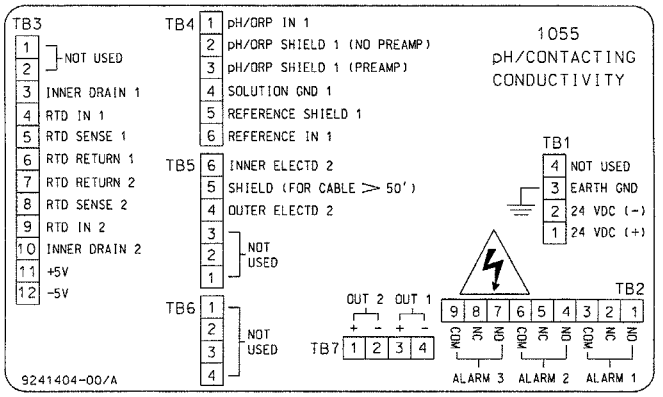
1. Refer to Section 2.0 for installation instructions.
2. Wire sensor(s) to the analyzer. See the drawings below. Refer to the sensor instruction sheet for details. Make alarm and output connections as shown below.

NOTE

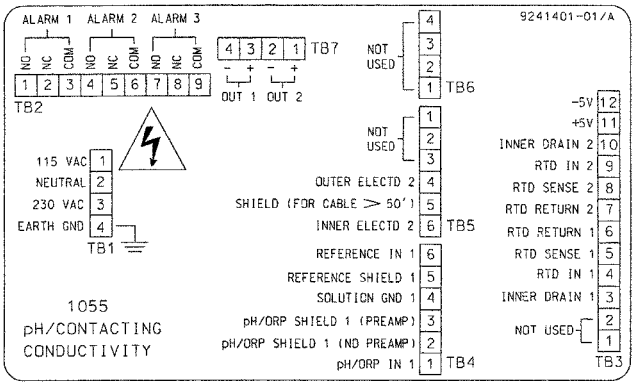
For sensors without solution ground, please use the RC kit included with the instrument.



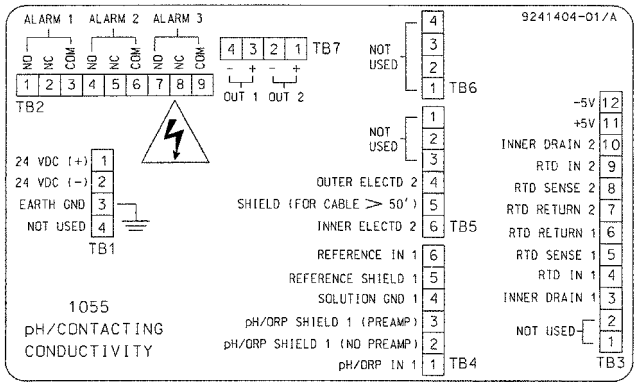
Wiring Connections for Solu Comp II Model 1055-01-10 (Panel Mount with 115/230 Vac Power)



Wiring Connections for Solu Comp II Model 1055-02-10 (Panel Mount with 24 Vdc Power)



Wiring Connections for Solu Comp II Model 1055-01-11 (Surface/Pipe Mounting with 115/230 Vac Power)



Wiring Connections for Solu Comp II Model 1055-02-11 (Surface/Pipe Mounting with 24 Vdc Power)

3. Once connections are secured and verified, apply power to the analyzer.

CONTINUED ON THE FOLLOWING PAGE

4. When the analyzer is powered up for the first time, **Quick Start** screens appear. Using **Quick Start** is easy.
   a. A blinking field shows the position of the cursor.
   b. Use the ◀ or ▶ key to move the cursor left or right. Use the ▲ or ▼ key to move the cursor up or down or to increase or decrease the value of a digit. Use the ▲ or ▼ key to move the decimal point.
   c. Press ENTER to store a setting. Press EXIT to leave without storing changes. Pressing EXIT also returns the display to the previous screen.

English	Fran ais
Espa ol	>>

5. Choose the desired language. Select **>>** to show more choices.

# of sensors?	
One	**Two**

6. Choose the number of sensors wired to the analyzer.

NOTE

If **One** sensor is chosen, only **S1** (pH/ORP) will be available. **S2** (conductivity) cannot be chosen for single measurement.

S1 Measure?	**pH**
Redox	ORP

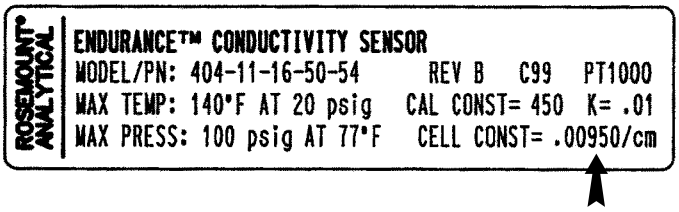
7. Select the measurement for sensor 1.

S2 Measure?	**Cond**
TDS	Resistivity

8. Select the measurement for sensor 2. This screen will not appear if one sensor is selected.

Cell Constant?
S1: **1**.0000/cm

9. Enter the cell constant for the conductivity sensor (sensor 2). See label attached to sensor.



If there is no cell constant on the label, calculate it from the equation:

$$\text{cell const} = K\left(\frac{500 + \text{cal const}}{1000}\right)$$

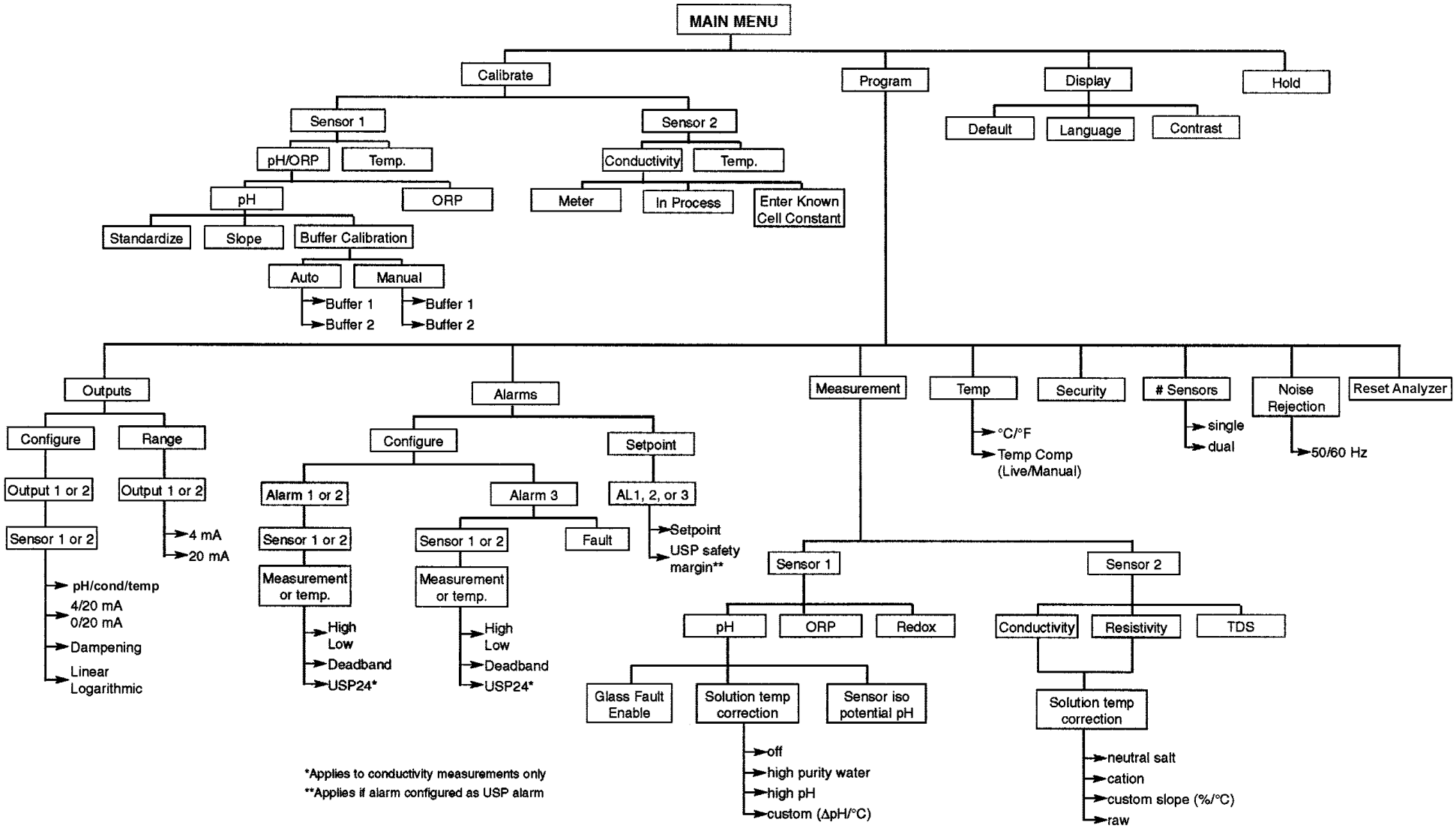
Temperature in?
C F

10. Choose temperature units.

11. The main display appears. The outputs and alarms are assigned to default values. To change settings, refer to Section 5.0, Programming the Analyzer. To reinstall factory settings and return to Quick Start, see Section 5.10.

QUICK REFERENCE GUIDE

MENU TREE FOR pH/ORP/REDOX/CONDUCTIVITY/RESISTIVITY/TDS MEASUREMENTS



*Applies to conductivity measurements only

**Applies if alarm configured as USP alarm

MODEL SOLU COMP II
DUAL INPUT pH/CONDUCTIVITY ANALYZER

TABLE OF CONTENTS

Section	Title	Page
1.0	**DESCRIPTION AND SPECIFICATIONS**	1
1.1	Features and Applications	1
1.2	Specifications	2
1.3	Ordering Information	8
2.0	**INSTALLATION**	11
2.1	Unpacking and Inspection	11
2.2	Installation	11
3.0	**WIRING**	15
3.1	Preparing Conduit Openings	15
3.2	Power, Alarm, Output, and Sensor Connections	15
4.0	**DISPLAY AND OPERATION**	26
4.1	Display	26
4.2	Keypad	26
4.3	Programming and Calibrating the Solu Comp II - Tutorial	27
4.4	Security	28
4.5	Using Hold	28
5.0	**PROGRAMMING THE ANALYZER**	29
5.1	General	29
5.2	Changing StartUp Settings	29
5.3	Configuring and Ranging the Outputs	32
5.4	Configuring Alarms and Assigning Setpoints	34
5.5	Selecting Type of Measurement and Activating Solution Temperature Correction	35
5.6	Choosing Temperature Units and Manual/Automatic Temperature Compensation	40
5.7	Setting a Security Code	41
5.8	Noise Rejection	42
5.9	Single Sensor or Dual Sensor Input	42
5.10	Resetting Factory Calibration and Factory Default Settings	43
5.11	Selecting a Default Screen, Language, and Screen Contrast	43

TABLE OF CONTENTS CONT'D

Section	Title	Page
6.0	**CALIBRATION**	45
6.1	Introduction	45
6.2	Calibrating Temperature	46
6.3	Two-Point Buffer Calibration (Auto Calibration)	48
6.4	Two-Point Buffer Calibration (Manual Calibration)	50
6.5	Making the Analyzer Reading Match a Second Instrument (Standardization)	52
6.6	Entering a Known Slope	53
6.7	ORP Calibration	54
6.8	Calibrating an In-Service Sensor - Conductivity	55
6.9	Placing a New Sensor in Service - Conductivity	59
6.10	Calibrating the Analyzer - Conductivity	60
7.0	**MAINTENANCE**	62
7.1	Overview	62
7.2	Replacement Parts	62
8.0	**TROUBLESHOOTING**	65
8.1	Overview	65
8.2	Troubleshooting Using Fault Codes	65
8.3	Troubleshooting When No Error Message is Showing - pH	67
8.4	Troubleshooting When No Error Message is Showing - Conductivity	70
8.5	Troubleshooting When No Error Message is Showing - General	71
8.6	Simulating Inputs - pH	72
8.7	Simulating Inputs - Conductivity	73
8.8	Simulating Temperature	74
8.9	Measuring Reference Voltage	75
9.0	**RETURN OF MATERIAL**	76

LIST OF TABLES

Number	Title	Page
5-1	Default Settings	30
7-1	Replacement Parts for Solu Comp II (Panel Mount Version)	63
7-2	Replacement Parts for Solu Comp II (Pipe/Surface Mount Version)	64

LIST OF FIGURES

Number	Title	Page
2-1	Panel Mount Installation	12
2-2	Pipe Mount Installation	13
2-3	Surface Mount Installation	14
3-1	Removing the Knockouts	15
3-2	Wiring Connections for Solu Comp II Model 1055pH-01-10 (Panel Mount with 115/230 Vac Power)	16
3-3	Wiring Connections for Solu Comp II Model 1055pH-02-10 (Panel Mount with 24 Vdc Power)	16
3-4	Wiring Connections for Solu Comp II Model 1055pH-01-11 (Wall/Pipe Mounting with 115/230 Vac Power)	17
3-5	Wiring Connections for Solu Comp II Model 1055pH-02-11 (Wall/Pipe Mounting with 24 Vdc Power)	17
3-6	Panel Mount Wiring to Models 399-09-62, 400, 401, 402, 403, and 404	18
3-7	Pipe/Wall Mount Wiring to Models 399-14, 400, 401, 402, 403, and 404	19
3-8	Pipe/Wall Mount Wiring to Models 399VP-09, 400, 401, 402, 403, and 404	20
3-9	Panel Mount Wiring to Models 399VP-09, 400, 401, 402, 403, and 404	21
3-10	Pipe/Wall Mount Wiring to Models 399-09-62, 400, 401, 402, 403, and 404	22
3-11	Panel Mount Wiring to Models 399-14, 400, 401, 402, 403, and 404	23
3-12	Wiring Model 1055-11-22-32 to Models 399-09-62 and GP-1	24
3-13	Wiring Model 1055-10-22-32 to Model 399-14	25
3-14	Wiring Model 1055 to Models 320HP-58 and 400, 401, 402, 403, or 404	25
4-1	Displays During Normal Operation	26
4-2	Solu Comp II Keypad	26
5-1	Assigning Outputs 1 and 2	32
5-2	High Alarm Logic	34
5-3	Low Alarm Logic	34
6-1	Calibration Slope and Offset	48
6-2	Calibration Against a Standard Cell	55
7-1	Exploded View of Solu Comp II (Panel Mount Version)	63
7-2	Exploded View of Solu Comp II (Pipe/Surface Mount Version)	64
8-1	Continuity and Leakage Check	66
8-2	Simulating Inputs When the Preamplifier is in the Analyzer	72
8-3	Simulating pH Input When the Preamplifier is in the Sensor	72
8-4	Simulating Conductivity	73
8-5	Three-Wire RTD Configuration	74
8-6	Simulating RTD Inputs	74
8-7	Checking for a Poisoned Reference Electrode	75

About This Document

This manual contains instructions for installation and operation of the Solu Comp II Model 1055 Dual Input pH/Conductivity Analyzer.

The following list provides notes concerning all revisions of this document.

Rev. Level	Date	Notes
0	1/01	This is the initial release of the product manual. The manual has been reformatted to reflect the Emerson documentation style and updated to reflect any changes in the product offering.
A	2/02	Revised specs.
B	7/02	Added 399 wiring diagrams.
C	7/02	Added UL specs.
D	11/02	Deleted option code -41.
E	4/03	Revised CE info, maintenance info, and drawing #41055112.
F	3/04	Revised H2SO4 specs & recommended sensors on pages 4 & 6.
G	10/04	Updated mounting drawings on pages 13 & 14.
H	11/04	Updated mounting drawing on page 12.
I	12/04	Revised USP references
J	4/05	Revised panel mount drawing
K	2/06	Revised Case and Analog Output specifications on page 2.

SECTION 1.0. DESCRIPTION AND SPECIFICATIONS

1.1 FEATURES AND APPLICATIONS
1.2 SPECIFICATIONS
1.3 ORDERING INFORMATION AND ACCESSORIES

1.1 FEATURES AND APPLICATIONS

The Solu Comp II analyzers offer the choice of single or dual sensor input with measurement choices of pH/ORP, resistivity/conductivity/TDS, % concentration, ratio conductivity, total and free chlorine, dissolved oxygen, dissolved ozone, flow and temperature. Dual measurement analyzers offer a wide choice of measurement combinations thus reducing the cost per loop and needed panel space.

FIELD COMMISSION OPTION: The Solu Comp II can be ordered with the ability to commission measurements in the field. This added flexibility can greatly reduce the number of spare instruments required for field servicing.

QUICK START PROGRAMMING: Exclusive Quick Start screens appear the first time the Solu Comp II is powered up. Screen prompts direct the user to register the number of sensors, the measurement unit(s) and the language to display. Some measurement specific prompts are also displayed. The measurement loop is ready for use in a matter of minutes.

MENUS: Menu screens for calibrating and registering choices are simple and intuitive. Plain language prompts guide the user through the procedures. There are no service codes to enter before gaining access to menus.

DUAL SENSOR INPUT AND OUTPUT: The Solu Comp II accepts single or dual sensor input. The two 4-20 mA outputs can be independently programmed to correspond to any selected measurement or temperature. Output damping and linear or log output may also be field selected.

ALARMS: The Solu Comp II has three fully programmable alarm relays that can be assigned to any selected measurement or temperature. Alarms can be configured as high, low, or USP[1]. The third relay has the additional choice of fault alarm operation. When selected, a fault alarm will activate the relay when a sensor or analyzer fault occurs.

ENCLOSURE: The panel mount version fits standard ½ DIN panel cutouts, and its shallow depth is ideally suited for easy mounting in Hoffman-type enclosures. A panel mount gasket is included to maintain the weather rating of the panel. Surface/pipe mount enclosure includes self-tapping screws for surface mounting. A pipe mounting accessory kit is available for mounting to a 2-inch pipe.

DISPLAY: The two-line, 16-character, back-lit display can be customized to meet user requirements. All operations and descriptive messages can be field selected for English, French, German, Italian, Spanish, or Portuguese. Informative screens, which permit data not shown in the regular display, may be seen at the push of a button.

TEMPERATURE: Most measurements (except ORP and flow) require temperature compensation. The Solu Comp II will automatically recognize either a Pt100 or Pt1000 RTD, normally built into the sensor. When this RTD is present, the Solu Comp II can be set up to display the temperature in °C or °F as well as set any one or more of the alarms and/or outputs to respond to this sensor input. If two measurements with temperature are present either can be chosen for each alarm and output selected.

[1]USP alarm applies to conductivity/resistivity only.

1.2 SPECIFICATIONS - General

Case: ABS (panel-mount), polycarbonate (pipe- and surface-mount). All versions are NEMA 4X/CSA 4 (IP65).

Dimensions

Panel (code -10): 6.10 x 6.10 x 3.72 in. (155 x 155 x 94.5 mm)

Surface/Pipe (code -11): 6.23 x 6.23 x 3.23 in. (158 x 158 x 82 mm); see page 5 for dimensions of pipe mounting bracket.

Conduit openings: Accepts PG13.5 or 1/2 in. conduit fittings

Display: Two line, 16-character, back-lit display. Character height: 4.8 mm. Display can be customized to meet individual requirements. Depending on number of sensors, as many as 14 display screens are available.

Ambient temperature and humidity: 0 to 50°C, (32 to 122°F) RH 5 to 95% (non-condensing)

Note: The analyzer is operable from -20 to 60°C (-4 to 140°F) with some degradation in display performance.

Power:

Code -01: 115/230 Vac ±15%, 50/60 Hz ±6%, 8.0W
Code -02*: 24 Vdc ±15%, 6.0W
Installation Category II

* *For +24Vdc Power Supply use only devices meeting NEC Class II or UL recognized (UL 1950).*

⧈ Equipment protected throughout by double insulation.

Hazardous Location:

C SP® US –LR 34186 Class I, Division 2, Groups A, B, C, & D

FM APPROVED

POLLUTION DEGREE 4: Extended Environment Outdoor use where conductive contamination such as rain, snow, or dust may be present. (Hazardous Location only)

Ordinary Location: (-68 only)

UL® LISTED

12RN

POLLUTION DEGREE 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

RFI/EMI: EN-61326
LVD: EN-61010-1 CE

Input: Choice of single or dual sensor input with measurement choices of pH/ORP, conductivity/resistivity, toroidal conductivity, flow, chlorine, dissolved oxygen, and dissolved ozone. Field-commissioned units allow user to change measurements on either or both inputs. See combination guide for valid combinations. For contacting conductivity measurements, temperature element must be a Pt 1000 RTD. For other measurements, use either a Pt100 RTD, Pt1000 RTD, or 22k NTC (D.O. only).

Outputs: Two 4-20 mA or 0-20 mA isolated outputs. Continuously adjustable. Linear or logarithmic. Maximum load 500 ohms. Output dampening with time constant of 5 sec is user-selectable.

Alarms: Three alarm relays for process measurement(s) or temperature. Alarm 3 can be configured as a fault alarm, instead of a process alarm. Each relay can be configured independently. Alarm logic (high or low activation or USP*) and deadband are user-programmable. The USP* alarm can be programmed to activate when the conductivity is within a user-selectable percentage of the limit.

**conductivity/resistivity measurement only*

Relays: Form C, single pole double throw, epoxy sealed

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

Terminal Connections Rating: 26-14 AWG wire size

Weight/Shipping weight (rounded up to nearest lb or nearest 0.5 kg)**:** 3 lb (1.5 kg)/4 lb (2.0 kg)

CONTACTING CONDUCTIVITY (Codes -20 and/or -30)

Measures conductivity in the range 0 to 20,000 µS/cm. Display choices are conductivity, resistivity, and TDS (total dissolved solids). Three temperature corrections are available: high purity water (dilute sodium chloride), cation conductivity (dilute hydrochloric acid), and adjustable linear temperature coefficient (0 to 5.00%/°C). Temperature correction can be disabled, allowing the analyzer to display raw conductivity.

PERFORMANCE SPECIFICATIONS -

Range	Cell constant (/cm)	Accuracy[1,2]
0.055 - 9.99 µS/cm	0.01	0.9% of reading or ±0.002 µS/cm
10 - 50 µS/cm	0.01	±2% of reading
0.055 - 500 µS/cm	0.1	±2% of reading or ±0.1 µS/cm
0.055 - 5000 µS/cm	1.0	±2% of reading or ±1 µS/cm
0 - 5 mS/cm	1.0	±2% of reading or ±0.001 mS/cm
0 - 20 mS/cm	10	±2% of reading or ±0.01 mS/cm

ANALYZER (CONDUCTIVITY INPUT)

Accuracy (Resistivity):** 0.9% of reading

Accuracy (Temperature):** ±0.1°C between 5°C and 100°C; ±1°C between 101°C and 200°C

Stability: 0.5% of reading/month

Ambient Temperature Effect: ±0.05% of reading/°C

Output Accuracy: ±0.1 mA

Temperature correction: High purity water (dilute sodium chloride), cation conductivity (dilute hydrochloric acid), linear temperature coefficient (0.0 to 5.00%/°C), or none. High purity water and cation conductivity temperature correction apply between 0 and 100°C. Linear temperature coefficient can be applied between -5 and 200°C.

Measurement Range: 0.0 to 20,000 µS/cm, 0.05 to 20 MΩ-cm, or 0 to 10,000 ppm TDS

Temperature Range: -5°C to 200°C (23°F to 392°F)



[1] whichever is greater
[2] Accuracy values pertain to Endurance Model 400 Series conductivity sensors only

RECOMMENDED SENSORS FOR CONDUCTIVITY:

The Solu Comp II is intended for use with the ENDURANCE Model 400 series conductivity sensor (Pt 1000 RTD).

Model 400 Screw-in/Insertion

Model 400VP Screw-in/Insertion with 6.0 VP connector

Model 401 Screw-in/Insertion (except 401-15)

Model 402 Retractable

Model 402VP Retractable with 6.0 VP connector

Model 403 Sanitary Flanged

Model 403VP Sanitary Flanged with 6.0 VP connector

Model 404 Flow-Through

The analyzer can also be used with Rosemount Analytical conductivity sensor Models 140, 141, 142, and 150 having a Pt 100 RTD.

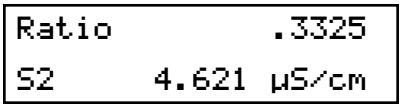
Refer to the table to select the appropriate cell constant.

Range, µS/cm	Cell constant, /cm
0.0 to 50	0.01
5 to 500	0.1
50 to 5,000	1.0
500 to 20,000	10

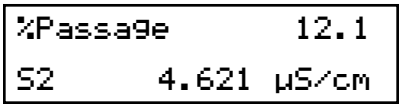
Ratio Conductivity (Codes -20-30):

The Dual Conductivity Solu Comp II can function as a ratio analyzer or recovery device (% passage or % rejection). Product sensor 2's conductivity reading is always displayed.

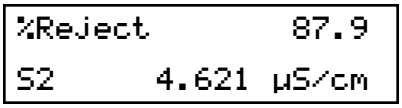
Ratio



%Pass



%Reject



TOROIDAL CONDUCTIVITY (Codes -21 and/or -31)

When used with Model Series 200 Toroidal Conductivity Sensors, display choices are conductivity, resistivity, and percent concentration. The percent concentration selection includes the choice of four common solutions (0-12% NaOH, 0-15% HCl, and 0-25% or 96-99.7% H_2SO_4). The conductivity-concentration algorithms for these solutions are fully temperature compensated. For other solutions, a simple-to-use menu allows the customer to enter his own data. The analyzer accepts as many as five (5) data points and fits either a linear (two [2] points) or a quadratic function (three [3] or more points) to the data. Reference temperature and linear temperature slope may also be adjusted for optimum results.

RECOMMENDED SENSORS:

Model 222 Flow-through conductivity sensor

Model 225 Clean-in-place conductivity sensor

Model 226 Large bore conductivity sensor

Model 228 Toroidal conductivity sensor

Model 242 Flow-through conductivity sensor

Model 247 Economy conductivity sensor

PERFORMANCE SPECIFICATIONS -

Measurement Range: see table below

Accuracy: ± 1% of reading and ± 0.01 mS/cm

Repeatability: ± 0.5% of reading and ± 0.005 mS/cm

Stability: ± 0.25% of reading and ± 0.005 mS/cm/month, noncumulative

Ambient Temperature Effect: ± 0.05% of reading/°C

Temperature Compensation: -15 to 200°C (5 to 392°F) automatic or manual. Automatic requires a Pt100/1000 RTD

Temperature correction: Linear temperature coefficient (0.0 to 5.00%/°C) neutral salt (dilute sodium chloride) or none



INDUCTIVE SENSORS					
Conductivity Sensor Model Number	**226**	**228**	**225**	**222 (1in.)**	**222 (2 in.)**
Cell Constant*	**1.0**	**3.0**	**3.0**	**6.0**	**4.0**
Minimum Range	**50**	**250**	**250**	**500**	**500**
Maximum Range	**1,000,000**	**2,000,000**	**2,000,000**	**2,000,000**	**2,000,000**
* Typical	**FULL SCALE MICROSIEMENS/cm**				

pH/ORP (Codes -22 and/or -32)

For use with any standard pH or ORP sensor and all Uniloc sensors and junction boxes with built-in diagnostic style preamplifiers, display choices are pH, ORP or Redox. The automatic buffer recognition feature uses stored buffer values and their temperature curves for the most common buffer standards available worldwide. The analyzer will recognize the value of the buffer being measured and perform a self stabilization check on the sensor before completing the calibration. Manual or automatic temperature compensation is keypad selectable. Change in pH due to process temperature can be compensated using a programmable temperature coefficient or isopotential point. Measurement and display of pH glass and reference impedance helps alert the user to sensor maintenance needs.

**reference impedance is suppressed with amperometric/pH combinations (-24, -25, -26)*

PERFORMANCE SPECIFICATIONS - ANALYZER (pH INPUT)

Measurement Range [pH]: 0 to 14 pH

Accuracy: ±0.01 pH

Repeatability: ±0.01 pH

Stability: ±0.01 pH/month, non-cumulative

Temperature Coefficient: ±0.003 pH/°C

Temperature Compensation: Pt100/Pt1000 RTD, Automatic or Manual -15 to 100°C (5 to 212°F)

Temperature Correction: Choose from standard measurement compensation, solution temperature correction for high purity or dilute base solutions, and custom temperature correction.

PERFORMANCE SPECIFICATIONS - ANALYZER (ORP INPUT)

Measurement Range [ORP]: -1400 to +1400 mV

Accuracy: ±2.0 mV

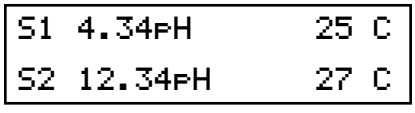
Repeatability: ±1.0 mV

Stability: ±1.0 mV/month, non-cumulative

Temperature Coefficient: ±0.2 mV/°C

Temperature Measurement: -15 to 100°C (5 to 212°F)

Temperature Correction: none required



RECOMMENDED SENSORS FOR pH:

Model 320B Flow Through pH
Model 320HP High Purity pH
Model 328A Steam Sterilizable pH
Model 370 and 371 EuroSenz pH
Model 381+ Insertion/Submersion/Flow Through pH
Model 385+ Insertion/Submersion/Retractable pH
Model 389 Insertion/Submersion pH
Model 396 Insertion/Submersion pH
Model 396VP Insertion/Submersion pH with VP 6.0 connector
Model 396P Insertion/Submersion pH
Model 396PVP Insertion/Submersion pH with VP 6.0 connector
Model 396R Retractable pH
Model 396RVP Retractable pH with VP 6.0 connector
Model 397 Quik Disconnect pH
Model 398 Insertion/Submersion pH
Model 398VP Insertion/Submersion with VP 6.0 connector
Model 398R Retractable pH
Model 398RVP Retractable pH with VP 6.0 connector
Model 399 Insertion/Submersion pH
Model Hx338 Steam Sterilizable pH
Model Hx348 Steam Sterilizable pH

When used with conductivity (-20-32 or -22-30):

Model 320HP High Purity pH
Model 381+ Insertion/Submersion/Flow Through pH
Model 385+ Insertion/Submersion/Retractable pH
Model 396P Insertion/Submersion pH
Model 396PVP Insertion/Submersion pH with VP 6.0 connector
Model 396R Retractable pH
Model 396RVP Retractable pH with VP 6.0 connector

RECOMMENDED SENSORS FOR ORP:

Model 330 Flow Through ORP
Model 371 EuroSenz ORP
Model 381+ Insertion/Submersion/Flow Through ORP
Model 385+ Insertion/Submersion/Retractable pH
Model 389 Insertion/Submersion ORP
Model 396P Insertion/Submersion ORP
Model 396PVP Insertion/Submersion ORP with VP 6.0 connector
Model 396R Retractable ORP
Model 398 Insertion/Submersion ORP
Model 398VP Insertion/Submersion with VP 6.0 connector
Model 398R Retractable ORP
Model 398RVP Retractable ORP with VP 6.0 connector

When used with conductivity (-20-32 or -22-30):

Model 320HP High Purity ORP
Model 381+ Insertion/Submersion/Flow Through ORP
Model 385+ Insertion/Submersion/Retractable ORP
Model 396P Insertion/Submersion ORP
Model 396PVP Insertion/Submersion ORP with VP 6.0 connector
Model 396R Retractable ORP
Model 396RVP Retractable ORP with VP 6.0 connector

FLOW
(Standard on all models or stand alone, Code -23 and/or -33)

For use with most pulse signal flow sensors, the Solu Comp II's user selectable units of measure include flow rates in GPM (Gallon per minute), LPM (liters per minute), or m3/hr (cubic meters per hour), and velocity in ft/sec or m/sec. When configured to measure flow, the unit also acts as a totalizer in the chosen unit (gallons, liters, or cubic meters).

Dual flow instruments can be configured as a % recovery device or a flow difference device.

PERFORMANCE SPECIFICATIONS

Frequency Range: 0.5 - 4000 Hz

Flow Rate: 0 - 9999 GPM, LPM, m3/hr

Totalized Flow: 0 - 9,999,999 Gallons; 37,850,000 Liters; 37,850 m3

Accuracy: ±1% (±1.5% from 3000 to 4000 Hz)

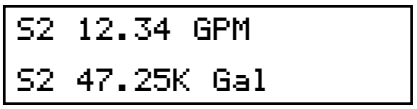
Repeatability: ±1%

RECOMMENDED SENSORS

+GF+ Signet 515 Rotor-X Flow sensor Model 515/8510-XX (PN P51530-PO)

Fluidyne Flow Sensor Model 2300A (PN Hydro-Flow-2300-A-10-5R-3-1-1)

Consult factory for other pulse type sensor compatibility.



FREE AND TOTAL CHLORINE (Code -24)

When used with a chlorine specific membrane-covered amperometric sensor, display choices are free chlorine or total chlorine. (Total chlorine measurement requires the use of the Model SCS921 or other sample conditioning system). Because the permeability of the membrane is a function of temperature, a correction is necessary when the sensor is used at a temperature different from the one at which it was calibrated. The Solu Comp II automatically applies the temperature correction factor. The process temperature is measured by an RTD in the sensor. An input filter allows the user to configure the analyzer for rapid response or low noise. The low noise option is recommended for samples containing less than 0.1 ppm chlorine.

pH is also a factor in the measurement of free chlorine. An aqueous solution of free chlorine is a mixture of hypochlorous acid and hypochlorite ion. The relative amount of each depends on the temperature and pH. Generally, increasing the pH and temperature reduces the amount of hypochlorous acid in the mixture. Because the response of the sensor to hypochlorous acid is greater than its response to hypochlorite, accurate determination of chlorine requires knowledge of the pH and temperature of the sample. If the pH is relatively constant, a fixed pH correction factor can be entered into the analyzer. If the pH is greater than 7 and fluctuates by more than 0.2, continuous measurement of the pH and automatic pH correction is necessary. For automatic pH correction, select code -32 and an appropriate pH sensor.

PERFORMANCE SPECIFICATIONS

Measurement Range: 0-20 ppm (mg/L) chlorine (as Cl_2)

Resolution: 0.001 ppm

Automatic pH Correction (requires Code -32): 5.0 to 9.5 pH

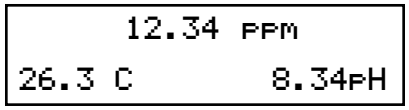
Temperature Correction: Automatic (with Pt100 RTD in sensor) or manual 0-50°C. Can be disabled if desired.

Input filter: time constant 1 - 999 sec

RECOMMENDED SENSORS

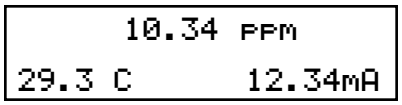
Chlorine: 499A CL-01 Free Chlorine or 499A CL-02 Total Residual Chlorine (requires sample conditioning)

pH: 399-09-62, 399VP-09, 399-14



DISSOLVED OXYGEN (Code -25)

When used with an oxygen permeable membrane-covered amperometric sensor, display choices are ppb or ppm dissolved oxygen or % saturation. Because the permeability of the membrane is a function of temperature, a correction is necessary when the sensor is used at a temperature different from the one at which it was calibrated. The Solu Comp II automatically applies the temperature correction factor. The process temperature is measured by an RTD in the sensor. Calibrating the analyzer is as simple as exposing the sensor to air and keying in the barometric pressure. If removing the sensor from the process is impractical, the analyzer can also be calibrated against a standard instrument. Solubility correction factors for liquids containing high concentrations of electrolytes can be registered into the analyzer. The Solu Comp II automatically calculates ppb/ppm dissolved oxygen taking into account the high salt concentration.



PERFORMANCE SPECIFICATIONS

Measurement Range: 0-20 ppm (mg/L) dissolved oxygen; 0- 250% saturation

Resolution: 0.01 ppm; 0.1 ppb for 499A TrDO sensor (when O_2 <1.00 ppm); 0.1%

Temperature Correction for Membrane Permeability: Automatic (with Pt100 RTD in sensor) or manual 0-50°C. Can be disabled if desired.

Input filter: 1- 255 samples

RECOMMENDED SENSORS

Model 499A DO Dissolved Oxygen Sensor

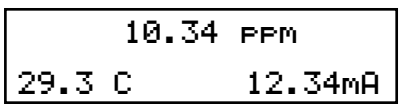
Model Hx438 Steam Sterilizable Dissolved Oxygen Sensor

Model Gx438 Steam Sterilizable Dissolved Oxygen Sensor

Model 499A TrDO Trace Dissolved Oxygen Sensor (soon to be released)

DISSOLVED OZONE (Code -26)

For use with an ozone permeable membrane-covered amperometric sensor. Because the permeability of the membrane is a function of temperature, a correction is necessary when the sensor is used at a temperature different from the one at which it was calibrated. The Solu Comp II automatically applies the temperature correction factor. The process temperature is measured by an RTD in the sensor. The Solu Comp II is calibrated taking a measurement of the ozone level in the process by an independent chemical method and setting the display equal to the measured value. An input filter allows the user to configure the analyzer for rapid response of low noise. The low noise option is recommended for samples containing less than 0.1 ppm dissolved ozone.



PERFORMANCE SPECIFICATIONS

Measurement Range: 0-10 ppm (mg/L)

Resolution: 0.001 ppm dissolved ozone

Temperature Correction for Membrane Permeability: Automatic (with Pt100 RTD in sensor) or manual 0-35°C. Can be disabled if desired.

Input filter: time constant 1 - 999 sec

RECOMMENDED SENSOR

Model 499A OZ Dissolved Ozone Sensor

LOOP SPECIFICATIONS WITH A MODEL 499A OZ SENSOR

Loop Accuracy: ±5% of reading or ± 3 ppb at 25°C, whichever is greater

Repeatability: ±2% of reading at a constant temperature

1.3 ORDERING INFORMATION

The Solu Comp II analyzers offer the choice of single or dual sensor input with measurement choices of pH/ORP, conductivity/resistivity, toroidal conductivity, flow, chlorine, dissolved oxygen, and dissolved ozone. See combination guide (on the following page) for valid combinations. Standard features include two isolated outputs, three alarm relays, customizable two-line display, and temperature correction.

MODEL 1055 SOLU COMP II ANALYZER	
CODE	POWER
01	115/230 Vac, 50/60 Hz
02	24 Vdc

CODE	MOUNTING
10	Panel mounting enclosure
11	Pipe/Surface mounting enclosure (Pipe mounting requires accessory kit PN 23820-00)

CODE	MEASUREMENT 1 (Required Selection)
20	Contacting Conductivity
21	Toroidal Conductivity
22	pH/ORP
23	Flow
24	Chlorine
25	Dissolved Oxygen
26	Ozone

CODE	MEASUREMENT 2 (Optional)
30	Contacting Conductivity
31	Toroidal Conductivity
32	pH/ORP
33	Flow

CODE	OPTIONAL
68	UL Approval

Field Commisssioned Suites option offers the user the ability to commission the Solu Comp II to any valid measurement combination. This feature provides the benefit of a reduction in the number of spare instruments required to meet emergency inventory needs. Please refer to the Suites tables (on the following page) for valid measurement combinations. Suites include a complete set of instrument wiring labels.

MODEL 1055 SOLU COMP II ANALYZER	
CODE	POWER
01	115/230 Vac, 50/60 Hz
02	24 Vdc

CODE	MOUNTING
10	Panel mounting enclosure
11	Pipe/Surface mounting enclosure (Pipe mounting requires accessory kit PN 23820-00)

CODE	FIELD-COMMISSIONED SUITES (Optional) see tables below
S1	Suite 1 - Field Commissioned Measurement (basic)
S1A	Suite 1 - Field Commissioned Measurement (includes amperometric)
S2	Suite 2 - Field Commissioned Measurement (basic)
S2A	Suite 2 - Field Commissioned Measurement (includes amperometric)

CODE	OPTIONAL
DM	Dual Measurement

CODE	OPTIONAL
68	UL Approval

COMBINATION GUIDE

Measurement Choices

Measure 1 \ Measure 2	None	pH/ORP	Flow	Conductivity	
				Toroid	Contact
pH/ORP					
Contacting conductivity					
Flow					
Toroidal Conductivity					
Dissolved Oxygen					
Chlorine					
Ozone					

Available
Not available

5

Field Commissioned Measurement Choices Suite 1

	Measure 1 \ Measure 2	None	Dual Measurement (DM)		
			pH/ORP	Flow	Contacting Conductivity
Basic	pH/ORP				
Basic	Contacting conductivity				
Amperometric	Dissolved Oxygen*				
Amperometric	Chlorine				
Amperometric	Ozone				
	Toroidal Conductivity				

Available
Not available

5

Field Commissioned Measurement Choices Suite 2

	Measure 1 \ Measure 2	None	Dual Measurement (DM)			
			pH/ORP	Flow	Conductivity	
					Toroid	Contact
Basic	pH/ORP					
Basic	Flow					
Basic	Contacting conductivity					
Basic	Toroidal Conductivity					
Amperometric	Dissolved Oxygen*					
Amperometric	Chlorine					
Amperometric	Ozone					

Available
Not available

* For D.O. sensors with 22k thermistor, use Suite 1 only.

ACCESSORIES (Weights are rounded up to nearest whole lb or 0.5 kg)

PART NUMBER	DESCRIPTION	WEIGHT	SHIPPING WT.
23820-00	Pipe mounting kit, includes U-bolts, mounting bracket, nuts, washers, and screws (complete)	2 lb (1.0 kg)	4 lb (2.0 kg)
23554-00	Gland fittings, PG 13.5, 5 per package	1 lb (0.5 kg)	2 lb (1.0 kg)
9240048-00	Tag, stainless steel (specify marking)	1 lb (0.5 kg)	1 lb (0.5 kg)
	pH INPUT		
9210012	Buffer Solution, 4.01 pH, 16 oz.	1 lb (0.5 kg)	2 lb (1.0 kg)
9210013	Buffer Solution, 6.86 pH, 16 oz.	1 lb (0.5 kg)	2 lb (1.0 kg)
9210014	Buffer Solution, 9.18 pH, 16 oz.	1 lb (0.5 kg)	2 lb (1.0 kg)
	CONDUCTIVITY INPUT		
SS-1	Conductivity Standard, 1409 µS/cm at 25°C, 1 quart (945 mL)	2 lb (1.0 kg)	4 lb (2.0 kg)
SS-1A	Conductivity Standard, 1409 µS/cm at 25°C, 1 gallon (3785 mL)	9 lb (4.0 kg)	11 lb (5.0 kg)
SS-5	Conductivity Standard, 1000 µS/cm at 25°C, 1 quart (945 mL)	2 lb (1.0 kg)	4 lb (2.0 kg)
SS-5A	Conductivity Standard, 1000 µS/cm at 25°C, 1 gallon (3785 mL)	9 lb (4.0 kg)	11 lb (5.0 kg)
SS-6	Conductivity Standard, 200 µS/cm at 25°C, 1 quart (945 mL)	2 lb (1.0 kg)	4 lb (2.0 kg)
SS-6A	Conductivity Standard, 200 µS/cm at 25°C, 1 gallon (3785 mL)	9 lb (4.0 kg)	11 lb (5.0 kg)
SS-7	Conductivity Standard, 5000 µS/cm at 25°C, 1 quart (945 mL)	2 lb (1.0 kg)	4 lb (2.0 kg)
SS-7A	Conductivity Standard, 5000 µS/cm at 25°C, 1 gallon (3785 mL)	9 lb (4.0 kg)	11 lb (5.0 kg)

SECTION 2.0. INSTALLATION

2.1 UNPACKING AND INSPECTION
2.2 INSTALLATION

2.1 UNPACKING AND INSPECTION

Inspect the shipping container. If it is damaged, contact the shipper immediately for instructions. Save the box. If there is no apparent damage, unpack the container. Be sure all items shown on the packing list are present. If items are missing, notify Rosemount Analytical immediately.

2.2 INSTALLATION

2.2.1 General Information

1. Although the analyzer is suitable for outdoor use, do not install it in direct sunlight or in areas of extreme temperatures.
2. Install the analyzer in an area where vibrations and electromagnetic and radio frequency interference are minimized or absent.
3. Keep the analyzer and sensor wiring at least one foot from high voltage conductors. Be sure there is easy access to the analyzer.
4. **AC power and relay wiring should not enter via top conduit openings and should be kept separated from other wiring in the analyzer after installation.**
5. The analyzer is suitable for panel, pipe, or surface mounting. Refer to the table below.
6. See Section 3.1 for removal of conduit knockouts.

Type of Mounting	Section
Panel	2.2.2
Pipe	2.2.3
Surface	2.2.4

7. To reduce the likelihood of stress on wiring connections, the hinged front panel (-11 models) shall not be removed from the base during wiring installation, and there shall be sufficient wire leads to avoid stress on conductors.
8. For UL-approved models (-68), the clear wiring shield must be installed prior to operation.

2.2.2 Panel Mounting.

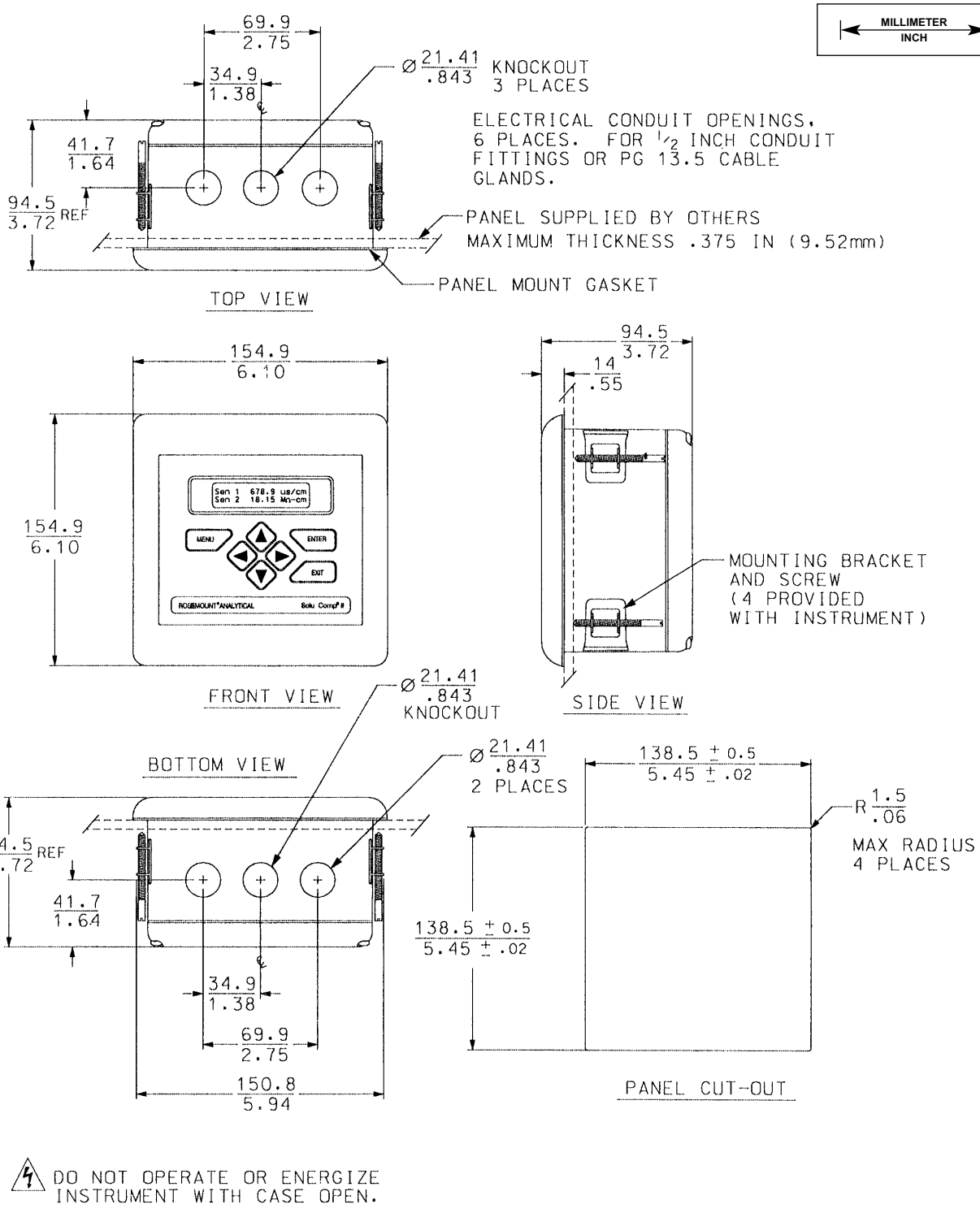


FIGURE 2-1. Panel Mount Installation

Access to the wiring terminals is through the rear cover. Four screws hold the cover in place.

2.2.3 Pipe Mounting.

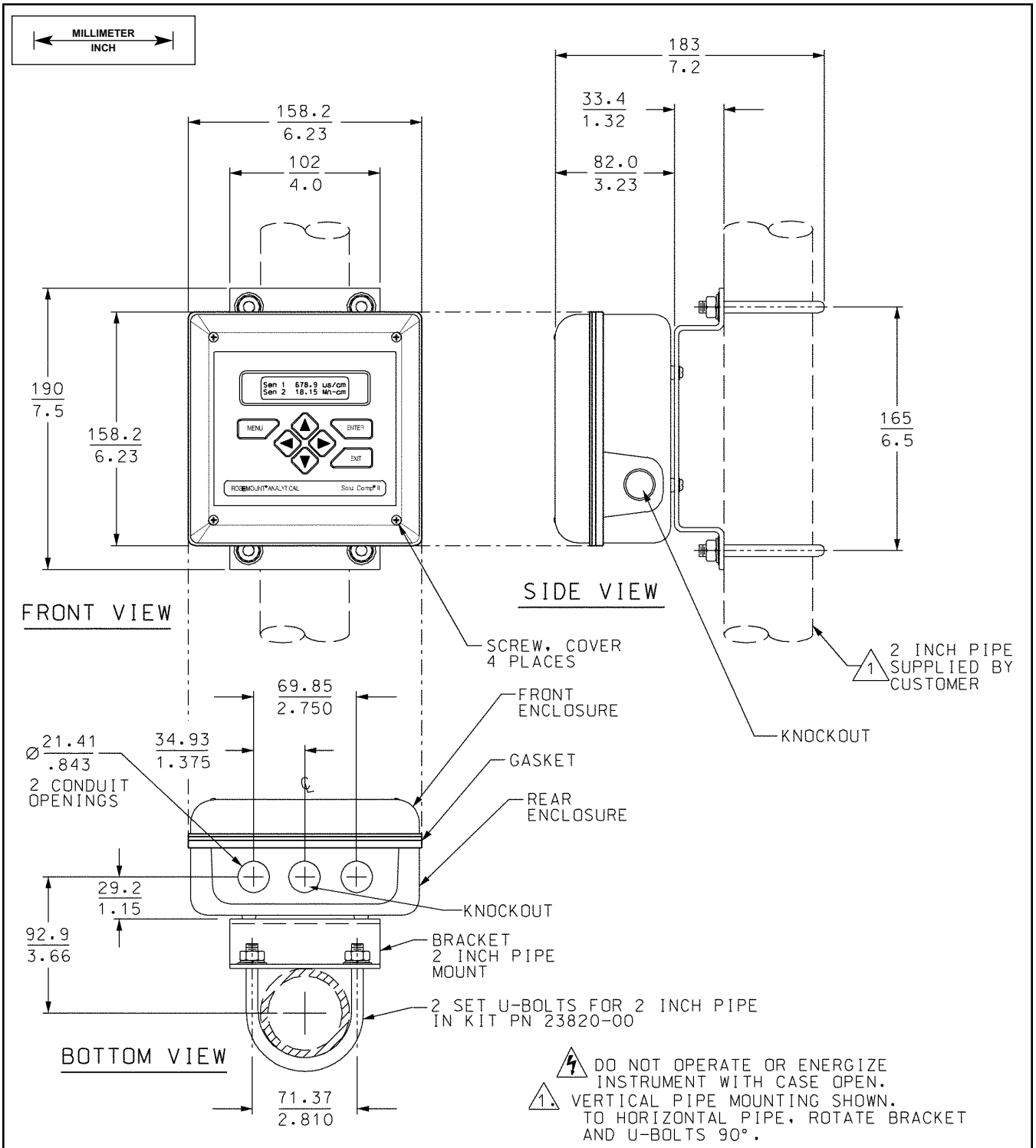


FIGURE 2-2. Pipe Mount Installation

The front panel is hinged at the bottom. The panel swings down for access to the wiring terminals.

2.2.4 Surface Mounting.

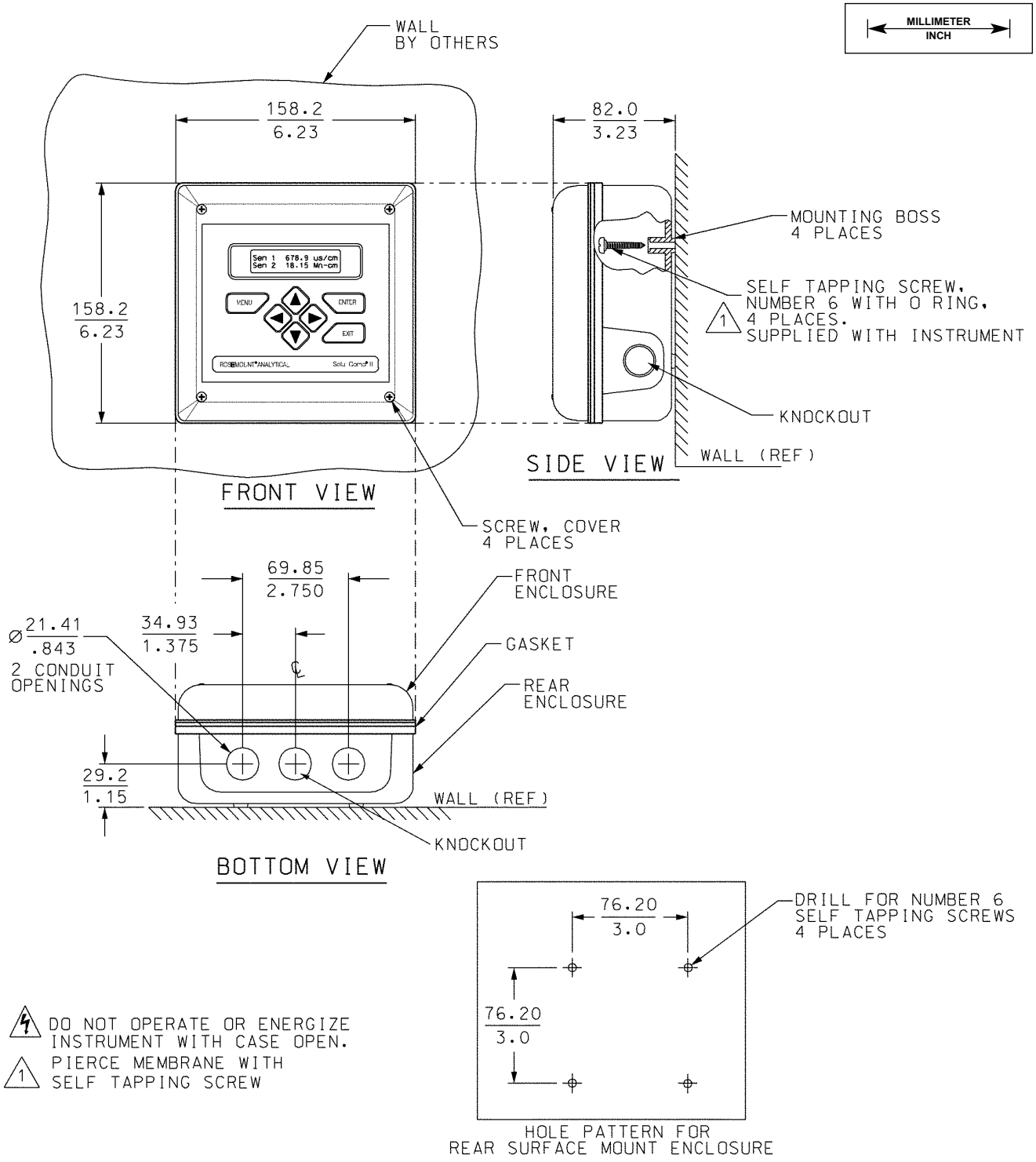


FIGURE 2-4. Surface Mount Installation

The front panel is hinged at the bottom. The panel swings down for access to the wiring terminals.

SECTION 3.0.
WIRING

3.1 PREPARING CONDUIT OPENINGS
3.2 POWER, ALARM, OUTPUT, AND SENSOR CONNECTIONS

3.1 PREPARING CONDUIT OPENINGS

The number of conduit openings and the location depend on the model.

Model	Description	Conduit openings
1055-10	panel mount	two open, three knockouts
1055-11	surface or pipe mount	three open, no knockouts

Conduit openings accept 1/2-inch conduit fittings or PG 13.5 cable glands. To keep the case watertight, block unused openings with NEMA 4X or IP65 conduit plugs.

NOTE

Use watertight fittings and hubs that comply with the requirements of UL514B. Connect the conduit hub to the conduit before attaching the fitting to the analyzer (UL508-26.16).

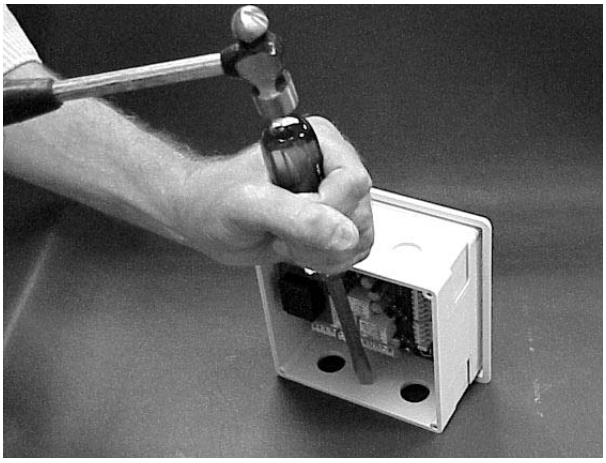


FIGURE 3-1. Removing the Knockouts

Figure 3-1 shows how to remove the knockouts. The knockout grooves are on the outside of the case. Place the screwdriver blade on the inside of the case and align it approximately along the groove. Rap the screwdriver sharply with a hammer until the groove cracks. Move the screwdriver to an uncracked portion of the groove and continue the process until the knockout falls out. Use a small knife blade to remove the flash from the inside of the hole.

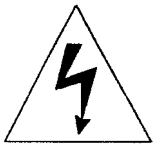
3.2 POWER, ALARM, OUTPUT, AND SENSOR CONNECTIONS

The Solu Comp II is available in two mounting configurations.The positions of the power, alarm, output, and sensor terminal blocks are different in each. Refer to the table to find the correct drawing.

For best EMI/RFI protection use shielded output signal cable enclosed in an earth-grounded metal conduit. Connect the shield to earth ground at terminal 4 on TB1.

MODEL	MOUNTING	POWER	FIGURE
1055pH-01-10	Panel	115/230 Vac	3-2
1055pH-02-10		24 Vdc	3-3
1055pH-01-11	Surface/Pipe	115/230 Vac	3-4
1055pH-02-11		24 Vdc	3-5

AC wiring should be 14 gauge or greater. Provide a switch or breaker to disconnect the analyzer from the main power supply. Install the switch or breaker near the analyzer and label it as the disconnecting device for the analyzer.



WARNING: RISK OF ELECTRICAL SHOCK

AC connections and grounding must be in compliance with UL 508 or local electrical code. DO NOT apply power to the analyzer until all electrical connections are verified and secure.

Keep sensor and output signal wiring separate from power wiring. Do not run sensor and power wiring in the same conduit or close together in a cable tray.

NOTE

For sensors without solution ground, please use the RC kit included with the instrument.

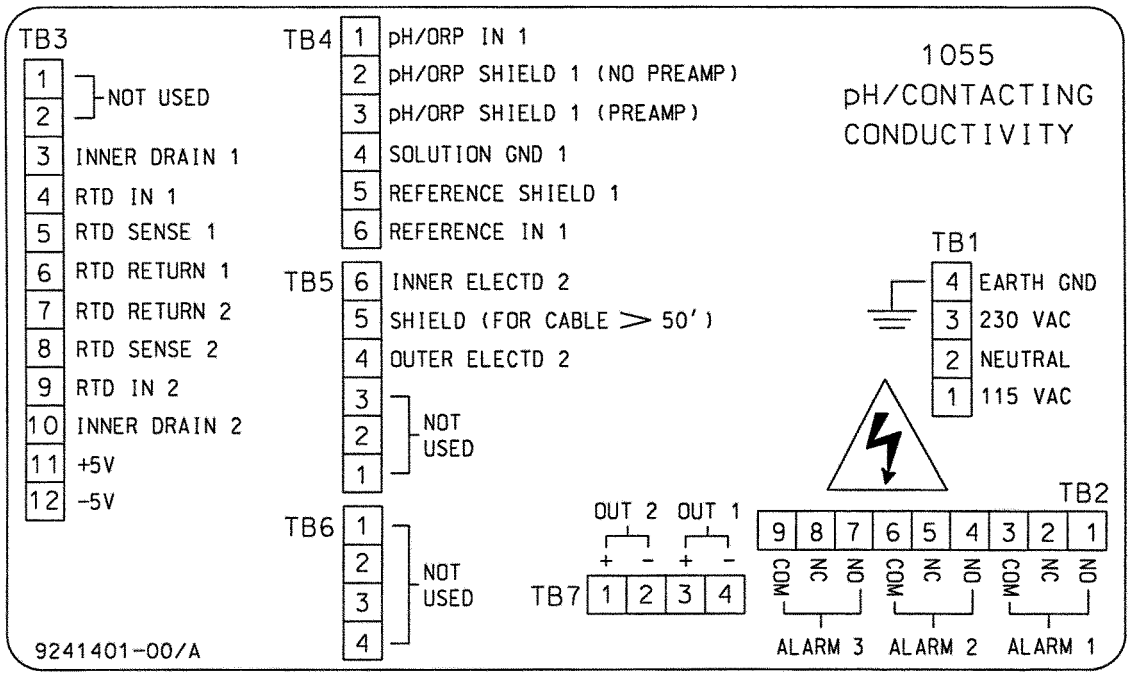


FIGURE 3-2. Wiring Connections for Solu Comp II Model 1055-01-10 (Panel Mount with 115/230 Vac Power)

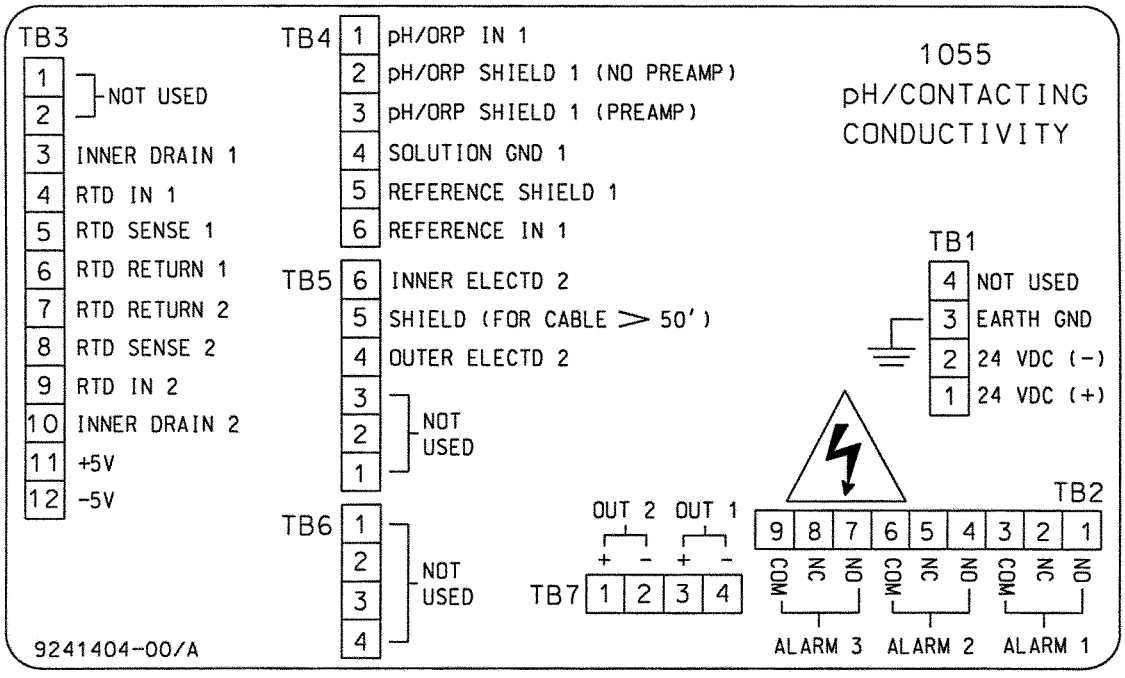


FIGURE 3-3. Wiring Connections for Solu Comp II Model 1055-02-10 (Panel Mount with 24 Vdc Power)

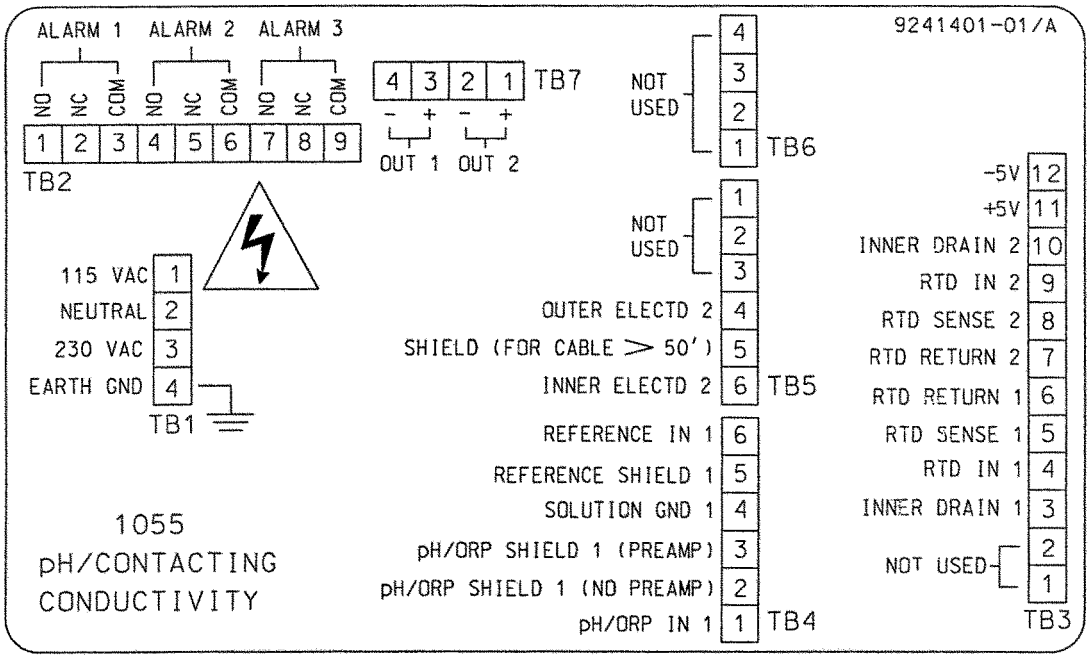


FIGURE 3-4. Wiring Connections for Solu Comp II Model 1055-01-11 (Surface/Pipe Mounting with 115/230 Vac Power)

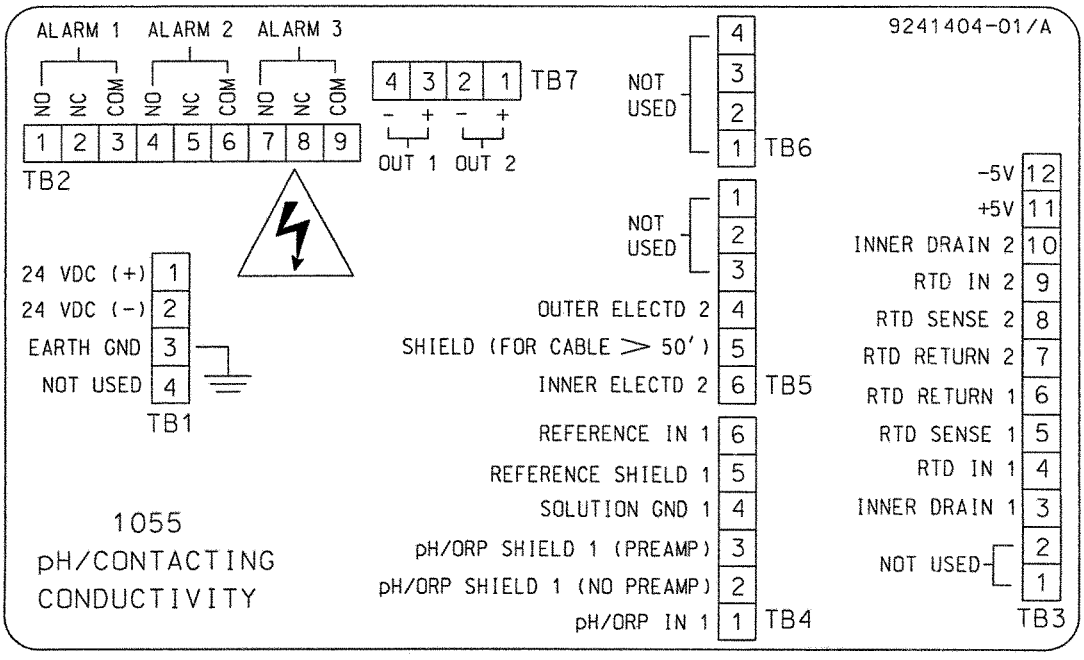


FIGURE 3-5. Wiring Connections for Solu Comp II Model 1055-02-11 (Surface/Pipe Mounting with 24 Vdc Power)

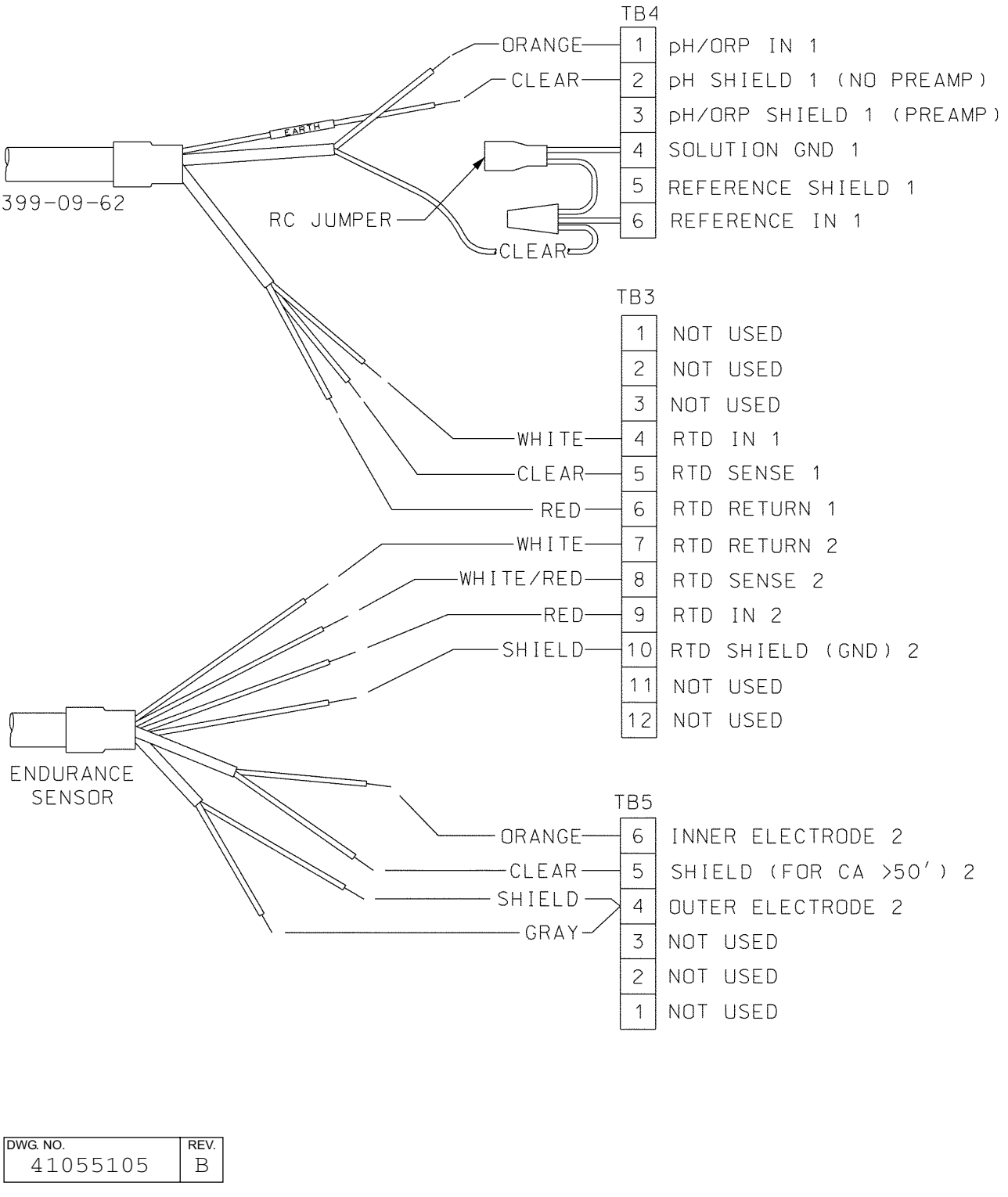


FIGURE 3-6. Panel Mount Wiring to Models 399-09-62, 400, 401, 402, 403, and 404.

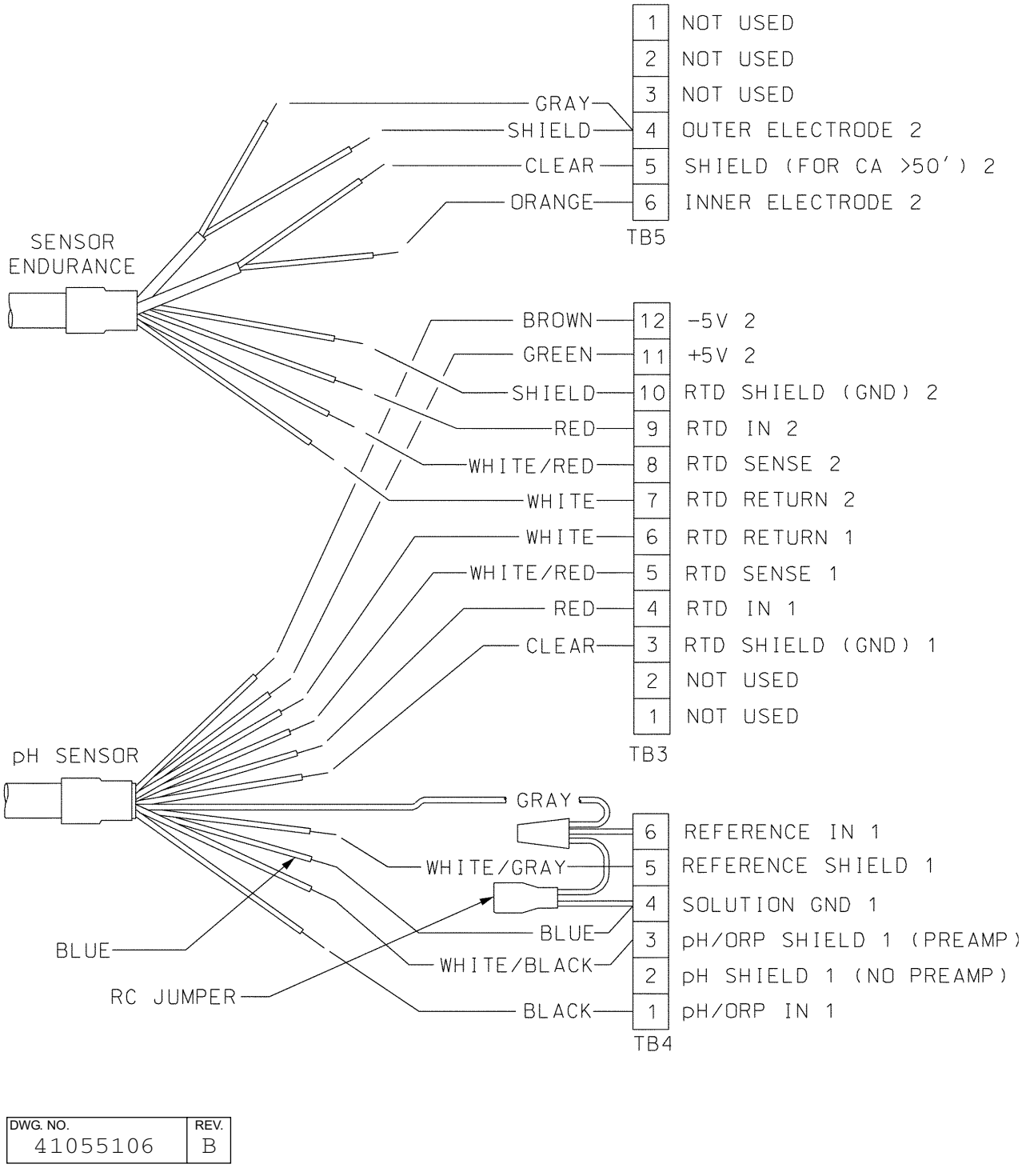


FIGURE 3-7. Pipe/Wall Mount Wiring to Models 399-14, 400, 401, 402, 403, and 404.

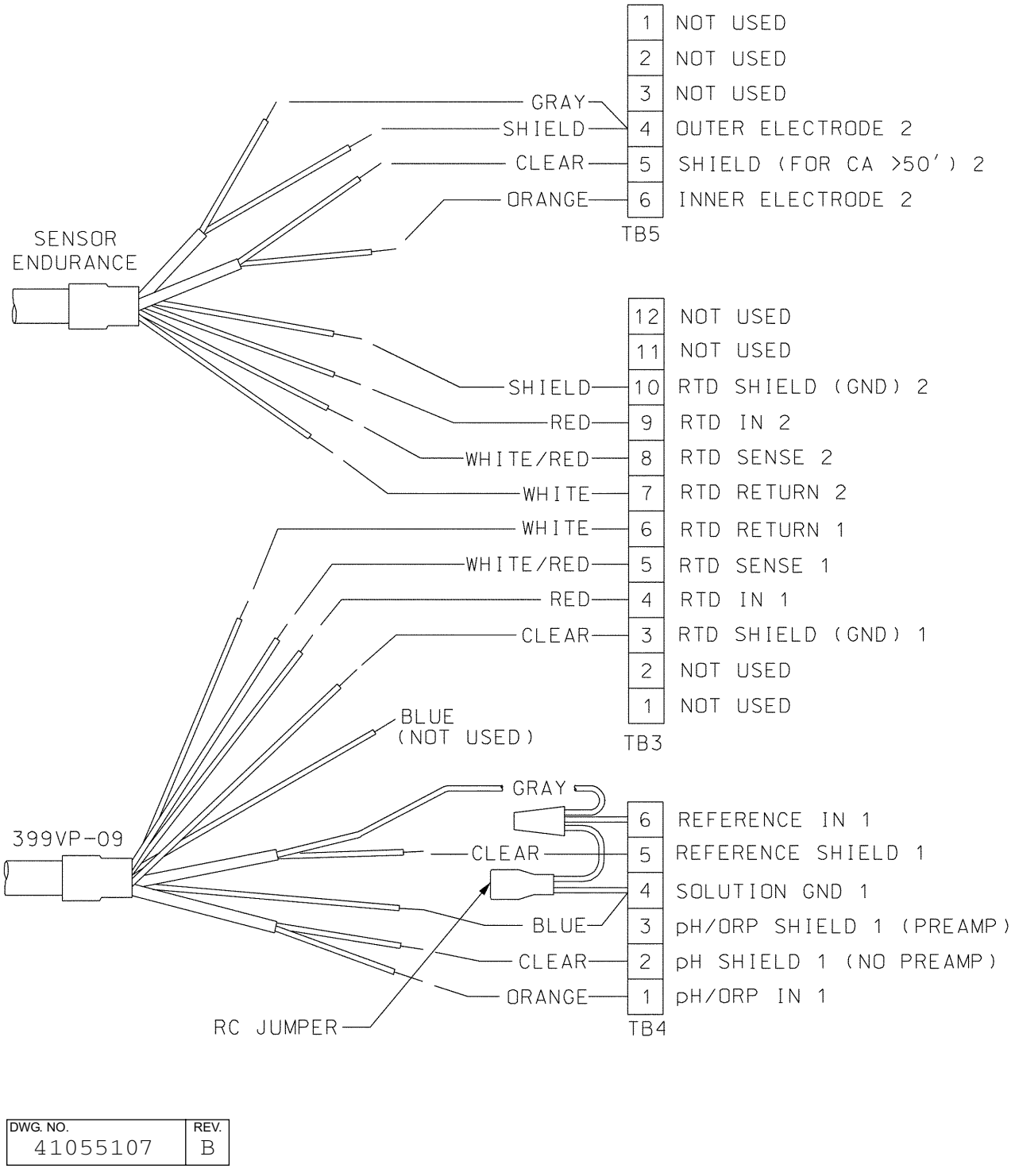


FIGURE 3-8. Pipe/Wall Mount Wiring to Models 399VP-09, 400, 401, 402, 403, and 404.

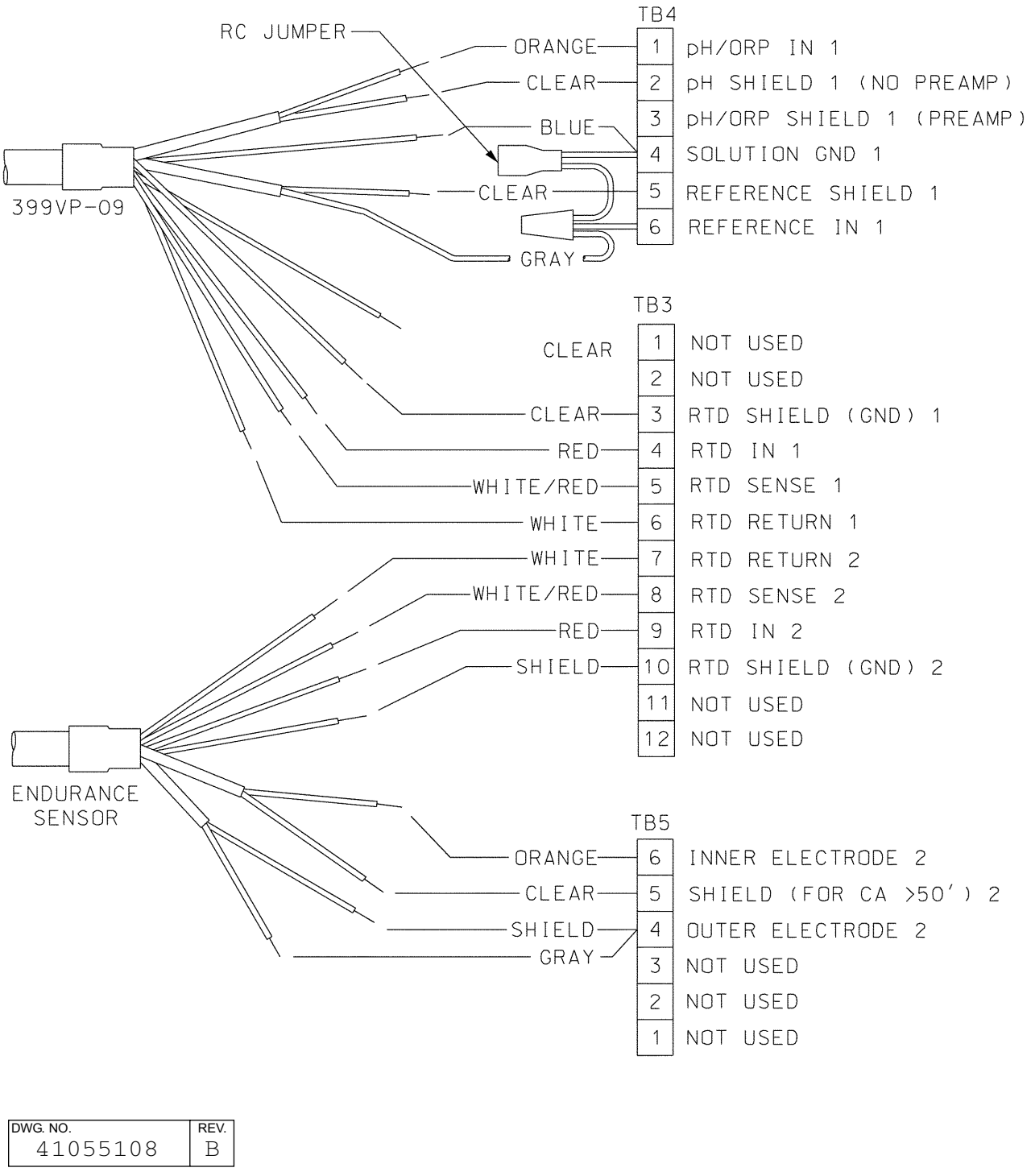


FIGURE 3-9. Panel Mount Wiring to Models 399VP-09, 400, 401, 402, 403, and 404.

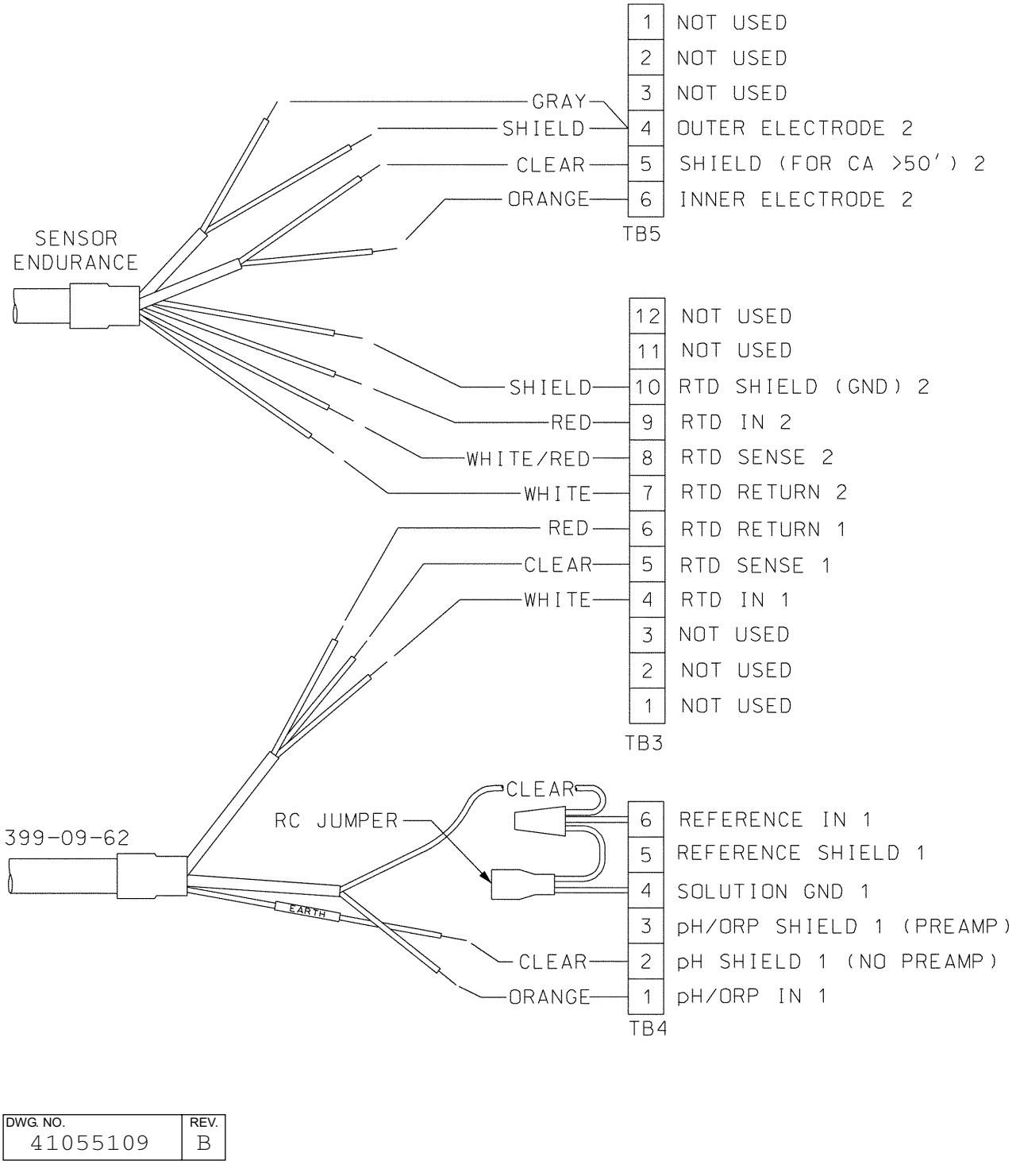


FIGURE 3-10. Pipe/Wall Mount Wiring to Models 399-09-62, 400, 401, 402, 403, and 404.

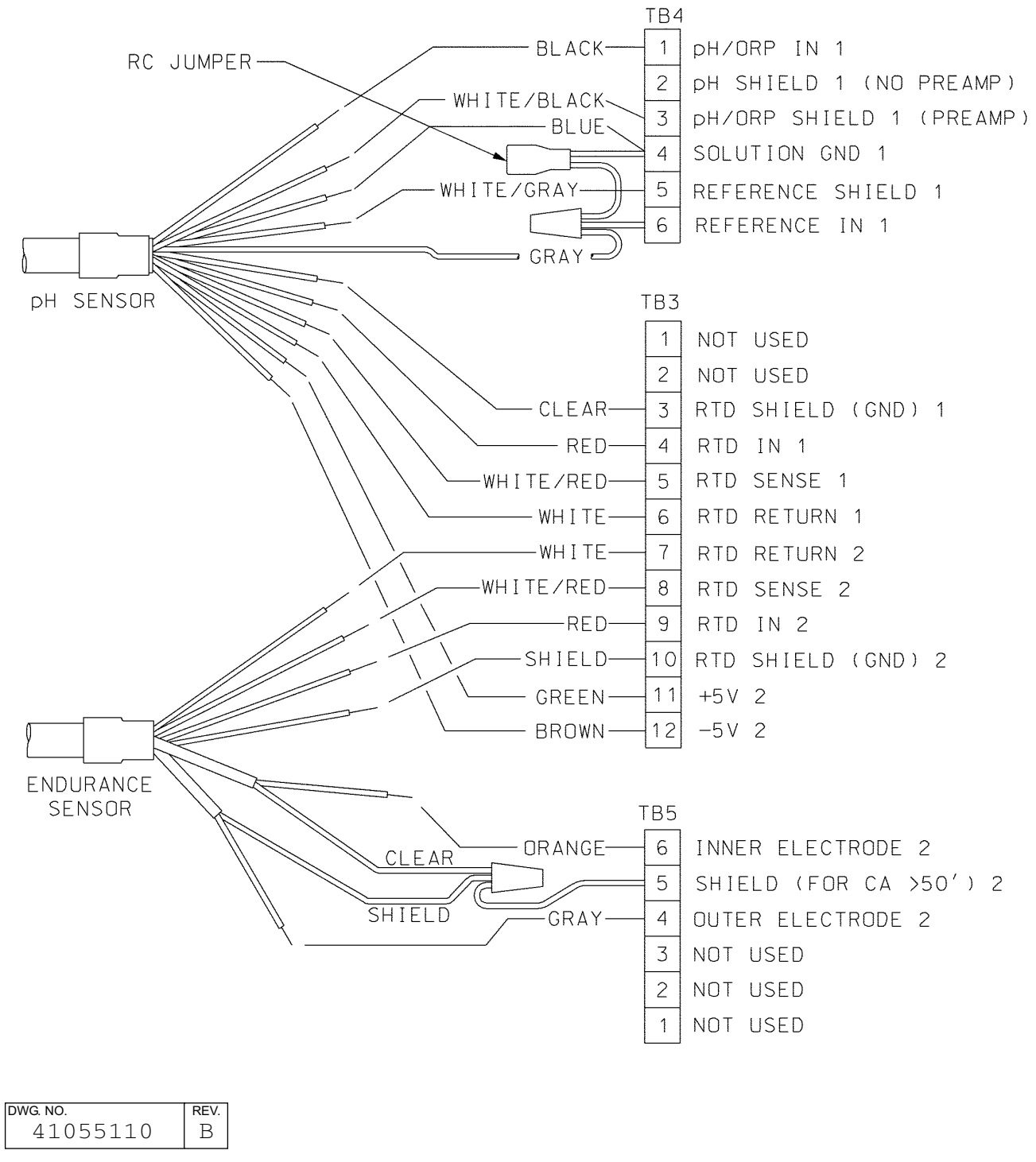
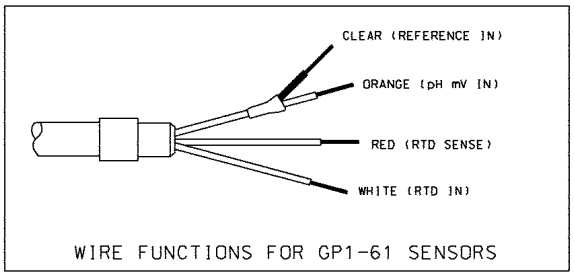
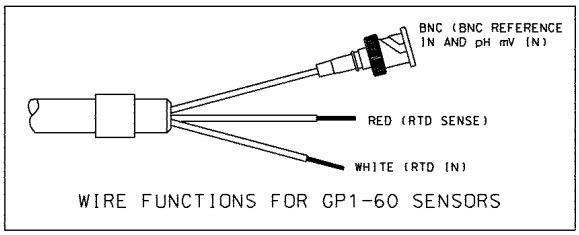
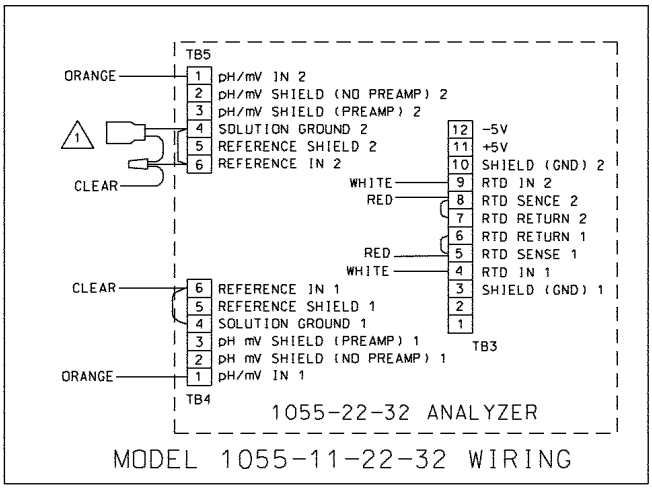
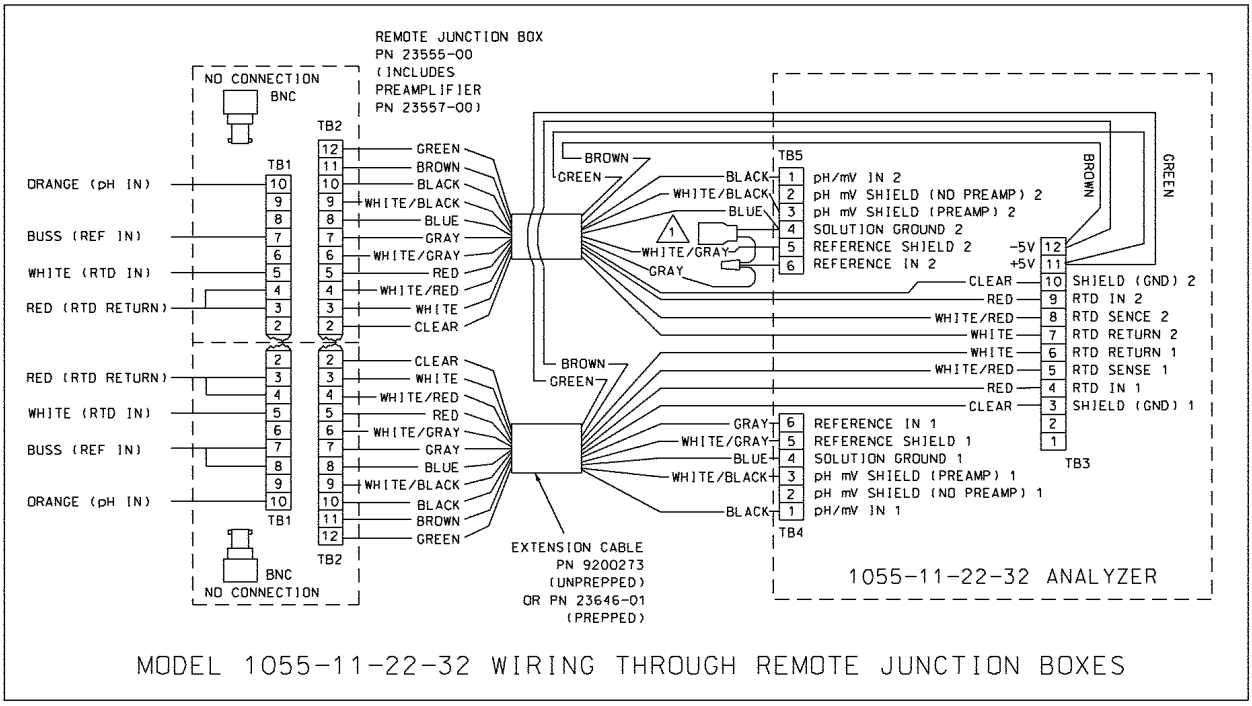


FIGURE 3-11. Panel Mount Wiring to Models 399-14, 400, 401, 402, 403, and 404.









1 RC JUMPER REQUIRED FOR DUAL MEASUREMENT ONLY.

DWG. NO.	REV.
40105536	C

FIGURE 3-12. Wiring Model 1055-11-22-32 to Models 399-09-62 and GP-1.

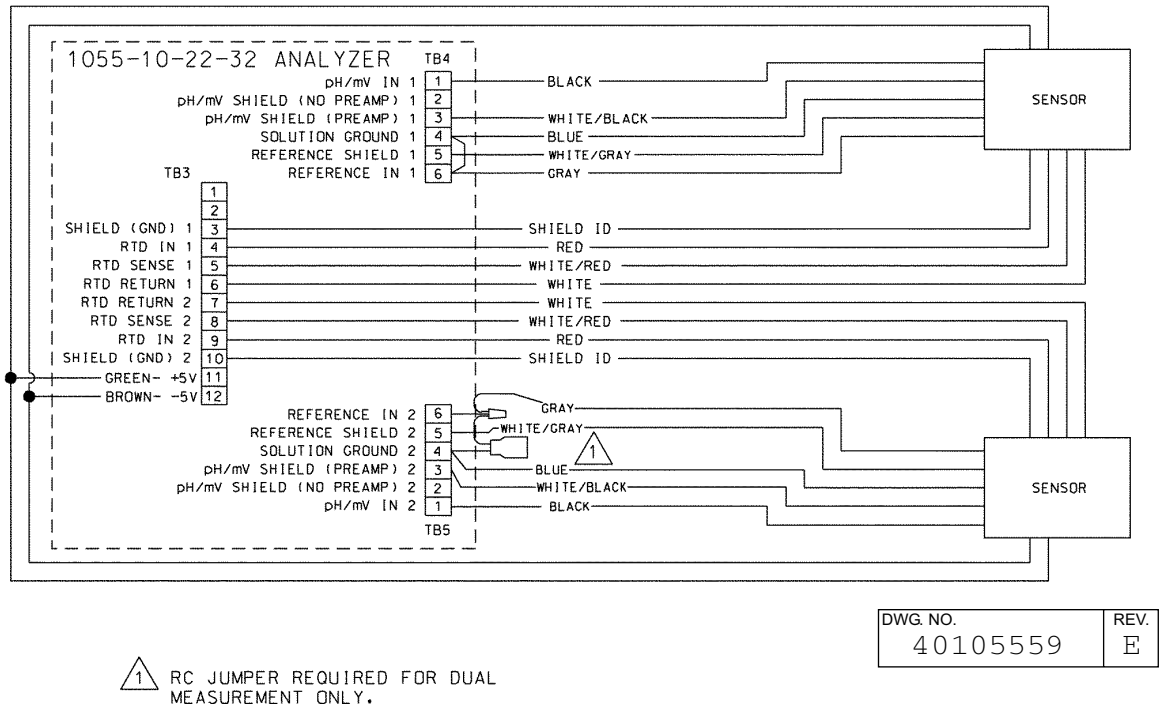


FIGURE 3-13. Wiring Model 1055-10-22-32 to Model 399-14

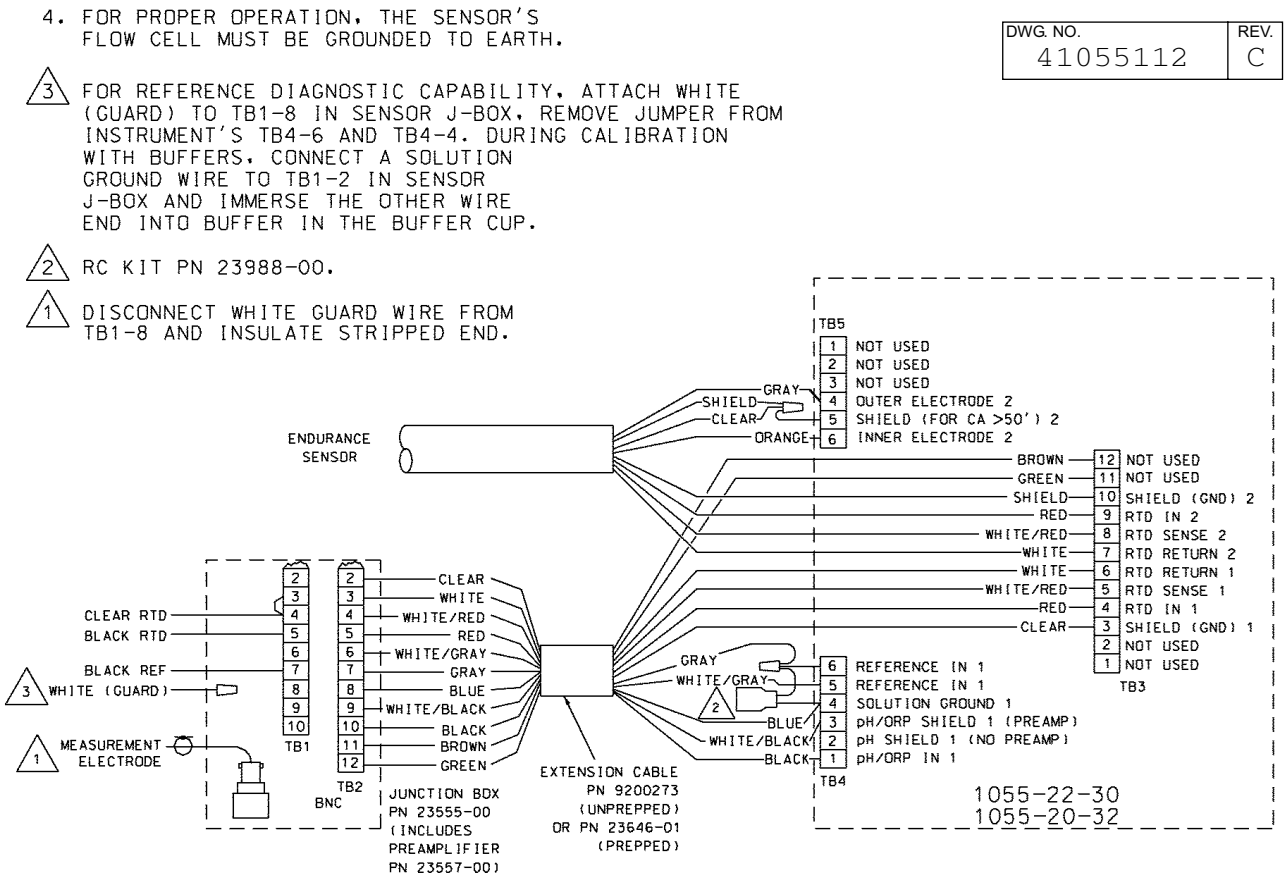


FIGURE 3-14. Wiring Model 1055 to Model 320HP-58 and 400, 401, 402, 403, or 404

SECTION 4.0
DISPLAY AND OPERATION

4.1 DISPLAY
4.2 KEYPAD
4.3 PROGRAMMING AND CALIBRATING THE SOLU COMP II - TUTORIAL
4.4 SECURITY
4.5 USING HOLD

4.1. DISPLAY

The Solu Comp II has a two-line display. The display can be customized to meet user requirements (see Section 5.11). Figure 4-1 shows some of the displays available during normal operation. View A is the default screen for a dual sensor. View B is the default screen for a single sensor.

The Solu Comp II has information screens that supplement the data in the main display. Press or to view the information screens. **The last information screen is the software version.**

During calibration and programming, key presses cause different displays to appear. The displays are self-explanatory and guide the user step-by-step through the procedure.

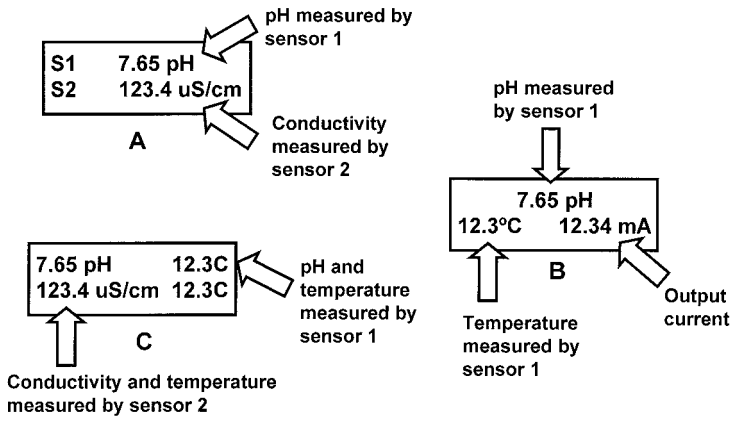


FIGURE 4-1. Displays During Normal Operation

Screen A shows pH measured by sensor 1 and conductivity measured by sensor 2. Sensor 1 must always be pH, and sensor 2 must always be conductivity. Although Screen A is the most useful screen, other display screens are possible. For example, Screen B shows data for sensor 1 (pH) only, and Screen C shows pH and conductivity, as well as temperature, measured by sensor 1 and 2.

4.2 KEYPAD

Figure 4-2 shows the Solu Comp II keypad.

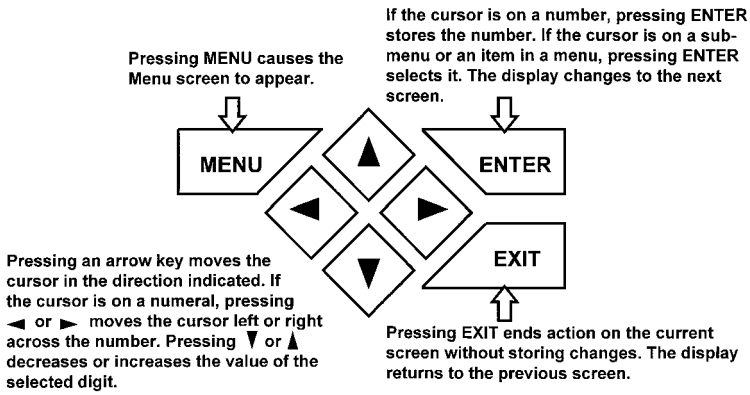


FIGURE 4-2. Solu Comp II Keypad

Four arrow keys move the cursor around the screen. A blinking word or numeral show the position of the cursor. The arrow keys are also used to change the value of a numeral. Pressing ENTER stores numbers and settings and moves the display to the next screen. Pressing EXIT returns to the previous screen without storing changes. Pressing MENU always causes the main menu screen to appear. Pressing MENU followed by EXIT causes the main display to appear.

4.3 PROGRAMMING AND CALIBRATING THE SOLU COMP II - TUTORIAL

Setting up and calibrating the Solu Comp II is easy. The following tutorial describes how to move around in the programming menus. For practice, the tutorial also describes how to assign conductivity values to the 4 and 20 mA outputs for sensor 1.



1. If the MENU screen (shown at the left) is not already showing, press MENU. **Calibrate** is blinking, which means the cursor is on **Calibrate**.



2. To assign pH or conductivity values to current outputs, the **Program** sub-menu must be open. Press . The cursor moves to **Program** (**Program** blinking). Press ENTER. Pressing ENTER opens the **Program** sub-menu.

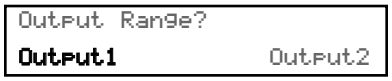


3. The **Program** sub-menu permits the user to set outputs, alarms, automatic or manual temperature compensation, and a security code. When the sub-menu opens, **Outputs** is blinking, which means the cursor is on Outputs. Press or (or any arrow key) to move the cursor around the display. Move the cursor to **>>** and press ENTER to cause a second screen with more program items to appear. There are three screens in the **Program** menu. Pressing **>>** and ENTER in the third screen causes the display to return to the first screen (**Outputs**, **Alarms**, **Measurement**).

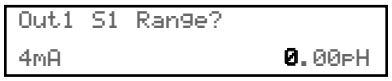
4. For practice, assign pH values to the 4 and 20 mA outputs for sensor 1. Move the cursor to **Outputs** and press ENTER.



5. The screen shown at left appears. The cursor is on **Output Range** (blinking). Output range is used to assign values to the low and high current outputs. Press ENTER.



6. The screen shown at left appears. The Solu Comp II has two outputs, output 1 and output 2. Move the cursor to the desired output and press ENTER. For purposes of the example, choose **Output 1**.

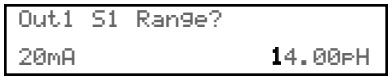


7. The screen shown at left appears. **Out1 S1** in the top line means output 1 (**Out1**) is assigned to sensor 1 (**S1**). Either output can be assigned to either sensor (sensor and output assignments are made under the **Output Configure** menu shown in step 5). Use the **Out1 S1 Range?** screen to assign a pH value to the **4 mA** output.

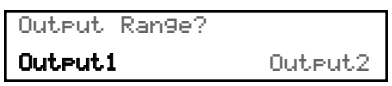
   a. Use the arrow keys to change the pH to the desired value. Press or to move the cursor from digit to digit. Press or to increase or decrease the value of the digit. Holding or down causes the numeral to continuously scroll up or down.

   b. To move the decimal point, press or until the cursor is on the decimal point. Press to move the decimal point to the right. Press to move the decimal point to the left.

   c. Press ENTER to store the setting.



8. The screen shown at left appears. Use this screen to assign a full scale pH value to the **20 mA** output. Use the arrow keys to change the pH to the desired value. Press ENTER to store the setting.



9. The screen shown at left appears. To assign values to the low and high currents for output 2, select **Output 2** and follow the prompts.

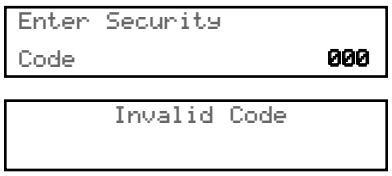
10. To return to the main menu, press MENU. To return to the main display press MENU then EXIT, or press EXIT repeatedly until the main display appears. To return to the previous display press EXIT.

NOTE
To store values or settings, press ENTER before pressing EXIT.

4.4 SECURITY

4.4.1 How the Security Code Works

Use the security code to prevent accidental or unwanted changes to program settings, displays, and calibration.



1. If a security code has been programmed, pressing MENU causes the security screen to appear.
2. Enter the three-digit security code.
3. If the entry is correct, the main menu screen appears. If the entry is incorrect, the **Invalid Code** screen appears. The **Enter Security Code** screen reappears after 2 seconds.

4.4.2 Bypassing the Security Code

Enter 555. The main menu will open.

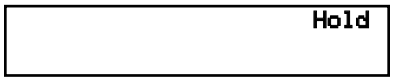
4.4.3 Setting a Security Code

See Section 5.7.

4.5 USING HOLD

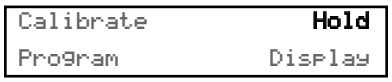
4.5.1 Purpose

The analyzer output is always proportional to measured pH or conductivity. To prevent unwanted alarms and improper operation of control systems or dosing pumps, place the analyzer in hold before removing the sensor for calibration and maintenance. Be sure to remove the analyzer from hold once calibration is complete. During hold, both outputs remain at the last value. **Once in hold, the analyzer remains there indefinitely.** While in hold, the screen shown to the left appears periodically.

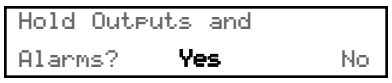


4.5.2 Using the Hold Function

To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.



1. Press MENU. The main menu screen appears. Choose **Hold**.



2. The **Hold Outputs and Alarms ?** screen appears. Choose **Yes** to place the analyzer in hold. Choose **No** to take the analyzer out of hold.
3. The main display screen will appear.

SECTION 5.0
PROGRAMMING THE ANALYZER

5.1 GENERAL
5.2 CHANGING STARTUP SETTINGS
5.3 CONFIGURING AND RANGING THE OUTPUTS
5.4 CONFIGURING ALARMS AND ASSIGNING SETPOINTS
5.5 SELECTING THE TYPE OF MEASUREMENT AND ACTIVATING SOLUTION TEMPERATURE CORRECTION
5.6 CHOOSING TEMPERATURE UNITS AND MANUAL OR AUTOMATIC TEMPERATURE COMPENSATION
5.7 SETTING A SECURITY CODE
5.8 NOISE REJECTION
5.9 SINGLE SENSOR OR DUAL SENSOR INPUT
5.10 RESETTING FACTORY CALIBRATION AND FACTORY DEFAULT SETTINGS
5.11 SELECTING A DEFAULT SCREEN, LANGUAGE, AND SCREEN CONTRAST

5.1 GENERAL

This section describes how to do the following:

1. configure and assign values to the current outputs
2. configure and assign setpoints to the alarm relays
3. choose pH, ORP, redox, conductivity, resistivity, or TDS
4. choose temperature units and manual or automatic temperature mode
5. set a security code
6. tell the analyzer the frequency of the ac power (needed for optimum noise rejection)
7. tell the analyzer the number of sensors being used
8. reset the analyzer to factory calibration and default settings
9. select a default display screen

Default settings are shown in Table 5-1 on the following page. To change a default setting, refer to the section listed in the table. To reset default settings, see Section 5.10.

5.2 CHANGING STARTUP SETTINGS

When the Solu Comp II is powered up for the first time, startup screens appear. The screens prompt the user to identify the number of sensors being used and whether pH, ORP, redox, conductivity, resistivity, or TDS is being measured. If incorrect settings were entered at startup, enter the correct settings now. To change the number of sensors refer to Section 5.9. To change the measurement, refer to Section 5.5.

FOR BEST RESULTS, ENTER THE NUMBER OF SENSORS BEING USED (SECTION 5.9) AND WHETHER pH, ORP, REDOX, CONDUCTIVITY, RESISTIVITY, OR TDS IS BEING MEASURED (SECTION 5.5) BEFORE MAKING OTHER PROGRAM SETTINGS.

TABLE 5-1. DEFAULT SETTINGS

1. SENSOR-OUTPUT ASSIGNMENTS (pH, ORP, redox, conductivity, resistivity, or TDS is selected during Quick Start)

Sensor(s)	Output 1	Output 2	Section
Single sensor	pH/ORP/Redox	Temperature	5.3 and 5.9
Dual sensor	pH/ORP/Redox (sensor 1)	Conductivity/Resistivity (sensor 2)	5.3 and 5.9

2. OTHER OUTPUT SETTINGS

Output	Dampening	0 or 4 mA	Mode	Section
1	off	4	Linear	5.3
2	off	4	Linear	5.3

3. OUTPUT RANGES (pH, ORP, redox, conductivity, resistivity, or TDS is selected during Quick Start)

Measurement	Range	Section
pH	0 to 14	5.3
ORP/Redox	-1400 to 1400 mV	5.3
Temperature	0 to 100°C	5.3
Resistivity	0.0 to 20 MΩ-cm	5.3
TDS	0 to 1000 ppm	5.3
Conductivity — 0.01/cm	0 to 10 μS/cm	5.3
Conductivity — 0.1/cm	0 to 100 μS/cm	5.3
Conductivity — 1.0/cm	0 to 1000 μS/cm	5.3
Conductivity — 10/cm	0 to 20 mS/cm	5.3

4. ALARM CONFIGURATION AND SETPOINTS

	Alarm			
	1	2	3	Section
Assigned to	Sensor 1 (pH, ORP)	Sensor 2 (conductivity) (note 1)	Fault	5.4
High or low	High	High (note 2)	NA	5.4
Deadband	0	0	NA	5.4
Setpoint (pH)	14 (high); 0 (low)	14 (high); 0 (low)	NA	5.4
Setpoint (ORP/Redox)	1400 mV (high); -1400 (low)	1400 mV (high); -1400 (low)	NA	5.4
Setpoint (conductivity)	1000 μS/cm (high); 0 (low)	1000 μS/cm (high); 0 (low)	NA	5.4
Setpoint (resistivity)	20 MΩ-cm (high); 0 (low)	20 MΩ-cm (high); 0 (low)	NA	5.4
Setpoint (TDS)	1000 ppm (high); 0 (low)	1000 ppm (high); 0 (low)	NA	5.4

Note 1: For single sensor input, alarm 2 is assigned to sensor 1.
Note 2: For resistivity measurements, alarm is low.

TABLE 5-1. DEFAULT SETTINGS (continued)

5. TEMPERATURE RELATED SETTINGS

		Section
Units	°C	5.6
Automatic temperature compensation (pH)	On	5.6
Automatic temperature correction (conductivity)	On	5.6
Solution temperature correction (pH)	Off	5.5
Isopotential pH	7.00	5.5
Temperature correction (conductivity)	neutral salt	5.5
Temperature slope	2%/°C	5.5

6. MISCELLANEOUS SETTINGS

		Section
Language	English	5.11
Hold	off	4.5
Security code	000 (no security code)	5.7
ac power frequency	60 Hz	5.8

5.3 CONFIGURING AND RANGING THE OUTPUTS.

5.3.1 Purpose

The Solu Comp II accepts input from a pH, ORP, or conductivity sensor and has two current outputs. This section describes how to configure and range the outputs. **CONFIGURE THE OUTPUTS FIRST.**

1. Configuring an output means
   a. Selecting either a 4-20 mA or 0-20 mA output,
   b. Assigning a sensor and a measurement (pH, ORP, redox potential, conductivity, resistivity, or total dissolved solids [TDS]) to output 1 and output 2,
   c. Turning on or turning off output current dampening,
   d. Choosing a linear or logarithmic output.
2. Ranging the outputs means assigning values to the low (0 or 4 mA) and high (20 mA) outputs.

5.3.2 Definitions

1. CURRENT OUTPUTS. The analyzer provides either a continuous 4-20 mA or 0-20 mA output current directly proportional to pH, ORP, redox potential, conductivity, resistivity, or TDS.
2. ASSIGNING OUTPUTS. Figure 5-1 shows the ways in which the outputs can be assigned.
3. DAMPEN. Output dampening smooths out noisy readings. It also increases the response time of the output. With output dampening the time to reach 63% of final reading following a step change is 5 sec. Output dampening does not affect the response time of the display.
4. MODE. The current output can be made directly proportional to the displayed value (linear mode) or directly proportional to the common logarithm of the displayed value (log mode).

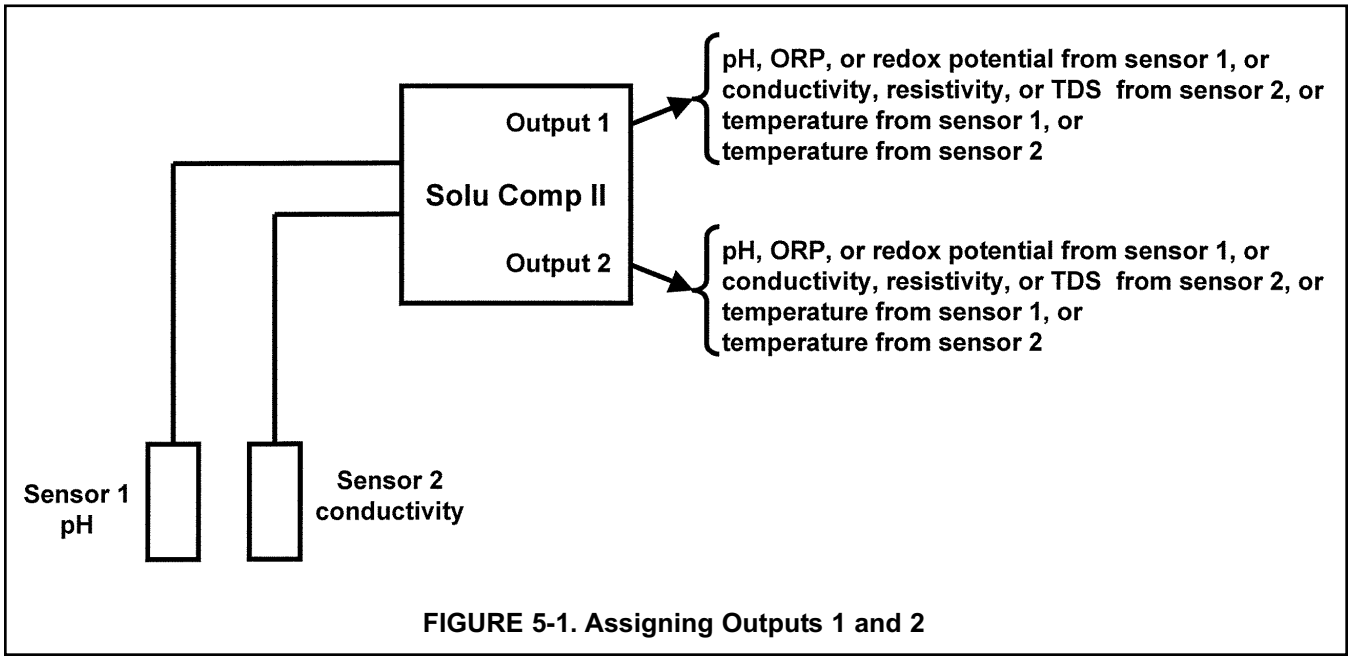


FIGURE 5-1. Assigning Outputs 1 and 2

5.3.3. Procedure: Configure Outputs.

To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.



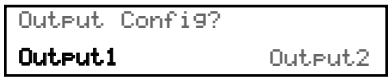
1. Press MENU. The main menu screen appears. Choose **Program**.



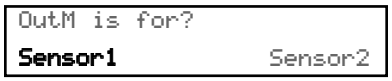
2. Choose **Outputs**.



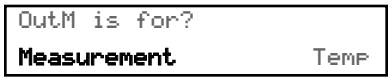
3. Choose **Output Configure**.



4. Choose **Output1** or **Output2**.



5. Choose **Sensor1** (pH) or **Sensor2** (conductivity). Either sensor can be assigned to either output.



6. Choose **Measurement** or **Temp**. If the output selected was assigned to Sensor 1, **Measurement** means pH, ORP, or redox. If the output selected was assigned to Sensor 2, **Measurement** means conductivity, resistivity, or TDS.
7. Make the appropriate settings:
   a. Choose **4-20 mA** or **0-20 mA**.
   b. Choose **Yes** or **No** for output dampening.
   c. Choose **Linear** or **Log** output.
8. The display returns to the **Output Config?** screen. Select the other output or press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

5.3.4. Procedure: Assigning Values to the Low and High Current Outputs (Output Ranging)

To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.



1. Press MENU. The main menu screen appears. Choose **Program**.



2. Choose **Outputs**.



3. Choose **Output Range**. Choose **Output1** or **Output2**.
4. Make the appropriate settings.
   a. Assign a value to the low current (**0 mA** or **4 mA**) output.
   b. Assign a value to the high current (**20 mA**) output.
5. The display returns to the **Output Range** screen. Select the other output or press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

5.4 CONFIGURING ALARMS AND ASSIGNING SETPOINTS

5.4.1 Purpose

This section describes how to do the following:

1. assign an alarm relay to a sensor,
2. set the alarm logic to high or low,
3. assign values to the alarm setpoints,
4. set the alarm deadbands.

ALARM RELAYS MUST BE CONFIGURED BEFORE ASSIGNING SETPOINTS.

5.4.2 Definitions

1. ASSIGNING ALARMS. There are three alarms (**AL1**, **AL2**, and **AL3**). Alarms 1 and 2 can be assigned to any sensor. For example, **AL1** and **AL2** can be assigned to sensor 1 with, perhaps, one alarm configured as a high alarm and the other as a low alarm, and **AL3** can be assigned to sensor 2. Alarm 3 can be assigned to either sensor or used as a fault alarm. The fault alarm activates when a fault exists in a sensor or the analyzer.
2. FAULT ALARM. A fault condition exists when the Solu Comp II detects a problem with a sensor or with the analyzer that is likely to cause seriously erroneous readings. If Alarm 3 was programmed as a fault alarm, the alarm 3 relay will activate. The word **Fault** will appear alternately in the display with the reading.
3. ALARM LOGIC, SETPOINTS, AND DEADBANDS. See Figures 5-2 and 5-3.

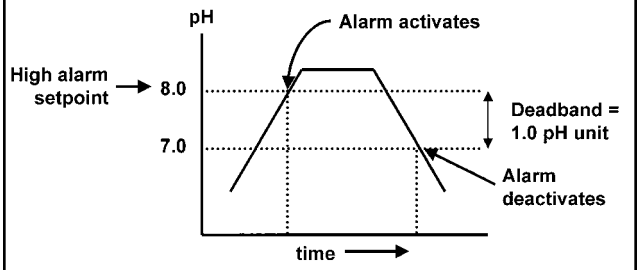


FIGURE 5-2. High Alarm Logic

The alarm activates when the pH exceeds the high setpoint. The alarm remains activated until the reading drops below the value determined by the deadband.

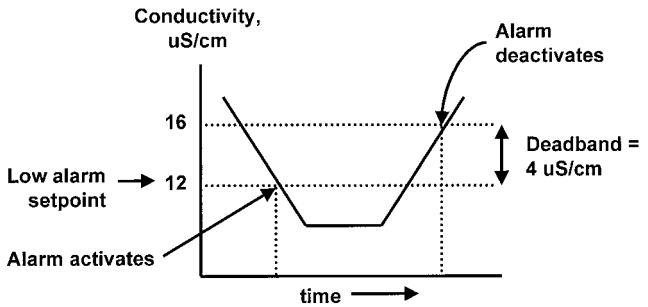


FIGURE 5-3. Low Alarm Logic

The alarm activates when the conductivity drops below the low setpoint. The alarm remains activated until the reading increases above the value determined by the deadband.

Alarm relays are single pole-double throw (SPDT). When an alarm is activated, the coil is energized.

When an alarm activates, **AL1**, **AL2**, or **AL3** (as appropriate) appears periodically in the display.

4. USP 24 ALARM. Any alarm, if assigned to sensor 2 (conductivity) can be configured as a USP 24 alarm. A USP 24 alarm activates when the non-temperature-corrected conductivity (raw conductivity) of the water is within a user-selectable percentage (safety range) of the USP 24 limit. For example, at 40°C the USP 24 limit is 1.7 µS/cm. If the safety range is 10%, the USP 24 alarm activates when the raw conductivity exceeds 1.7 - (0.1 x 1.7) or 1.53 µS/cm.

5.4.3 Procedure: Configuring Alarms

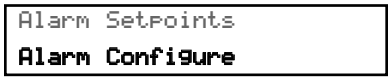
To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.



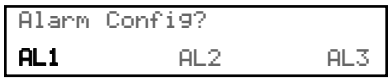
1. Press MENU. The main menu screen appears. Choose **Program**.



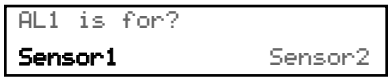
2. Choose **Alarms**.

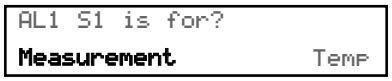


3. Choose **Alarm Configure**.



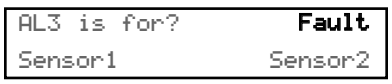
4. Choose Alarm 1 (**AL1**), Alarm 2 (**AL2**), or Alarm 3 (**AL3**).





5. For **AL1** or **AL2**
   a. Choose **Sensor 1** (pH) or **Sensor 2** (conductivity).
   b. Choose **Measurement** or **Temp**.
   c. Choose **High**, **Low** or **USP 24. USP 24** appears only if **Sensor 2** was selected.
   d. Set the alarm **Deadband**.

6. The display returns to the **Alarm Configure?** screen. Select another alarm or press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

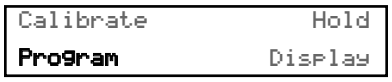


7. For **AL3**
   a. Choose **Sensor1** (pH), **Sensor2** (conductivity), or **Fault**.
   b. For sensor 1 or 2, choose **Measurement** or **Temp**.
   c. Choose **High**, **Low** or **USP 24. USP 24** appears only if **Sensor 2** was selected. Set the deadband.
   d. Choosing **Fault** means **AL3** will activate when a sensor or analyzer fault exists. There is no user setting to make.

8. The display returns to the **Alarm Configure?** screen. Select another alarm or press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

5.4.4 Procedure: Programming Alarm Setpoints

To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.



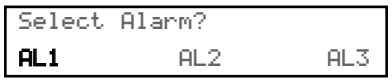
1. Press MENU. The main menu screen appears. Choose **Program**.



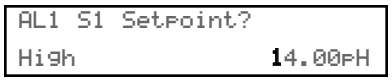
2. Choose **Alarms**.



3. Choose **Alarm Setpoints**.



4. Choose Alarm 1 **(AL1**), Alarm 2 (**AL2**), or Alarm 3 (**AL3**).



5. The display shows the alarm selected (**AL1**) and the configuration. The alarm is for Sensor 1 (**S1**), and the logic is high. Use the arrow keys to change the alarm setpoint.



6. If the alarm is USP 24, the display shows the alarm selected and the USP safety margin. Change the safety margin to the desired value.

7. The display returns to the **Select Alarm?** screen. Select another alarm or press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

5.5 SELECTING THE TYPE OF MEASUREMENT AND ACTIVATING SOLUTION TEMPERATURE CORRECTIONS

5.5.1 Purpose

This section describes how to do the following:

1. Program the Solu Comp II to measure pH, ORP, redox potential, conductivity, resistivity, or total dissolved solids.
2. Enable or disable glass impedance fault.
3. Select a solution temperature correction for pH.
4. Change the analyzer pH isopotential point.
5. Select a solution temperature correction for conductivity.

5.5.2 Definitions — pH/ORP

1. ORP. ORP is oxidation-reduction potential. It is the voltage difference between a noble metal (usually platinum) indicator electrode and a silver/silver chloride reference electrode.
2. REDOX. Redox is redox potential. Redox potential is measured the same way as ORP. The sign of the redox potential is the negative of ORP.
3. SIGN CONVENTION. The ORP of a solution of 0.1 M iron (II) ammonium sulfate and 0.1 M iron (III) ammonium sulfate in 1 M sulfuric acid is positive. The redox potential is negative.
4. GLASS IMPEDANCE FAULT. The Solu comp II can be used with pH sensors having advanced diagnostic features, which permit the continuous determination of glass and reference electrode impedance. When the analyzer detects low glass impedance, indicating a broken or cracked glass membrane, it automatically displays a fault message. If the Solu Comp II is to be used with non-glass pH electrodes, the glass impedance fault should be disabled.
5. SOLUTION TEMPERATURE CORRECTION. The pH of a solution, particularly an alkaline one, is a function of temperature. If the temperature changes, so does the pH, even though the concentration of the acid or base causing the pH remains constant. Solution temperature compensation converts the pH at the measurement temperature to the pH at a reference temperature. The Solu Comp II corrects the pH to a reference temperature of 25°C.

   For an accurate solution temperature correction, the exact composition of the solution must be known. The Solu Comp II has built-in temperature corrections for high purity water and for dilute solutions of a strong base. The analyzer also accepts a custom correction.
6. CUSTOM TEMPERATURE CORRECTION. The custom temperature correction has units of ΔpH/°C. The example shows how the analyzer uses the custom correction. Suppose the pH of the solution being measured decreases 0.022 units for every Celsius degree rise in temperature. The temperature correction is -0.022pH/°C. If the pH at 20°C is 8.95, the corrected pH (at 25°C) is 8.95 + (-0.022)(25 - 20) or 8.84.
7. ISOPOTENTIAL pH. The isopotential pH is the pH at which the cell voltage (the cell is the pH electrode, reference electrode, and solution being measured) is independent of temperature. Most pH cells have isopotential pH reasonably close to 7.00, so the Solu Comp II assumes the cell isopotential pH is 7.00. However, certain specialized electrodes have isopotential pH different from 7.00.

NOTE

Do NOT change the isopotential pH of the transmitter unless you are thoroughly familiar with the role of sensor and analyzer isopotential point in pH measurement, OR the sensor operating instructions specifically state the isopotential pH is a value other than pH 7.00.

5.5.3 Definitions — conductivity/resistivity

1. NEUTRAL SALT CORRECTION. Neutral salt temperature correction is appropriate for most applications involving natural and treated waters in which neutral salts are primarily responsible for the conductivity. It is NOT suitable if the sample is a dilute acid or base. The neutral salt correction programmed into the Solu Comp II takes into account the contribution of water to the overall conductivity (or resistivity). **Therefore, the neutral salt works for high purity water as well as for waters having higher conductivity.** The correction algorithm assumes the salt is sodium chloride. Because the change in the conductivity of sodium chloride solutions with temperature is similar to most other aqueous salt solutions, the correction is suitable for most applications. The correction applies between 0 and 100°C, and the reference temperature is 25°C.
2. LINEAR TEMPERATURE COEFFICIENT OR TEMPERATURE SLOPE. The change in the conductivity of most electrolyte solutions having conductivity greater than about 5 μS/cm at 25°C can be expressed by the the following equation:

$$C_{25} = \frac{C_t}{1+ a(t - 25)}$$

   In the equation, C_{25} is the conductivity at 25°C, C_t is the conductivity at t°C, and a is the linear temperature coefficient. The linear temperature coefficient, or temperature slope, has units of %/°C. In the equation, the temperature coefficient is expressed as a decimal fraction. The linear temperature coefficient depends to some extent on both the temperature and concentration of the salt solution. The temperature coefficient also varies from salt to salt.

   For maximum accuracy, the temperature coefficient must be appropriate for the salt or salts in solution, their concentration, and the temperature. Frequently, the relationship must be determined by experiment. Fortunately, for most dilute neutral electrolyte solutions, a linear temperature coefficient of 2.00%/°C (0.0200) is appropriate. The table gives typical ranges for different dilute electrolyte solutions.

	Slope (%/°C)
Neutral salts	1.8 - 2.2
Acids and acid salts	1.0 - 1.6
Bases and basic salts	1.6 - 3.0
High purity water	Use neutral salt correction

3. CATION TEMPERATURE CORRECTION. Cation conductivity, sometimes called acid conductance, is used in steam power plants to measure salt contamination in boiler feedwater and steam. The Solu Comp II automatically corrects for the variation in the conductivity of extremely dilute hydrochloric acid with temperature and displays the conductivity at 25°C. The correction is valid to 100°C, so the Solu Comp II can be used for degassed cation conductivity measurements. Cation conductivity temperature correction also applies to semiconductor etch rinse baths, which contain trace amounts of acids.
4. RAW. Raw conductivity is the conductivity of the sample at the measurement temperature.
5. TDS. TDS is total dissolved solids. The Solu Comp II calculates TDS (in ppm) by multiplying the conductivity (corrected to 25°C using a temperature coefficient of 2%/°C) by 0.65.

5.5.4 Procedure.

To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.



1. Press MENU. The main menu screen appears. Choose **Program**.



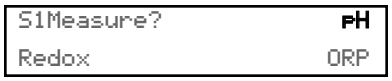
2. Choose **Measurement**.



3. Choose **Sensor 1** (pH) or **Sensor 2** (conductivity). For a single input configuration, the **Sensor 1 Sensor 2** screen does not appear.

   If you chose Sensor 1, go to step 4.

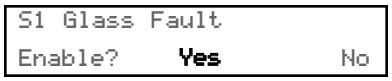
   If you chose Sensor 2, go to step 11.



4. For **Sensor 1**, choose **pH, Redox**, or **ORP**.

   If you chose **pH**, do steps 5 through 9.

   If you chose **ORP** or **Redox**, do step 10.



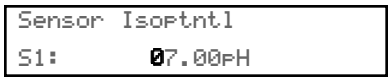
5. Choose **NO** if the pH sensing electrode is **NOT** a glass electrode.



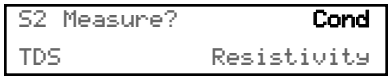
6. Choose **Soln Temp Corr** or **Sensor Isoptntl**.



7. For **Soln Temp Corr**, choose **Off**, **UltraPure**, **HighpH**, or **Custom**. For **Custom**, enter the desired temperature coefficient.



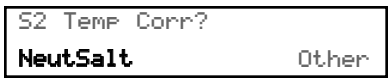
8. For **Sensor Isoptntl**, enter the desired sensor isopotential pH. Do not change the sensor isopotential pH unless the sensor is known to have an isopotential pH different from 7.00.
9. The display returns to the screen shown in step 3. Choose **Sensor 2** (conductivity) and follow the prompts. See step 11.
10. If **Redox** or **ORP** was selected, there are no further settings to make. The display returns to the screen shown in step 3. Choose **Sensor 2** (conductivity) and follow the prompts. See step 11.



11. For **Sensor 2**, choose **Cond** (conductivity), **Resistivity**, or **TDS** (total dissolved solids).

    If you chose **Cond** or **Resistivity**, go to step 12.

    If you chose **TDS**, go to step 14.



12. Choose **NeutSalt**, **Slope**, **Cation**, or **Raw**. For **Slope**, enter the desired temperature coefficient in %/°C.
13. The display returns to the screen shown in step 3. Press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.
14. If **TDS** was selected, there are no further settings to make.The display returns to the screen shown in step 3. Press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

5.6 CHOOSING TEMPERATURE UNITS AND MANUAL OR AUTOMATIC TEMPERATURE COMPENSATION

5.6.1 Purpose

This section describes how to do the following:

1. Choose temperature display units (°C or °F).
2. Choose automatic or manual temperature compensation for pH.
3. Choose automatic or manual temperature correction for conductivity/resistivity.
4. Enter a temperature for manual temperature compensation.

5.6.2 Definitions — pH

1. AUTOMATIC TEMPERATURE COMPENSATION — pH. The analyzer uses a temperature-dependent factor to convert measured cell voltage to pH. In automatic temperature compensation, the analyzer measures the temperature and automatically calculates the correct conversion factor. For maximum accuracy, use automatic temperature compensation.
2. MANUAL TEMPERATURE COMPENSATION — pH. In manual temperature compensation, the analyzer converts measured voltage to pH using the temperature entered by the user. It does not use the actual process temperature. Do **NOT** use manual temperature compensation unless the process temperature varies no more than about ±2°C or the pH is between 6 and 8. Manual temperature compensation is useful if the sensor temperature element has failed and a replacement sensor is not available.

5.6.3 Definitions — Conductivity/Resistivity

1. AUTOMATIC TEMPERATURE CORRECTION — CONDUCTIVITY. The conductivity of an electrolyte solution depends strongly on temperature. To allow comparison among measurements made at different temperatures, conductivity and resistivity measurements are usually converted to the value at 25°C. The Solu Comp II performs the correction automatically using a neutral salt, dilute acid, or linear temperature coefficient algorithm. See Section 5.5.3 for more information.
2. MANUAL TEMPERATURE CORRECTION — CONDUCTIVITY. In manual temperature compensation, the analyzer converts measured conductivity (or resistivity) to the value at 25°C using the temperature entered by the user. It does not use the actual process temperature.

5.6.4 Procedure.

To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.



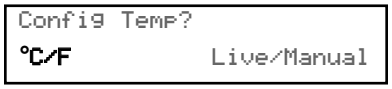
1. Press MENU. The main menu screen appears. Choose **Program**.



2. Choose **>>**.



3. Choose **Temp.**



4. Choose **°C/F** to change temperature units. Choose **Live/Manual** to turn on (Live) or turn off (Manual) automatic temperature compensation.
   a. If **°C/F** is chosen, select **°C** or **°F** in the next screen.
   b. If **Live/Manual** is chosen, select **Live** or **Manual** for sensor 1 (pH) in the next screen.
   c. If **Manual** is chosen, enter the temperature in the next screen. The temperature entered in this step will be used in all subsequent measurements, no matter what the process temperature is.
   d. The display will return to the **Live/Manual** screen for sensor 2 (conductivity). Make the desired selections for sensor 2.

5.7 SETTING A SECURITY CODE

5.7.1 Purpose.

This section describes how to set a security code. The security code prevents program and calibration settings from accidentally being changed. Refer to Section 4.4 for additional information.

5.7.2 Procedure.

To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.



1. Press MENU. The main menu screen appears. Choose **Program**.



2. Choose **>>**, then **Security**.



3. Enter a three digit security code. The security code takes effect two minutes after the last key stroke.

4. The display returns to the security menu screen. Press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

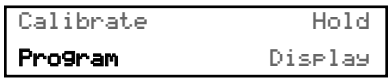
5.8 NOISE REJECTION

5.8.1 Purpose.

For maximum noise rejection, the frequency of the ac power must be entered in the analyzer.

5.8.2. Procedure.

To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.



1. Press MENU. The main menu screen appears. Choose **Program**.



2. Choose **>>**.



3. Choose **>>**.



4. Choose **Noise Rejection**.
5. Enter the mains frequency, 50 Hz or 60 Hz.
6. The display returns to the **Noise Rejection** screen. To return to the main menu, press EXIT. To return to the main display, press MENU followed by EXIT.

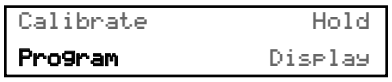
5.9 SINGLE SENSOR OR DUAL SENSOR INPUT

5.9.1 Purpose

The Solu Comp II accepts input from a single sensor or from two sensors. This section describes how to program the analyzer for single or dual sensors. **COMPLETE THIS SECTION BEFORE DOING OTHER PROGRAMMING.**

5.9.2 Procedure.

To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.



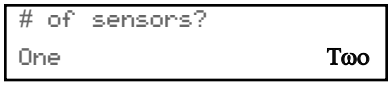
1. Press MENU. The main menu screen appears. Choose **Program**.



2. Choose **>>**.



3. Choose **#Sensors**.



4. Choose **One** or **Two**. Choosing **One** configures the analyzer as a pH analyzer. Conductivity cannot be selected for single measurement.
5. The display returns to the **# Sensors** screen. To return to the main menu, press MENU. To return to the main display, press MENU followed by EXIT.

5.10 RESETTING FACTORY CALIBRATION AND FACTORY DEFAULT SETTINGS

5.10.1 Purpose.

This section describes how to re-install factory calibration and default values. The process also clears all fault messages and returns the display to the first quick start screen.

5.10.2. Procedure.

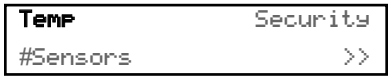
To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.



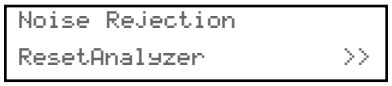
1. Press MENU. The main menu screen appears. Choose **Program**.



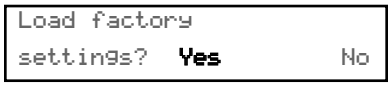
2. Choose **>>**.



3. Choose **>>**.



4. Choose **ResetAnalyzer**.



5. Choose **Yes** or No. If **Yes** is selected, previous settings are cleared and the **Quick Start Menu** appears.

5.11 SELECTING A DEFAULT SCREEN, LANGUAGE, AND SCREEN CONTRAST

5.11.1 Purpose

This section describes how to do the following:

1. set a default display screen

   The default display screen is the screen shown during normal operation. The Solu Comp II allows the user to choose from a large number of screens. Which screens are available depends on how the analyzer was configured. The following is an explanation of the abbreviations used in the screens.

   In the display:

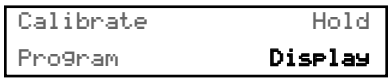
   i. **S** means sensor. **S1** is sensor 1, and **S2** is sensor 2. If neither **S1** nor **S2** appears, then the analyzer has been configured for a single sensor input.

   ii. **G** is glass electrode impedance, and **R** is reference electrode impedance.

2. select a language
3. change the screen contrast

To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.

5.11.2 Procedure: Selecting a Display Screen

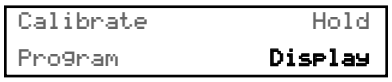


1. Press MENU. The main menu screen appears. Choose **Display**.



2. Choose **Default Display**.
3. Press or until the desired display appears. Press ENTER. For an explanation of abbreviations, see Section 5.11.1.
4. The display returns to the screen in step 2. To return to the main menu, press MENU. To return to the main display, press MENU followed by EXIT.

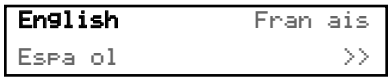
5.11.3 Procedure: Choosing a Language



1. Press MENU. The main menu screen appears. Choose **Display**.

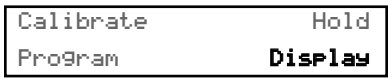


2. Choose **Language**.

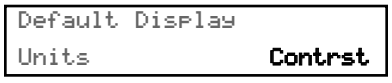


3. Choose English, Français, Español, Deutsch, Italiano, or Portugues.
4. The display returns to the screen in step 2. To return to the main menu, press MENU. To return to the main display, press MENU followed by EXIT.

5.11.4 Procedure: Changing Screen Contrast



1. Press MENU. The main menu screen appears. Choose **Display**.



2. Choose **Contrst**.



3. Press or to increase or decrease the screen contrast. As contrast increases, the number increases.
4. The display returns to the screen shown in step 2. To return to the main menu, press MENU. To return to the main display, press MENU followed by EXIT.

SECTION 6.0
CALIBRATION

6.1 INTRODUCTION
6.2 CALIBRATING TEMPERATURE
6.3 AUTO CALIBRATION - pH
6.4 MANUAL CALIBRATION - pH
6.5 STANDARDIZATION - pH
6.6 ENTERING A KNOWN SLOPE - pH
6.7 ORP CALIBRATION
6.8 CALIBRATING AN IN-SERVICE SENSOR - CONDUCTIVITY
6.9 PLACING A NEW SENSOR IN SERVICE - CONDUCTIVITY
6.10 CALIBRATING THE ANALYZER - CONDUCTIVITY

6.1 INTRODUCTION

The Calibrate Menu allows the user to calibrate sensor 1 (pH or ORP) and sensor 2 (conductivity). The temperature response of each sensor can also be calibrated.

For pH sensors, two-point buffer calibration is standard. In auto calibration the analyzer calculates the pH of the buffer from the nominal value entered by the user and does not accept calibration data until readings are stable. In manual calibration the user enters buffer values and judges when readings are stable. The pH reading can also be standardized, that is, forced to match the reading from a referee instrument. Finally, if the user knows the electrode slope (at 25°C), he can enter it directly.

The ORP calibration is a single-point calibration against an ORP standard.

For conductivity measurements, several types of calibration are possible. The sensor and analyzer can be calibrated as a unit against a solution having an accurately known conductivity, or they can be calibrated against a referee instrument. The analyzer and sensor can also be calibrated separately. The analyzer is calibrated against a known resistance. The sensor cell constant can be measured independently and the results entered directly into the Solu Comp II.

6.2 CALIBRATING TEMPERATURE

6.2.1 Purpose

Temperature is important in the measurement of pH, ORP, and conductivity (or resistivity) for different reasons.

Temperature affects the measurement of pH in three ways.

1. The analyzer uses a temperature dependent factor to convert measured cell voltage to pH. Normally, a slight inaccuracy in the temperature reading is unimportant unless the pH reading is significantly different from 7.00. Even then, the error is small. For example, at pH 12 and 25°C, a 1°C error produces a pH error less than ±0.02.
2. During auto calibration, the Solu Comp II recognizes the buffer being used and calculates the actual pH of the buffer at the measured temperature. Because the pH of most buffers changes only slightly with temperature, reasonable errors in temperature do not produce large errors in the buffer pH. For example, a 1°C error causes **at most** an error of ±0.03 in the calculated buffer pH.
3. The Solu Comp II can be programmed to calculate and display pH at a reference temperature (25°C). The maximum change in solution pH with temperature is about ±0.04 pH/°C, so a 1°C temperature error does introduce a small error. However, the major source of error in solution temperature compensation is using an incorrect temperature coefficient.

Temperature affects the measurement of ORP in a complicated fashion that is best determined empirically.

Conductivity is a strong function of temperature. Therefore, to compare conductivity measurements made at different temperatures, conductivity must be converted to the value at a reference temperature, usually 25°C. The conductivity of most dilute electrolyte solutions changes about 2%/°C, so a small error in temperature is of little consequence. The conductivity of high purity water changes about 5%/°C or more, so small errors in temperature can lead to substantial errors in the corrected conductivity. Although accurate temperature measurement is important, often the major error in the corrected conductivity arises from the use of an incorrect temperature coefficient.

Without calibration the accuracy of the temperature measurement is about ±0.4°C. Calibrate the sensor/analyzer unit if

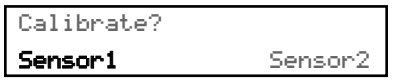
1. ±0.4°C accuracy is not acceptable
2. the temperature measurement is suspected of being in error. Calibrate temperature by making the analyzer reading match the temperature measured with a **standard thermometer**.

6.2.2 Procedure

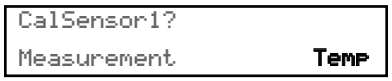
1. Remove the sensor from the process. Place it in an insulated container of water along with a **calibrated thermometer**. Submerge at least the bottom two inches of the sensor. Stir continuously.
2. Allow the sensor to reach thermal equilibrium. For some sensors, the time constant for a change in temperature is 5 min., so it may take as long as 30 min. for temperature equilibration.
3. If the sensor cannot be removed from the process, measure the temperature of a flowing sample taken from a point as close to the sensor as possible. Let the sample continuously overflow an insulated container holding a **calibrated thermometer**.
4. Change the Solu Comp II display to match the **calibrated thermometer** using the procedure below.



a. Press MENU. The main menu screen appears. Choose **Calibrate**.



b. Choose **Sensor1** (pH) or **Sensor2** (conductivity).



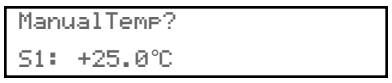
c. Choose **Temp**.



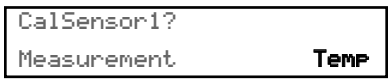
d. If the analyzer was programmed in Section 5.6 to use the actual process temperature, the screen at left will appear. To calibrate the temperature, change the number in the second line to match the temperature measured with the **standard thermometer**. Press ENTER. Go to step f.

   If the calibration temperature is more than 2 or 3°C different from the live reading, see Section 8.3.1 or Section 8.4.2.

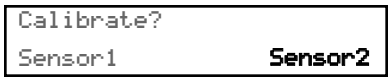
   If the analyzer was programmed to use a temperature entered by the user, go to step e.



e. The screen at left will appear if the analyzer was programmed for manual temperature compensation. Change the temperature to the desired value, then press ENTER. The analyzer will use the temperature entered in this step in all measurements and calculations, no matter what the true temperature is.



f. The screen at left will appear. Press EXIT.



g. Choose the other sensor and calibrate its temperature response.

h. To return to the main display, press MENU followed by EXIT.

6.3 AUTO CALIBRATION — pH

6.3.1 Purpose

1. New sensors must be calibrated before use. Regular recalibration is also necessary.

2. Use auto calibration instead of manual calibration. Auto calibration avoids common pitfalls and reduces errors.

6.3.2 Definitions

1. AUTO CALIBRATION. The analyzer recognizes the buffers and uses temperature-corrected pH values in the calibration. The table lists the buffers the Solu Comp II recognizes.

pH at 25°C (nominal pH)	Standard(s)
1.68	NIST, DIN 19266, JSI 8802, BSI (see note 1)
3.56	NIST, BSI
3.78	NIST
4.01	NIST, DIN 19266, JSI 8802, BSI
6.86	NIST, DIN 19266, JSI 8802, BSI
7.00	(see note 2)
7.41	NIST
9.18	NIST, DIN 19266, JSI 8802, BSI
10.01	NIST, JSI 8802, BSI
12.45	NIST, DIN 19266

Note 1: NIST is National Institute of Standards, DIN is Deutsche Institute für Normung, JSI is Japan Standards Institute, and BSI is British Standards Institute.

Note 2: pH 7 buffer is not a standard buffer. It is a popular commercial buffer in the United States.

The Solu Comp II also measures noise and drift and does not accept calibration data until readings are stable. Calibration data will be accepted as soon as the pH reading is constant to within 0.02 units for 10 seconds. The stability settings cannot be changed.

2. SLOPE AND OFFSET. Once the Solu Comp II successfully completes the calibration, it calculates and displays the calibration slope and offset. The slope is reported as the slope at 25°C. Figure 6-1 defines the terms.

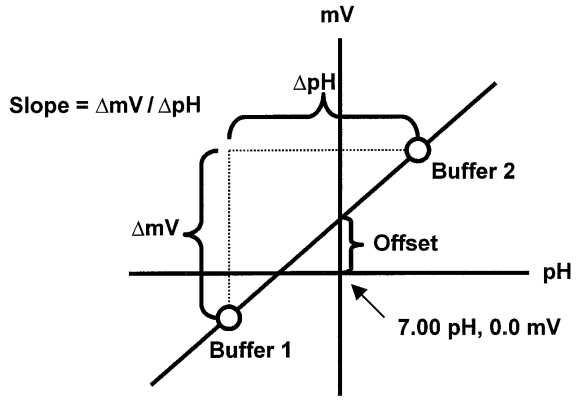


FIGURE 6-1. Calibration Slope and Offset

6.3.3 Procedure

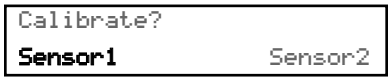
1. Obtain two buffer solutions. Ideally the buffer pH values should bracket the range of pH values to be measured.

2. Remove the sensor from the process liquid. If the process and buffer temperatures are appreciably different, place the sensor in a container of tap water at the buffer temperature. Do not start the calibration until the sensor has reached the buffer temperature. Thirty minutes is usually adequate.

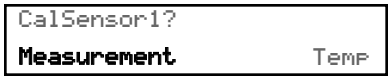
3. Calibrate the sensor by using the procedure on the following page.



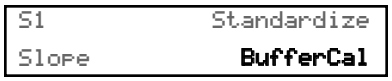
a. Press MENU. The main menu screen appears. Choose **Calibrate**.



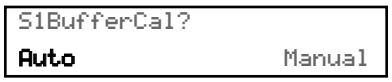
b. Choose **Sensor1** (pH sensor).



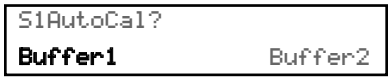
c. Choose **Measurement**.



d. Choose **BufferCal**.



e. Choose **Auto**.



f. Choose **Buffer1**.

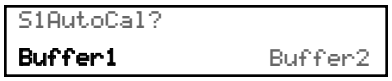
g. Rinse the sensor with water and place it in buffer 1. Be sure the glass bulb and reference junction are completely submerged. Swirl the sensor.



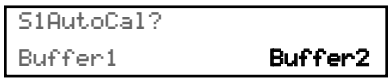
h. The screen at left is displayed until the reading is stable (<0.02 pH change in 10 sec). When the reading is stable, the screen in step i appears. To bypass automatic stabilization, press ENTER at any time.



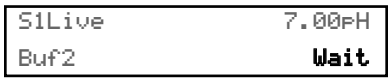
i. The top line shows the actual reading (**S1Live**). The analyzer also identifies the buffer and displays the nominal buffer value (buffer pH at 25°C). If the displayed value is not correct, press or to select the correct value. The nominal value will change, for example, from 7.01 pH to 6.86 pH. Press ENTER.



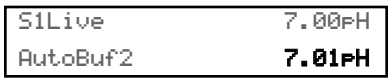
j. The screen shown at left appears.



k. Remove the sensor from buffer 1, rinse it with water, and place it in buffer 2. Swirl the sensor. Choose **Buffer2**.



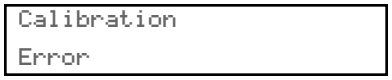
l. The screen at left is displayed until the reading is stable (<0.02 pH change in 10 sec). When the reading is stable, the screen in step m appears. To bypass automatic stabilization, press ENTER at any time.



m. The top line shows the actual reading (**S1Live**). The analyzer also identifies the buffer and displays the nominal buffer value (buffer pH at 25°C). If the displayed value is not correct, press or to select the correct value. The nominal value will change, for example, from 7.01 pH to 6.86 pH. Press ENTER to accept the nominal value.



n. If the calibration was successful, the analyzer will display the offset and slope (at 25°C). The display will return to the screen in step b. Choosing **Sensor2** (conductivity sensor) will permit the conductivity measurement to be calibrated.



o. If the slope is out of range (less than 45 mV/pH or greater than 60 mV/pH), an error screen appears. The display then returns to step f. Repeat the calibration.

p. To return to the main display, press MENU followed by EXIT.

6.4 MANUAL CALIBRATION — pH

6.4.1 Purpose

1. New sensors must be calibrated before use. Regular recalibration is also necessary.
2. Use manual calibration if non-standard buffers are being used; otherwise, use auto calibration. Auto calibration avoids common pitfalls and reduces errors.

6.4.2 Definitions

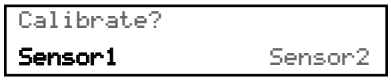
1. MANUAL CALIBRATION. In auto calibration the analyzer recognizes the buffer and uses the temperature-corrected pH value in the calibration. The analyzer also measures noise and drift and does not accept calibration data until readings are stable. During manual calibration, the user must judge when readings are stable and look up and enter the buffer values.
2. SLOPE AND OFFSET. Once the Solu Comp II successfully completes the calibration, it calculates and displays the calibration slope and offset. The slope is reported as the slope at 25ºC. Figure 6-1 defines the terms.

6.4.3 Procedure

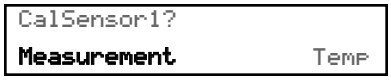
1. Obtain two buffer solutions. Ideally, the buffer pHs should bracket the range of pH values to be measured. Also obtain a thermometer. The pH of most buffer solutions is a function of temperature. To calibrate the sensor properly, the pH of the buffer at the measurement temperature must be entered in the analyzer.
2. Remove the sensor from the process liquid. If the process and buffer temperature are appreciably different, place the sensor in a container of tap water at the buffer temperature. Do not start the calibration until the sensor has reached the buffer temperature. Thirty minutes is usually adequate.
3. Calibrate the sensor using the procedure on the following page.



a. Press MENU. The main menu screen appears. Choose **Calibrate**.



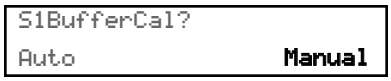
b. Choose **Sensor1** (pH sensor).



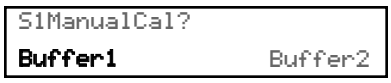
c. Choose **Measurement**.



d. Choose **BufferCal**.



e. Choose **Manual**.

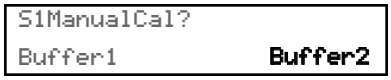


f. Choose **Buffer1**.

g. Rinse the sensor with water and place it in buffer 1. Be sure the glass bulb and junction are completely submerged. Swirl the sensor. Also place a thermometer in the buffer. Press ENTER



h. The top line shows the actual buffer reading (**S1 Live**). Wait until the reading is stable, then note the temperature. Change the pH in the second line to the pH of the buffer at the measured temperature. Press ENTER.



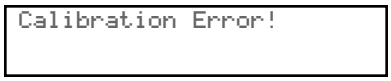
i. The screen at left appears. Choose **Buffer2**. Rinse the sensor and thermometer with water and place them in buffer 2. Be sure the bulb and junction are submerged. Swirl the sensor.



j. The top line shows the actual buffer reading (**S1 Live**). Wait until the reading is stable, then note the temperature. Change the pH in the second line to the pH of the buffer at the measured temperature. Press ENTER.



k. If the calibration was successful, the analyzer will display the offset and slope (at 25°C). The display will return to the screen in step b. Choosing **Sensor2** (conductivity sensor) will permit the conductivity measurement to be calibrated.



l. If the slope is out of range (less than 45 mV/pH or greater than 60 mV/pH), an error screen appears. The display then returns to step f. Repeat the calibration.

m. To return to the main display, press MENU followed by EXIT.

6.5 STANDARDIZATION — pH

6.5.1 Purpose

1. The pH measured by the Solu Comp II analyzer can be changed to match the reading from a second or referee instrument. The process of making the two readings agree is called standardization.
2. During standardization, the difference between the two pH values is converted to the equivalent voltage. The voltage, called the reference offset, is added to all subsequent measured cell voltages before they are converted to pH. If a standardized sensor is placed in a buffer solution, the measured pH will differ from the buffer pH by an amount equivalent to the standardization offset.

6.5.2 Procedure

1. Install the sensor in the process liquid.
2. Once readings are stable, measure the pH of the liquid using a referee instrument.
3. Because the pH of the process liquid may change if the temperature changes, measure the pH of the grab sample immediately after taking it.
4. For poorly buffered samples, it is best to determine the pH of a continuously flowing sample from a point as close as possible to the sensor.
5. Standardize the Solu Comp II analyzer by following the steps below.

Calibrate Hold Program Display	a. Press MENU. The main menu screen appears. Choose **Calibrate**.
Calibrate? **Sensor1** Sensor2	b. Choose **Sensor1** (pH sensor).
CalSensor1? **Measurement** Temp	c. Choose **Measurement**.
S1 **Standardize** Slope BufferCal	d. Choose **Standardize**.
Live 7.00pH CalS1 **0**7.00pH	e. The top line shows the present pH reading. Change the pH reading in the second line to match the referee instrument. Press ENTER.
Invalid Input! Max: 14.00pH	f. The screen at left appears if the entered pH was greater than 14.00. The display then returns to step e. Repeat the standardization.
S1 **Standardize** Slope BufferCal	g. If the entry was accepted, the screen at left appears. To verify that the new pH was accepted, return to the main display by pressing MENU followed by EXIT.

6.6 ENTERING A KNOWN SLOPE VALUE — pH

6.6.1 Purpose

If the electrode slope is known from other measurements, it can be entered directly in the Solu Comp II analyzer. The slope must be entered as the slope at 25°C. To calculate the slope at 25°C from the slope at temperature t°C, use the equation:

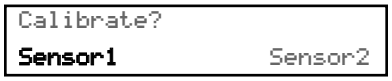
$$\text{slope at } 25°C = (\text{slope at } t°C)\ \frac{298}{t°C + 273}$$

Changing the slope overrides the slope determined from the previous buffer calibration.

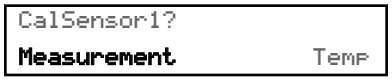
6.6.2 Procedure



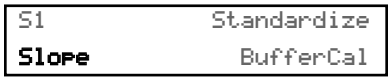
1. Press MENU. The main menu screen appears. Choose **Calibrate**.



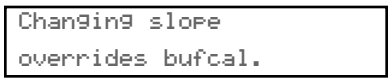
2. Choose **Sensor1** (pH sensor).



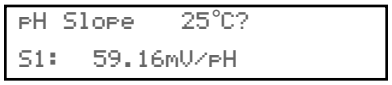
3. Choose **Measurement**.



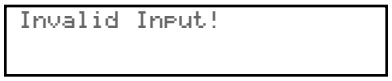
4. Choose **Slope**.



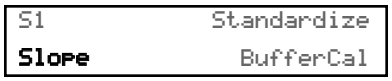
5. The screen at left appears briefly.



6. Change the slope to the desired value. Press ENTER.



7. The slope must be between 45 and 60 mV/pH. If the value entered is outside this range, the screen at left appears.



8. If the entry was accepted, the screen at left appears.

9. To return to the main display, press MENU followed by EXIT.

6.7 ORP CALIBRATION

6.7.1 Purpose

1. For process control, it is often important to make the measured ORP agree with the ORP of a standard solution.
2. During calibration, the measured ORP is made equal to the ORP of a standard solution at a single point.

6.7.2 Preparation of ORP standard solutions

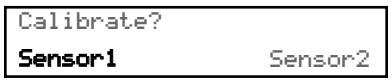
ASTM D1498-93 gives procedures for the preparation of iron (II) - iron (III) and quinhydrone ORP standards. The iron (II) - iron (III) standard is recommended. It is fairly easy to make, is not particularly hazardous, and has a shelf life of about one year. In contrast, quinhydrone standards contain toxic quinhydrone and have only an eight-hour shelf life.

Iron (II) - iron (III) standard is available from Rosemount Analytical as PN R508-16OZ. The ORP of the standard solution measured against a silver-silver chloride reference electrode is 476±20mVdc at 25°C. The redox potential is -476±20mVdc at 25°C.

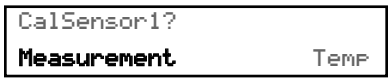
6.7.3 Procedure



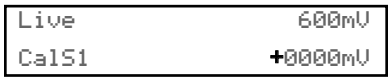
1. Press MENU. The main menu screen appears. Choose **Calibrate**.



2. Choose **Sensor1** (ORP sensor).



3. Choose **Measurement**.



4. The top line shows the actual ORP or redox potential (**S1Live**). Once the reading is stable, change the number in the second line to the desired value. Press ENTER.
5. The display returns to the screen in step 2. Choosing **Sensor2** will permit the conductivity measurement to be calibrated.
6. To return to the main display, press MENU followed by EXIT.

6.8 CALIBRATING AN IN-SERVICE SENSOR — CONDUCTIVITY

6.8.1 Purpose

1. After a conductivity sensor has been in service for a period of time, recalibration may be necessary.
2. There are three ways to calibrate a sensor.
   a. Use a **standard instrument and sensor** to measure the conductivity of the process stream. It is not necessary to remove the sensor from the process piping. See Figure 6-2. The temperature correction used by the standard instrument may not exactly match the temperature correction used by the Solu Comp II. **To avoid errors, turn off temperature correction in the both the analyzer and the standard instrument.**

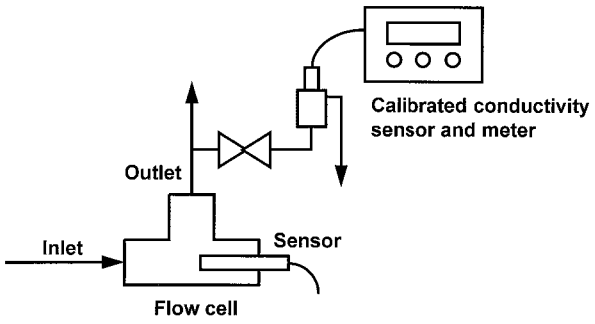


FIGURE 6-2. Calibration Against a Standard Cell

To ensure adequate flow past the sensor during calibration, take the sample downstream from the sensor. For best results, use a flow-through standard cell. If the process temperature is much different from ambient, keep connecting lines short and insulate the flow cell.

   b. Place the sensor in a solution of known conductivity and make the analyzer reading match the conductivity of the **standard solution**. Use this method if the sensor can be easily removed from the process piping and a standard is available. Be careful using standard solutions having conductivity less than 100 μS/cm. Low conductivity standards are highly susceptible to atmospheric contamination. Avoid calibrating sensors with 0.01/cm cell constants against conductivity standards in the range 100 to 300 μS/cm. The resistance of these solutions may be too low for an accurate measurement. Calibrate sensors with 0.01/cm cell constant using method c. For additional information, see ASTM D5391.
   c. To calibrate a 0.01/cm sensor, check it against a **standard instrument and 0.01/cm sensor** while both sensors are measuring water having a conductivity between 5 and 10 μS/cm. To avoid drift caused by absorption of atmospheric carbon dioxide, saturate the sample with air before making the measurements.

6.8.2 Procedure-Calibration against a standard meter and cell

1. Calibration against a **standard meter and cell** transfers the calibration of the standard instrument to the process instrument.
2. Calibrate the **standard meter and cell** using an accepted procedure, for example ASTM D 1125, Standard Methods 2510, or equivalent. A portable, calibrated standard meter and cell is available from Rosemount Analytical (Model Number 1055C-01-99SQ SQ6053).
3. Most conductivity instruments automatically correct measured conductivity to the value at 25°C. Different instruments may apply slightly different temperature corrections. **To avoid errors during calibration, turn off automatic temperature correction in both the analyzer and the standard meter.**

NOTE

If a portable reference meter is not available and the conductivity of the grab sample must be determined in the laboratory, temperature correction in both the Solu Comp II and the laboratory instrument MUST REMAIN ON. Be sure that the reference instrument and the Solu Comp II are applying the same temperature correction.

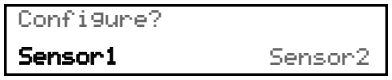
4. Turn off temperature correction.



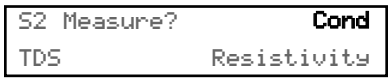
a. Press MENU. The main menu screen appears. Choose **Program**.



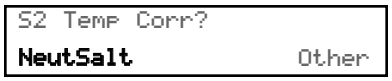
b. Choose **Measurement**.



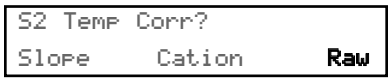
c. Choose **Sensor2** (conductivity).



d. Choose **Cond.**



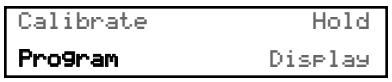
e. Choose **Other**.



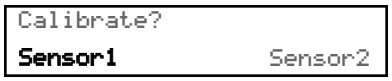
f. Choose **Raw**.

g. The display returns to the screen in step c. Return to the main display by pressing MENU followed by EXIT.

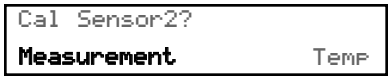
5. Make the Solu Comp II reading agree with the known conductivity.



a. Press MENU. The main menu screen appears. Choose **Calibrate**.



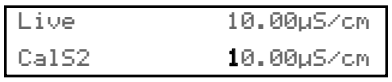
b. Choose **Sensor2** (conductivity).



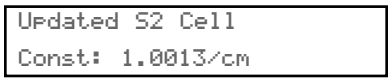
c. Choose **Measurement**.



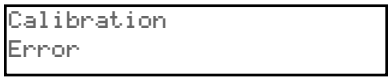
d. Choose **InProcess**.



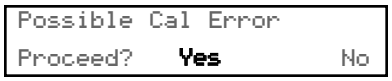
e. The first line is the current (or live) conductivity reading. Change the number in the second line to match the conductivity of the standard. Press ENTER. Be sure the live reading is stable before making changes.



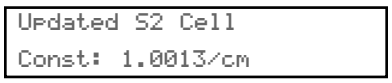
f. If the calibration is acceptable, the updated cell constant screen appears for 5 seconds. The display returns to the screen in step b.



g. If the calibration is unacceptable (cell constant is less than 0.0001/cm or greater than 100/cm), the **Calibration Error** screen appears for 5 seconds. The display then returns to the screen in step e. Repeat the calibration.



h. If the change is more than 10% of the present value, the Solu Comp II displays a warning screen. Choose **Yes** to have the analyzer accept the calibration. Choose **No** to repeat the calibration. Go to steps i through k.



i. After the calibration is accepted, the updated cell constant screen appears for about 5 seconds.

j. The display returns to the screen in step b. Choosing **Sensor1** (pH sensor) will permit the pH measurement to be calibrated.

k. Press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

6. **BEFORE RETURNING THE ANALYZER TO SERVICE, BE SURE TO SET TEMPERATURE COMPENSATION BACK TO THE ORIGINAL SETTING(S).**

6.8.3 Procedure-Calibration against a standard solution

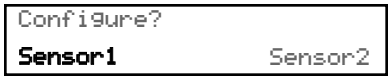
1. Remove the sensor from the process. Rinse it with deionized water.
2. Rinse the sensor with standard solution. Immerse the sensor in the solution to above the vent holes. Move the sensor up and down several times to ensure liquid touches all the inside surfaces. Repeat twice, using **fresh solution** each time.
3. If the conductivity of the **standard** is defined at only certain temperatures, use a **constant temperature bath** to keep the solution at the required temperature. Measure temperature with a **calibrated thermometer** or use the Solu Comp II to measure temperature. If temperature is not shown in the main display, press or until a screen showing temperature appears. To prevent contamination and evaporation, keep the standard in a covered container until it reaches temperature. Once the standard is at the desired temperature, place the rinsed sensor in the solution. Immerse the sensor to well above the vent holes. Move the sensor up and down to let air bubbles escape. When making the measurement, keep the sensor at least 1/4 inch (6 mm) away from the bottom and sides of the container. If the sensor touches the container, the conductivity reading may be in error.
4. If the conductivity of the standard as a function of temperature is known, simply fill a container with **standard solution** and place the rinsed sensor in the container. Immerse the sensor to well above the vent holes. Move the sensor up and down to let air bubbles escape. When making the measurement, keep the sensor at least 1/4 inch (6 mm) away from the bottom and sides of the container. If the sensor touches the container, the conductivity reading may be in error. Also place a **calibrated thermometer** in the solution or use the Solu Comp II to measure temperature. If temperature is not shown in the main display, press or until a screen showing temperature appears. Note the conductivity of the standard at the measured temperature.
5. Turn off temperature correction in the Solu Comp II.



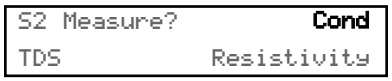
a. Press MENU. The main menu screen appears. Choose **Program**.



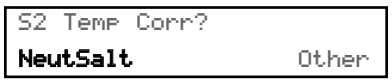
b. Choose **Measurement**.



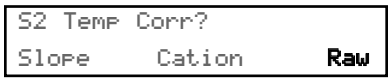
c. Choose **Sensor2** (conductivity).



d. Choose **Cond.**



e. Choose **Other**.



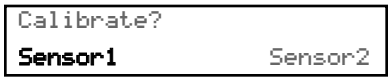
f. Choose **Raw**.

g. The display returns to the screen in step c. Return to the main display by pressing MENU followed by EXIT.

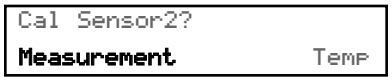
6. Make the Solu Comp II reading agree with the known conductivity.



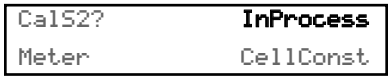
a. Press MENU. The main menu screen appears. Choose **Calibrate**.



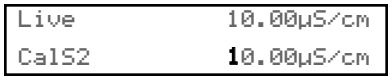
b. Choose **Sensor2** (conductivity).



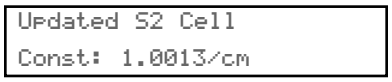
c. Choose **Measurement**.



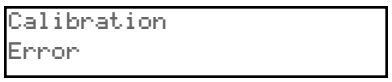
d. Choose **InProcess**.



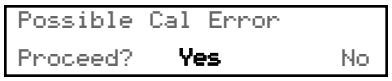
e. The first line is the current (or live) conductivity reading. Change the number in the second line to match the conductivity of the standard. Press ENTER. Be sure the live reading is stable before making changes.



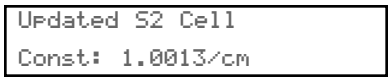
f. If the calibration is acceptable, the updated cell constant screen appears for 5 seconds. The display returns to the screen in step b.



g. If the calibration is unacceptable (cell constant is less than 0.0001/cm or greater than 100/cm), the **Calibration Error** screen appears for 5 seconds. The display then returns to the screen in step e. Repeat the calibration.



h. If the change is more than 10% of the present value, the Solu Comp II displays a warning screen. Choose **Yes** to have the analyzer accept the calibration. Choose **No** to repeat the calibration. Go to steps i through k.



i. After the calibration is accepted, the updated cell constant screen appears for about 5 seconds.

j. The display returns to the screen in step b. Choosing **Sensor1** (pH sensor) will permit the pH measurement to be calibrated.

k. Press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

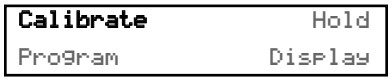
7. **BEFORE RETURNING THE ANALYZER TO SERVICE, BE SURE TO SET TEMPERATURE COMPENSATION BACK TO THE ORIGINAL SETTING(S).**

6.9 PLACING A NEW SENSOR IN SERVICE - CONDUCTIVITY

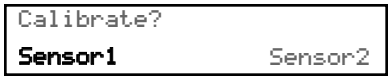
6.9.1 Purpose

New conductivity sensors rarely need calibration. The cell constant printed on the label is sufficiently accurate for most applications.

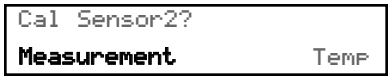
6.9.2 Procedure



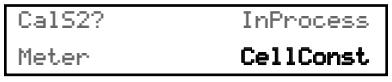
1. Press MENU. The main menu screen appears. Choose **Calibrate**.



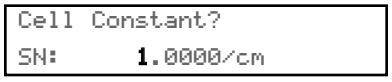
2. Choose **Sensor 2** (conductivity).



3. Choose **Measurement**.



4. Choose **CellConst**.



5. Enter the cell constant printed on the label attached to the sensor cable.

6. The display returns to the screen in step 4. To return to the main display, press MENU followed by EXIT.

6.10 CALIBRATING THE ANALYZER - CONDUCTIVITY.

6.10.1 Purpose

1. After a conductivity analyzer has been in service for a period of time recalibration may be necessary.
2. To check the calibration of the Solu Comp II, see Section 8.7. If the calibration does not meet specifications, the analyzer can be recalibrated according to Section 6.10.2.
3. To calibrate the Solu Comp II, replace the conductivity cell with a known resistance and make the analyzer reading match the resistor value. **The resistor(s) used for calibration must be accurate to within ±0.1%.**

6.10.2 Procedure

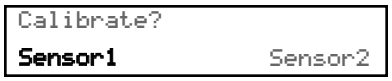
1. Use a **standard** resistor **(accuracy ±0.1%)** or a standard decade box **(accuracy ±0.1%)** for the calibration.
2. Choose the resistor based on the cell constant being used and the range of the measurement.

Cell constant	Conductivity (µS/cm)	Resistor (kΩ)
0.01	<0.5	100
	0.5 - 5.0	10
	>5	1
0.10	<0.5	1000
	0.5 - 5.0	100
	5 - 50	10
	>50	1
1.0	<5	1000
	5 - 50	100
	50 - 500	10
	>500	1
10	50 - 500	100
	500 - 5000	10
	>5000	1

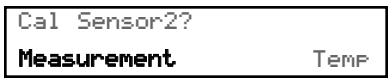
Some of the conductivity values in the table are near the extreme ends of the recommended range for the cell constant. Refer to the table in Section 8.4.5 for recommended ranges.

3. Disconnect the sensor leads and connect the standard resistor or decade box to terminals 4 and 6 on TB5.

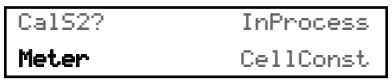
   If a standard decade box is being used, keep the leads as short as possible (less than 5 ft). It is not necessary to disconnect the RTD leads.



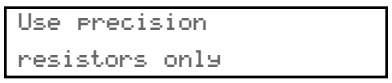
4. Choose **Sensor2** (conductivity sensor).



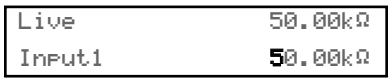
5. Choose **Measurement**.



6. Choose **Meter**.



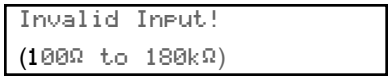
7. The information screen shown at left appears momentarily.



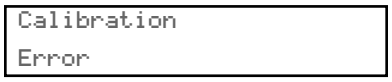
8. The first line is the live resistance reading. Change the number in the second line to match the true resistance. Resistance must be entered in units of kΩ. For example, enter 100 Ω as .1000 kΩ. Be sure the live reading is stable before changing the number in the second line. Press ENTER.

NOTE

The live reading is the measured value of the resistor. It is a raw measurement. It is unaffected by the cell constant and temperature correction algorithm.



9. If a resistance value outside the range 100 Ω to 180 kΩ was entered, the calibration will not be accepted. The screen at left appears for five seconds. Then, the display returns to the screen in step 8. Repeat the calibration. For best results, use a resistance from the table in step 2.



10. If the corrected resistance is more than 5% different from the factory calibration, the calibration will not be accepted. The screen at left appears for five seconds. Then, the display returns to the screen in step 8.

11. If the calibration is acceptable, the display returns to the screen in step 6.

12. Press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

TO RESET THE FACTORY RESISTANCE CALIBRATION, SEE SECTION 5.10.

SECTION 7.0
MAINTENANCE

7.1 OVERVIEW
7.2 REPLACEMENT PARTS

7.1 OVERVIEW

The Solu Comp II analyzer needs little routine maintenance. The calibration of the analyzer and sensor should be checked periodically. To recalibrate the analyzer and sensor, see Section 6.0.

Clean the analyzer case and front panel by wiping with a clean soft cloth dampened with water **ONLY**. Do not use solvent, like alcohol, that might cause a buildup of static charge.

7.2 REPLACEMENT PARTS

Many components of the analyzer are replaceable. Refer to the table below to find the correct parts diagram.

Model	Description	See Figure
1055-10	Panel mounting enclosure	7-1
1055-11	Pipe/surface mounting enclosure	7-2

TABLE 7-1. Replacement Parts for Solu Comp II (Panel Mount Version)

Location in Figure 7-1	PN	Description	Shipping Weight
1	23823-00	Panel mounting kit, includes four brackets and four set screws	2 lb/1.0 kg
2	23837-00	Enclosure, front, for panel mount version, includes keypad	3 lb/1.0 kg
3	33654-00	Gasket, front, for panel mount version	2 lb/1.0 kg
4	note	Screw, 2-56 x 0.187 in., with integral washer	
5	23822-00	Display board, LCD	2 lb/1.0 kg
6	note	PCB, microprocessor	
7	note	Screw, self-tapping, #4 x 0.375 in.	
8	note	PCB, power supply, 115/230 Vac or 24 Vdc	
9	note	Screw, 4-40 x 0.31 in., with integral washer	
10	33658-00	Gasket, rear cover, for panel mount version	2 lb/1.0 kg
11	23838-00	Enclosure cover, rear, for panel mount version, 115/230 Vac	2 lb/1.0 kg
11	23838-01	Enclosure cover, rear, for panel mount version, 24 Vdc	2 lb/1.0 kg
12	note	Self-tapping screws, #6 x 1.25 in.	

Note: Information about circuit boards and size of screws and washers is for information only. Circuit boards (other than the display board) and screws and washers cannot be purchased from Rosemount Analytical.
Shipping weights are rounded up to the nearest whole lb or 0.5 kg.

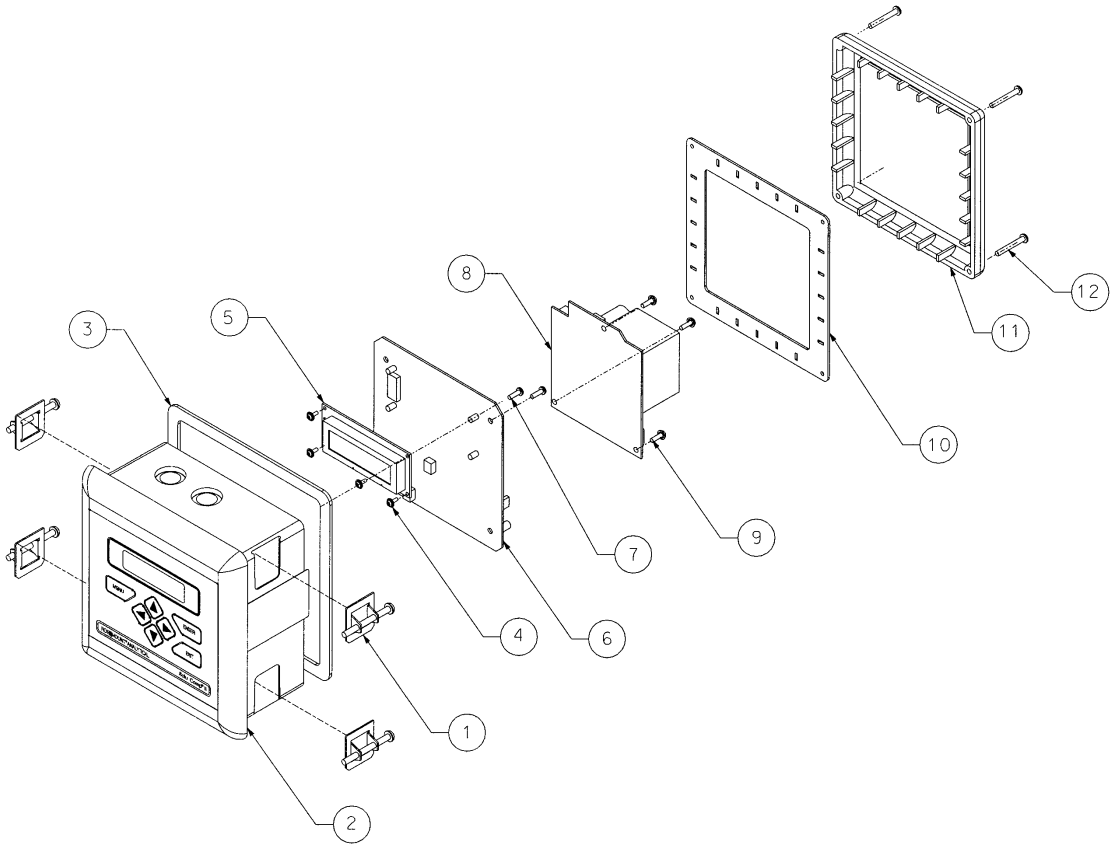


FIGURE 7-1. Exploded View of Solu Comp II (Panel Mount Version)

TABLE 7-2. Replacement Parts for Solu Comp II (Pipe/Surface Mount Version)

Location in Figure 7-2	PN	Description	Shipping Weight
1	note	Screw, 6-32 x 1.38 in.	
2	note	Washer	
3	23834-00	Enclosure, front, for pipe/surface mount version, includes keypad and hinge	2 lb/1.0 kg
4	33655-00	Gasket for pipe/surface mount version	2 lb/1.0 kg
5	note	Screw, 2-56 x 0.187 in., with integral washer	
6	23822-00	Display board, LCD	2 lb/1.0 kg
7	note	PCB, microprocessor	
8	note	Self-tapping screw, #4 x 0.375 in.	
9	note	PCB, power supply, 115/230 Vac or 24 Vdc	
10	note	Screw, 4-40 x 0.31 in., with integral washer	
11	23836-00	Enclosure, rear, for pipe/surface mount version, includes standoffs and hinge brackets	3 lb/1.5 kg
not shown	23833-00	Surface mount kit; consists of four self-tapping screws #6 x 1.75 in. and four O-rings	1 lb/0.5 kg

Note: Information about circuit boards and size of screws and washers is for information only. Circuit boards (other than the display board) and screws and washers cannot be purchased from Rosemount Analytical.
Shipping weights are rounded up to the nearest whole lb or 0.5 kg.

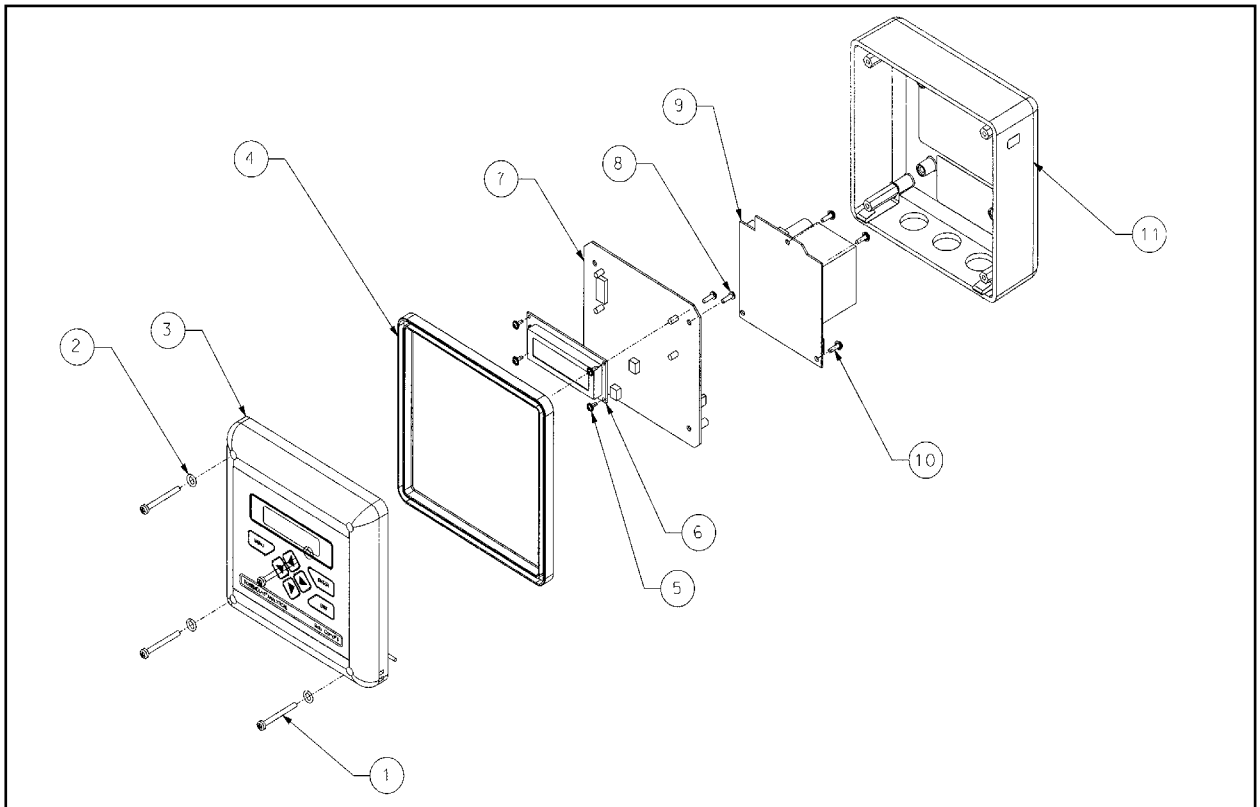


FIGURE 7-2. Exploded View of Solu Comp II (Pipe/Surface Mount Version)

SECTION 8.0
TROUBLESHOOTING

8.1 OVERVIEW
8.2 TROUBLESHOOTING USING FAULT CODES
8.3 TROUBLESHOOTING WHEN NO ERROR MESSAGE IS SHOWING — pH
8.4 TROUBLESHOOTING WHEN NO ERROR MESSAGE IS SHOWING — CONDUCTIVITY
8.5 TROUBLESHOOTING WHEN NO ERROR MESSAGE IS SHOWING — GENERAL
8.6 SIMULATING INPUTS — pH
8.7 SIMULATING INPUTS — CONDUCTIVITY
8.8 SIMULATING TEMPERATURE
8.9 MEASURING REFERENCE VOLTAGE — pH

8.1 OVERVIEW

The Solu Comp II continuously monitors itself and the sensor for faults. When the analyzer detects a fault, the word *fault* appears in the display alternately with the measurement. If alarm 3 was configured as a fault alarm, the alarm relay will energize. The outputs do not change during a fault condition. They continue to reflect the measured pH, ORP, conductivity, resistivity, TDS, or temperature. **Press to display the fault codes.**

8.2 TROUBLESHOOTING USING FAULT CODES

Fault Code	Explanation	See Section
S1 Out of Range	Absolute value of measured voltage exceeds 2500 mV (pH/ORP only)	8.2.1
S1 Broken Glass	pH sensitive glass membrane is broken	8.2.2
S2 Open	Sensor 2 (conductivity) is open	8.2.3
S2 Shorted	Sensor 2 (conductivity) is shorted	8.2.3
TC1 Open or TC2 Open	RTD for sensor 1 or sensor 2 is open	8.2.4
TC1 Shorted or TC2 Shorted	RTD for sensor 1 or sensor 2 is shorted	8.2.4
S1 or S2 Sense Line Open	RTD sense line for sensor 1 or sensor 2 is open	8.2.5
EEPROM Failure	EEPROM failure	8.2.6

8.2.1 Absolute Value of Measured Voltage Exceeds 2500 mV

The voltage of a pH cell is usually between 600 mV and -600 mV, and the voltage of an ORP cell is between 2000 and -2000 mV. Readings outside the range -2500 mV to 2500 mV usually indicate a problem with sensor wiring or analyzer electronics.

A. If the sensor is being installed for the first time, check the wiring connections. See Section 3.2. If a junction box is being used, check connections at the junction box, too.

B. If the preamplifier is in a junction box, verify that the wires supplying the power (±5 Vdc) to the preamplifier are connected at the analyzer and junction box.

C. Verify that the sensor is completely submerged in the process liquid.

8.2.2 pH Sensitive Glass Membrane is Broken

The Solu Comp II continuously measures the impedance between the sensor solution ground and the inside of the pH-sensing electrode. If the glass membrane is intact, the impedance is normally between 10 MΩ and 1000 MΩ. If the membrane is cracked or broken, the impedance drops below 10 MΩ. If the membrane is cracked or broken, the sensor must be replaced.

8.2.3 Conductivity Sensor Open or Shorted

Open or **shorted** means an open or short circuit in the conductivity sensor or wiring. An open error may also mean that the sensor is not immersed in the process liquid.

A. If sensor is being installed for the first time, check the wiring connections. See Section 3.2.

B. Verify that the sensor is completely immersed in the process liquid.

C. Remove the sensor from the process liquid. Rinse with water. Inspect the sensor for obvious signs of damage such as cracks or chips. Verify that the vent holes are not blocked.

D. Disconnect the sensor from the analyzer and check continuity and leakage resistance as shown in Figure 8-1. If the resistances are not in limits, replace the sensor.

E. If the resistances are in limits, check the analyzer. See Section 8.7.

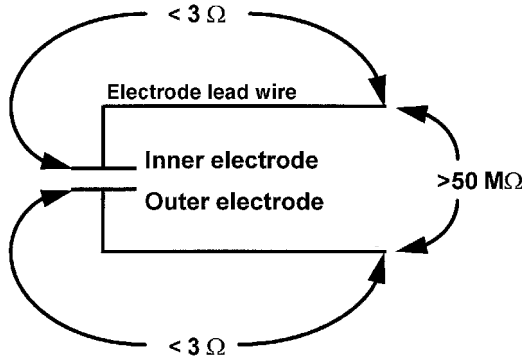


FIGURE 8-1. Continuity and Leakage Check.

Use an ohmmeter to measure the resistances indicated. Be sure the sensor is dry when checking the resistance.

8.2.4 RTD for Sensor 1 or Sensor 2 Open or Shorted.

There is an open or short in the sensor RTD or wiring.

A. If sensor is being installed for the first time, check the wiring connections. See Section 3.2.

B. Disconnect the sensor from the analyzer and measure the resistance between the RTD lead wires. See the sensor manual to identify the RTD leads. If there is an open or short circuit, replace the sensor.

C. If there is no open or short, check the analyzer. See Section 8.8.

8.2.5 RTD Sense Line for Sensor 1 or Sensor 2 is Open.

The Solu Comp II measures temperature using a three-wire RTD. See Figure 8-5. The in and return leads connect the RTD to the measuring circuit in the analyzer. A third wire, called the sense line, is connected to the return line. The sense line allows the analyzer to correct for the resistance of the in and return leads and to correct for changes in lead wire resistance with temperature.

A. Verify that all wiring connections are secure.

B. The analyzer can be operated with the sense line open. The measurement will be less accurate because the analyzer can no longer correct for lead wire resistance and for changes in lead wire resistance with ambient temperature. However, if the sensor is to be used at approximately constant temperature, the lead wire resistance error can be eliminated by calibrating the sensor at the measurement temperature. Errors caused by changes in lead wire resistance with changes in ambient temperature cannot be eliminated.To make the error message disappear, connect the RTD sense and return terminals with a jumper.

8.2.6 EEPROM Failure.

Call the factory at (800) 854-8257.

8.3 TROUBLESHOOTING WHEN NO ERROR MESSAGE IS SHOWING — pH.

Problem	See Section
New temperature during calibration more than 2-3°C different from the live reading	8.3.1
Calibration Error warning during two-point calibration	8.3.2
Calibration Error warning during standardization	8.3.3
Invalid Input while manually entering slope	8.3.4
Sensor does not respond to known pH changes	8.3.5
Calibration was successful, but process pH is slightly different from expected value	8.3.6
Calibration was successful, but process pH is grossly wrong and/or noisy	8.3.7

8.3.1 Difference Between Solu Comp II and Standard Thermometer is Greater Than 3°C.

A. Is the standard thermometer, RTD, or thermistor accurate? General purpose liquid-in-glass thermometers, particularly ones that have been mistreated, can have surprisingly large errors.

B. Is the temperature element in the pH sensor completely submerged in the test liquid?

C. Is the standard temperature sensor submerged to the correct level?

D. Review Section 6.2.

8.3.2 Calibration Error During Two-Point Calibration

Once the two-point (manual or automatic) calibration is complete, the Solu Comp II automatically calculates the sensor slope (at 25°). If the slope is greater than 60 mV/pH or less than 45 mV/pH, the analyzer displays the Calibration Error screen and does not update the calibration. Check the following:

A. Are the buffers accurate? Inspect the buffers for obvious signs of deterioration, such as turbidity or mold growth. Neutral and slightly acidic buffers are highly susceptible to molds. Alkaline buffers (pH 9 and greater) that have been exposed to air for long periods may also be inaccurate. Alkaline buffers absorb carbon dioxide from the atmosphere, which lowers the pH. If a high pH buffer was used in the failed calibration, repeat the calibration using a fresh buffer. If fresh buffer is not available, use a lower pH buffer. For example, use pH 4 and 7 buffer instead of pH 7 and 10 buffer.

B. Was adequate time allowed for temperature equilibration? If the sensor was in a process substantially hotter or colder than the buffer, place it in a container of water at ambient temperature for at least 20 minutes before starting the calibration. Using auto calibration avoids calibration errors caused by temperature drift. The analyzer will not update readings until the drift is less than 0.02 pH over 10 seconds.

C. Were correct pH values entered during manual calibration? Using auto calibration eliminates errors caused by improperly entering data.

D. Is the sensor properly wired to the analyzer? Check the sensor wiring including any connections in a junction box. See Section 3.2.

E. Is the sensor dirty or coated? See the sensor instruction manual for cleaning instructions.



F. Is the sensor faulty? With the main display showing, use or to scroll through the information screens until the electrode impedance screen (at left) is displayed. Refer to the table on the following page for an interpretation of the impedance readings.

Another way of checking for a faulty sensor is to replace it with a new one. If the new sensor can be calibrated, the old sensor has failed.

G. Is the analyzer faulty? The best way to check for a faulty analyzer is to simulate pH inputs. See Section 8.6.

REFERENCE IMPEDANCE (**Ref Imp**)	
less than 40 kΩ (20 kΩ for TUpH sensors)	Normal reading, reference junction is clean.
between 40 and 140 kΩ (20 - 140 kΩ for TUpH sensors)	Reference junction is fouled or dirty.
greater than 140 kΩ	Reference junction is blocked or electrolyte is depleted. Sensor has failed.
GLASS IMPEDANCE (**Glass Imp**)	
less than 10 MΩ	Glass bulb is cracked or broken. Sensor has failed.
between 10 and 1000 MΩ	Normal reading.
greater than 1000 MΩ	pH sensor may be nearing the end of its service life.

8.3.3 Calibration Error during Standardization.

During standardization, the millivolt signal from the pH cell is increased or decreased until it agrees with the pH reading from a referee instrument. A unit change in pH requires an offset of about 59 mV. The Solu Comp II limits the offset to ±1400 mV. If the standardization causes an offset greater than ±1400 mV, the analyzer will display the Calibration Error screen. The standardization will not be updated. Check the following:

A. Is the referee pH meter working and properly calibrated? Check the response of the referee sensor in buffers.

B. Is the process sensor working properly? Check the process sensor in buffers.

C. Is the sensor fully immersed in the process liquid? If the sensor is not completely submerged, it may be measuring the pH of the liquid film covering the glass bulb and reference element. The pH of this film may be different from the pH of the bulk liquid.

D. Is the sensor fouled? The sensor measures the pH of the liquid adjacent to the glass bulb. If the sensor is heavily fouled, the pH of liquid trapped against the bulb may be different from the bulk liquid.

E. Has the sensor been exposed to poisoning agents (sulfides or cyanides) or has it been exposed to extreme temperature? Poisoning agents and high temperature can shift the reference voltage many hundred millivolts. To check the reference voltage, see Section 8.9.

8.3.4 Invalid Input While Manually Entering Slope.

If the sensor slope is known from other sources, it can be entered directly into the analyzer. The Solu Comp II will not accept a slope (at 25°C) outside the range 45 to 60 mV/pH. See section 8.3.2 for troubleshooting sensor slope problems.

8.3.5 Sensor Does Not Respond to Known pH Changes.

A. Did the expected pH change really occur? If the process pH reading was not what was expected, check the performance of the sensor in buffers. Also, use a second pH meter to verify the change.

B. Is the sensor properly wired to the analyzer?

C. Is the glass bulb cracked or broken? Check the glass electrode impedance. See Section 8.3.2, step f.

D. Is the analyzer working properly. Check the analyzer by simulating the pH input.

8.3.6 Buffer Calibration Is Acceptable, Process pH Is Slightly Different from Expected Value.

Differences between pH readings made with an on-line instrument and a laboratory or portable instrument are normal. The on-line instrument is subject to process variables, for example ground potentials, stray voltages, and orientation effects that may not affect the laboratory or portable instrument. To make the process reading agree with a referee instrument, see Section 6.5.

8.3.7 Calibration Was Successful, but Process pH Is Grossly Wrong and/or Noisy.

Grossly wrong or noisy readings suggest a ground loop (measurement system connected to earth ground at more than one point), a floating system (no earth ground), or noise being brought into the analyzer by the sensor cable. The problem arises from the process or installation. It is not a fault of the analyzer. The problem should disappear once the sensor is taken out of the system. Check the following:

A. Is a ground loop present?
   1. Verify that the system works properly in buffers. Be sure there is no direct electrical connection between the buffer containers and the process liquid or piping.
   2. Strip back the ends of a heavy gauge wire. Connect one end of the wire to the process piping or place it in the process liquid. Place the other end of the wire in the container of buffer with the sensor. The wire makes an electrical connection between the process and sensor.
   3. If offsets and noise appear after making the connection, a ground loop exists.

B. Is the process grounded?
   1. The measurement system needs one path to ground: through the process liquid and piping. Plastic piping, fiberglass tanks, and ungrounded or poorly grounded vessels do not provide a path. A floating system can pick up stray voltages from other electrical equipment.
   2. Ground the piping or tank to a local earth ground.
   3. If noise still persists, simple grounding is not the problem. Noise is probably being carried into the instrument through the sensor wiring.

C. Simplify the sensor wiring.
   1. Disconnect all sensor wires at the analyzer except pH/mV IN, REFERENCE IN, RTD IN and RTD RETURN. See the wiring diagrams in Section 3.2. If the sensor is wired to the analyzer through a remote junction box containing a preamplifier, disconnect the wires at the sensor side of the junction box.
   2. Tape back the ends of the disconnected wires to keep them from making accidental connections with other wires or terminals.
   3. Connect a jumper wire between the RTD RETURN and RTD SENSE terminals (see wiring diagrams in Section 3.2). Connect a second jumper wire between the REFERENCE IN and SOLUTION GROUND terminals.
   4. If noise and/or offsets disappear, the interference was coming into the analyzer through one of the sensor wires. The system can be operated permanently with the simplified wiring.

D. Check for extra ground connections or induced noise.
   1. If the sensor cable is run inside conduit, there may be a short between the cable and the conduit. Re-run the cable outside the conduit. If symptoms disappear, there is a short between the cable and the conduit. Likely a shield is exposed and touching the conduit. Repair the cable and reinstall it in the conduit.
   2. To avoid induced noise in the sensor cable, run it as far away as possible from power cables, relays, and electric motors. Keep sensor wiring out of crowded panels and cable trays.
   3. If ground loops persist, consult the factory. A visit from an experienced technician may be required to solve the problem.

8.4 TROUBLESHOOTING WHEN NO ERROR MESSAGE IS SHOWING — CONDUCTIVITY

Problem	See Section
Calibration Error using standard resistors	8.4.1
New temperature during calibration more than 2-3°C different from the live reading	8.4.2
Possible Error Warning during calibration against standard solutions	8.4.3
Possible Error Warning during calibration against standard meter and cell	8.4.4
Measurement seems wrong: too high, too low, or doesn't match referee instrument	8.4.5

8.4.1 Calibration Error Using Standard Resistors

A. Check the accuracy of the standard resistor or decade box.

B. Contact resistance and lead resistance can be a major source of error, particularly when a low value resistor is being used. To minimize errors, be sure all connections are tight and use the shortest leads possible.

8.4.2 Difference Between Solu Comp II and Standard Thermometer is Greater Than 3°C.

A. Is the reference thermometer, RTD, or thermistor accurate? General purpose thermometers, particularly ones that have been mistreated, can have surprisingly large errors.

B. Review Section 6.2.

8.4.3 Possible Error Warning During Calibration Against a Standard Solution.

A. Review Section 6.8.1 and 6.8.3.

B. Is the conductivity of the standard solution appropriate for the cell constant of the sensor? Refer to the table in Section 8.4.5. Choose a conductivity standard approximately in the center of the range.

C. Is a 0.01/cm sensor being calibrated? Generally, it is best not to calibrate 0.01/cm cells against standard solutions. Standards having low conductivity are readily contaminated by atmospheric carbon dioxide. Contamination increases the apparent conductivity of the standard, leading to cell constants that are too low. Standards having high conductivity can also be a problem. When high conductivity solutions are measured with low constant sensors, the solution resistance is low. The resistance of the oxide film on the electrodes may then be contributing an appreciable amount to the measured resistance. Thus, the apparent conductivity is too low, and the cell constant is too high. It is best to calibrate 0.01/cm cells against a 0.01/cm standard cell using a solution with conductivity between 5 and 10 μS/cm.

D. Has the correct conductivity been entered? If calibration was done with temperature correction turned off, be sure to enter the conductivity of the standard at the measurement temperature. If temperature correction was left on, use the conductivity at 25°C. Verify that the temperature correction algorithm being used is appropriate for the standard.

E. Were readings, including temperature, stable before calibration?

8.4.4 Possible Error Warning During Calibration Against a Standard Meter and Cell.

A. Review Section 6.8.1 and 6.8.2.

B. Is the calibration of the standard instrument correct and is the cell constant of the standard the same decade as the sensor being calibrated?

C. Is the temperature correction in the Solu Comp II and the reference instrument either both turned off (recommended) or both turned on? If the temperature correction is on, are both instruments using the same temperature correction?

D. Is there good circulation of test solution around the sensors?

E. Were readings, including temperature, stable before calibration?

8.4.5 Measurement seems wrong.

A. If sensor is being installed for the first time, check the wiring connections. See Section 3.2.

B. Verify that the sensor is completely immersed in the process liquid.

C. Be sure the sensor has a cell constant appropriate for the liquid being measured. Refer to the table below.

Conductivity, µS/cm	Cell constant, /cm
0.0 - 50	0.01
5 - 500	0.10
50 - 5000	1.0
500 - 20,000	10

D. Remove the sensor from the process liquid. Rinse with water. Inspect the sensor for obvious signs of damage such as cracks or chips. Verify that the vent holes are not blocked. If the sensor is dirty or fouled, clean it. Usually, rinsing the sensor with a forceful stream of water is adequate. A soft bristle brush, like a toothbrush, may help dislodge solids. Do not use a wire brush. For advice concerning the use of chemical solvents, refer to the sensor instruction manual.

E. Check the sensor for continuity and leakage. See Section 8.2.3

F. If the resistances are not in limits, replace the sensor.

G. If the resistances are in limits, check the analyzer. See Section 8.7.

8.5 TROUBLESHOOTING WHEN NO ERROR MESSAGE IS SHOWING — GENERAL

Problem	See Section
Current output is too low	8.5.1
Alarm relays do not operate when setpoint is exceeded	8.5.2
Display is unreadable — too faint or all pixels dark	8.5.3

8.5.1 Current Output Too Low.

Load resistance is too high. Maximum load is 600 Ω.

8.5.2 Alarm Relays Do Not Work

A. Verify the relays are properly wired.

B. Replace power supply PCB. See Table 7-1 or 7-2.

8.5.3 Display is Unreadable.

While holding down the MENU key, press or until the display has the correct contrast.

8.6 SIMULATING INPUTS — pH

8.6.1 General

This section describes how to simulate a pH input into the Solu Comp analyzer. To simulate a pH measurement, connect a standard millivolt source to the transmitter. If the transmitter is working properly, it will accurately measure the input voltage and convert it to pH. Although the general procedure is the same, the wiring details depend on the location of the preamplifier.

8.6.2 Simulating pH input when the preamplifier is in the analyzer.

1. Turn off automatic temperature correction and solution temperature correction. From the Program menu, choose **Temp**. Then choose **Live/Manual** and enter 25°C. See Section 5.6 for details.
2. Disconnect the sensor and connect a jumper wire between terminals 1 and 6 and terminals 4 and 6 on TB4. See Figure 8-2.
3. From the display menu choose the pH/temperature/mV screen. The measured voltage should be 0 mV and the pH should be 7.00. Because calibration data stored in the analyzer may be offsetting the input voltage, the displayed pH may not be exactly 7.00.
4. If a standard millivolt source is available, disconnect the jumper wire between terminals 1 and 6 and connect the voltage source as shown in Figure 8-2. Be sure to jumper the reference and solution ground terminals.

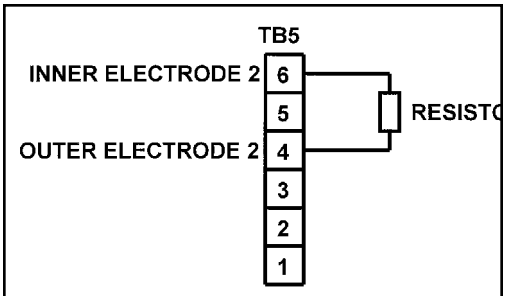


FIGURE 8-2. Simulating Inputs When the Preamplifier is in the Analyzer

5. Calibrate the analyzer using the procedure in Section 6.3. Use 0.0 mV for Buffer 1 (pH 7.00) and -177.4 mV for Buffer 2 (pH 10.00). If the analyzer is working properly it should accept the calibration. The slope should be 59.16 mV/pH and the offset should be zero.
6. To check linearity, return to the main display and the pH/temperature/mV screen. Set the voltage source to the values shown in the table and verify that the pH and millivolt readings match the values in the table.

Voltage (mV)	pH (at 25°)
295.8	2.00
177.5	4.00
59.2	6.00
-59.2	8.00
-177.5	10.00
-295.8	12.00

8.6.3 Simulating pH input when the preamplifier is in a junction box.

The procedure is the same as described in Section 8.6.2. Keep the connections between the analyzer and the junction box in place. Disconnect the sensor at the sensor side of the junction box and connect the voltage source as shown in Figure 8-3.

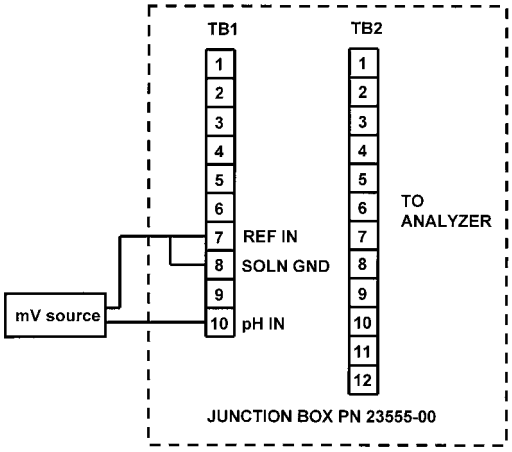


FIGURE 8-3. Simulating pH Input When the Preamplifier is in the Sensor.

8.6.4 Simulating pH input when the preamplifier is in the sensor.

The preamplifier in the sensor simply converts the high impedance signal into a low impedance signal without amplifying it. To simulate pH values, follow the procedure in Section 8.6.2.

8.7 SIMULATING INPUTS — CONDUCTIVITY

To check the performance of the analyzer, use standard resistors to simulate conductivity.

A. **Set the temperature correction to raw (Section 5.5).**

B. Connect the standard resistors to TB-5 as shown in Figure 8-4.

C. Determine how closely the displayed resistivity or conductivity agrees with the known resistance.

To convert resistance to conductivity, use the equation:

$$\text{Conductivity } (\mu S/cm) = \frac{\text{Cell constant (/cm)}}{\text{Resistance } (\Omega)} \times 10^6$$

or

$$\text{Conductivity (mS/cm)} = \frac{\text{Cell constant (/cm)}}{\text{Resistance } (\Omega)} \times 10^3$$

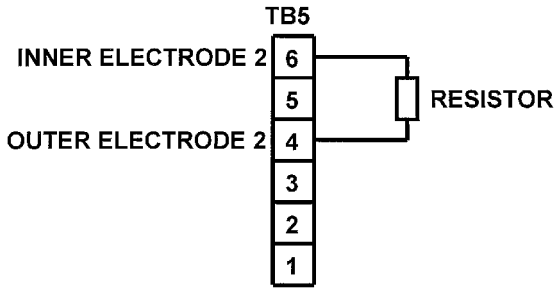


FIGURE 8-4. Simulating Conductivity

Thus, if the cell constant is 0.103/cm and the standard resistance is 500 Ω, the displayed conductivity should be (0.103/cm)(10^6)/(500Ω) or 206 μS/cm.

To convert resistance to resistivity, use the equation:

$$\text{Resistivity } (M\Omega\text{-cm}) = \frac{\text{Resistance } (M\Omega)}{\text{Cell constant (/cm)}}$$

Thus, if the cell constant is 0.01020/cm and the standard resistance is 100 kΩ (0.100 MΩ), the displayed resistivity should be (0.100 MΩ)/(0.01020/cm) or 9.80 MΩ-cm.

Consult the table for the accuracy specification:

Range	Cell constant (/cm)	Accuracy*
0.055 - 10 μS/cm	0.01	±0.9% of reading or ±0.002 μS/cm
0.055 - 50 μS/cm	0.01	±2% of reading
0.055 - 500 μS/cm	0.1	±2% of reading or ±0.1 μS/cm
0.055 - 5000 μS/cm	1.0	±2% of reading or ±1 μS/cm
0 - 5 mS/cm	1.0	±2% of reading or ±0.001 mS/cm
0 - 20 mS/cm	10	±2% of reading or ±0.01 mS/cm
10 - 20 MΩ-cm	0.01	0.9% of reading

**whichever is greater*

D. If the analyzer does not meet the accuracy specifications, it can be recalibrated. See Section 6.10.

8.8 SIMULATING TEMPERATURE

8.8.1 General.

The Solu Comp II accepts either a Pt100 or a Pt1000 RTD in a three-wire configuration. See Figure 8-5.

8.8.2 Simulating temperature

To simulate the temperature input, wire a decade box to the analyzer or junction box as shown in Figure 8-6.

To check the accuracy of the temperature measurement, set the resistor simulating the RTD to the values indicated in the table and note the temperature readings. The measured temperature might not agree with the value in the table. During sensor calibration an offset might have been applied to make the measured temperature agree with a standard thermometer. The offset is also applied to the simulated resistance. The Solu Comp II is measuring temperature correctly if the difference between measured temperatures equals the difference between the values in the table to within ±0.1°C.

For example, start with a simulated resistance of 103.9 Ω, which corresponds to 10.0°C. Assume the offset from the sensor calibration was -0.3 Ω. Because of the offset, the analyzer calculates temperature using 103.6 Ω. The result is 9.2°C. Now change the resistance to 107.8 Ω, which corresponds to 20.0°C. The analyzer uses 107.5 Ω to calculate the temperature, so the display reads 19.2°C. Because the difference between the displayed temperatures (10.0°C) is the same as the difference between the simulated temperatures, the analyzer is working correctly.

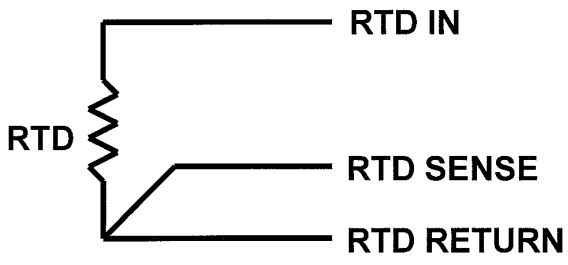


FIGURE 8-5. Three-Wire RTD Configuration.

Although only two wires are required to connect the RTD to the analyzer, using a third (and sometimes fourth) wire allows the analyzer to correct for the resistance of the lead wires and for changes in the lead wire resistance with temperature.

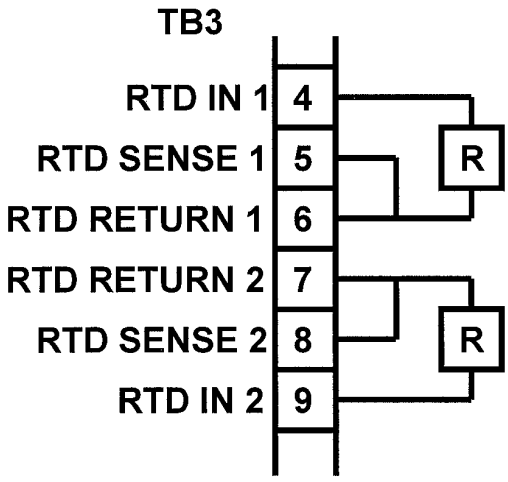


FIGURE 8-6. Simulating RTD Inputs.

Temp. (°C)	Pt 100 (Ω)	Pt 1000 (Ω)
0	100.0	1000
10	103.9	1039
20	107.8	1078
25	109.7	1097
30	111.7	1117
40	115.5	1155
50	119.4	1194
60	123.2	1232
70	127.1	1271
80	130.9	1309
85	132.8	1328
90	134.7	1347
100	138.5	1385

8.9 MEASURING REFERENCE VOLTAGE

Some processes contain substances that poison or shift the potential of the reference electrode. Sulfide is a good example. Prolonged exposure to sulfide converts the reference electrode from a silver/silver chloride electrode to a silver/silver sulfide electrode. The change in reference voltage is several hundred millivolts. A good way to check for poisoning is to compare the voltage of the reference electrode with a silver/silver chloride electrode known to be good. The reference electrode from a new sensor is best. See Figure 8-7. If the reference electrode is good, the voltage difference should be no more than about 20 mV. A poisoned reference electrode usually requires replacement.

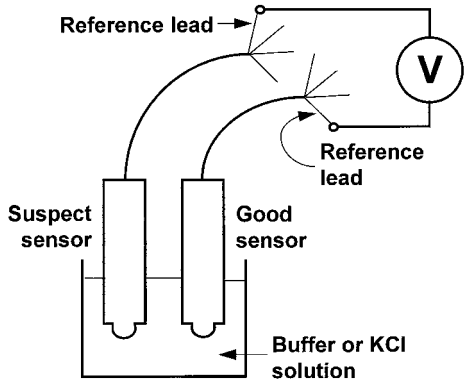


FIGURE 8-7. Checking for a Poisoned Reference Electrode.

Refer to the sensor wiring diagram to identify the reference leads. A laboratory silver/silver chloride electrode can be used in place of the second sensor.

SECTION 9.0
RETURN OF MATERIAL

9.1 GENERAL
9.2 WARRANTY REPAIR
9.3 NON-WARRANTY REPAIR

9.1 GENERAL.

To expedite the repair and return of instruments, proper communication between the customer and the factory is important. Before returning a product for repair, call 1-949-757-8500 for a Return Materials Authorization (RMA) number.

9.2 WARRANTY REPAIR.

The following is the procedure for returning instruments still under warranty:

1. Call Rosemount Analytical for authorization.
2. 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 unit must be supplied.
3. Carefully package the materials and enclose your “Letter of Transmittal” (see Warranty). If possible, pack the materials in the same manner as they were received.
4. Send the package prepaid to:

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

   Attn: Factory Repair

   RMA No. _____

   Mark the package: Returned for Repair

   Model No. ____

9.3 NON-WARRANTY REPAIR.

The following is the procedure for returning for repair instruments that are no longer under warranty:

1. Call Rosemount Analytical for authorization.
2. Supply the purchase order number, and make sure to provide the name and telephone number of the individual to be contacted should additional information be needed.
3. Do Steps 3 and 4 of Section 9.2.

NOTE

Consult the factory for additional information regarding service or repair.

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.

The right people,
the right answers,
right now.

ROSEMOUNT ANALYTICAL
CUSTOMER SUPPORT CENTER
1-800-854-8257

ON-LINE ORDERING NOW AVAILABLE ON OUR WEB SITE
http://www.raihome.com

Specifications subject to change without notice.

Credit Cards for U.S. Purchases Only.

Emerson Process Management

Liquid Division
2400 Barranca Parkway
Irvine, CA 92606 USA
Tel: (949) 757-8500
Fax: (949) 474-7250

http://www.raihome.com

EMERSON
Process Management

© Rosemount Analytical Inc. 2005

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP