1 YEAR WARRANTY

MADE IN USA

CE

User's Guide

CDCN685 & CDCN686
Conductivity Analyzer

omega.com®
ΩOMEGA®

OMEGAnet® Online Service www.omega.com	Internet e-mail info@omega.com

Servicing North America:

USA:
ISO 9001 Certified
One Omega Drive, P.O. Box 4047
Stamford CT 06907-0047
TEL: (203) 359-1660 FAX: (203) 359-7700
e-mail: info@omega.com

Canada:
976 Bergar
Laval (Quebec) H7L 5A1, Canada
TEL: (514) 856-6928 FAX: (514) 856-6886
e-mail: info@omega.ca

For immediate technical or application assistance:

USA and Canada: Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA®
Customer Service: 1-800-622-2378 / 1-800-622-BEST®
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN®
TELEX: 996404 EASYLINK: 62968934 CABLE: OMEGA

Mexico: En Español: (001) 203-359-7803 e-mail: espanol@omega.com
FAX: (001) 203-359-7807 info@omega.com.mx

Servicing Europe:

Benelux:
Postbus 8034, 1180 LA Amstelveen, The Netherlands
TEL: +31 (0)20 3472121 FAX: +31 (0)20 6434643
Toll Free in Benelux: 0800 0993344
e-mail: sales@omegaeng.nl

Czech Republic:
Frystatska 184/46, 733 01 Karviná, Czech Republic
TEL: +420 (0)59 6311899 FAX: +420 (0)59 6311114
Toll Free: 0800-1-66342 e-mail: info@omegashop.cz

France:
11, rue Jacques Cartier, 78280 Guyancourt, France
TEL: +33 (0)1 61 37 29 00 FAX: +33 (0)1 30 57 54 27
Toll Free in France: 0800 466 342
e-mail: sales@omega.fr

Germany/Austria:
Daimlerstrasse 26, D-75392 Deckenpfronn, Germany
TEL: +49 (0)7056 9398-0 FAX: +49 (0)7056 9398-29
Toll Free in Germany: 0800 639 7678
e-mail: info@omega.de

United Kingdom:
ISO 9002 Certified
One Omega Drive, River Bend Technology Centre
Northbank, Irlam, Manchester
M44 5BD United Kingdom
TEL: +44 (0)161 777 6611 FAX: +44 (0)161 777 6622
Toll Free in United Kingdom: 0800-488-488
e-mail: sales@omega.co.uk

IMPORTANT SAFETY INFORMATION

This analyzer is compliant with safety standards as outlined in:

FMRC Class Numbers 3600, 3611, and 3810 (U.S.A.)
CSA C22.2 No. 142 and C22.2 No. 213 (Canada)
EN 61010-1 (European Community)

Please read and observe the following:

- Opening the analyzer door exposes you to line power voltage, if present, at terminals on TB2 and TB3 inside the enclosure. This may be hazardous. Always remove line power before entering this area in the analyzer. However, the analyzer door assembly contains only low voltage and is completely safe to handle.
- Wiring or repairs should only be performed by qualified personnel and only to an unpowered analyzer.
- Whenever it appears that analyzer safety is questionable, disable the analyzer to ensure against any unintended operation. For example, an unsafe condition is likely when:

  1) The analyzer appears visibly damaged.
  2) The analyzer fails to operate properly or provide the intended measurements.
  3) The analyzer has been stored for long periods at temperatures above 158°F (70°C).

- This analyzer must be installed by specially trained personnel in accordance with relevant local codes and instructions contained in this operating instruction manual. Observe the analyzer's technical specifications and input ratings. If one line of the line power mains is not neutral, use a double-pole mains switch to disconnect the analyzer.

HELPFUL IDENTIFIERS

In addition to information on installation and operation, this instruction manual may contain WARNINGS pertaining to user safety, CAUTIONS regarding possible instrument malfunction, and NOTES on important, useful operating guidelines.

WARNING:

A WARNING LOOKS LIKE THIS. IT WARNS YOU OF THE POTENTIAL FOR PERSONAL INJURY.

CAUTION:

A CAUTION LOOKS LIKE THIS. IT ALERTS YOU TO POSSIBLE INSTRUMENT MALFUNCTION OR DAMAGE.

☞ ***NOTE:*** *A note looks like this. It alerts you to important, useful operating information.*

Definition of Equipment Symbols

This symbol **means CAUTION** and alerts you to possible danger or instrument malfunction. Refer to this manual before proceeding.

This symbol **means that this is a protective ground terminal** and alerts you to connect an earth ground to it.

This symbol **means that there is alternating current present** and alerts you to be careful.

CONDENSED OPERATING INSTRUCTIONS

This manual contains details for all operating aspects of the instrument. The following condensed instructions are provided to assist you in getting the instrument started up and operating as quickly as possible. **These condensed instructions only pertain to basic conductivity measurement operation.** To measure resistivity, TDS, or a calculated Sensor A and B measurement, or to use specific features of the instrument, refer to the appropriate sections in this manual for instructions.

A. CONNECTING SENSOR(S)/CONFIGURING TEMPERATURE ELEMENT(S)

1. After the analyzer is properly mounted (Part Two, Section 2), connect the CDE680 series contacting conductivity sensor(s), matching wire colors to terminals as indicated:

Sensor A		
Wire Colors	Analyzers with "B" Prefix Serial No.	Analyzers with "A" or No Letter Prefix Serial No.
Clear w/black (outer shield)	Grounding strip lug	Terminal #17 on TB1
Blue	Terminal #18 on TB1	Terminal #18 on TB1
White	Terminal #19 on TB1	Terminal #19 on TB1
Clear (inner shield wire)	Terminal #20 on TB1	Terminal #20 on TB1
Black	Terminal #21 on TB1	Terminal #21 on TB1
Red	Terminal #22 on TB1	Terminal #22 on TB1

Sensor B		
Wire Colors	Analyzers with "B" Prefix Serial No.	Analyzers with "A" or No Letter Prefix Serial No.
Clear w/black (outer shield)	Grounding strip lug	Terminal #11 on TB1
Blue	Terminal #12 on TB1	Terminal #12 on TB1
White	Terminal #13 on TB1	Terminal #13 on TB1
Clear (inner shield wire)	Terminal #14 on TB1	Terminal #14 on TB1
Black	Terminal #15 on TB1	Terminal #15 on TB1
Red	Terminal #16 on TB1	Terminal #16 on TB1

2. The analyzer is supplied factory-set for use with the Pt 1000 ohm temperature element built into the enhanced performance contacting conductivity sensors. Therefore, temperature element configuration is not necessary unless you want MANUAL temperature compensation.

B. CONNECTING LINE POWER

Important: Follow the instructions in Part Two, Section 3.5 to connect line power to the analyzer.

C. ADJUSTING DISPLAY CONTRAST

Ambient lighting conditions may make it necessary to adjust display contrast to improve visibility. With the MEASURE screen displayed, press and hold the **ENTER key** and simultaneously press the ⇧ **or** ⇩ **key** until attaining the desired contrast.

D. CALIBRATING THE ANALYZER

The analyzer must be calibrated so that measured values will correspond to actual process values. It can be traditionally "wet" calibrated. However, since measured conductivity is greatly affected by small changes in temperature, Omega strongly recommends using its DRY-CAL method for highest measuring accuracy of conductivity and temperature. Besides, DRY-CAL is actually a normal part of

CONDENSED OPERATING INSTRUCTIONS

D. CALIBRATING THE ANALYZER -- (continued)

configuring the sensor characteristics during initial startup, and **DRY-CAL eliminates the need for conductivity reference solutions.** This method also automatically sets the analyzer measuring range to match the inherent range of the sensor's cell constant. For more details about the benefits of DRY-CAL, refer to the "Calibration Tip!" in Part Three, Section 5.1.

NOTE: *DRY-CAL eliminates the need for periodic re-calibration! The only requirement, depending on the application, may be to periodically clean the sensor. Only when the sensor is replaced is it necessary to perform a new DRY-CAL calibration.*

Calibration Tip! Each contacting conductivity sensor has a unique zero point and offset. Consequently, when calibrating a sensor for the first time, always zero it according to step 1. Zeroing provides the best possible measuring accuracy, and eliminates any discrepancy between Sensor A and B measurement channels.

DRY-CAL, routinely attained while configuring the analyzer for sensor characteristics, requires entry of the sensor's certified "K" value and temperature "T factor" which are unique to each sensor. When using two sensors, enter each unique set of values using the respective sensor menu screens.

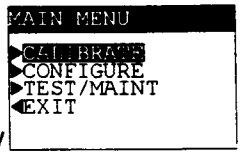
1. Zero the sensor if it is being calibrated for the first time. If not, disregard this step and proceed with step 2.

Zeroing Tip! If at any time during zeroing, the "ZERO: CONFIRM FAILURE?" screen appears, press **ENTER key** to confirm. Then, use the ⇧ **or** ⇩ **key** to select between "CAL REPEAT?" or "CAL EXIT?" and do one of the following:

- With the "ZERO: CAL REPEAT?" screen selected, press **ENTER key** to repeat zeroing.
- With the "ZERO: CAL: EXIT?" screen selected, press **ENTER key**. Then, after the "ZERO: CONFIRM ACTIVE?" screen appears, press **ENTER key** to return the analog outputs and relays to their active states (MEASURE screen appears).

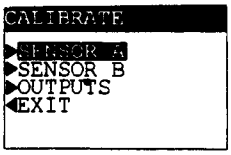
A. Make sure that the sensor is dry before zeroing.

B. Press **MENU key** to display



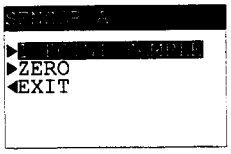
.

C. With the "CALIBRATE" line selected, press **ENTER key** to display



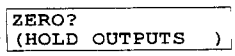
.

D. With the "SENSOR A" line selected, press **ENTER key** to display



.

E. Use ⇩ **key** to select the "ZERO" line, and press **ENTER key** to display



.

F. Press **ENTER key** to "hold" the analog outputs and relays at their present states during zeroing. (Outputs can also be transferred to present values or allowed to remain active.)

(continued on next page)

CONDENSED OPERATING INSTRUCTIONS

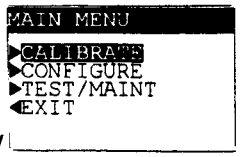
D. CALIBRATING THE ANALYZER -- (continued)

G. With the "ZERO: IN DRY AIR?" screen displayed and the dry sensor held in air, press **ENTER key** to start the automatic zeroing.

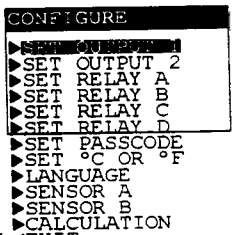
H. After the "ZERO: CONFIRM ZERO OK?" screen appears, press **ENTER key** to end zeroing.

I. After the "ZERO: CONFIRM ACTIVE?" screen appears, press **ENTER key** to return the analog outputs and relays to their active states (MEASURE screen appears).

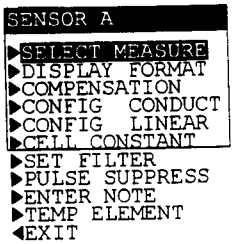
2. Press **MENU key** to display



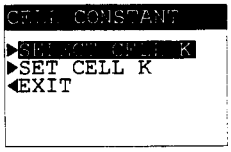
3. Use ⇩ **key** to select the "CONFIGURE" line, and press **ENTER key** to display



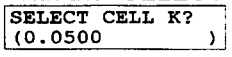
4. Use ⇩ **key** to select the "SENSOR A" line, and press **ENTER key** to display



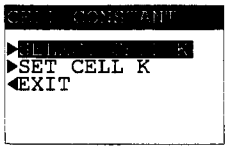
5. Use ⇩ key to select the "CELL CONSTANT" line, and press **ENTER key** to display



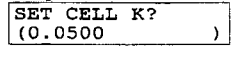
6. With the "SELECT CELL K" line selected, press **ENTER key** to display a cell category screen like



7. Use ⇩ **and** ⇧ **keys** to select the nominal cell category that corresponds to the sensor's Omega-certified "K" value shown on a label attached to its cable or to the inside cover of its optional junction box. Then press **ENTER key** to enter the selection.



8. After the screen re-appears, use ⇩ **key** to select the "SET CELL K" line and press **ENTER key** to display a cell "K" value screen like

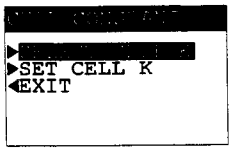


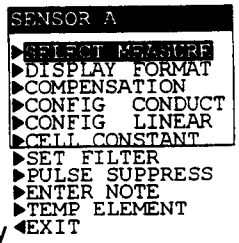
9. Use ⇨ **and** ⇦ **keys** to coarse adjust, and ⇧ **and** ⇩ **keys** to fine adjust the displayed value to exactly match the sensor's Omega-certified "K" value. Then press **ENTER key** to enter the value.

(continued on next page.)

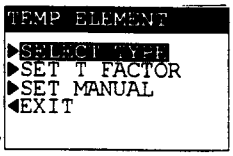
CONDENSED OPERATING INSTRUCTIONS

D. CALIBRATING THE ANALYZER -- (continued)

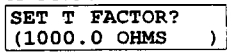
10. After the 

screen re-appears, press **ESC key** once to display 

.

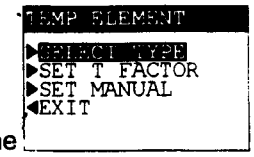
11. Use ⇩ **key** to select the "TEMP ELEMENT" line, and press **ENTER key** to display 

.

12. Use ⇩ **key** to select the "SET T FACTOR" line, and press **ENTER key** to display a "T" factor value screen like 

.

13. Use ⇨ **and** ⇦ **keys** to coarse adjust, and ⇧ **and** ⇩ **keys** to fine adjust the displayed value to exactly match the sensor's Omega-certified "T" factor. Then press **ENTER key** to enter the value.

14. After the 

screen re-appears, press **MENU key** once and then **ESC key** once to display the MEASURE screen.

This completes the DRY-CAL calibration. The analyzer is now ready to accurately measure conductivity.

To change the display format of the MEASURE screen, for example, from 0-2000 µS/cm to 0.000-2.000 mS/cm, refer to Part Three, Section 4.2 under the subheading "Selecting Measurement Display Format."

NOTE: *If the values you intend to measure are above the analyzer's set measuring range (not its selected display format), use a different sensor that has the appropriate nominal cell constant. For a listing of sensor cell constants and their inherent measuring ranges, refer to Table A in Part Three, Section 4.2 under the subheading "Selecting Measurement Display Format."*

E. COMPLETING ANALYZER CONFIGURATION

To further configure the analyzer to your application requirements, use the appropriate CONFIGURE screens to make selections and "key in" values. Refer to Part Three, Section 4 for complete configuration details.

TABLE OF CONTENTS

PART ONE - INTRODUCTION

PART TWO - INSTALLATION

PART THREE - OPERATION

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

ILLUSTRATIONS

TABLES

PART ONE - INTRODUCTION

SECTION 1
GENERAL INFORMATION

1.1 Capability Highlights

Sensor Inputs:

The analyzer has two independent sensor inputs for monitoring two measurement points. Each input accepts the CDE680 series enhanced performance contacting conductivity sensors.

Model No.	Sensor Type	# Inputs	# Relays
CDCN685	CDE680 series	1 or 2	2
CDCN686	CDE680 series	1 or 2	4

MEASURE Screens

With the display in the normal MEASURE screen mode, you can press the ⇨ **or** ⇦ **key** to sequentially show any of these four different MEASURE screens:

- Measured Sensor A value (conductivity, resistivity, orTDS).
- Measured Sensor B value (conductivity, resistivity, or TDS).
- Measured Sensor A and B values and temperatures.
- *Calculated Sensor A and B measurement (% reject, % pass, ratio A/B, ratio B/A, diff. A-B, or diff. B-A).

*The calculated measurement can only be displayed when two sensors are used and the analyzer has been correctly configured for CALCULATION.

The bottom auxiliary display line, shown in reverse video on each of the four MEASURE screens, can be changed by pressing the ⇩ **and** ⇧ **keys** to show these measurements:

- Measured Sensor A temperature (°C or °F).
- Measured Sensor B temperature (°C or °F).
- Analog Output #1 value (mA).
- Analog Output #2 value (mA).

Passcode-protected Access:

For security, you can enable a passcode feature to restrict access to configuration and calibration settings to authorized personnel only. See Part Three, Section 4.7 for details.

Calibration:

It is highly recommended to calibrate the analyzer using the DRY-CAL method. However, the analyzer can be traditionally "wet" calibrated. For calibration details, refer to Part Three, sections 5.2 or 5.3 respectively. The mA values for each analog output can also be calibrated (Section 5.4).

Analog Output:

The analyzer provides two isolated analog outputs (#1 and #2). Each output can be set to be 0-20 mA or 4-20 mA, and assigned to represent one of the following:

- Measured Sensor A conductivity, resistivity, or TDS.
- Measured Sensor A temperature.
- Measured Sensor B conductivity, resistivity, or TDS.
- Measured Sensor B temperature.
- *Calculate Sensor A and B measurement (% reject, % pass, ratio A/B, ratio B/A, diff. A-B, or diff. B-A).

*An analog output can only represent the calculated measurement when two sensors are used and the analyzer has been correctly configured for CALCULATION.

Parameter (or calculated measurement) values can be entered to define the endpoints at which the minimum and maximum analog output values are desired.

During calibration, both analog outputs can be selected to:

- Hold their present values (HOLD OUTPUTS)
- Transfer to preset values to operate control elements by an amount corresponding to those values (XFER OUTPUTS)
- Remain active to respond to the measured value (ACTIVE OUTPUTS).

For analog output transfer setup details, see Part Three, Section 4.5 under the subheading "Setting Transfer Value."

Relays:
The analyzer may have two or four electromechanical relays, all with SPDT contacts. Each relay can be set to function as a control relay, dual-alarm relay, or a status relay. A control or alarm relay can be assigned to be driven by one of the following:

- Measured Sensor A conductivity, resistivity, or TDS.
- Measured Sensor A temperature.
- Measured Sensor B conductivity, resistivity, or TDS.
- Measured Sensor B temperature.
- *Calculated Sensor A and B measurement (% reject, % pass, ratio A/B, ratio B/A, diff. A-B, or diff. B-A).

*A relay can only be driven by the calculated measurement when two sensors are used and the analyzer has been correctly configured for CALCULATION.

Refer to Part Three, Section 4.6 for relay setup details.

☞ ***NOTE:*** *When a relay is set to function as a status relay, it is no longer configurable. Instead, it becomes a dedicated system diagnostic-only alarm relay that automatically energizes when the "WARNING CHECK STATUS" message flashes on the MEASURE screen. This occurs when the analyzer detects a "fail" diagnostic condition. See Part Three, Section 6.1 for more details.*

Except for status relays, during calibration the relay on/off states are affected in the same way as the analog outputs by the "(HOLD/XFER/ACTIVE OUTPUTS)" screen selection. These relays are also held at their present on/off states, transferred to desired preset on/off states, or remain active to respond to measured values. For relay transfer setup details, see Part Three, Section 4.6, under the subheading "Selecting Transfer Mode."

1.2 Modular Construction

The modular construction of the analyzer simplifies field servicing and provides electrical safety. The front door/ keypad assembly uses voltages no greater than 24 VDC, and is completely safe to handle.

Opening the analyzer door accesses terminals inside the enclosure for electrical connections. Line power must be connected to specifically designated terminals on TB3.

WARNING:

REMOVE LINE POWER BEFORE NEARING THIS AREA TO AVOID ELECTRICAL SHOCK.

1.3 Retained Configuration Values

All user-entered configuration values are retained indefinitely, even if power is lost or turned off. The non-volatile analyzer memory does not require battery backup.

1.4 Analyzer Serial Number

A label with the analyzer model number, serial number, build date, and other items is affixed to the top of the enclosure.

1.5 EMI/RFI Immunity

The analyzer is designed to provide protection from most normally encountered electromagnetic interference. This protection exceeds US standards and meets European IEC 801-series testing for electromagnetic and radio frequency emissions and susceptibility. Refer to Figure 1-1 and the specifications in Section 2.1 for more information.

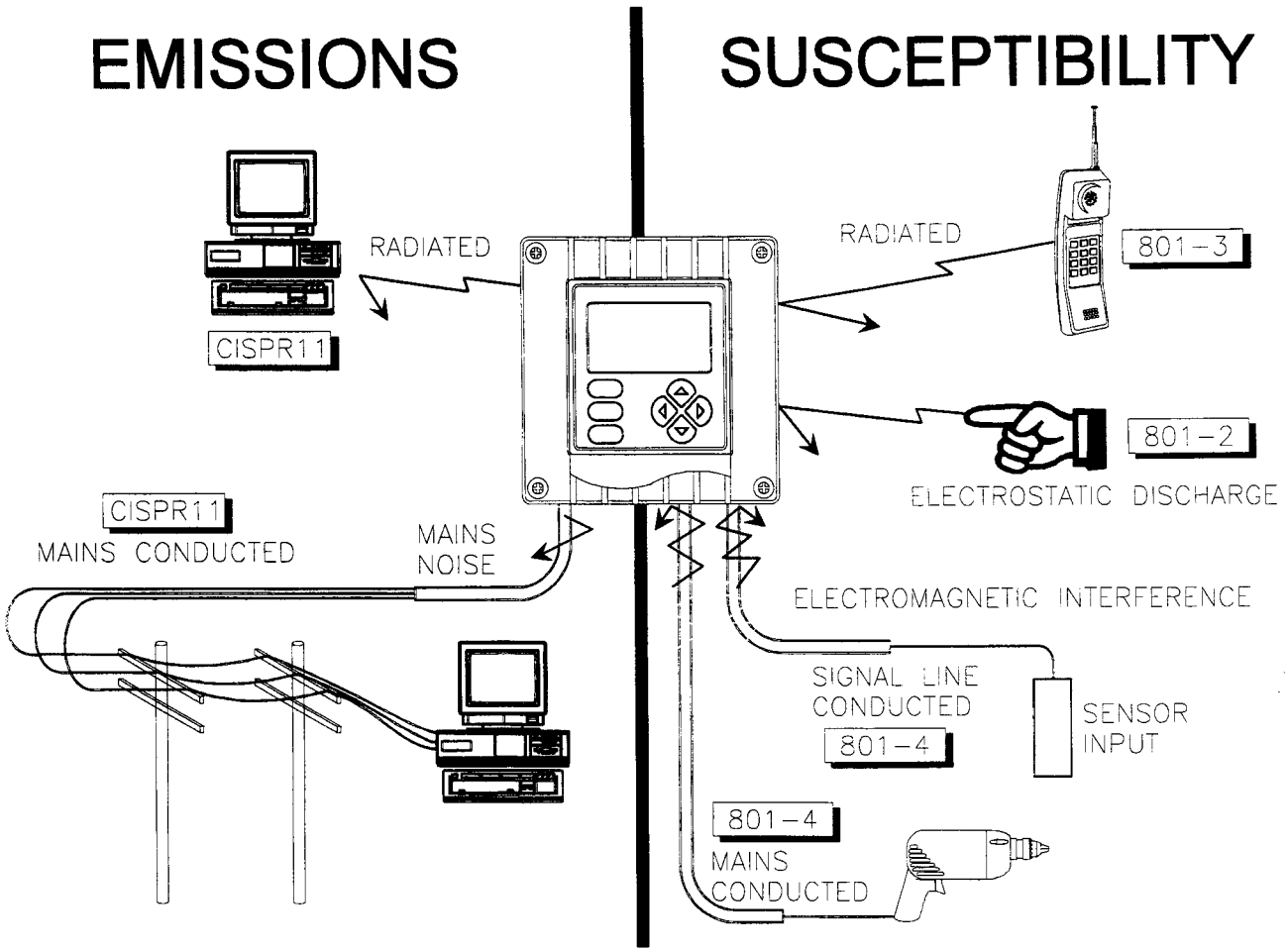


FIGURE 1-1 EMI/RFI Immunity Diagram

SECTION 2
SPECIFICATIONS

2.1 Operational

Display ..... Graphic dot matrix LCD, 128 x 64 pixels with LED backlighting; 1/2 inch (13 mm) main character height; 1/8 inch (3 mm) auxiliary information character height; menu screens contain up to six text lines

Measurement	Selectable Ranges
Conductivity	µS/cm: 0-2.000, 0-20.00, 0-200.0, or 0-2000 mS/cm: 0-2.000, 0-20.00, 0-200.0, or 0-2000
Resistivity	0-19.99 MΩ • cm or 0-19.99 KΩ • cm
TDS	0-9999 ppm or 0-9999 ppb
Calculated Sensor A and B Measurement:	
% Rejection	0-100%
% Passage	0-100%
Ratio A/B or B/A	0-9.999, 0-99.99, 0-999.9, or 0-9999
Difference A-B or B-A	Same ranges as those listed above for conductivity, resistivity, or TDS
Temperature	-4.0 to +392.0°F or -20.0 to +200.0°C
mA Outputs (#1 and #2)	0.00-20.00 mA or 4.00-20.00 mA

Ambient Conditions:
- Operation ..... -4 to +140°F (-20 to +60°C); 0-95% relative humidity, non-condensing
- Storage ..... -22 to +158°F (-30 to +70°C); 0-95% relative humidity, non-condensing

Relays:
- Types/Outputs ..... Two or four electromechanical relays; SPDT (Form C) contacts; U.L. rated 5A 115/230 VAC, 5A @ 30 VDC resistive
- Operational Mode ..... Each relay (A, B, C, and D) can be assigned to be driven by the:
  - Selected Sensor A or B measurement (conductivity, resistivity, TDS, or temperature)
  - Calculated Sensor A and B measurement (% rejection, % passage, ratio A/B, ratio B/A, difference A-B, or difference B-A)
- Function Modes:
  - Control ..... Settings for high/low phasing, setpoint, deadband, overfeed timer, off delay, and on delay
  - Alarm ..... Settings for low alarm point, low alarm point deadband, high alarm point, high alarm point deadband, off delay, and on delay
  - Status ..... Not configurable; relay only activates when a sensor or analyzer "fail" diagnostic WARNING condition exists
- Indicators ..... Relay A, B, C, and D annunciators indicate respective relay status

Temperature Compensation ..... Automatic or manual, -4.0 to 392.0°F (-20.0 to +200.0°C), with selection for Pt 1000 ohm RTD or Pt 100 ohm RTD temperature element, or a manually entered value

NOTE: *Depending on Sensor A or B's selected measurement, not all of the following temperature compensation methods are available:*

- *Linear % per °C slope*
- *Built-in ammonia temperature properties table*
- *Built-in natural water temperature properties table*
- *No compensation*

2.2 Analyzer Performance (Electrical, Analog Outputs)

Sensor-to-Analyzer Distance ..... 300 ft. (91 m) maximum

Power Requirements ..... 90-130 VAC, 50/60 Hz. (10 VA max.) or 180-260 VAC, 50/60 Hz. (10 VA max.)

Calibration Methods:
- DRY-CAL ..... Enter certified cell constant "K" value and temperature "T" factor of the sensor.
- 1 POINT SAMPLE ..... Enter one reference solution value or one sample value (determined by laboratory analysis or a comparison reading).
- ZERO ..... With the dry sensor in air, press keys to initiate automatic system zeroing.

Analog Outputs .....Two isolated 0/4-20 mA outputs; each with 0.004 mA (12-bit) resolution and capability to drive up to 600 ohm loads

NOTE: *Each output can be assigned to represent Sensor A or B's selected parameter (conductivity, resistivity, or TDS), Sensor A or B's temperature, or a calculated Sensor A and B measurement (% rejection, % passage, ratio A/B, ratio B/A, difference A-B, or difference B-A). Parameter (or calculated measurement) values can be entered to define the endpoints at which the minimum and maximum mA output values are desired. During calibration, both outputs can be selected to hold their present values, transfer to preset values to operate control elements by an amount corresponding to those values, or remain active to respond to the measured value.*

Memory Backup (non-volatile) .....All user settings are retained indefinitely in memory (EEPROM)

EMI/RFI Conformance .....Exceeds US and meets European standards for conducted and radiated emissions and immunity; certified CE compliant for applications as specified by EN 50081-1 for emissions and EN 50082-2 for immunity

Electrical Certifications:
- General Purpose (pending) .....UL, C-UL, FM, and CENELEC
- Division 2 (pending).....UL, C-UL, and FM: Groups A, B, C, D, F, and G
- Zone 2 (pending).....CENELEC: Group IIC

Accuracy .....0.1% of span
Stability .....0.05% of span per 24 hours, non-cumulative
Repeatability .....0.1% of span or better
Temperature Drift.....Zero and Span: less than 0.03% of span/°C

2.3 Mechanical

Enclosure.....NEMA 4X; polycarbonate face panel, epoxy-coated cast aluminum door and case with four 1/2 inch (13 mm) conduit holes; nylon mounting bracket, and stainless steel hardware

Mounting Configurations .....Panel, surface, and pipe (horizontal and vertical) mounting

Net Weight.....3.5 lbs. (1.6 kg) approximately

PART TWO - INSTALLATION

SECTION 1
UNPACKING

After unpacking, it is recommended to save the shipping carton and packing materials in case the instrument must be stored or re-shipped. Inspect the equipment and packing materials for signs of shipping damage. If there is any evidence of damage, notify the transit carrier immediately.

SECTION 2
MECHANICAL REQUIREMENTS

2.1 Location

1. It is recommended to locate the analyzer as close as possible to the installed sensor. The maximum allowable distance between an installed sensor and the analyzer is 300 feet (91 m).

2. Mount the analyzer in a location that is:

   - ➥ Clean and dry where there is little or no vibration.
   - ➥ Protected from corrosive fluids.
   - ➥ Within ambient temperature limits (-4 to +140°F or -20 to +60°C).

CAUTION:

EXPOSING THE ANALYZER TO DIRECT SUNLIGHT MAY INCREASE THE OPERATING TEMPERATURE ABOVE ITS SPECIFIED LIMIT.

2.2 Mounting

Figure 2-1 illustrates the various ways to mount the analyzer using the supplied bracket and hardware. Determine the mounting method and attach the hardware as shown in the respective illustration. Refer to Figure 2-2 for analyzer installation dimension details.

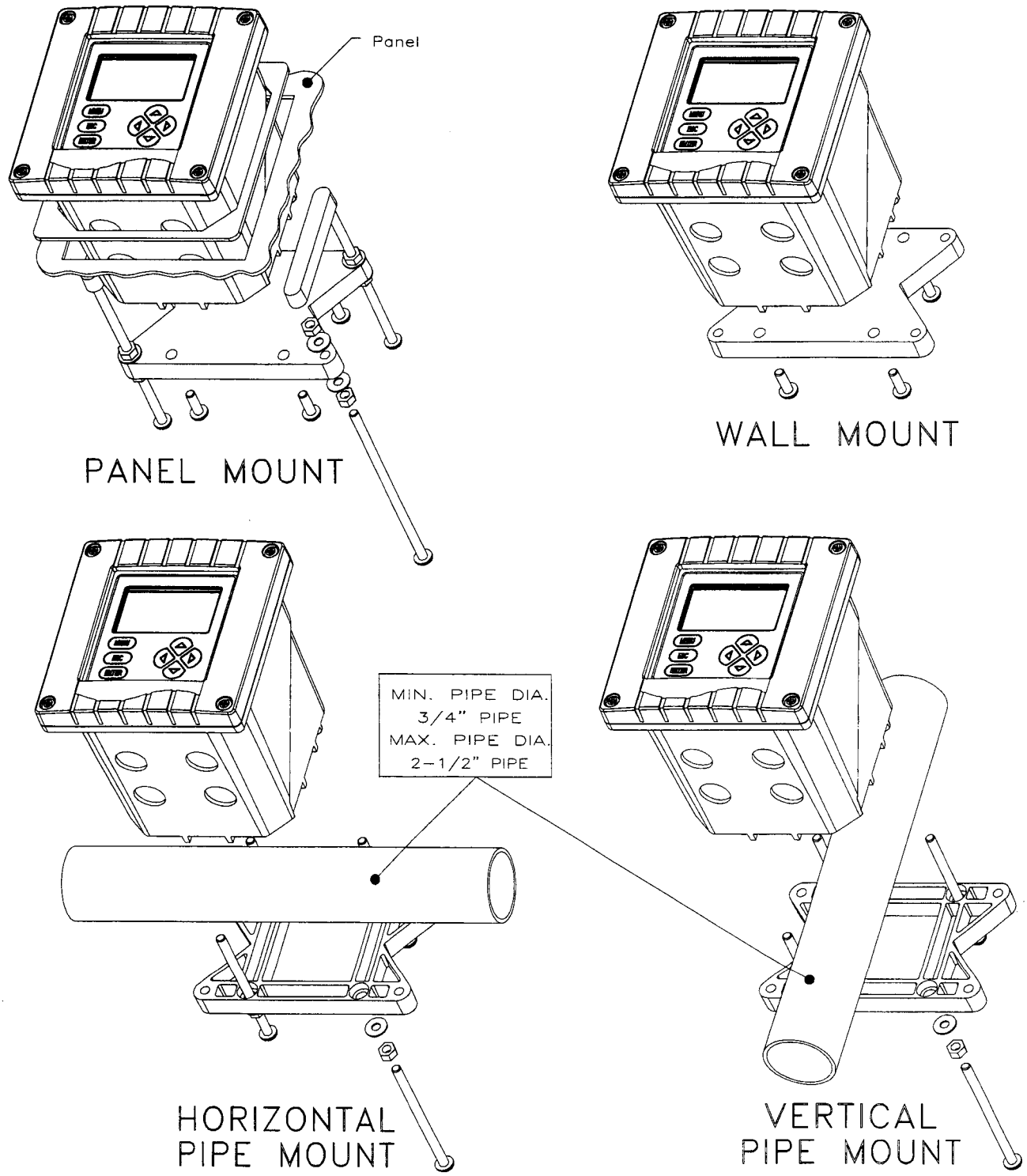


FIGURE 2-1 Analyzer Mounting Arrangements

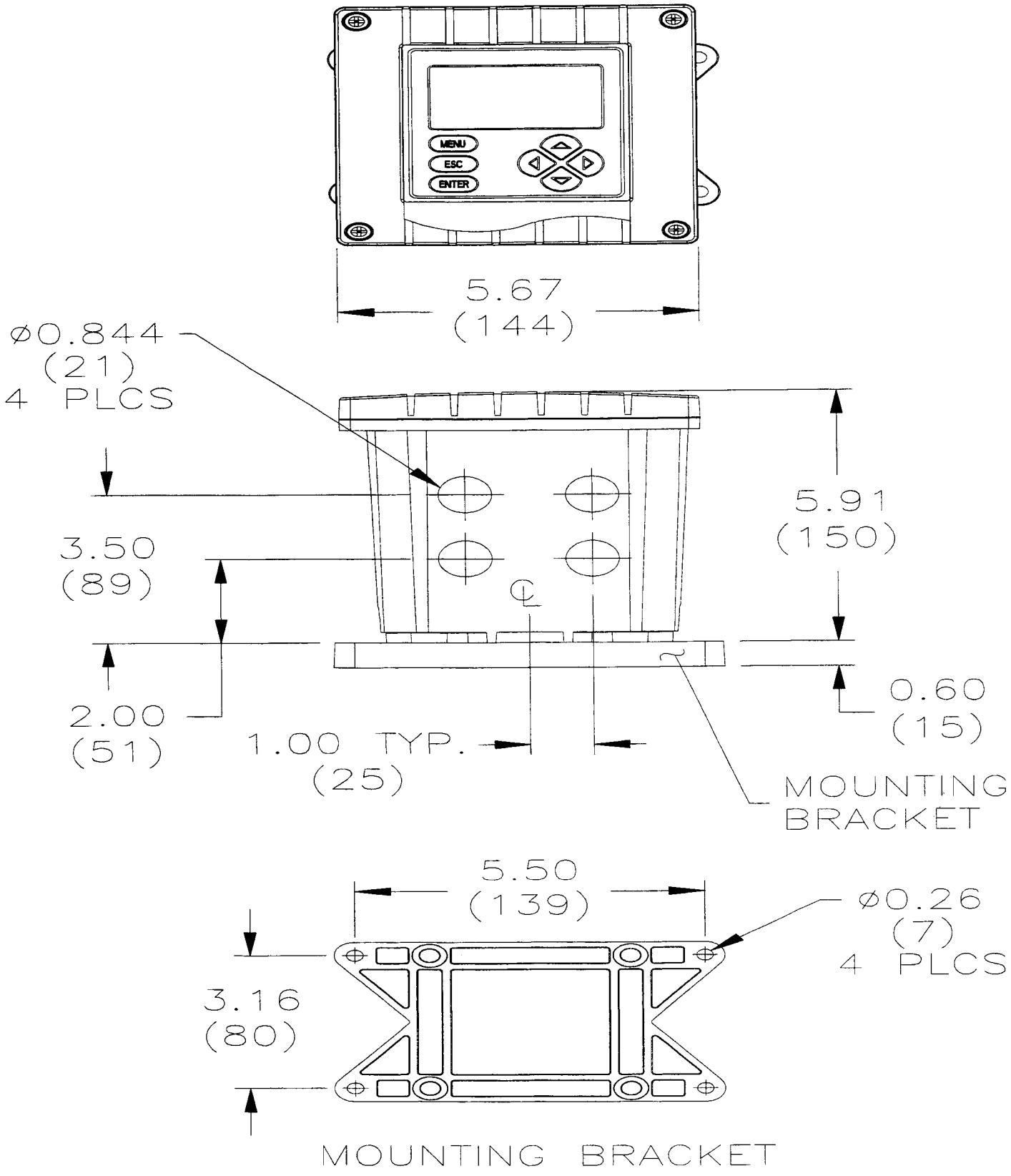


FIGURE 2-2 Analyzer Installation Dimensions Details

2.3 Conduit Hole Requirements

Recommendation: Run all wiring to the analyzer in 1/2-inch, grounded metal conduits. If using only shielded cables, appropriate strain reliefs or cable grips are required.
Consult Omega's PH application engineer if cable grips and watertight lock nuts are required. Seal unused cable entry holes with appropriate plugs.

NOTE: *Use NEMA 4-rated fittings and plugs to maintain the watertight integrity of the NEMA 4X enclosure.*

SECTION 3
ELECTRICAL CONNECTIONS

3.1 Enhanced Performance Contacting Conductivity Sensor(s)

To access terminal blocks for electrical connections, open the left-hinged enclosure door by unscrewing the four fasteners. Figure 2-3 or 2-4 shows the terminal block arrangement and terminal designations inside the analyzer.

NOTE: *All terminals are suitable for single wires up to 14 AWG (2.5 mm^2). If the analyzer is equipped with only A and B relays, "RELAY C" and "RELAY D" terminals are non-functioning (all relay designations are always shown).*

Wiring Tip! To comply with European Community (CE) electromagnetic compatibility requirements, follow these general wiring guidelines:

1. Keep all cable shields as short as possible inside the analyzer, and connect them to the ground terminals provided. Performance may be improved by using cable glands that enable the shield to directly contact the analyzer chassis.
2. Use Steward ferrite 28 B0590-000 or equivalent on the sensor cable -- two turns required.
3. In harsh conducted RF conditions, connect the earth ground of the analyzer to a local, known earth ground source.

NOTE: *For ease of wiring, connect line power and relay outputs through the back conduit holes before connecting the sensor, and analog outputs.*

All CDE680 series contacting conductivity sensors have a built-in Pt 1000 ohm RTD temperature element for automatic temperature compensation.

Wiring Tip! Route the sensor cable in 1/2-inch, grounded metal conduit to protect it from moisture,
electrical noise, and mechanical damage.

For installations where the distance between sensor and analyzer exceeds the standard 20 ft. (6 m) sensor cable length, indirectly connect the sensor to the analyzer using a junction box and interconnect cable.

NOTE: *Do not route the sensor cable in any conduit containing AC power wiring ("electrical noise" may interfere with the sensor signal).*

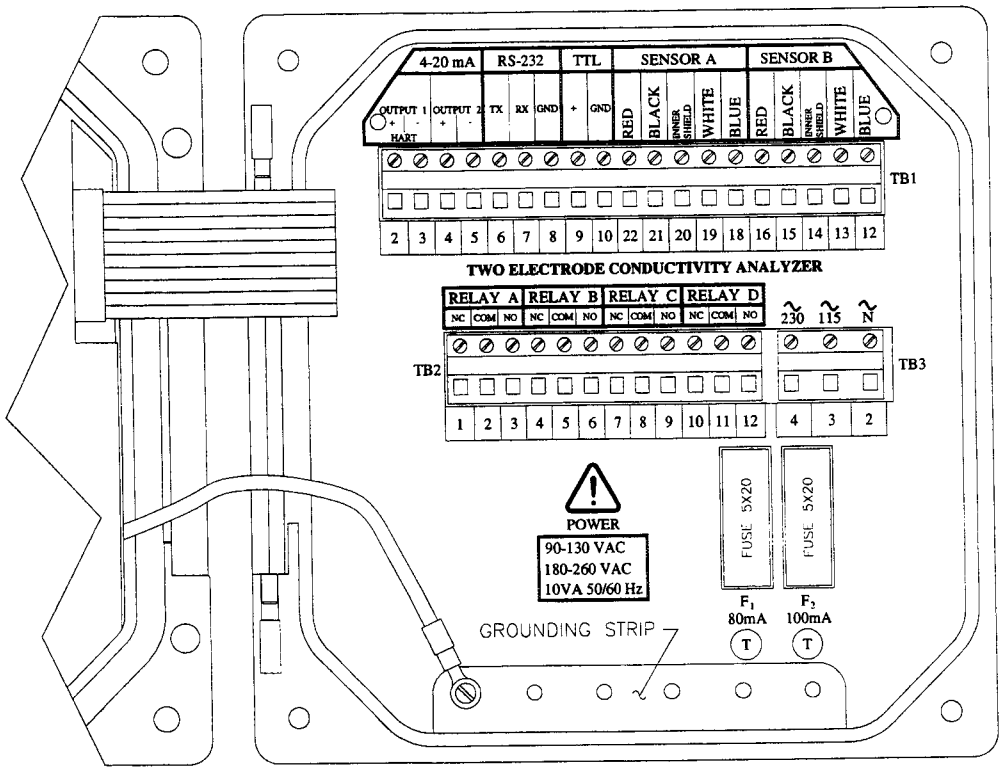


FIGURE 2-3 Terminal Block Designations for Analyzers with "B" Prefix Serial Numbers

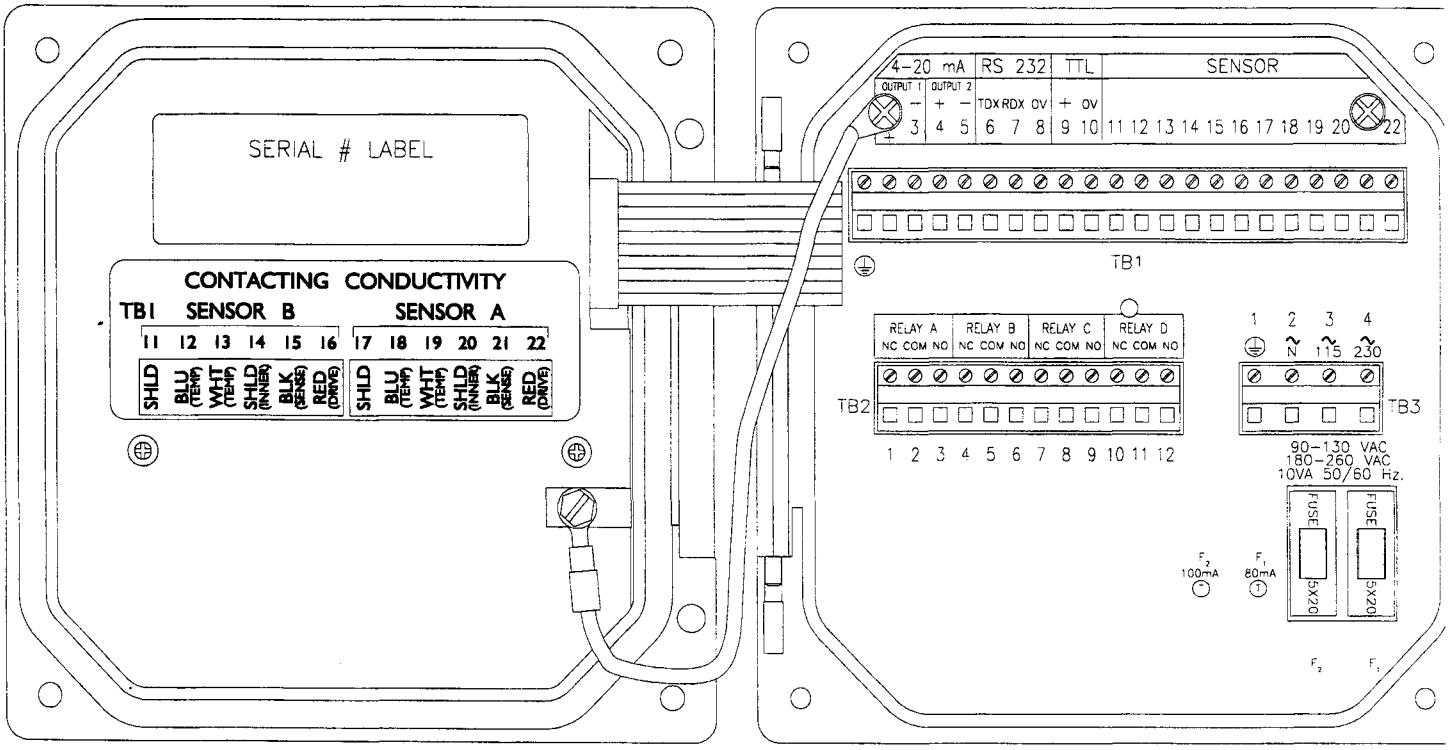


FIGURE 2-4 Terminal Block Designations for Analyzers with "A" or No Letter Prefix Serial Numbers

The analyzer can be used with one or two conductivity sensors. Refer to Figure 2-5 or 2-6 and connect each sensor's cable (or interconnect) wires to appropriate terminals on TB1, matching colors as indicated.

NOTE: *For best immunity to electromagnetic interference, always connect each sensor cable's outer shield wire (clear with black band -- not its clear-only inner shield wire) to:*

- *The grounding strip at bottom of case (5 open holes) for analyzers with "B" prefix serial numbers.*
- *Terminal 17 and Terminal 11 on TB1 for each respective sensor for analyzers with "A" or no letter serial numbers.*

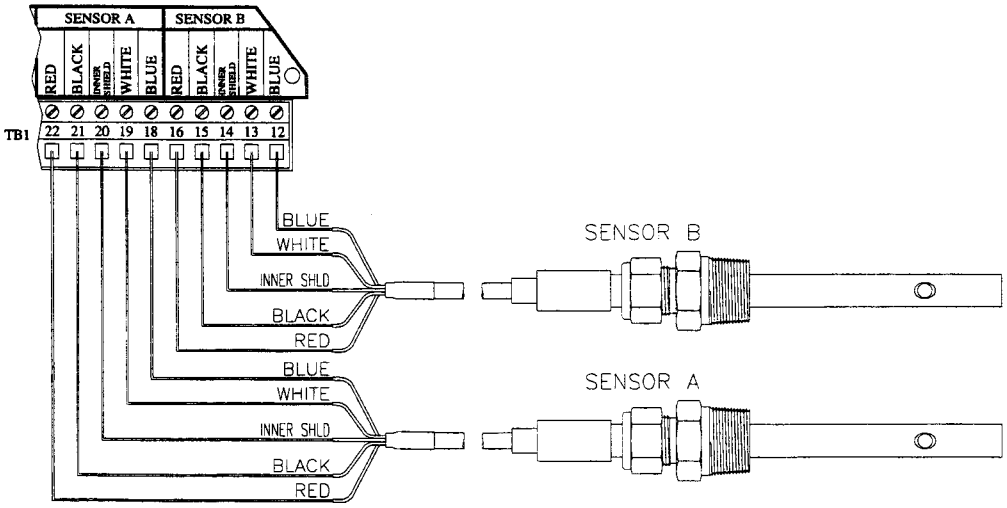


FIGURE 2-5 Connecting Omega Contacting Conductivity Sensor(s) to Analyzers with "B" Prefix Serial Numbers

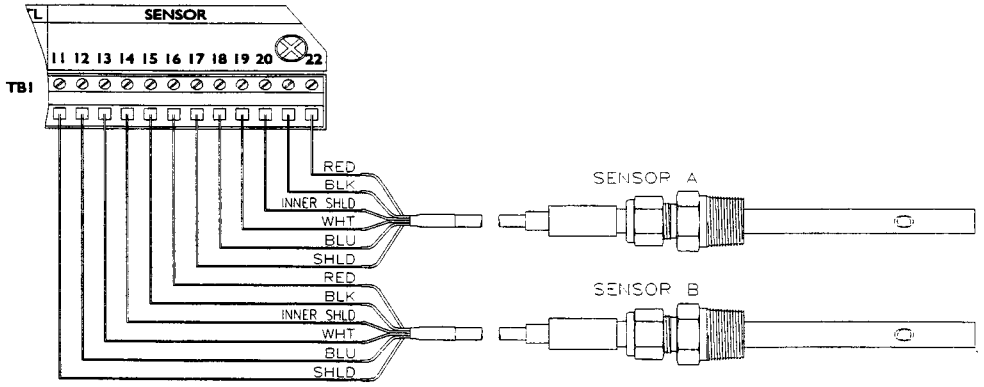


FIGURE 2-6 Connecting Omega Contacting Conductivity Sensor(s) to Analyzers with "A" or No Letter Prefix Serial Numbers

3.2 Analog Outputs

Two isolated analog outputs (#1 and #2) are provided. Each output can be set to be 0-20 mA or 4-20 mA. Also, each output can be assigned to represent one of the following:

- Measured Sensor A conductivity, resistivity, or TDS.
- Measured Sensor A temperature.
- Measured Sensor B conductivity, resistivity, or TDS.
- Measured Sensor B temperature.
- *Calculated Sensor A and B measurement (% reject, % pass, ratio A/B, ratio B/A, diff. A-B, or diff. B-A).

*An analog output can only represent the calculated measurement when two sensors are used and the analyzer has been correctly configured for CALCULATION.

For details on configuring the outputs, refer to Part Three, Section 4.5.

Wiring Tip! Use high quality, shielded instrumentation cable for connecting the analog outputs. To protect the output signal from EMI/RFI, connect cable shields to:

- The grounding strip at bottom of case (5 open holes, Fig. 2-3) for analyzers with "B" prefix serial numbers.
- The "ground symbol" Terminal 1 on TB1 (Figure 2-4) for analyzers with "A" or no letter prefix serial numbers.

Each 0/4-20 mA output can drive a load of up to 600 ohms.

- For Output #1: Connect the load to Terminals 2 and 3 on TB1, matching polarity as indicated.
- For Output #2: Connect the load to Terminals 4 and 5 on TB1, matching polarity as indicated.

3.3 Relay Outputs

The analyzer may be equipped with two or four electromechanical relays. For relay setup details, refer to Part Three, Section 4.6.

CAUTION:

DO NOT EXCEED THE CONTACT RATING FOR EACH RELAY (5A 115/230 VAC). WHEN SWITCHING LARGER CURRENTS, USE AN AUXILIARY RELAY SWITCHED BY THE ANALYZER RELAY TO EXTEND ANALYZER RELAY LIFE. WHEN USING RELAY OUTPUTS, MAKE SURE THAT LINE POWER WIRING CAN ADEQUATELY CONDUCT THE CURRENT DRAW OF THE SWITCHED LOAD(S).

Two or four sets of SPDT relay outputs (Relays A and B, and C and D) are provided at Terminals 1 through 12 on TB2. **The relay outputs are not powered.** The line power used to power the analyzer may also be used to power the control or alarm devices with these relay contacts.

Refer to Figure 2-7 for a general wiring arrangement. Always check control wiring to insure that line power will not be shorted by the relay switching action, and that wiring conforms to local codes.

WARNING:

MAKE SURE THAT LINE POWER IS NOT PRESENT WHILE CONNECTING WIRES TO TB2 RELAY TERMINALS.

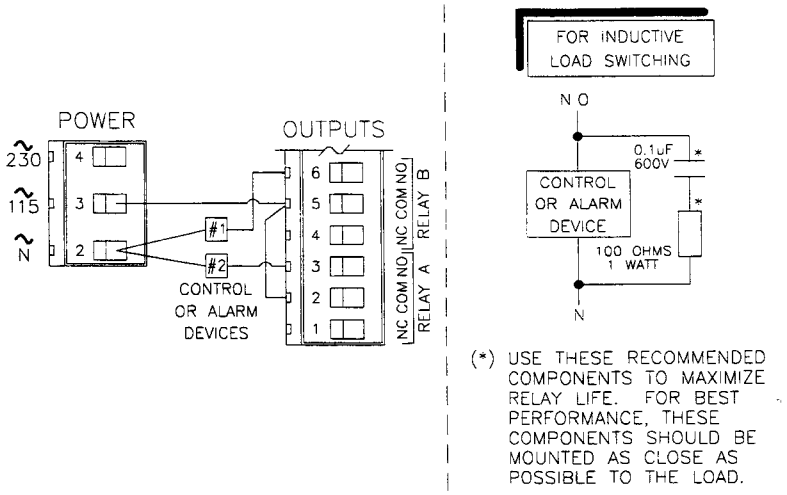


FIGURE 2-7 Connecting Control/Alarm Device(s) To Electromechanical Relay(s)

3.4 Closed Contact Input

The closed contact input feature of the analyzer enables you to conveniently change the analog outputs and all control or alarm relays to their preset transfer states. To use this feature:

1. Preset analog outputs and relays to desired transfer states:
   - Outputs: See Part Three, Section 4.5 under subheading "Setting Transfer Value (mA)."
   - Relays: See Part Three, Section 4.6 under subheading "Selecting Transfer Mode (relay on/off)."
2. Remotely (or locally) jumper Terminals 9 and 10 on TB1 to change analog outputs and relays in their transfer states.

Refer to appropriate figures on the next page and connect line power to TB3 terminals using the standard three-wire connection arrangement. **Use wiring practices which conform to local codes** (example: National Electric Code Handbook in the U.S.A.).

WARNING:

REMOVE LINE POWER WHILE CONNECTING LINE POWER WIRES TO THE TB3 TERMINALS. ALSO, USE ONLY THE STANDARD THREE-WIRE CONNEC-TION

ARRANGE-MENT FOR SINGLE-PHASE LINE POWER TO PREVENT AN UNSAFE CONDITION, AND TO ENSURE PROPER ANALYZER OPERATION.

NOTE: *In all cases, connect the line power cable ground wire (usually green) to:*

- *The grounding strip at bottom of case (5 open holes -- Figures 2-8, 2-10, or 2-12) for analyzers with "B" prefix serial numbers.*
- *The "ground symbol" terminal 1 on TB3 (Figures 2-9, 2-11, or 2-13) for analyzers with "A" or no letter prefix serial numbers.*

The "115" and "230" voltage circuits are protected with internal, board-mounted slow-blow fuses.

NOTE: *For 230 volt split phase line power, be sure to conform to local codes with regard to fusing the 115 volt line connected to the "N" terminal.*

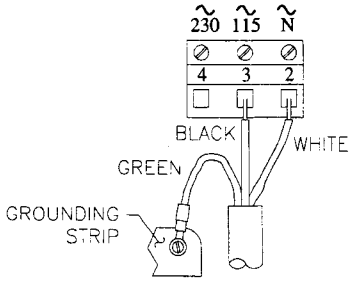


FIGURE 2-8 Connecting 115 Volt Single Phase to Analyzers with "B" Prefix Serial Numbers

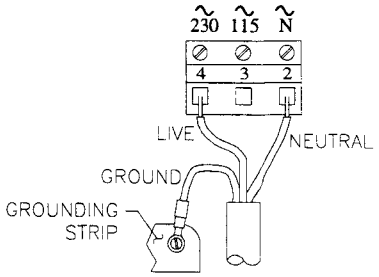


FIGURE 2-10 Connecting 230 Volt Single Phase to Analyzers with "B" Prefix Serial Numbers

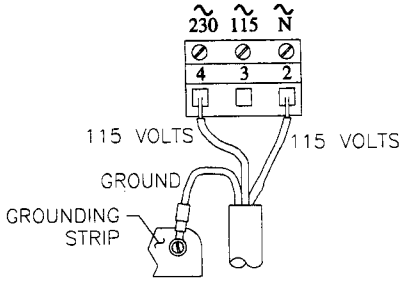


FIGURE 2-12 Connecting 230 Volt Split Phase to Analyzers with "B" Prefix Serial Numbers

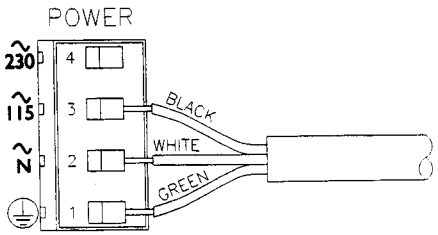


FIGURE 2-9 Connecting 115 Volt Single Phase to Analyzers with "A" or No Letter Prefix Serial Numbers

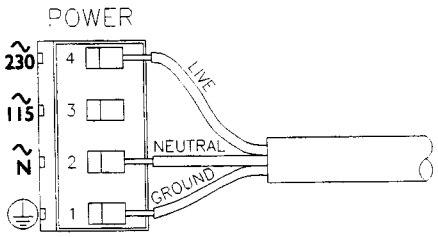


FIGURE 2-11 Connecting 230 Volt Single Phase to Analyzers with "A" or No Letter Prefix Serial Numbers

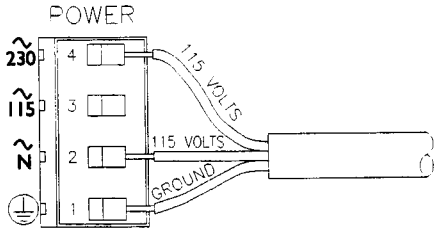


FIGURE 2-13 Connecting 230 Volt Split Phase to Analyzers with "A" or No Letter Prefix Serial Numbers

PART THREE - OPERATION

SECTION 1
USER INTERFACE

1.1 Display

The user interface consists of an LCD display and a keypad with **MENU**, **ENTER**, **ESC**, ⇦, ⇨, ⇧, **and** ⇩ **keys**.

By using the keypad, you can display three basic types of screens:

- **MEASURE screens** to show measured values. Pressing the ⇨ **or** ⇦ **key** while viewing a MEASURE screen (normal display mode) sequentially displays these measurements:
  1. Measured Sensor A conductivity, resistivity, or TDS.
  2. Measured Sensor B conductivity, resistivity, or TDS.
  3. Measured Sensor A and B values and temperatures.
  4. *Calculated Sensor A and B measurement (% reject, % pass, ratio A/B, ratio B/A, diff. A-B, or diff. B-A).

*The calculated measurement can only be displayed when two sensors are used and the analyzer has been correctly configured for CALCULATION.

Pressing the ⇩ **or** ⇧ **key** changes the MEASURE screen's bottom auxiliary line (in reverse video) to show these other measurements:

- Measured Sensor A temperature (°C or °F).
- Measured Sensor B temperature (°C or °F).
- Analog Output #1 value (mA).
- Analog Output #2 value (mA).

An example of a typical MEASURE screen is:

On the MEASURE screen's top line, Relay A, B, C, and D annunciators will appear when their relay operational state changes. When a relay overfeed timer is used and it has "timed out," the respective relay annunciator continuously blinks until the overfeed condition is resolved.

1.2 Keypad

- **Menu screens** to move within the three main branches of the analyzer menu tree, enabling access to edit/selection screens. (EXIT screens indicate the end of a menu branch and enable you, by pressing the **ENTER key**, to move up one level in the menu tree. This is functionally the same as pressing the **ESC key**.)

- **Edit/selection screens** to enter values/choices to calibrate, configure, and test the analyzer.

The keypad enables you to move throughout the analyzer menu tree. The keys and their related functions are:

1. **MENU key:** Pressing this key always displays the top of the menu tree ("MAIN MENU" selection screen). To display the top-level menu screen for a desired main branch (CALIBRATE, CONFIGURE or TEST/MAINT), use the ⇩ **and** ⇧ **keys** to select the corresponding line, and press the **ENTER key**. The **MENU key** can also be used to "abort" the procedure to change values or selections.

2. **ENTER key:** Pressing this key displays an available menu or edit/selection screen, or enters (saves) values/selections.

3. **ESC key:** Pressing this key always takes the display up one level in the menu tree. (Example: With the "MAIN MENU" branch selection screen displayed, pressing the **ESC key** once takes the display up one level to the MEASURE screen.)

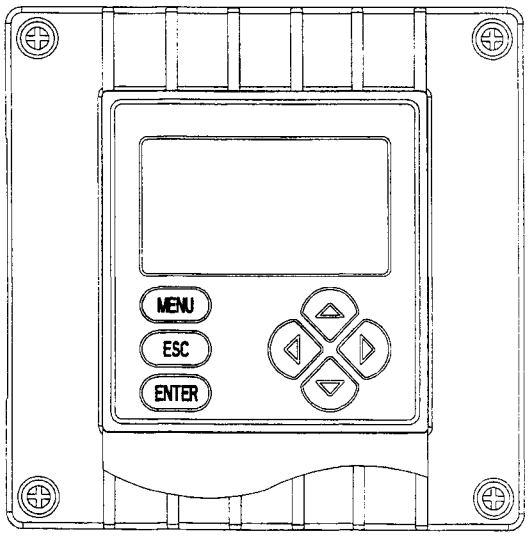


FIGURE 3-1 Analyzer Keypad

1.3 MEASURE Screen (normal display mode)

4. ⇦ **and** ⇨ **keys:** Depending on the type of displayed screen, these keys do the following:
   - MEASURE Screens: Sequentially selects between four MEASURE screens.
   - Menu Screens: These keys are non-functional.
   - Edit/Selection Screens: "Coarse" adjusts the displayed numerical value/choice.
5. ⇧ **and** ⇩ **keys:** Depending on the type of displayed screen, these keys do the following:
   - MEASURE Screens: Changes the bottom auxiliary display line, shown in reverse video, between measured Sensor A temperature, Sensor B temperature, Output #1 mA value, or Output #2 mA value.
   - Menu Screens: Moves reverse video cursor up or down respectively to select a displayed line item.
   - Edit/Selection Screens: "Fine" adjusts numerical value, enclosed by parenthesis, up or down respectively or moves up or down respectively between choices enclosed by parenthesis.

The MEASURE screen is normally displayed. When the **MENU key** is pressed, various screens to calibrate, configure, or test the analyzer temporarily replace the MEASURE screen. If the keypad is not used within 30 minutes, except during calibration and while using specific analyzer test/ maintenance functions, the display automatically returns to the MEASURE screen. To display the MEASURE screen at any time, press the **MENU key** once and then the **ESC key** once.

When viewing the MEASURE screen, you can press the ⇨ **or** ⇦ **key** to select between four different measurements. These MEASURE screen examples illustrate this feature:

NOTE: *When the analyzer returns to its normal MEASURE screen mode, the appearing MEASURE screen is always the version last selected. Note that the top two screen examples show "SENSOR A" and "SENSOR B" notations on their top lines, illustrating the analyzer notation feature. To create your own notation, refer to Part Three, Section 4.2, under the subheading "Changing Top Line Notation on MEASURE Screens."*

Also, the "% REJECT" screen is an example of a calculated Sensor A and B measurement. The analyzer can also calculate and display other measurements. Refer to Part Three, Section 4.3 for details.

When a measured value is beyond the analyzer measuring range, a series of " + " or " - " screen symbols appear, indicating that the value is respectively above or below range.

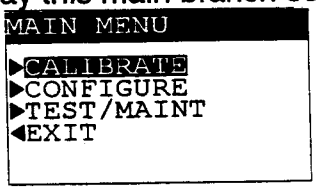
SECTION 2
MENU STRUCTURE

2.1 Displaying Main Branch Selection Screen

The analyzer menu tree is divided into three main branches: CALIBRATE, CONFIGURE, and TEST/MAINT. Each main branch is structured similarly in layers with top-level menu screens, related lower-level submenu screens and, in many cases, sub-submenu screens.

Each layer contains an EXIT line or screen to return the display up one level to the previous layer of screens. For convenience, the layers within each main branch are organized with the most frequently used functions at their beginning, rather than the functions used for initial startup.

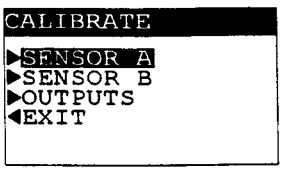
Press the **MENU key** to always display this main branch selection screen:

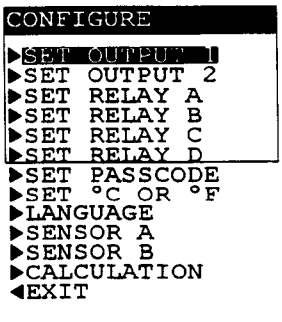


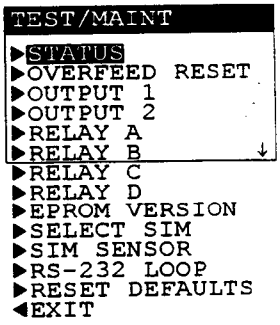
2.2 Displaying Top-level Menu Screens

1. After displaying the main branch selection screen, use the ⇩ **and** ⇧ **keys** to select the line corresponding to the desired branch (shown in reverse video).
2. Press the **ENTER key** to display the top-level menu screen for that branch.

The top-level menu screens for each main branch are:







Menu Structure Tip! The ▶ symbol pointing at each listed item indicates there is a related lower-level submenu screen, sub-submenu screen, or edit/selection screen.

Some menu lists are too long to completely fit on the screen. A ↓ symbol at the bottom right of the list indicates that you can display hidden items by pressing the

2.3 Displaying Submenu Screens

⇩ **key**. As you display these items a ↕ symbol appears, indicating that items now hidden above and below the list can be displayed by respectively pressing the ⇧ **or** ⇩ **key**. When a ↑ symbol appears, it indicates you have reached the end of the menu list. You can move back up the list using the ⇧ **key**.

NOTE: *The ▷ symbol pointing at a listed menu item indicates that this item is not relevant to, nor required for, the previously entered setup choices and, therefore, is not available.*

1. After displaying the top-level menu screen, use the ⇩ **and** ⇧ **keys** to select the line corresponding to the desired lower-level submenu screen.

2. Press the **ENTER key** to display the submenu screen.

When a submenu or sub-submenu screen contains a first line ending with a "?," it is an edit/selection screen. Pressing the ⇩ **or** ⇧ **key** changes the value/choice enclosed by parenthesis (second line on screen).

Example: With this submenu edit screen displayed:

```
SET °C OR °F?
(°C                )
```

pressing the ⇩ **key** displays this related choice:

```
SET °C OR °F?
(°F                )
```

2.4 Adjusting Edit/Selection Screen Values

Edit/selection screens always contain a second line enclosed by parenthesis -- see examples shown above and below. The enclosed value/choice can be edited/changed by using the ⇧ **and** ⇩ **keys**. Pressing the **ENTER key** saves the change.

```
SET PARAMETER?
(SENSOR A          )
```

```
SET 4mA VALUE?
(10.22 uS/cm       )
```

Use the ⇦ **and** ⇨ **keys** to "coarse" adjust numerical values. The ⇧ **and** ⇩ **keys** "fine" adjust numerical values up or down respectively. The longer the key is pressed, the faster the number changes.

2.5 Entering (Storing) Edit/Selection Screen Values/Choices

After the desired value/choice is displayed, press the **ENTER key** to enter (store) it into the non-volatile analyzer memory. The previous screen will then re-appear.

NOTE: *You can always press the **ESC key** to abort saving a new setting. The original setting will be retained.*

SECTION 3
ADJUSTING DISPLAY CONTRAST

Ambient lighting conditions may make it necessary to adjust the analyzer display contrast to improve visibility. With the MEASURE screen displayed, press and hold the **ENTER key** and simultaneously press the ⇧ **or** ⇩ **key** until attaining the desired contrast.

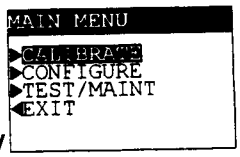
SECTION 4
CONFIGURING THE ANALYZER

4.1 Selecting Language to Operate Analyzer

NOTE: *When the passcode feature is enabled (Section 4.7), you must successfully enter the passcode before attempting to enter a configuration setting.*

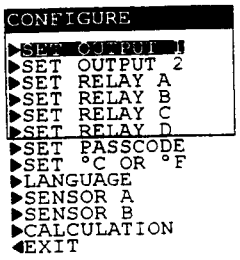
The analyzer can display screens in various languages including English, French (Français), German (Deutsche), Spanish (Español), and others. The analyzer is factory-set for English. To change languages:

1. Press **MENU key** to display



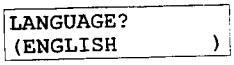
. Use ⇩ **key** to select the "CONFIGURE" line.

2. Press **ENTER key** to display



. Use ⇩ **key** to select the "LANGUAGE" line.

3. Press **ENTER key** to display



. Use ⇩ **and** ⇧ **keys** to view the language choices.

4. With the desired language displayed, press **ENTER key** to enter this selection.

4.2 Configuring Sensor (A and B) Characteristics

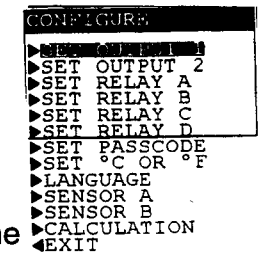
NOTE: *After a language is selected and entered, all screens will be displayed in that language*

The analyzer can be used with one or two sensors, providing up to two separate measurement channels. Each sensor can be independently selected to measure a different parameter. Also, each sensor can have a different nominal cell constant.

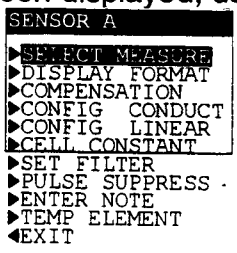
The analyzer must be configured to define the characteristics of each sensor including its "K" value, temperature element type, "T" factor, and other related items such as temperature compensation, input signal filtering, pulse suppression, etc. When using two sensors, configure them in the same way using their respective menu screens.

NOTE: *For calculated Sensor A and B measurements (% reject, % pass, ratio A/B, ratio B/A, diff. A-B, or diff. B-A), both sensors must be configured for the same measurement (conductivity, resistivity, or TDS). However, each sensor may be set for a different display format and a different cell constant.*

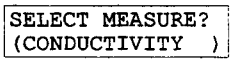
Selecting Measurement (CONDUCTIVITY, RESISTIVITY, or TDS)

1. With the 

screen displayed, use ⇩ **key** to select "SENSOR A" line.

2. Press **ENTER key** to display 

.

3. With the "SELECT MEASURE" line selected, press **ENTER key** to display 

. Use ⇩ **and** ⇧ **keys** to view the three choices:
   - **CONDUCTIVITY:** Selects system to measure conductivity.
   - **RESISTIVITY:** Selects system to measure resistivity.
   - **TDS:** Selects system to measure total dissolved solids.

Selecting Measurement Display Format

WARNING: WHEN THE SENSOR MEASUREMENT IS CHANGED, ALL USER-ENTERED VALUES ARE REPLACED BY FACTORY-DEFAULT VALUES.

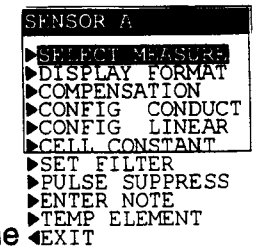
4. With the desired choice displayed, press **ENTER key** to enter this selection.

After choosing the measurement, select the desired display format. The selected units and resolution will then appear on all applicable screens.

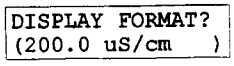
The nominal cell constant of a sensor determines the sensor's inherent measuring range. Table A lists cell constants and their respective measuring ranges. When configuring the measuring units and display resolution for your application, make sure they are within the sensor's inherent listed range. If not, choose a sensor with the appropriate constant.

Table A – SENSOR CELL CONSTANTS and MEASURING RANGES			
Sensor Cell Constant	Inherent Measuring Range		
	Conductivity (in µS/cm)	Resistivity (in MΩ • cm)	TDS (in ppm)
0.05	0-100	0.002-20	See Note below
0.5	0-1000	0.001-20	See Note below
1	0-2000	not applicable	See Note below
5	0-10,000	not applicable	See Note below
10	0-200,000	not applicable	See Note below

NOTE: *To determine which cell constant to use, convert the full-scale TDS value to its equivalent conductivity value at 25°C. Do this by multiplying the TDS value by "2." Then find the range in the Conductivity column corresponding to the calculated value. The cell constant to use in that row.*



1. With the screen displayed, use ⇩ **key** to select "DISPLAY FORMAT" line.

2. Press **ENTER key** to display 

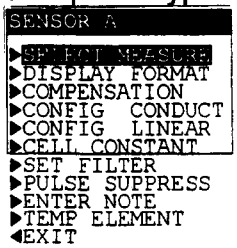
. Use ⇩ **and** ⇧ **keys** to view all choices. Depending on the selected measurement, the choices are:

For CONDUCTIVITY		For RESISTIVITY
2.000 µS/cm	2.000 mS/cm	XX.XX MΩ • cm
20.00 µS/cm	20.00 mS/cm	XXX.X KΩ • cm
200.0 µS/cm	200.0 mS/cm	
2000 µS/cm	2000 mS/cm	For TDS
		XXXX ppm
		XXXX ppb

3. With the desired choice displayed, press **ENTER key** to enter this selection.

Selecting Temperature Compensation

Configure the required type of temperature compensation for the selected measurement.



1. With the screen displayed, use ⇩ **key** to select "COMPENSATION" line.

2. Press **ENTER key** to display

```
≡SENSOR A
▶T-COMPENSATION⇕
```

. Use ⇩ **and** ⇧ **keys** to view all choices:

- **LINEAR (recommended for most aqueous solutions)**
- AMMONIA (not shown for TDS measurement; only use this built-in temperature properties table for specific applications -- consult factory)
- NATURAL WATER (not shown for TDS measurement; only use this built-in temperature properties table for specific applications -- consult factory)
- OPTIONAL TABLE* (user-specified temperature table)
- NONE (measured values are uncompensated)

* Only select OPTIONAL TABLE choice when the analyzer is equipped with a customer-specified, factory-configured temperature compensation table.

Configuring TDS Measurement (not needed for other measurements)

NOTE: *The factory default for temperature compensation is LINEAR with a 2.00% per °C slope and 25.0°C reference temperature. This provides the best results for most aqueous solutions. To enter different slope and reference temperature values for an uncommon solution, refer to subheading "Configuring Selected Temp. Compensation" for details.*

3. With the desired choice displayed, press **ENTER key** to enter this selection.

Configuring LINEAR Temperature Compensation
(not needed for other compensation methods)

Only when TDS is selected must the measurement be further configured by defining a conductivity-to-TDS conversion factor. If CONDUCTIVITY or RESISTIVITY was selected, disregard this subsection -- no measurement configuration is needed.

1. With the

```
SENSOR A
▶SELECT MEASURE
▶DISPLAY FORMAT
▶COMPENSATION
▶CONFIG CONDUCT
▶CONFIG LINEAR
▶CELL CONSTANT
▶SET FILTER
▶PULSE SUPPRESS
▶ENTER NOTE
▶TEMP ELEMENT
◀EXIT
```

screen displayed, use ⇩ **key** to select the "CONFIG TDS" line.

2. Press **ENTER key** to display

```
CONFIG TDS
▶SELECT FACTOR
▶SET FACTOR
◀EXIT
```

.

3. With the "SELECT FACTOR" line selected, press **ENTER key** to display

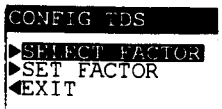
```
SELECT FACTOR?
(NaCl          )
```

. Use ⇩ **and** ⇧ **keys** to view both choices:

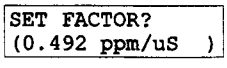
- **NaCl:** Configures analyzer to use the built-in NaCl conductivity-to-TDS conversion factor.

- **USER DEFINED:** Configures analyzer to use a user-entered conductivity-to-TDS conversion factor.

4. With the desired choice displayed, press **ENTER key** to enter this selection. If the "NaCl" conversion factor was selected, TDS measurement configuration is complete. If you selected "USER DEFINED," you must enter a conductivity-to-TDS conversion factor:

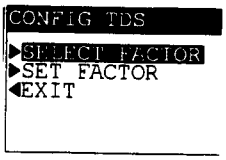
   A. With the 

   screen displayed, use the ⇩ **key** to select the "SET FACTOR" line.

   B. Press **ENTER key** to display 

   .

   C. Adjust the displayed value to the desired conductivity-to-TDS conversion factor, and press **ENTER key** to enter the value. (Use ⇨ **and** ⇦ **keys** for coarse adjust; ⇧ **and** ⇩ **keys** for fine adjust.)

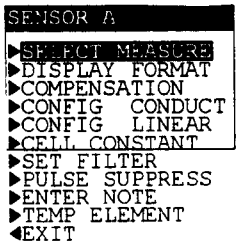
   D. After the 

   screen re-appears, press **ESC key** once to return to the "SENSOR A" submenu screen.

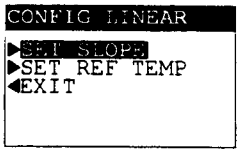
Only when LINEAR is the selected temperature compensation determine if it should be further configured by entering a slope, in % per °C, and a reference temperature. If the built-in AMMONIA or NATURAL WATER properties table or NONE was selected, disregard this subsection -- no compensation configuration is needed.

NOTE: *If "OPTIONAL TABLE" compensation was selected, the analyzer must be equipped with a customer-specified, factory-configured temperature compensation table.*

LINEAR compensation factory defaults are 2.00%/°C slope and 25.0°C reference temperature. These values are appropriate for most aqueous solutions. Use chemical handbook tables to find values for uncommon solutions. To enter different values, do the following:

1. With the 

screen displayed, use the ⇩ **key** to select the "CONFIG LINEAR" line.

2. Press **ENTER** to display 

.

3. With the "SET SLOPE" line selected, press **ENTER key** to display

```
SET SLOPE?
(2.00 %/°C     )
```

4. Adjust the displayed value to the desired % per °C slope, and press **ENTER key** to enter the value. (Use ⇨ **and** ⇦ **keys** for coarse adjust; ⇧ **and** ⇩ **keys** for fine adjust.)

5. After the

```
CONFIG LINEAR
▶SET SLOPE
▶SET REF TEMP
◀EXIT
```

screen re-appears, use ⇩ **key** to select the "SET REF TEMP" line.

6. Press **ENTER key** to display

```
SET REF TEMP?
(25.0°C     )
```

7. Adjust the displayed value to the desired reference temperature, and press **ENTER key** to enter it. (Use ⇨ **and** ⇦ **keys** for coarse adjust; ⇧ **and** ⇩ **keys** for fine adjust.)

8. After the

```
CONFIG LINEAR
▶SET SLOPE
▶SET REF TEMP
◀EXIT
```

screen re-appears, press **ESC key** once to return to the "SENSOR A" submenu screen.

Entering Sensor's Omega-certified "K" Value

Each Omega sensor has a unique, certified "K" value shown on a label attached to the sensor cable or to the inside cover of its optional junction box head. By entering this "K value," calibration (including zeroing) is only necessary when this sensor is replaced. This also sets the analyzer measuring range to match the inherent range of the sensor's cell constant.

1. With the

```
SENSOR A
▶SELECT MEASURE
▶DISPLAY FORMAT
▶COMPENSATION
▶CONFIG CONDUCT
▶CONFIG LINEAR
▶CELL CONSTANT
▶SET FILTER
▶PULSE SUPPRESS
▶ENTER NOTE
▶TEMP ELEMENT
◀EXIT
```

screen displayed, use the ⇩ **key** to select the "CELL CONSTANT" line.

2. Press **ENTER key** to display

```
CELL CONSTANT
▶
▶SET CELL K
◀EXIT
```

3. With the "SELECT CELL K" line selected, press **ENTER key** to display

```
SELECT CELL K?
(0.0500     )
```

4. Use ⇩ **and** ⇧ **keys** to select the nominal cell category that corresponds to the sensor's Omega-certified "K" value, and press **ENTER key** to enter this selection.

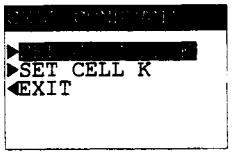
5. After the

```
CELL CONSTANT
▶
▶SET CELL K
◀EXIT
```

screen re-appears, use ⇩ **key** to select the "SET CELL K" line.

6. Press **ENTER key** to display
```
SET CELL K?
(0.0500          )
```
.

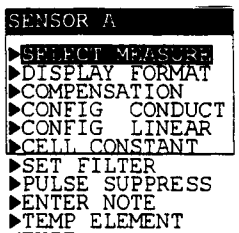
7. Adjust the displayed value to exactly match the sensor's Omega-certified "K" value, and press **ENTER key** to enter the value. (Use ⇨ **and** ⇦ **keys** for coarse adjust; ⇧ **and** ⇩ **keys** for fine adjust.)



8. After the screen re-appears, press **ESC key** once to return to the "SENSOR A" submenu screen.

Setting Sensor Signal Filter Time

A time constant (in seconds) can be set to filter or "smooth out" the sensor signal. A minimum value of "0 seconds" has no smoothing effect. A maximum value of "60 seconds" provides maximum smoothing. Deciding what sensor signal filter time to use is a compromise. The higher the filter time, the longer the sensor signal response time will be to a change in the actual process value.

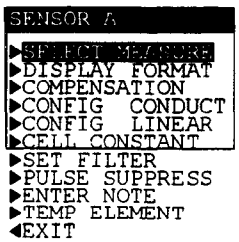


1. With the screen displayed, use ⇩ **key** to select the "SET FILTER" line.

2. Press **ENTER key** to display
```
SET FILTER?
(0 SECONDS       )
```
.

3. Adjust the displayed value to the desired filter time, and press **ENTER key** to enter the value. (Use ⇨ **and** ⇦ **keys** for coarse adjust; ⇧ **and** ⇩ **keys** for fine adjust.)

Selecting Pulse Suppression (on/off)
Sometimes an external interference may occasionally cause the measurement system to provide unstable readings. Common causes include entrained gas bubbles in the process, and electromagnetic interference (EMI or "electrical noise" pulses). The analyzer has a pulse suppression feature to counteract this condition and stabilize readings. Example: Suppose the analyzer reading is steadily showing 1880 µS/cm, then suddenly jumps to 1950 µS/cm for a few seconds, and returns to 1880 µS/cm. By turning on this feature, the analyzer will perceive this as a temporary upset, "suppressing" most of this pulse change and providing a smoother measurement reading.



1. With the screen displayed, use ⇩ **key** to select the "PULSE SUPPRESS" line.

2. Press **ENTER key** to display PULSE SUPPRESS? (OFF). Use ⇩ **and** ⇧ **keys** to view both choices (OFF or ON).

1. With the desired choice displayed, press **ENTER key** to enter this selection.

Changing Top Line Notation on MEASURE Screens (only COND A and B screens)

The top lines of the four MEASURE screens are factory set to read "COND A" and "COND B." These notations can be changed, for example, to "BASIN 1" and "BASIN 2" to tailor the analyzer MEASURE screens to the application. The respective top lines would then be "MEASURE BASIN 1" and "MEASURE BASIN 2." Each notation is limited to eight characters which can be a combination of capital letters A through Z, numbers 0 through 9, and spaces.

1. With the
SENSOR A
▶SELECT MEASURE
▶DISPLAY FORMAT
▶COMPENSATION
▶CONFIG CONDUCT
▶CONFIG LINEAR
▶CELL CONSTANT
▶SET FILTER
▶PULSE SUPPRESS
▶ENTER NOTE
▶TEMP ELEMENT
◀EXIT
screen displayed, use ⇩ **key** to select the "ENTER NOTE" line.

2. Press **ENTER key** to display ENTER NOTE? ([C]OND A).

3. Create the desired notation within the second line's parenthesis:

   A. Starting with the extreme left character position, use ⇧ **and** ⇩ **keys** to select the desired first character.

   B. Press ⇨ **key** to access the second character position. Use ⇧ **and** ⇩ **keys** to select desired second character.

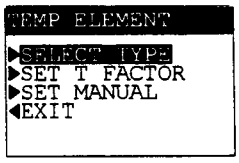
   C. Repeat procedure until desired notation is displayed.

4. Press **ENTER key** to enter the displayed notation.

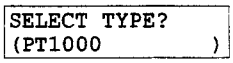
Selecting Temperature Element Type

Configure the analyzer to define the temperature element being used for temperature compensation. If an element is not used, you must select MANUAL temperature compensation and enter a specific temperature value.

1. With the
SENSOR A
▶SELECT MEASURE
▶DISPLAY FORMAT
▶COMPENSATION
▶CONFIG CONDUCT
▶CONFIG LINEAR
▶CELL CONSTANT
▶SET FILTER
▶PULSE SUPPRESS
▶ENTER NOTE
▶TEMP ELEMENT
◀EXIT
screen displayed, use ⇩ **key** to select the "TEMP ELEMENT" line.

2. Press **ENTER key** to display 

.

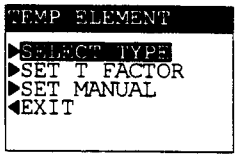
3. With the "SELECT TYPE" line selected, press **ENTER key** to display 

. Use ⇩ **and** ⇧ **keys** to view the three choices:

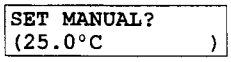
   - **PT1000:** Configures analyzer for use with a Pt 1000 RTD temperature element (used in all Omega CDE680-series contacting conductivity sensors).
   - **PT100:** Configures analyzer for use with a Pt 100 RTD temperature element.
   - **MANUAL:** Configures analyzer for fixed manual temp. compensation when not using a temperature element.

   NOTE: *When not using a temperature sensor, the MEASURE screen will flash "WARNING: CHECK STATUS." To clear this message, select "MANUAL" using this "SELECT TYPE?" screen.*

4. With the desired choice displayed, press **ENTER key** to enter this selection. If "MANUAL?" was selected, you must set the specific manual temperature compensation value:

   A. With the 

screen displayed, use ⇩ **key** to select the "SET MANUAL" line.

   B. Press **ENTER key** to display 

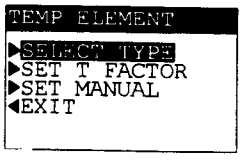
.

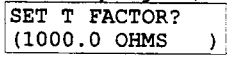
   C. Adjust displayed value to the desired fixed temperature, and press **ENTER key** to enter it. (Use ⇨ **and** ⇦ **keys** for coarse adjust; ⇧ **and** ⇩ **keys** for fine adjust.)

Entering Sensor's Omega-certified "T" Factor
Omega tests each sensor to provide a unique, certified temperature "T" factor because:

- Temperature greatly affects conductivity measurement accuracy.
- The inherent ohm value of the Pt 1000 RTD temperature element varies slightly from sensor to sensor, affecting temperature measurement accuracy.

By entering the sensor's unique "T" factor, you enable the analyzer to provide the highest possible measuring accuracy for both temperature and conductivity.

1. With the 

screen displayed, use ⇩ **key** to select the "SET T FACTOR" line.
2. Press **ENTER key** to display 

.

3. Use ⇧ **and** ⇩ **keys** to adjust the displayed value to exactly match the sensor's Omega-certified "T" factor, and press **ENTER key** to enter the value.

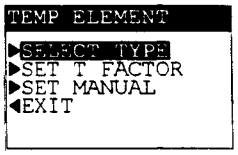
SPECIAL CASE -- ALTERED SENSOR CABLE LENGTH
(only for sensors with PT 1000 temperature elements*)

Changing the standard 20 ft. (6 m) sensor cable length, by shortening it or adding an interconnect cable, will affect temperature measuring accuracy. The Omega-certified "T" factor is based on standard cable length. To compensate for altered cable length measuring error, change the certified "T" factor entry:

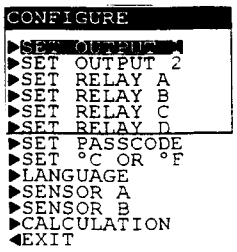
- Shortened Sensor Cable: To increase the analyzer temperature reading to match the known solution temperature, decrease the "T" factor by 3.85 ohms for each °C difference.
- Added Interconnect Cable: To decrease the analyzer temperature reading to match the known solution temperature, increase the "T" factor by 3.85 ohms for each °C difference.

Example: Suppose the known solution temperature is 50°C and the analyzer reads 53°C due to interconnect cable resistance. Multiply the 3°C difference by 3.85 ohms to get 11.55. Then increase the sensor "T" factor by adding 11.55 to it and entering that value. If, due to a shortened sensor cable, the analyzer was reading 3°C less than the known solution temperature you would decrease the sensor "T" factor by subtracting 11.55 from it.

*Sensors with PT 100 temperature elements provide inherently less accurate temperature readings and are not recommended.



4. After the screen re-appears, press **ESC key** twice to return to the following "CONFIGURE" top-level menu screen:



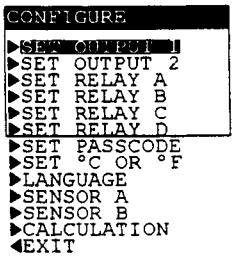
4.3 Configuring Calculated Sensor A and B Measurement

The analyzer can provide a calculated measurement by using the measured Sensor A and Sensor B values. The calculated measurement can be displayed, and the analog output(s) and/or relay(s) can be assigned to represent it.

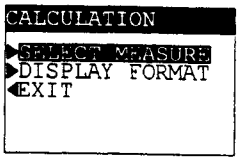
NOTE: *For a calculated measurement, both sensors must be:*

- *Connected and used.*
- *Configured for the same measurement (conductivity, resistivity, or TDS)*
- *Set for the same measurement units. However, each sensor can have a different cell constant providing an inherently different measuring range.*

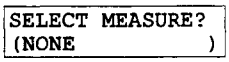
Selecting Calculated Measurement
(none, % reject, % pass, ratio A/B, ratio B/A, diff. A-B, or iff. B-A)



1. With the top-level menu screen displayed, use ⇩ **key** to select the "CALCULATION" line.



2. Press **ENTER key** to display .

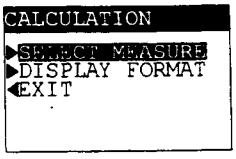
3. With the "SELECT MEASURE" line selected, press **ENTER key** to display 

. Use ⇩ **and** ⇧ **keys** to view the choices (NONE, % REJECT, % PASS, RATIO A/B, RATIO B/A, DIFF A-B, or DIFF B-A).

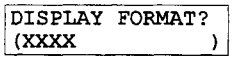
4. With the desired choice displayed, press **ENTER key** to enter this selection.

Selecting Calculated RATIO A/B or RATIO B/A Measurement Display Format
(not needed for other calculated measurements)

Only when RATIO A/B or RATIO B/A is the selected calculated measurement must its display format be further configured. If % REJECT or % PASS was selected, disregard this subsection -- no display format configuration is needed. If DIFF A-B or DIFF B-A was selected, the display format is automatically set by the Sensor A and B display format selections -- no format configuration is needed.

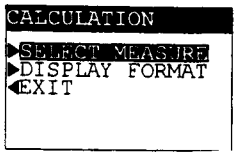


1. With the screen displayed, use ⇩ **key** to select the "DISPLAY FORMAT" line.

2. Press **ENTER key** to display 

. Use ⇩ **and** ⇧ **keys** to view the four choices (XXXX, XXX.X, XX.XX, or X.XXX).

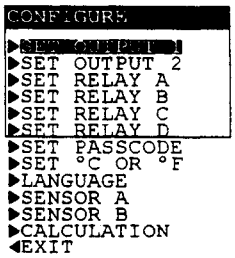
3. With the desired choice displayed, press **ENTER key** to enter this selection.



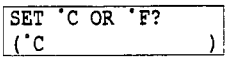
4. After the re-appears, press **ESC key** once to return to the "CONFIGURE" top-level menu screen.

4.4 Selecting Temperature Display Format (°C or °F)

The MEASURE screen can be set to display temperature values in °C or °F. In either case, the display resolution for measured temperature is always in tenths of a degree.

1. With the 

top-level menu screen displayed, use ⇩ **key** to select the "SET °C OR °F" line.

2. Press **ENTER key** to display 

. Use ⇩ **and** ⇧ **keys** to view both choices (°C or °F).

3. With the desired choice displayed, press **ENTER key** to enter this selection.

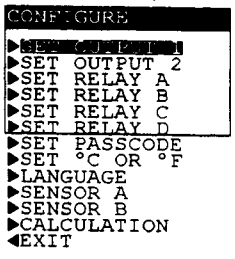
4.5 Configuring Outputs (1 and 2)

The analyzer provides two isolated analog outputs (#1 and #2). Configure both outputs in the same way using their respective menu screens.

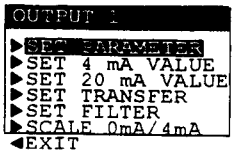
Assigning Representative Parameter
Depending on the system setup, each output can be assigned to represent <u>one</u> of the following:

- Measured Sensor A conductivity, resistivity, or TDS.
- Measured Sensor A temperature.
- Measured Sensor B conductivity, resistivity, or TDS.
- Measured Sensor B temperature.
- *Calculated Sensor A and B measurement (% reject, % passage, ratio A/B, ratio B/A, diff A-B, or diff B-A).

*An analog output can only represent the calculated measurement when two sensors are used <u>and</u> the analyzer has been correctly configured for CALCULATION.

1. With the 

screen displayed and the "SET OUTPUT 1" line selected, press **ENTER key** to display:



2. With the "SET PARAMETER" line selected, press **ENTER key** to display
```
SET PARAMETER?
(SENSOR A      )
```
. Use ⇩ **and** ⇧ **keys** to view the choices.

3. With the desired choice displayed, press **ENTER key** to enter this selection.

Setting Parameter Values for 0/4 mA and 20 mA

You can set the parameter (or calculated measurement) values to define the endpoints at which the minimum and maximum output values are desired.

1. With the
```
OUTPUT 1
▶SET PARAMETER
▶SET 4 mA VALUE
▶SET 20 mA VALUE
▶SET TRANSFER
▶SET FILTER
▶SCALE 0mA/4mA
◀EXIT
```
screen displayed, use ⇩ **key** to select the "SET 4 mA VALUE" line.

2. Press **ENTER key** to display
```
SET 4mA VALUE?
(10.22 mS/cm   )
```
.

3. Set the displayed value at which 0/4 mA is desired, and press **ENTER key** to enter the value. (Use ⇨ **and** ⇦ **keys** for coarse adjust; ⇧ **and** ⇩ **keys** for fine adjust.)

4. After the
```
OUTPUT 1
▶SET PARAMETER
▶SET 4 mA VALUE
▶SET 20 mA VALUE
▶SET TRANSFER
▶SET FILTER
▶SCALE 0mA/4mA
◀EXIT
```
screen re-appears, use ⇩ **key** to select the "SET 20 mA VALUE" line.

5. Press **ENTER key** to display
```
SET 20mA VALUE?
(19.99 mS/cm   )
```
.

6. Set the displayed value at which 20 mA is desired, and press **ENTER key** to enter the value.

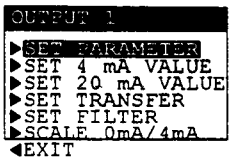
NOTE: *If the same values are set for 0/4 mA and 20 mA, the output automatically goes to, and remains at, 20 mA.*

Setting Transfer Value (mA)
Each analog output is normally active (responds to the measured value of its assigned parameter). During calibration, however, both outputs can be set to:

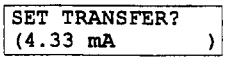
- Hold their present values.
- Transfer to preset values to operate control elements by amounts corresponding to those values.
- Active to respond to the measured values.

NOTE: *The analog outputs can be held at any time by selecting the "HOLD OUTPUTS" line in the TEST/ MAINT menu and pressing the* ***ENTER key****.*

If your application requires it, assign a mA transfer value for the analog output.

1. With the 

screen displayed, use ⇩ **key** to select the "SET TRANSFER" line.

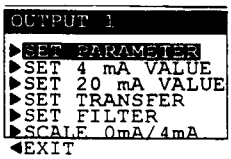
2. Press **ENTER key** to display 

.

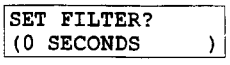
3. Set the displayed value to the desired transfer value, and press **ENTER key** to enter it. (Use ⇨ **and** ⇦ **keys** for coarse adjust; ⇧ **and** ⇩ **keys** for fine adjust.)

Setting Output Filter Time

A time constant (in seconds) can be set to filter or "smooth out" the output signal. A minimum value of "0 seconds" has no smoothing effect. A maximum value of "60 seconds" provides maximum smoothing. Deciding what output filter time to use is a compromise. The higher the filter time, the longer the output signal response time will be to a change in the measured value.

1. With the 

screen displayed, use ⇩ **key** to select the "SET FILTER" line.

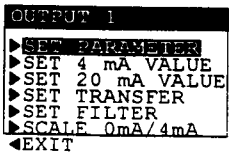
2. Press **ENTER key** to display 

.

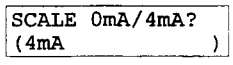
3. Adjust the displayed value to the desired filter time, and press **ENTER key** to enter it. (Use ⇨ **and** ⇦ **keys** for coarse adjust; ⇧ **and** ⇩ **keys** for fine adjust.)

Setting Output Scale Low Endpoint (0/4 mA)

Each output can be set to be 0-20 mA or 4-20 mA.

1. With the 

screen displayed, use ⇩ **key** to select the "SCALE 0mA/4mA" line.

2. Press **ENTER key** to display 

. Use ⇩ **and** ⇧ **keys** to view both choices.

3. With the desired choice displayed, press **ENTER key** to enter this selection.

4.6 Configuring Relays (A, B, C, and D)

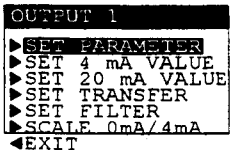
The analyzer may be equipped with two or four electromechanical relays (A and B, and C and D). Each relay can be set to function as a control, alarm, or status relay. Only a control or alarm relay operates in response to the measured value. **A status relay is not configurable.** It is a dedicated system diagnostic-only alarm relay that automatically energizes when the "WARNING CHECK STATUS" message flashes on the MEASURE screen. This occurs when the analyzer detects a sensor or analyzer "fail" diagnostic condition. Configure all relays in the same way using their respective menu screens.

Assigning
Representative Parameter

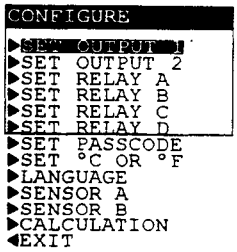
Depending on the system setup, each control or alarm relay can be assigned to use one of the following for its operation:

- Measured Sensor A conductivity, resistivity, or TDS.
- Measured Sensor A temperature.
- Measured Sensor B conductivity, resistivity, or TDS.
- Measured Sensor B temperature.
- *Calculated Sensor A and B measurement (% reject, % pass, ratio A/B, ratio B/A, diff. A-B, or diff. B-A).

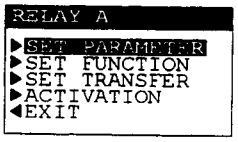
*A relay can only use the calculated measurement for its operation when two sensors are used and the analyzer has been correctly configured for CALCULATION.

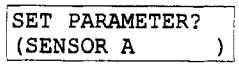
1. With the


submenu screen displayed, press **ESC key** once to display:



2. Use ⇩ **key** to select the "SET RELAY A" line, and press **ENTER key** to display:



3. With the "SET PARAMETER" line selected, press **ENTER key** to display


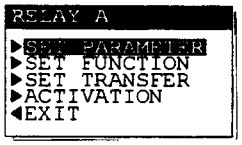
. Use ⇩ **and** ⇧ **keys** to view the choices.

4. With the desired choice displayed, press **ENTER key** to enter this selection.

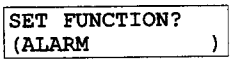
Each relay can be selected to function as a:

- Dual-alarm relay (with separate high and low alarm points and deadbands)

- Control relay (with phasing, setpoint, deadband, and overfeed timer)
- Status relay that is not configurable.

1. With the 

screen displayed, use ⇩ **key** to select the "SET FUNCTION" line.

2. Press **ENTER key** to display 

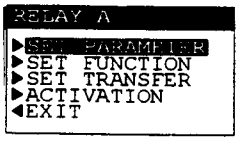
. Use ⇩ **and** ⇧ **keys** to view the choices (ALARM, CONTROL, or STATUS).

3. With the desired choice displayed, press **ENTER key** to enter this selection.

Selecting Transfer Mode (relay on or off)
Each control or alarm relay is normally active, responding to the measured value of its assigned parameter. During calibration, however, the relays can be set to:

- Hold their present on/off states.
- Transfer to preset on/off states.
- Active to respond to the measured values.

If your application requires it, assign a relay on/off transfer state:

1. With the 

screen displayed, use ⇩ **key** to select the "SET TRANSFER" line.

2. Press **ENTER key** to display 

. Use ⇩ **and** ⇧ **keys** to view both choices (DE-ENERGIZED or ENERGIZED).

3. With the desired choice displayed, press **ENTER key** to enter this selection.

Setting Activation (Configuration) Values
The group of configuration settings available to a relay is dependent on its selected function mode (alarm or control). **Relays set for status function mode are not configurable.** Table B describes all relay configuration settings, categorized by relay function mode:

Table B -- RELAY CONFIGURATION SETTINGS

Setting	Description
For Alarm Relay	
Low Alarm	Sets the value at which the relay will turn on in response to decreasing measured value.

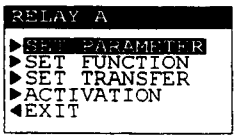
High Alarm	Sets the value at which the relay will turn on in response to increasing measured value.
Low Deadband	Sets the range in which the relay remains on after the measured value increases above the low alarm value.
High Deadband	Sets the range in which the relay remains on after the measured value decreases below the high alarm value.
Off Delay	Sets a time (0-300 seconds) to delay the relay from normally turning off.
On Delay	Sets a time (0-300 seconds) to delay the relay from normally turning on.
For Control Relay	
Phase	A "high" phase assigns the relay setpoint to respond to increasing measured value; conversely, a "low" phase assigns the relay setpoint to respond to decreasing measured value.
Setpoint	Sets the value at which the relay will turn on.
Deadband	Sets the range in which the relay remains on after the measured value decreases below the setpoint value (high phase relay) or increases above the setpoint value (low phase relay).
Overfeed Timer	Sets the time (0-999.9 min.) to limit how long the relay can remain "on." For more details on overfeed timer operation, see Part Three, Section 7.
Off Delay	Sets a time (0-300 seconds) to delay the relay from normally turning off.
On Delay	Sets a time (0-300 seconds) to delay the relay from normally turning on.

NOTE: *When a relay is set to function as a status relay, the ▷ symbol at the start of the "ACTIVATION" line denotes that this menu item is not relevant and, therefore, not available.*

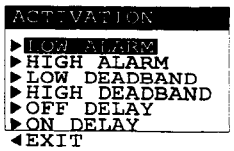
Also, it is possible to enter values that always keep a relay active or inactive. To avoid this, be sure that "low" values are lower than "high" values.

The "off delay" and "on delay" settings, available to control or alarm function relays, may be beneficial in eliminating process "overshoot" when there are long process pipe runs or delays in mixing.

To set Relay A configuration values:

1. With the 

screen displayed, use ⇩ **key** to select the "ACTIVATION" line.

2. Press **ENTER key** to display 

.

3. Use ⇩ **key** to select the appropriate relay setting line, and press **ENTER key** to display its corresponding edit/selection screen.

4. Use the same basic keypad operations described in previous setup procedures to enter the desired value for the displayed relay activation setting.

5. Repeat this procedure for each relay activation setting.

4.7 Enabling/Disabling Passcode

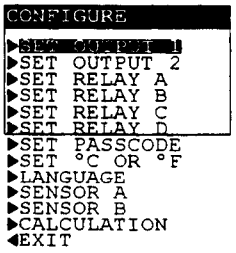
The analyzer has a passcode feature to restrict access to configuration and calibration settings to only authorized personnel.

- **DISABLED:** With passcode disabled, all configuration settings can be displayed and changed, and the analyzer can be calibrated.

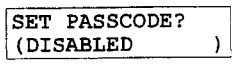
- **ENABLED:** With passcode enabled, all configuration settings can be displayed -- but they cannot be changed, and the analyzer cannot be calibrated. When you attempt to change a setting by pressing the **ENTER key**, a displayed notification requests passcode entry. A valid passcode entry saves the changed setting and returns the display to the "MAIN MENU" branch selection screen. An incorrect passcode entry causes the display to momentarily show an error notification and return to the "MAIN MENU" branch selection screen. There is no limit on attempts to enter a valid passcode.

The factory-set passcode is: 3456

To enable or disable the passcode feature:

1. With the 

top-level menu screen displayed, use ⇩ **key** to select the "SET PASSCODE" line.

2. Press **ENTER key** to display 

. Use ⇩ **and** ⇧ **keys** to view both choices (DISABLED or ENABLED).

3. With the desired choice displayed, press **ENTER key** to enter this selection.

4.8 Summary of Configuration Settings

Table C lists all configuration settings and their entry ranges/ choices and factory defaults, categorized by basic functions.

Table C -- ANALYZER CONFIGURATION SETTINGS (RANGES/CHOICES and DEFAULTS)

Displayed Screen Title	Entry Range or Choices (where applicable)	Factory Default	Your Setting
LANGUAGE Configuration Setting			
LANGUAGE?	ENOmegaSH, FRENCH, GERMAN, SPANISH, etc.	ENOmegaSH	
Sensor A and B Configuration Settings			
SELECT MEASURE?	CONDUCTIVITY, RESISTIVITY, or TDS	CONDUCTIVITY	
DISPLAY FORMAT? (full scale value)	CONDUCTIVITY: µS/cm: 2.000, 20.00, 200.0, or 2000 mS/cm: 2.000, 20.00, 200.0, or 2000 RESISTIVITY: XX.XX MΩ • cm or XXX.X KΩ • cm TDS: XXXX ppm or XXXX ppb	CONDUCTIVITY: For 0.05 cell: 20.00 µS/cm For 0.5 cell: 200.0 µS/cm For 1.0 cell: 2000 µS/cm For 5.0 cell: 20.00 mS/cm For 10 cell: 200.0 mS/cm RESISTIVITY: XX.XX MΩ • cm TDS: XXXX ppm	
T-COMPENSATION?	LINEAR, AMMONIA, NATURAL WATER, OPTIONAL TABLE, or NONE	Sensor A: LINEAR at 2.00% per °C with 25.0°C reference temp. Sensor B: MANUAL	
TDS: SELECT FACTOR?	NaCl or USER DEFINED	NaCl	
TDS: SET FACTOR?	0.01-99.99 ppm/µS	0.492 ppm/µS	
LINEAR: SET SLOPE?	0-4.00% per °C	2.00% per °C	
LINEAR: SET REF TEMP?	0-200.0°C or 32-392°F	25.0°C or 77°F	
Table C -- ANALYZER CONFIGURATION SETTINGS (RANGES/CHOICES and DEFAULTS -- continued)			
SELECT CELL K?	0.05, 0.5, 1.0, 5.0, or 10	1.0	
SET CELL K?	0.0500-10.0000	1.0000	
SET FILTER?	0-60 seconds	0 seconds	
PULSE SUPPRESS?	OFF or ON	OFF	
ENTER NOTE?	Enter up to eight characters to replace COND A or COND B	COND A and COND B	
TEMP ELE: SELECT TYPE?	PT1000, PT100, or MANUAL	PT1000	
TEMP ELEMENT: SET T FACTOR?	950-1050 ohms or 95-105 ohms	1000 OHMS	
TEMP ELE: SET MANUAL?	0.0-200.0°C	25.0°C	
CALCULATION Configuration Settings (Sensor A and B)			
SELECT MEASURE?	NONE, % REJECT, % PASS, RATIO (A/B), RATIO (B/A), DIFF (A-B), or DIFF (B-A)	NONE	
DISPLAY FORMAT?	% REJECT: non-selectable % PASS: non-selectable RATIO: XXXX, XXX.X, XX.XX, or X.XXX DIFF: Same ranges as those listed in "Sensor A and B Configuration Settings" category above	% REJECT: 0-100% % PASS: 0-100% RATIO A/B or B/A: XXXX DIFF: Same defaults as those listed in the "Sensor A and Sensor B Configuration Settings" category above	Not applicable Not applicable

Displayed Screen Title	Entry Range or Choices (where applicable)	Factory Default	Your Setting
TEMPERATURE Display Configuration Setting			
CONFIGURE: °C OR °F?	°C or °F	°C	

OUTPUT Configuration Settings			
SET PARAMETER?	SENSOR A, SENSOR B, TEMPERATURE A, TEMPERATURE B, or CALCULATED	Output 1: SENSOR A Output 2: SENSOR B	
SET 4mA VALUE?	CONDUCTIVITY: µS/cm: 0-2.000, 0-20.00, 0-200.0, or 0-2000 mS/cm: 0-2.000, 0-20.00, 0-200.0, or 0-2000 RESIST: 0-19.99 MΩ • cm or 0-999.9 KΩ • cm TDS: 0-9999 ppm or 0-9999 ppb TEMP: -20.0 to +200.0°C or -4.0 to 392.0°F	CONDUCTIVITY: 0 µS/cm or 0 mS/cm RESIST: 0 MΩ or 0 KΩ • cm TDS: 0 ppm or 0 ppb TEMP: 0.0°C or 32.0°F	
SET 20mA VALUE?	CONDUCTIVITY: µS/cm: 0-2.000, 0-20.00, 0-200.0, or 0-2000 mS/cm: 0-2.000, 0-20.00, 0-200.0, or 0-2000 RESIST: 0-19.99 MΩ • cm or 0-999.9 KΩ • cm TDS: 0-9999 ppm or 0-9999 ppb TEMP: -20.0 to +200.0°C or -4.0 to 392.0°F	CONDUCTIVITY: µS/cm: 2.000, 20.00, 200.0, or 2000 mS/cm: 2.000, 20.00, 200.0, or 2000 RESIST: 19.99 MΩ or 999.9 KΩ • cm TDS: 9999 ppm or 9999 ppb TEMP: 200.0°C or 392.0°F	
SET TRANSFER?	0-20 mA or 4-20 mA	Outputs 1 and 2: 12 mA	
SET FILTER?	0-60 seconds	Outputs 1 and 2: 0 seconds	
SCALE 0mA/4mA?	0 mA or 4 mA	Outputs 1 and 2: 4 mA	

Table C – ANALYZER CONFIGURATION SETTINGS (RANGES/CHOICES and DEFAULTS – continued)

Settings Common To Alarm and Control Relays:			
SET PARAMETER?	SENSOR A, SENSOR B, TEMPERATURE A, TEMPERATURE B, or CALCULATED	Relay A: SENSOR A Relay B: SENSOR B	
SET FUNCTION?	ALARM, CONTROL, or STATUS	Relays A and B: ALARM	
SET TRANSFER?	DE-ENERGIZED or ENERGIZED	Relays A and B: DE-ENERGIZED	
OFF DELAY?	0-300 seconds	0 seconds	
ON DELAY?	0-300 seconds	0 seconds	
Settings For Alarm Relays Only:			
LOW ALARM?	CONDUCTIVITY: µS/cm: 0-2.000, 0-20.00, 0-200.0, or 0-2000 mS/cm: 0-2.000, 0-20.00, 0-200.0, or 0-2000 RESIST: 0-19.99 MΩ • cm or 0-999.9 KΩ • cm TDS: 0-9999 ppm or 0-9999 ppb TEMP: -20.0 to +200.0°C or -4.0 to 392.0°F	CONDUCTIVITY: 0 µS/cm or 0 mS/cm RESIST: 0 MΩ or 0 KΩ • cm TDS: 0 ppm or 0 ppb TEMP: 0.0°C or 32.0°F	
Displayed Screen Title	Entry Range or Choices (where applicable)	Factory Default	Your Setting
HIGH ALARM?	CONDUCTIVITY: µS/cm: 0-2.000, 0-20.00, 0-200.0, or 0-2000 mS/cm: 0-2.000, 0-20.00, 0-200.0, or 0-	CONDUCTIVITY: µS/cm: 2.000, 20.00, 200.0, or 2000 mS/cm: 2.000, 20.00, 200.0,	

	2000 RESIST: 0-19.99 MΩ • cm or 0-999.9 KΩ • cm TDS: 0-9999 ppm or 0-9999 ppb TEMP: -20.0 to +200.0°C or -4.0 to 392.0°F	or 2000 RESIST: 19.99 MΩ or 999.9 KΩ • cm TDS: 9999 ppm or 9999 ppb TEMP: 200.0°C or 392.0°F	
LOW DEADBAND?	CONDUCTIVITY: 0-10% of range RESISTIVITY: 0-10% of range TDS: 0-10% of range TEMPERATURE: 0-10% of range	COND: 0 µS/cm or 0 mS/cm RESIST: 0 MΩ • cm or 0 KΩ • cm TDS: 0 ppm or 0 ppb TEMP: 0.0°C or 0.0°F	
HIGH DEADBAND?	CONDUCTIVITY: 0-10% of range RESISTIVITY: 0-10% of range TDS: 0-10% of range TEMPERATURE: 0-10% of range	COND: 0 µS/cm or 0 mS/cm RESIST: 0 MΩ • cm or 0 KΩ • cm TDS: 0 ppm or 0 ppb TEMP: 0.0°C or 0.0°F	
Settings For Control Relays Only:			
PHASE?	HIGH or LOW	For Relays A and B: HIGH	
SET SETPOINT?	CONDUCTIVITY: µS/cm: 0-2.000, 0-20.00, 0-200.0, or 0-2000 mS/cm: 0-2.000, 0-20.00, 0-200.0, or 0-2000 RESIST: 0-19.99 MΩ • cm or 0-999.9 KΩ • cm TDS: 0-9999 ppm or 0-9999 ppb TEMP: -20.0 to +200.0°C or -4.0 to 392.0°F	CONDUCTIVITY: µS/cm: 2.000, 20.00, 200.0, or 2000 mS/cm: 2.000, 20.00, 200.0, or 2000 RESIST: 19.99 MΩ or 999.9 KΩ • cm TDS: 9999 ppm or 9999 ppb TEMP: 200.0°C or 392.0°F	
DEADBAND?	CONDUCTIVITY: 0-10% of range RESISTIVITY: 0-10% of range TDS: 0-10% of range TEMPERATURE: 0-10% of range	COND: 0 µS/cm or 0 mS/cm RESIST: 0 MΩ • cm or 0 KΩ • cm TDS: 0 ppm or 0 ppb TEMP: 0.0°C or 0.0°F	
OVERFEED TIMER?	0-999.9 minutes	0 minutes	
PASSCODE CONFIGURATION Setting			
SET PASSCODE?	DISABLED or ENABLED	DISABLED	
TEST/MAINTENANCE Simulation Function Settings			
SELECT SIM?	SENSOR A, SENSOR B, TEMPERATURE A, TEMPERATURE B, or CALCULATED	SENSOR A	
SIM SENSOR?	Same ranges as those listed in the "OUTPUT Configuration Settings" category under "SET 4 mA VALUE."	Present measured value of Sensor A's selected parameter.	

SECTION 5
CALIBRATING THE ANALYZER

5.1 Things to Know About Calibration

Each contacting conductivity sensor has a unique zero point and offset. Consequently, **always zero the sensor when calibrating it for the first time** by following step 1 in either the DRY-CAL method (Section 5.2) or the 1-POINT SAMPLE method (Section 5.3). Zeroing provides the best possible measuring accuracy, and eliminates any discrepancies between Sensor A and B measurement channels.

Calibration Tip! Conductivity measurement is greatly affected by small changes in temperature. To measure temperature and, therefore, conductivity more accurately, Omega highly recommends using the DRY-CAL method, which is actually a normal part of configuring the sensor characteristics during initial startup. **DRY-CAL eliminates the need for conductivity reference solutions.** Also, it automatically sets the analyzer measuring range to match the inherent range of the sensor's cell constant. Furthermore, DRY-CAL eliminates the need for periodic re-calibration! The only requirement, depending on the application, may be periodic cleaning of the sensor. Only when replacing the sensor is a new DRY-CAL calibration necessary.

Each Omega enhanced performance conductivity sensor has two unique, Omega-certified values that need to be entered into the analyzer to complete DRY-CAL. The first is the sensor's cell "K" value shown on a label attached to its cable or to the inside cover of its optional junction box. The second is the temperature "T" factor shown on the same label. (Since the inherent ohm value of the Pt 1000 RTD temperature element built into each sensor varies slightly, Omega tests each sensor to provide its specific "T" factor.) If these two certified values were previously entered (Section 4.2 under respective subheadings), DRY-CAL is completed -- except for zeroing the sensor if it is being calibrated for the first time. To zero, follow only step 1 in Section 5.2. If the two certified values have not been entered, follow all steps in Section 5.2.

In addition to zeroing and calibrating each sensor for offset, you can also calibrate the analyzer analog output (1 and 2) values. Refer to Section 5.4 for details.

5.2 DRY-CAL Method (highly recommended)

The DRY-CAL method, a normal part of configuring the sensor characteristics during initial startup, requires entry of the Omega-certified "K" value and temperature "T" factor **which are unique to each sensor.** When using two sensors, enter each set of unique values using the respective sensor menu screens.

NOTE: *When the passcode feature is enabled (Section 4.7), you must successfully enter the passcode before attempting to calibrate the analyzer.*

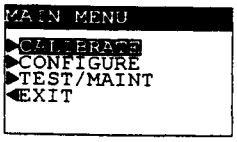
1. Zero the sensor if it is being calibrated for the first time. If not, disregard this step and proceed with step 2.

Zeroing Tip! If at any time during zeroing, the "ZERO: CONFIRM FAILURE?" screen appears, press **ENTER key** to confirm. Then, use the ⇧ **or** ⇩ **key** to select between "CAL REPEAT?" or "CAL EXIT?" and do one of the following:

- With the "ZERO: CAL REPEAT?" screen selected, press **ENTER key** to repeat zeroing.
- With the "ZERO: CAL: EXIT?" screen selected, press **ENTER key**. After the "ZERO: CONFIRM ACTIVE?" screen appears, press **ENTER key** to return the analog outputs and relays to their active states (MEASURE screen appears).

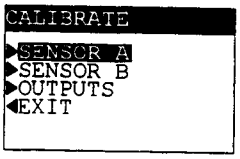
A. Make sure that the sensor is dry before zeroing.

B. Press **MENU key** to display

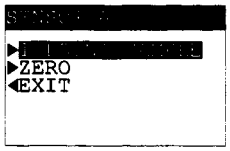


.

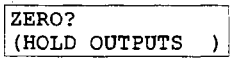
C. With the "CALIBRATE" line selected (shown in reverse video), press **ENTER key** to display:



D. With the "SENSOR A" line selected, press **ENTER key** to display:



E. Use ⇩ **key** to select the "ZERO" line, and press **ENTER key** to display



.

F. Use ⇧ **or** ⇩ **key** to view the three states that the analog outputs (and relays) can be in during calibration:

- **HOLD OUTPUTS:** Holds their present values.
- **XFER OUTPUTS:** Transfers to preset values.
- **ACTIVE OUTPUTS:** Responds to measured values.

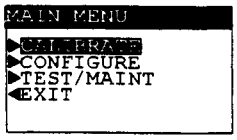
G. With the desired choice displayed, press **ENTER key** to enter this selection.

H. With the "ZERO: IN DRY AIR?" screen displayed and the dry sensor held in air, press **ENTER key** to confirm and to start automatic zeroing.

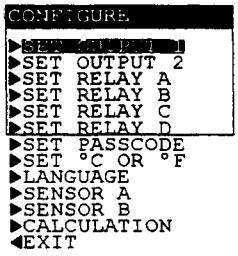
I. After the "ZERO: CONFIRM ZERO OK?" screen appears, press **ENTER key** to end zeroing.

J. After the "ZERO: CONFIRM ACTIVE?" screen appears, press **ENTER key** to return the analog outputs and relays to their active states (MEASURE screen appears).

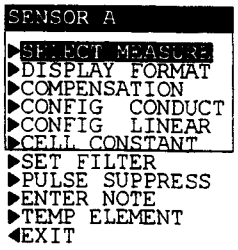
2. Press **MENU key** to display



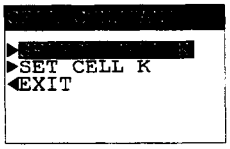
3. Use ⇩ **key** to select the "CONFIGURE" line (shown in reverse video), and press **ENTER key** to display:



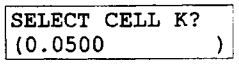
4. Use ⇩ **key** to select the "SENSOR A" line, and press **ENTER key** to display:



5. Use ⇩ **key** to select the "CELL CONSTANT" line, and press **ENTER key** to display:

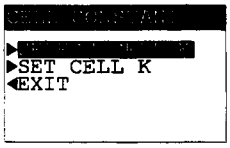


6. With the "SELECT CELL K" line selected, press **ENTER key** to display

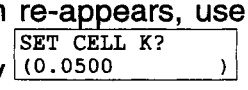


7. Use ⇩ **and** ⇧ **keys** to select the nominal cell category that corresponds to the sensor's Omega-certified "K" value shown on a label attached to its cable or to the inside cover of its optional junction box. Then press **ENTER key** to enter this selection.

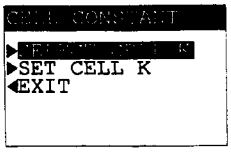
8. After the



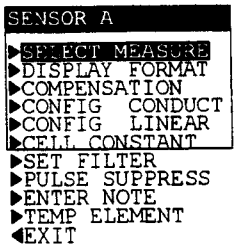
screen re-appears, use ⇩ **key** to select the "SET CELL K" line and press **ENTER key** to display



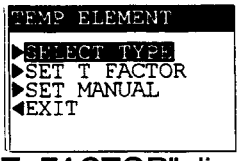
9. Use ⇨ **and** ⇦ **keys** to coarse adjust, and ⇧ **and** ⇩ **keys** to fine adjust the displayed value to exactly match the sensor's Omega-certified "K" value. Then press **ENTER key** to enter the value.

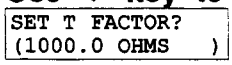
10. After the 

screen re-appears, press **ESC key** once to display:



11. Use ⇩ **key** to select the "TEMP ELEMENT" line, and press **ENTER key** to display:



12. Use ⇩ **key** to select the "SET T FACTOR" line, and press **ENTER key** to display 

.

13. Use ⇨ **and** ⇦ **keys** to coarse adjust, and ⇧ **and** ⇩ **keys** to fine adjust the displayed value to exactly match the sensor's Omega-certified "T" factor. Then press **ENTER key** to enter the value.

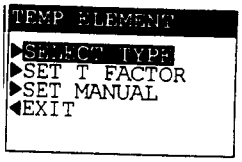
SPECIAL CASE -- ALTERED SENSOR CABLE LENGTH
(only for sensors with PT 1000 temperature elements*)

Changing the standard 20 ft. (6 m) sensor cable length, by shortening it or adding an interconnect cable, will affect temperature measuring accuracy. The Omega-certified "T" factor is based on standard cable length. To compensate for altered cable length measuring error, change the certified "T" factor entry:

- Shortened Sensor Cable: To increase the analyzer temperature reading to match the known solution temperature, decrease the "T" factor by 3.85 ohms for each °C difference.
- Added Interconnect Cable: To decrease the analyzer temperature reading to match the known solution temperature, increase the "T" factor by 3.85 ohms for each °C difference.

Example: Suppose the known solution temperature is 50°C and the analyzer reads 53°C due to interconnect cable resistance. Multiply the 3°C difference by 3.85 ohms to get 11.55. Then increase the sensor "T" factor by adding 11.55 to it and entering that value. If, due to a shortened sensor cable, the analyzer was reading 3°C less than the known solution temperature you would decrease the sensor "T" factor by subtracting 11.55 from it.

*Sensors with PT 100 temperature elements provide inherently less accurate temperature readings and are not recommended.



14. After the screen re-appears, press **MENU key** once and then **ESC key** once to display the MEASURE screen.

This completes the DRY-CAL method.

5.3 1 POINT SAMPLE Method (wet calibration)

This "wet" method requires removing the sensor from the process, immersing it into a properly prepared conductivity reference solution or process sample (value determined by laboratory analysis or a comparison reading), and entering the solution's known value. If using two sensors, calibrate each one in the same way using its respective menu screens.

NOTE: *When the passcode feature is enabled (Section 4.7), you must successfully enter the passcode before attempting to calibrate the analyzer.*

*An in-progress calibration can always be aborted by pressing the **ESC key**. After the "ABORT: YES?" screen appears, do one of the following:*

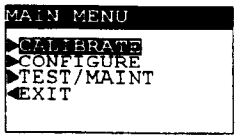
- *Press **ENTER key** to abort. After the "CONFIRM ACTIVE?" screen appears, press **ENTER key** to return the analog outputs and relays to their active states (MEASURE screen appears).*
- *Press ⇧ **or** ⇩ **key** to choose the "ABORT: NO?" screen, and press **ENTER key** to continue calibration.*

1. Zero the sensor if it is being calibrated for the first time. If not, disregard this step and proceed with step 2.

Zeroing Tip! If at any time during zeroing, the "ZERO: CONFIRM FAILURE?" screen appears, press **ENTER key** to confirm. Then, use the ⇧ **or** ⇩ **key** to select between "CAL REPEAT?" or "CAL EXIT?" and do one of the following:

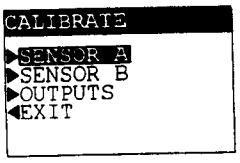
- With the "ZERO: CAL REPEAT?" screen selected, press **ENTER key** to repeat zeroing calibration.
- With the "ZERO: CAL: EXIT?" screen selected, press **ENTER key**. After the "ZERO: CONFIRM ACTIVE?" screen appears, press **ENTER key** to return the analog outputs and relays to their active states (MEASURE screen appears).

A. Make sure that the sensor is dry before zeroing.

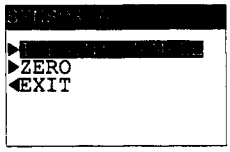
B. Press **MENU key** to display 

.

C. With the "CALIBRATE" line selected (shown in reverse video), press **ENTER key** to display:



D. With the "SENSOR A" line selected, press **ENTER key** to display:



E. Use ⇩ **key** to select the "ZERO" line, and press **ENTER key** to display

```
ZERO?
(HOLD OUTPUTS   )
```

.

F. Use ⇧ **or** ⇩ **key** to view the three states that the analog outputs (and relays) can be in during calibration:

- **HOLD OUTPUTS:** Holds their present values.
- **XFER OUTPUTS:** Transfers to preset values.
- **ACTIVE OUTPUTS:** Responds to measured values.

G. With the desired choice displayed, press **ENTER key** to enter this selection.

H. With the "ZERO: IN DRY AIR?" screen displayed and the dry sensor held in air, press **ENTER key** to confirm and start automatic zeroing.

I. After the "ZERO: CONFIRM ZERO OK?" screen appears, press **ENTER** to end zeroing.

J. After the "ZERO: CONFIRM ACTIVE?" screen appears, press **ENTER key** to return the analog outputs and relays to their active states (MEASURE screen appears).

2. When using a conductivity reference solution, its value should be near the typical measured process value for best accuracy. Prepare the solution by adding the listed grams of pure, dried NaCl shown in Table D to one liter of high purity, de-ionized, CO_2-free water to obtain the listed conductivity at 25°C. Solutions conductivity can be decreased by dilution with de-ionized water.

Table D -- CONDUCTIVITY REFERENCE SOLUTIONS

Desired Solution Value			Grams NaCl
µS/cm	mS/cm	ppm (NaCl)*	To Be Added
100	0.10	50	0.05
200	0.20	100	0.10
500	0.50	250	0.25
1000	1.00	500	0.50
2000	2.00	1010	1.01
3000	3.00	1530	1.53

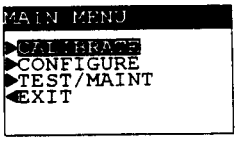
4000	4.00	2060	2.06
5000	5.00	2610	2.61
8000	8.00	4340	4.34
10,000	10.00	5560	5.56
20,000	20.00	11,590	11.59

*When using ppm measuring scale for compounds other than NaCl, refer to appropriate chemistry handbook for reference solution formulation.

3. Thoroughly rinse the clean sensor in de-ionized water. Then immerse the sensor in the prepared reference solution (or process sample). **Important:** Allow the sensor and solution temperatures to equalize. Depending on their temperature differences, this may take a few minutes.

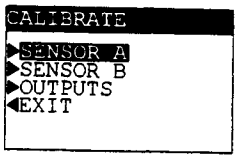
Calibration Tip! If at any time during calibration, the "1 POINT SAMPLE: CONFIRM FAILURE?" screen appears, press **ENTER key** to confirm. Then, use the ⇧ **or** ⇩ **key** to select between "CAL REPEAT?" or "CAL EXIT?" and do one of the following:

- With the "1 POINT SAMPLE: CAL REPEAT?" screen selected, press **ENTER key** to repeat calibration of the point.
- With the "1 POINT SAMPLE: CAL EXIT?" screen selected, press **ENTER key**. After the "1 POINT SAMPLE: CONFIRM ACTIVE?" screen appears, press **ENTER key** to return the analog outputs and relays to their active states (MEASURE screen appears).

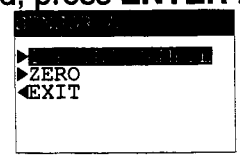
4. Press **MENU key** to display 

.

5. With the "CALIBRATE" line selected (shown in reverse video), press **ENTER key** to display:



6. With the "SENSOR A" line selected, press **ENTER key** to display:



7. With the "1 POINT SAMPLE" line selected, press **ENTER key** to display `1 POINT SAMPLE? (HOLD OUTPUTS )`.

8. Use ⇧ **or** ⇩ **key** to view the three states that the analog outputs (and relays) can be in during calibration:
   - **HOLD OUTPUTS:** Holds their present values.
   - **XFER OUTPUTS:** Transfers to preset values.
   - **ACTIVE OUTPUTS:** Responds to measured values.

9. With the desired choice displayed, press **ENTER key** to enter this selection.

10. If a process sample is used, determine its value using laboratory analysis or a calibrated portable meter.

11. With the sensor in solution and the `1 POINT SAMPLE: SAMPLE READY?` screen displayed, press **ENTER key** to confirm. This active `XXXX uS/cm READING STABLE?` screen appears showing the measurement reading.

12. Wait for the reading to stabilize which may take a few minutes. Then press **ENTER key**. The "PLEASE WAIT" screen may appear if the reading is still too unstable. After the reading has stabilized, this static `1 POINT SAMPLE? (XXXX uS/cm )` screen appears showing the "last measured" value.

13. Use ⇧ **and** ⇩ **keys** to adjust the displayed value to exactly match the known value of the reference solution (or process sample).

14. Press **ENTER key** to enter the value and complete calibration (CONFIRM CAL OK?" screen appears).

15. Remove the sensor from the reference solution (or process sample) and re-install the sensor into the process.

16. Press **ENTER key** to display the active measurement reading on the "1 POINT SAMPLE: CONFIRM AC-TIVE?" output status screen. When the reading corresponds to the actual typical process value, press **ENTER key** again to return the analog outputs and relays to their active states (MEASURE screen appears).

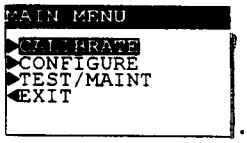
This completes "1 POINT SAMPLE" calibration.

5.4 Analog Outputs (1 and 2) Calibration

The analyzer analog outputs are factory-calibrated. However, they can be re-calibrated at any time if desired. Calibrate each output in the same way using its respective menu screens.

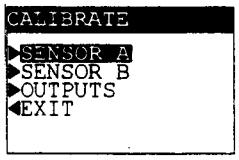
NOTE: *When the passcode feature is enabled (Section 4.7), you must successfully enter the passcode before attempting to calibrate the analog outputs.*

When an output is configured to be 0-20 mA, the analyzer will calibrate the 4 mA and 20 mA values (not the 0 mA value). Also, the analyzer adjustment range for output values during calibration is ± 2 mA.

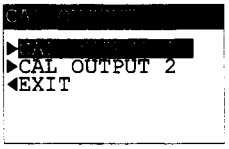
1. Press **MENU key** to display 

.

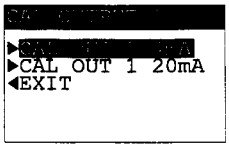
2. With the "CALIBRATE" line selected (shown in reverse video), press **ENTER key** to display:

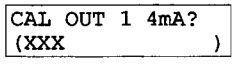


3. Use ⇩ **key** to select the "CAL OUTPUTS" line, and press **ENTER key** to display:



4. With the "CAL OUTPUT 1" line selected, press **ENTER key** to display:



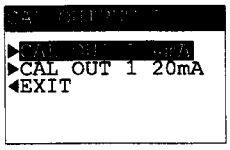
5. With the "CAL OUT 1 4 mA" line selected, press **ENTER key** to display 

.

6. The displayed value is "counts" -- not mA -- that dynamically change when the output is adjusted. Use a calibrated digital multimeter to measure Output 1's actual <u>minimum</u> value provided at OUTPUT 1 Terminals 2 and 3 on TB1.

7. Use ⇨ **and** ⇦ **keys** (coarse adjust) and ⇧ **and** ⇩ **keys** (fine adjust) to adjust Output 1's minimum value to read exactly "4.00 mA" on the digital multimeter -- not the analyzer display.

8. Press **ENTER key** to complete calibration of the minimum endpoint value.

9. After the 

screen re-appears, press ⇩ **key** once to select the "CAL OUT 1 20 mA" line, and press **ENTER key** to display

```
CAL OUT 1 20mA?
(XXXX          )
```

.

10. Once again the displayed value is "counts" -- not mA -- that dynamically change when the output is adjusted. Use a calibrated digital multimeter to measure Output 1's actual maximum value.

11. Use ⇨ **and** ⇦ **keys** (coarse adjust) and ⇧ **and** ⇩ **keys** (fine adjust) to adjust Output 1's maximum value to read exactly "20.00 mA" on the digital multimeter -- not the analyzer display.

12. Press **ENTER key** to complete calibration of the maximum endpoint value.

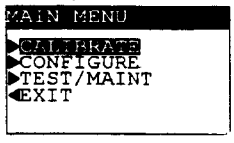
This completes Output 1 calibration.

The analyzer has TEST/MAINT menu screens to:

- Check system status for the analyzer, sensor and temperature inputs, and relays.
- Hold analog outputs.
- Manually reset all relay overfeed timers.
- Provide analog output test signals to confirm operation of connected devices.
- Test relay operation (energize or de-energize).
- Identify analyzer EPROM version.
- Simulate a measurement or temperature signal to exercise the measurement loop.
- Reset all configuration values to factory-set defaults.

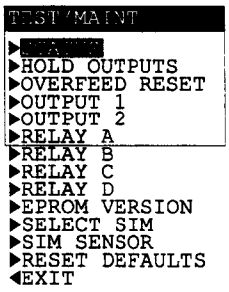
6.1 Checking Analyzer, Sensor, and Relay Status

With the analyzer's system diagnostic capabilities, you can check the operating status of the analyzer, sensors (measurement and temperature inputs), and relays. The MEASURE screen will flash the "WARNING CHECK STATUS" message when a system diagnostic condition has been detected. To determine the condition causing the warning, display the "STATUS" screens:

1. Press **MENU key** to display 

.

2. Use ⇩ **key** to select the "TEST/MAINT" line.

3. Press **ENTER key** to display 

.

4. With the "STATUS" line selected, press **ENTER key** to display the "STATUS: ANALYZER OK" screen. This screen confirms that the analyzer is operating properly. If "FAIL" appears, it may mean:
   - EPROM failure (data is not valid).
   - Scaling card not present or not recognized.
   - Analog-to-digital converter not responding.
   - RAM failure.

- Internal serial communications failure.

5. Press **ENTER key** once to view the "STATUS: SENSOR OK" screen. Then press the **ENTER key** again to view the "STATUS: TEMPERATURE OK" screen. If FAIL appears on either input status screen, it may indicate:
   - Sensor is disconnected or incorrectly wired.
   - Signal is very noisy or exceeds the measuring range.

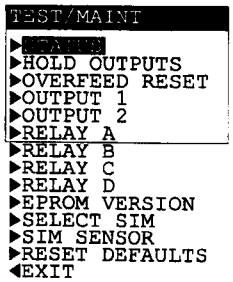
6. With the "STATUS: TEMPERATURE OK" screen displayed, press **ENTER key** once to view the "STATUS: RLY A" screen. Subsequent **ENTER key** presses display status screens for Relay B, C, and D. Status indications can be:

Status Indication	Meaning
ACTIVE (Relay energized; LED is on.)	Control Relay: Measured value exceeds setpoint. Alarm Relay: Measured value exceeds low or high alarm point. Status Relay: Existing sys. diag. condition has been detected.
INACTIVE (Relay not energized; LED is off.)	Control Relay: Measured value does not exceed setpoint. Alarm Relay: Measured value does not exceed low/high alarm pt. Status Relay: Analyzer has not detected sys. diag. condition.
TIMEOUT (Relay not energized; LED is blinking.)	Control Relay: Overfeed timer has timed out; manually reset it. ***NOTE:*** *TIMEOUT status only applies to control relays.*
COUNTING (Relay energized; LED is on.)	Control Relay: Overfeed timer is counting, but has not timed out. ***NOTE:*** *COUNTING status only applies to control relays.*

7. To end relay status checking, press **ESC** or **ENTER key**.

6.2 Holding Outputs

The analyzer has a convenient feature to hold the analog outputs, suspending operation of any connected devices.

1. With the 

screen displayed, use ⇩ **key** to select "HOLD OUTPUTS" line.

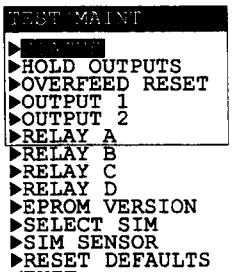
2. Press **ENTER key** to immediately hold the analog outputs ("HOLD OUTPUTS" screen appears, acknowledging that hold has occurred).

   NOTE: *If the keypad is not used within 30 minutes, the analog outputs will automatically change back to their active states and the display will return to the MEASURE screen.*

3. To return the analog outputs back to their "active" states, press **ENTER key** at any time.

6.3 Resetting Overfeed Timers

When a relay overfeed timer "times out," as indicated by its blinking annunciator, the timer must be manually reset using TEST/MAINT menu screens. The relay annunciator stops blinking after reset.



1. With the screen displayed, use ⇩ **key** to select the "OVERFEED RESET" line.

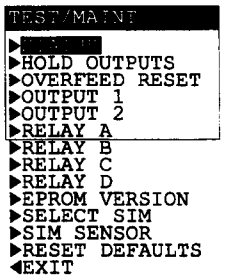
2. Press **ENTER key** to display "OVERFEED RESET" screen.

3. Press **ENTER key** again to reset all overfeed timers. The "OVERFEED RESET: DONE" screen appears, acknowledging that reset has occurred.

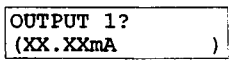
4. To return to the "TEST/ MAINT" top-level menu screen, press **ESC** or **ENTER key**.

6.4 Providing Output (1 and 2) Test Signals

The analyzer can provide analog output test signals of a desired milliamp value to confirm operation of connected devices. Test signals can be provided for both outputs in the same way using their respective menu screens.



1. With the screen displayed, use ⇩ **key** to select the "OUTPUT 1" line.

2. Press **ENTER key** to display 

.

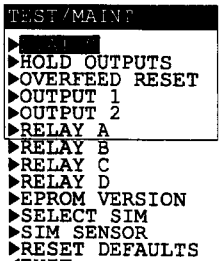
   NOTE: *Pressing **ENTER key** immediately provides the test signal. Its mA value is shown on this screen.*

3. Adjust the displayed value to obtain the desired mA output at the Output #1 terminals. (Use ⇨ **and** ⇦ **keys** for coarse adjust; ⇩ **and** ⇧ **keys** for fine adjust.)

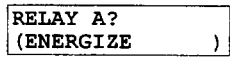
4. To end the output test signal and return to the "TEST/ MAINT" top-level menu screen, press **ESC** or **ENTER key**.

6.5 Testing Relay (A, B, C, and D) Operation

Relays A, B, C, and D can be tested to confirm their operation. Test each relay in the same way using its respective menu screens.

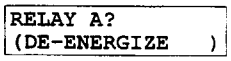


1. With the screen displayed, use ⇩ **key** to select the "RELAY A" line.

2. Press **ENTER key** to display 

.

3. Relay A should be energized. Confirm this by checking the NO and NC relay output terminals with a continuity meter.

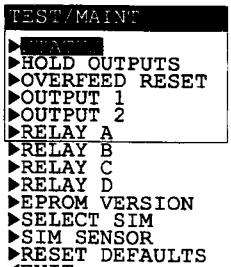
4. Press ⇧ **or** ⇩ **key** once to display 

. Relay A should be de-energized. Confirm this by checking the NO and NC relay output terminals with a continuity meter.

5. To end this test and return to the "TEST/MAINT" top-level menu screen, press **ESC** or **ENTER key**.

6.6 Checking EPROM Version

You can check the EPROM version used in the analyzer.



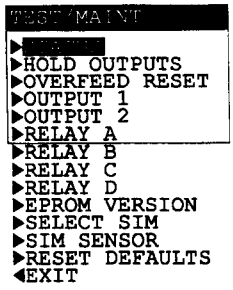
1. With the screen displayed, use ⇩ **key** to select the "EPROM VERSION" line.

2. Press **ENTER key** to view the EPROM version screen.

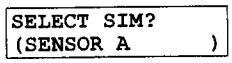
3. To return to the "TEST/MAINT" top-level menu screen, press **ESC** or **ENTER key**.

6.7 Selecting Type of Simulated Value

You can simulate a measured value to make the relays and analog outputs respond accordingly. First, select the type of simulated value using this subsection. Then, set the desired simulation value following the steps in subsection 6.8.

1. With the 

screen displayed, use ⇩ **key** to select the "SELECT SIM" line.

2. Press **ENTER key** to display 

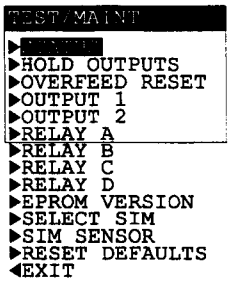
. Use ⇩ **and** ⇧ **keys** to view all choices:
   - **SENSOR A:** Depending on the sensor's configured measurement, selects the simulated value to be a Sensor A conductivity, resistivity, or TDS value.
   - **SENSOR B:** Depending on the sensor's configured measurement, selects the simulated value to be a Sensor B conductivity, resistivity, or TDS value.
   - **TEMPERATURE A:** Selects the simulated value to be a Sensor A temperature value.
   - **TEMPERATURE B:** Selects the simulated value to be a Sensor B temperature value.
   - ***CALCULATION:** Selects the simulated value to be a calculated Sensor A and B measurement value (% reject, % pass, ratio A/B, ratio B/A, diff. A-B, or diff. B-A).

> * A simulated value can only represent the calculated measurement when two sensors are used and the analyzer has been correctly configured for CALCULATION.

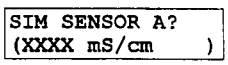
3. With the desired choice displayed, press **ENTER key** to enter this selection and return to the "TEST/MAINT" top-level menu screen.

6.8 Setting Simulation Value

After selecting the type of simulated value (subsection 6.7), set the desired simulation value.

1. With the 

screen displayed, use ⇩ **key** to select the "SIM SENSOR" line.

2. Press **ENTER key** to display 

.

   The value shown on this screen is now active, providing a corresponding mA value for both analog output

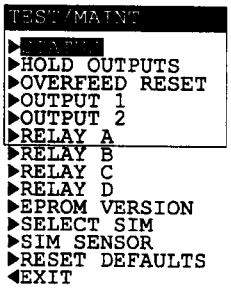
signals. (The relays, depending on their configured settings, may also respond to this simulation value.)

3. Adjust the displayed simulation value to the desired value. (Use ⇨ **and** ⇦ **keys** for coarse adjust; ⇧ **and** ⇩ **keys** for fine adjust.)

4. To end the simulation and return to the "TEST/MAINT" top-level menu screen, press **ESC** or **ENTER key.**

6.9 Resetting Configuration Values to Factory Defaults

You can conveniently reset <u>all</u> stored configuration settings, including calibration settings, simultaneously to factory-set defaults.



1. With the screen displayed, use ⇩ **key** to select the "RESET DEFAULTS" line.

2. Press **ENTER key** to display the "RESET DEFAULTS: ARE YOU SURE?" screen, asking if you really intend to perform this extreme action. (If you want to abort this action, press **ESC key** now.)

3. Press **ENTER key** to reset <u>all</u> stored configuration settings to factory defaults. The "RESET DEFAULTS: DONE" screen appears, acknowledging that reset has occurred.

4. To return to the "TEST/MAINT" top-level menu screen, press **ESC** or **ENTER key.**

SECTION 7
RELAY OVERFEED TIMER FEATURE

7.1 Why Use an Overfeed Timer

The useful relay overfeed timer feature, **only available to a relay set for the "control" function,** is described in more detail in this section.

Suppose that you configure a control relay with a high phase to operate in response to increasing measured value. The control relay will then turn on whenever the measured value exceeds its preset setpoint. When the measured value decreases below the setpoint by an amount you preset (the deadband setting), the relay will turn off. But what if a damaged sensor or a process upset condition keeps the measured value above the setpoint or deadband setting? The control element (valve, pump, etc.) switched by that relay would then continue to operate. Depending on the application control scheme, this may excessively dispense costly chemical additives or overly drain or divert the process. Also, the control element itself could be damaged due to excessive continuous or unusual operation such as a pump that is running dry. The useful overfeed timer prevents undesirable conditions like these from happening. It

restricts how long the relay and its connected control element will remain on regardless of conditions.

7.2 Configuring Relay Overfeed Timers

To set a relay overfeed timer, use its respective configuration menu screen. The time you set to restrict how long the relay stays on (0-999.9 minutes) should be just enough to provide acceptable results. An excessive setting may waste chemicals or the process itself. Initially, set this time as an estimate. Then, by experimenting and observing the response, periodically "fine tune" to optimize the setting.

7.3 Overfeed Timer "Timeout" Operation

When a control relay is on and its overfeed timer "times out," its annunciator will blink. This indicates that the relay is now off and will remain off until you manually reset the overfeed timer. After reset, the relay annunciator stops blinking. (All overfeed timers are reset simultaneously.)

7.4 Resetting Overfeed Timers

To manually reset <u>all</u> relay overfeed timers, please refer to Part Three, Section 6.3.

7.5 Interactions with Other Analyzer Functions

A relay overfeed timer can, and often will, interact with other analyzer functions while those functions are in use. Table E on the next page explains common overfeed timer interactions.

Table E -- RELAY OVERFEED TIMER INTERACTIONS WITH OTHER ANALYZER FUNCTIONS

Function Conditions		Resulting Action of Overfeed Timer
Manually Holding Relay Operation (When Outputs are Held at Start of Calibration)		
Off relay held in "off"	Overfeed timer was off	Overfeed timer remains off. After you change back to ACTIVE from the HOLD mode, the overfeed timer will remain off until the measured value (or a value you simulate) causes the relay to turn on.
On relay held in "on"	Overfeed timer was counting	Overfeed timer continues its "count down" until it turns the relay off. If you release HOLD <u>before</u> the timer "times out," the timer continues its "count down" until it turns the relay off or the timer automatically resets when the measured value (or a value you simulate) causes the relay to turn off. If you release HOLD <u>after</u> the timer has "timed out," it must be manually reset (Part Three, Section 6.3).
On relay held in "on"	Overfeed timer was timed out	Overfeed timer remains off which keeps the relay turned off. You must manually reset the timer (Part Three, Section 6.3).
Manually Transferring Relay Operation (When Outputs are Transferred at Start of Calibration)		

Off relay is transferred to "on"	Overfeed timer was off	Overfeed timer starts its "count down" until it turns the relay off. After you change the "on" relay back to "off," the overfeed timer automatically resets.
On relay is transferred to "off"	Overfeed timer was counting	Overfeed timer automatically resets. After you change the "off" relay back to "on," the overfeed timer starts its "count down" until it turns the relay off, or the timer automatically resets again when the measured value (or a value you simulate) causes the relay to turn off.
On relay is transferred to "off"	Overfeed timer was timed out	
Manually Testing Relay Operation (By Using TEST/MAINTENANCE Menu Screens)		
Off relay is changed to "on"	Overfeed timer was off	Overfeed timer starts its "count down" until it turns the relay off. After you change the "on" relay back to "off," the overfeed timer automatically resets.
On relay is changed to "off"	Overfeed timer was counting	Overfeed timer automatically resets. After you change the "off" relay back to "on," the overfeed timer starts its "count down" until it turns the relay off, or the timer automatically resets again when the measured value (or a value you simulate) causes the relay to turn off.
On relay is changed to "off"	Overfeed timer was timed out	
Operating a Relay By Simulating a Value (Using TEST/MAINTENANCE Menu Screens)		
Off relay is turned "on" by simulated value	Overfeed timer was off	Overfeed timer starts its "count down" until it turns the relay off. After you change the "on" relay back to "off," the overfeed timer automatically resets.
On relay is turned "off" by simulated value	Overfeed timer was counting	Overfeed timer automatically resets. After you change the "off" relay back to "on," the overfeed timer starts its "count down" until it turns the relay off, or the timer automatically resets again when the measured value (or a value you simulate) causes the relay to turn off.
On relay is turned "off" by simulation value	Overfeed timer was timed out	

PART FOUR - SERVICE AND MAINTENANCE

SECTION 1
GENERAL INFORMATION

1.1 Inspecting Sensor Cable

If a measurement problem exists and you suspect the sensor cables, inspect them for physical damage. If an interconnect cable is used, disconnect the cable at both ends (sensor and analyzer) and, using an ohmmeter, check its wires for continuity and internal shorts.

1.2 Replacing Fuse(s)

The analyzer is equipped with two board-mounted fuses (type T slow-blow; 5 mm x 20 mm size). Fuse values are shown to the left of the fuses (Figure 2-3 or 2-4). The fuses protect the 115 and 230 volt line power circuits.

WARNING:

DISCONNECT LINE POWER TO AVOID THE POSSIBILITY OF ELECTRICAL SHOCK.

1. After disconnecting line power, open the analyzer door and locate the fuses (shown in Figure 2-3 or 2-4).

2. Remove the blown fuse and replace it with a Omega fuse or an equivalent. Refer to Part Five -- Spare Parts -- for Omega fuse kit part number.

3. Reconnect line power and close the analyzer door.

1.3 Replacing Relays

The analyzer relays are soldered into a complex, multi-layered circuit board. To avoid the possibility of damaging this board while attempting to replace a relay:

- Simply return the complete analyzer to the Omega Customer Service Dept. or your local factory-authorized service organization for relay replacement.

-- or --

- Replace the complete scaling board assembly containing the relays. Refer to Part Five -- Spare Parts -- for the Omega scaling board assembly part number.

SECTION 2
PRESERVING MEASUREMENT ACCURACY

2.1 Keeping Sensor(s) Clean

To maintain measurement accuracy, periodically clean the sensor(s). Operating experience will help you determine the intervals between cleanings (typically once a month). Use the recommended cleaning procedure described in the Omega enhanced performance contacting conductivity sensor instruction manual.

2.2 Keeping Analyzer Calibrated

If the DRY-CAL method (Part Three, Section 5.2) was used to calibrate the analyzer, re-calibration is only required when replacing the Omega enhanced performance conductivity sensor. **If a different sensor brand is used, or if the analyzer was calibrated using the 1 POINT SAMPLE method, periodic re-calibration is required.** In all cases, always calibrate the analyzer when a sensor is replaced.

NOTE: *If your measuring application requires utmost accuracy, Omega offers a re-certification service to verify a used sensor's "K" value and temperature "T" factor. For details, call your local Omega representative or the Omega Customer Service Department.*

2.4 Avoiding Electrical Interference

Recommendation: Do not run the sensor cables (and interconnect cables, if used) in the same conduit with line power.

Maintenance Tip! Excess cable should not be coiled near motors or other equipment that may generate electrical or magnetic fields. Cut cables to proper length during installation to avoid unnecessary inductive pickup ("electrical noise" may interfere with sensor signal).

SECTION 3
TROUBLESHOOTING

3.1 Ground Loops

The analyzer may be affected by a "ground loop" problem (two or more electrically grounded points at different potentials).

Symptoms Indicating a Possible Ground Loop

- Analyzer reading is offset from the actual value by a consistent amount, or ....
- Analyzer reading is frozen on one value, or ....
- Analyzer reading is "off scale" (upscale or downscale).

Although the source of a ground loop is difficult to determine, there are several common causes.

Common Causes of a Ground Loop

- Components, such as recorders or computers, are connected to non-isolated analog outputs.
- Not using shielded cabling or failure to properly connect all cable shields.
- Moisture or corrosion in a junction box.

Determining if Ground Loop Exists

The following simple test can help to determine if there is a ground loop:

1. With the conductivity MEASURE screen displayed, put the sensor in a non-conductive container (plastic or glass) filled with a known value conductivity reference solution. Note the analyzer reading for this solution.
2. Connect one end of a wire to a known earth ground, such as the analyzer grounding strip (at bottom of case) or a metal water pipe. Place the other end of this wire into the reference solution next to the sensor.
3. Note the analyzer reading now and compare it with the reading taken in step 1. If the reading changed, a ground loop exists.

Finding Source of Ground Loop

Sometimes the source of a ground loop is easy to find, but it usually takes an organized approach to isolate the problem.

Troubleshooting Tip! Use a systematic troubleshooting method. If possible, start by grounding all shields and electrical grounds at one stable point. One at a time, turn off all pumps, motors and switches that are in contact with the process. Each time you do this,

check if the ground loop still exists. Since the process media being measured is electrically conductive, the source of the ground loop may not be readily apparent.

3.2 Isolating Measuring System Problem

When experiencing problems, try to determine the primary measurement system component causing the problem (sensor, analyzer, or interconnect cable, if used).

Checking Electrical Connections

1. Verify that line power exists at the appropriate analyzer TB3 terminals.

2. Check all analyzer cable connections to ensure they are properly connected.

Verifying Sensor Operation

To verify sensor operation, refer to the procedure in the troubleshooting section of the sensor instruction manual.

Verifying Analyzer Operation

Verify the operation of the Sensor A measuring channel. If the Sensor B channel is used, verify it in the same way. The following procedure applies to the Sensor A channel.

WARNING:

DISCONNECT LINE POWER TO AVOID THE POSSIBILITY OF ELECTRICAL SHOCK.

1. After disconnecting line power and the sensor(s) from the analyzer, connect a 1% tolerance, 1097 ohm resistor between Terminals 18 (blue) and 19 (white) on TB1. (When configured for a PT100 temperature element, use a 1% tolerance, 110 ohm resistor.)
2. Depending on the configured sensor cell constant, measuring units, and range, use the listed resistance in Table F (1% tolerance resistor or decade box) and connect it between Terminals 21 (black) and 22 (red) on the TB1 SENSOR block.

Table F -- FULL-SCALE EQUIVALENT TEST RESISTANCE VALUES

Configured Display Format	Configured "Nominal" Cell Constant				
	0.05 (see Note 1)	0.5	1	5	10
For Conductivity Measurement					
0-2.000 µS/cm	25 KΩ	not applicable	not applicable	not applicable	not applicable
0-20.00 µS/cm	2.5 KΩ	25 KΩ	not applicable	not applicable	not applicable
0-200.0 µS/cm	not applicable	2.5 KΩ	5 KΩ	not applicable	not applicable
0-2000 µS/cm	not applicable	not applicable	500 KΩ	2.5 KΩ	5 KΩ
0-2.000 mS/cm	not applicable	not applicable	not applicable	2.5 KΩ	5 KΩ
0-20.00 mS/cm	not applicable	not applicable	not applicable	not applicable	500 Ω
0-200.0 mS/cm	not applicable	not applicable	not applicable	not applicable	50 Ω
For Resistivity Measurement					
0-19.99 MΩ • cm	1 MΩ	not applicable	not applicable	not applicable	not applicable

0-999.9 KΩ • cm	50 KΩ	not applicable	not applicable	not applicable	not applicable
For TDS Measurement					
0-9999 ppm	3.2 Ω	32 Ω	64 Ω	320 Ω	640 Ω
0-9999 ppb	3.2 KΩ	32 KΩ	64 KΩ	320 KΩ	640 KΩ

NOTE 1: When measuring ultrapure water as conductivity (less than 1.00 microSiemens/cm), an 877 KΩ resistance will display 0.057 µS/cm. When measuring ultrapure water as resistivity, a 910 KΩ resistance will display 18.2 MΩ • cm.

3. Reconnect line power to the analyzer.

WARNING:

LINE POWER IS PRESENT. BE CAREFUL TO AVOID ELECTRICAL SHOCK.

4. Verify that the analyzer conductivity reading is full-scale for the applicable range. Also, verify that the analyzer temperature reading is 0°C.

Verifying Interconnect Cable Integrity

If these readings are achieved, the analyzer is operating properly, but the interconnect cable (if used) may be faulty.

WARNING:

DISCONNECT LINE POWER TO AVOID THE POSSIBILITY OF ELECTRICAL SHOCK.

1. After disconnecting line power, reconnect the sensor(s) directly to the analyzer (purposely bypassing the interconnect cable and junction box, if used).

2. Place the sensor(s) in a container of known value conductivity reference solution that is at room temperature.

3. Reconnect line power to the analyzer.

WARNING:

LINE POWER IS PRESENT. BE CAREFUL TO AVOID ELECTRICAL SHOCK.

4. Verify that the analyzer reading is the same as the known reference solution value. If the reading is achieved, the interconnect cable and/or junction box connections are probably faulty. Use a digital multimeter to check the interconnect cable for shorted or open wires.

ANALYZER REPAIR/RETURN

If you need spare parts, assistance in troubleshooting, or repair service, please contact Omega's Customer Service Department at: 1-800-TC- Omega

All analyzers returned for repair or replacement must be freight prepaid and include the following information:

1. A clearly written description of the malfunction.

2. Name of person to contact and the phone number where they can be reached.

3. Proper return address for shipping analyzer(s) back.
   Include preferred shipping method (UPS, Federal Express, etc.) if applicable.

4. A purchase order if analyzer(s) is out of warranty to cover costs of repair.

NOTE: *If the analyzer is damaged during return shipment because of inadequate packaging, the customer is responsible for any resulting repair costs. (**Recommendation:** Use the original Omega shipping carton or an equivalent.)*

Also, Omega will not accept analyzers returned for repair or replacement unless they are thoroughly cleaned and all process material is removed.

PART FIVE - SPARE PARTS AND ACCESSORIES

Description	Part Number
Analyzers with "B" Prefix Serial Numbers	
Complete Door Assembly:	C53A2010-003
Power Supply/Scaling Board Assembly	C53A2020-001
Ribbon Interconnect Cable	1000A3355-001
Analyzers with "A" Prefix Serial Numbers	
Complete Door Assembly	C53G1010-201
Power Supply/Scaling Board Assembly	C53G1040-101
Ribbon Interconnect Cable	1000A3334-101
Analyzers with No Letter Prefix Serial Numbers	
Complete Door Assembly	C53G1010-201
Power Supply/Scaling Board Assembly	C53G1040-101
Ribbon Interconnect Cable	4W001

The following parts are common to all CDCN-685 & 686 Analyzers:

Fuse Kit (one 80 mA fuse and one 100 mA fuse per package) 1000G3315-101

Mounting Hardware Kit 1000G3228-101

MADE IN USA

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course!

Shop online at www.omega.com

TEMPERATURE

- Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- Wire: Thermocouple, RTD & Thermistor
- Calibrators & Ice Point References
- Recorders, Controllers & Process Monitors
- Infrared Pyrometers

PRESSURE, STRAIN AND FORCE

- Transducers & Strain Gages
- Load Cells & Pressure Gages
- Displacement Transducers
- Instrumentation & Accessories

FLOW/LEVEL

- Rotameters, Gas Mass Flowmeters & Flow Computers
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

pH/CONDUCTIVITY

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
- Industrial pH & Conductivity Equipment

DATA ACQUISITION

- Data Acquisition & Engineering Software
- Communications-Based Acquisition Systems
- Plug-in Cards for Apple, IBM & Compatibles
- Datalogging Systems
- Recorders, Printers & Plotters

HEATERS

- Heating Cable
- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments

M3582/0303