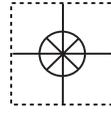


CE



User's Guide



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CDTX-90 Series Conductivity/Resistivity Transmitters



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The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient-connected applications.

Omega CDTX-90 Series Conductivity/Resistivity Transmitter



CAUTION!

- Remove power to unit before wiring input and output connections.
- Follow instructions carefully to avoid personal injury.

Contents

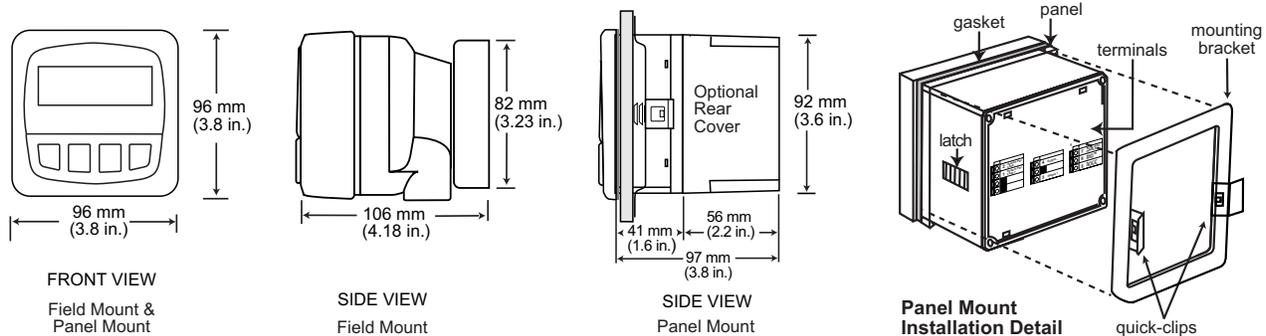
1. Installation
2. Specifications
3. Electrical Connections
4. Menu Functions

1. Installation

CDTX-90 Series transmitters are available in two styles: panel mount and field mount. The panel mount is supplied with the necessary hardware to install the transmitter. This manual includes complete panel mounting instructions. Field mounting requires a separate mounting kit. The FP90UM Universal kit enables the transmitter to be installed virtually anywhere. Detailed instructions for field installation options are included with the FP90UM Universal kit.

1.1 Panel Installation

1. The panel mount transmitter is designed for installation using a 1/4 DIN Punch. For manual panel cutout, an adhesive template is provided as an installation guide. Recommended clearance on all sides between instruments is 1 inch.
2. Place gasket on instrument, and install in panel.
3. Slide mounting bracket over back of instrument until quick-clips snap into latches on side of instrument.
4. To remove, secure instrument temporarily with tape from front or grip from rear of instrument. **DO NOT RELEASE.** Press quick-clips outward and remove.



2. Specifications

General

Compatible electrodes: Omega CDCE-90 Series Standard and Certified Series Conductivity/Resistivity Electrodes

Accuracy: $\pm 2\%$ of reading

Enclosure:

- Rating: NEMA 4X/IP65 front
- Case: PBT
- Panel case gasket: Neoprene
- Window: Polyurethane coated polycarbonate
- Keypad: Sealed 4-key silicone rubber
- Weight: Approx. 325g (12 oz.)

Display:

- Alphanumeric 2 x 16 LCD
- Contrast: User selected, 5 levels
- Update rate: 1.8 seconds

Electrical

- Power: 12 to 24 VDC $\pm 10\%$, regulated, 80 mA max.

Sensor input range:

- Conductivity: 0.055 to 400,000 μS
 - Resistivity: 10 K Ω to 18.2 M Ω
- (Measurements from 10 M Ω to 18 M Ω (0.055 μS to 0.1 μS) must be performed in solution temperatures from 20 °C to 100 °C.)

- TDS: 0.023 to 200,000 ppm
- Temperature: PT 1000, -25 to 120°C (-13 to 248°F)

Current output:

- 4 to 20 mA, isolated, fully adjustable and reversible
- Max loop impedance: 50 Ω max. @ 12 V
325 Ω max. @ 18 V
600 Ω max. @ 24 V

- Update rate: 200 mS
 - Accuracy: ± 0.03 mA @ 25°C, 24 V
- Relay outputs
(CDTX-90-2 includes 2 mechanical SPDT contacts):
- Maximum voltage rating: 5 A @ 30 VDC, or 5 A @ 250 VAC, resistive load
 - Programmable for:
 - High or Low setpoint with adjustable hysteresis
 - Pulse operation (max. rate 400 pulses/min)

Open-collector output, optically isolated:

- 50 mA max. sink, 30 VDC maximum pull-up voltage.
- Programmable for:
 - High or Low setpoint with adjustable hysteresis
 - Pulse operation (max. rate 400 pulses/min)

Environmental

- Operating temperature: -10 to 70°C (14 to 158°F)
- Storage temperature: -15 to 80°C (5 to 176°F)
- Relative humidity: 0 to 95%, non-condensing
- Maximum altitude: 2000 m (6562 ft)
- Insulation category: II
- Pollution degree: 2

Standards and Approvals

- CSA, CE, UL listed
- Immunity: EN50082-2
- Emissions: EN55011
- Safety: EN61010

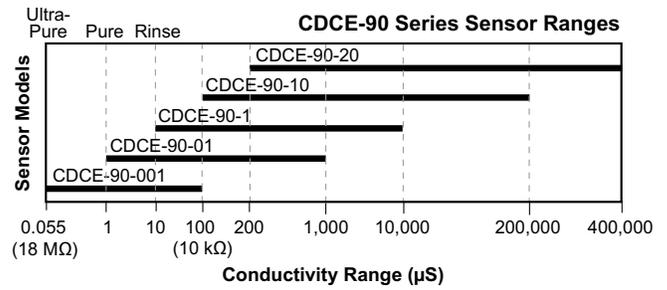
- Manufactured under ISO 9001 and ISO 14001
- **U.S.A. Patent # 5,708,363**

3. Electrical Connections

Sensor Selection

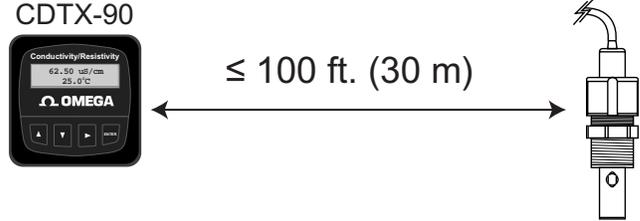
Select the sensor with a range closest to your process minimum and maximum values.

- CDCE-90-001 (0.01 cell): 0.055 to 100 μS (10 $\text{k}\Omega$ to 18 $\text{M}\Omega$)
Use the CDCE-90-001 for all resistivity requirements
- CDCE-90-01 (0.1 cell): 1 to 1000 μS
- CDCE-90-1 (1.0 cell): 10 to 10,000 μS
- CDCE-90-10 (10.0 cell): 100 to 200,000 μS
- CDCE-90-20 (20.0 cell): 200 to 400,000 μS



Wiring Tips:

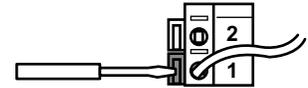
- Do not route sensor cable in conduit containing AC power wiring. Electrical noise may interfere with sensor signal.
- Routing sensor cable in grounded metal conduit will help prevent electrical noise and mechanical damage.
- Seal cable entry points to prevent moisture damage.
- Only one wire should be inserted into a terminal. Splice double wires outside the terminal.
- Sensor cable may not be extended over 100 ft.



Caution: Failure to fully open terminal jaws before removing wire may permanently damage instrument.

Wiring Procedure

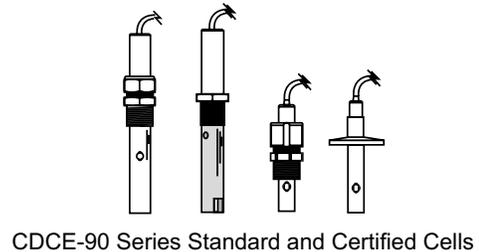
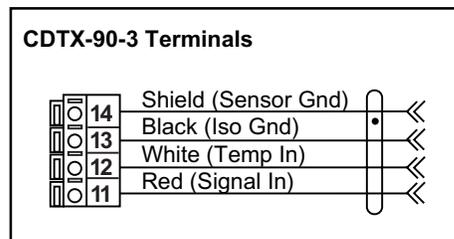
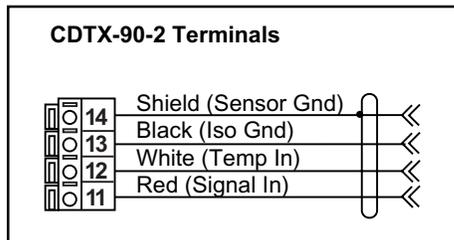
1. Remove 0.5 - 0.625 in. (13-16 mm) of insulation from wire end.
2. Press the orange terminal lever downward with a small screwdriver to open terminal jaws.
3. Insert exposed (non-insulated) wire end in terminal hole until it bottoms out.
4. Release orange terminal lever to secure wire in place. Gently pull on each wire to ensure a good connection.



Wiring Removal Procedure

1. Press the orange terminal lever downward with a small screwdriver to open terminal jaws.
2. When fully open, remove wire from terminal.

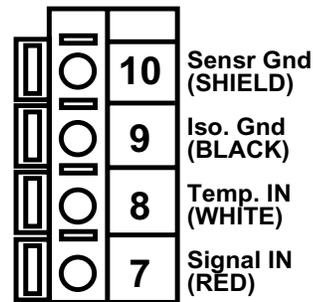
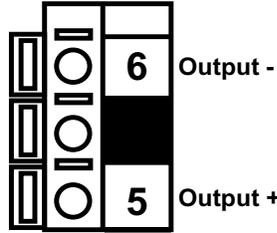
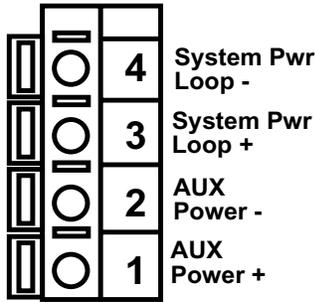
3.1 Sensor Connections



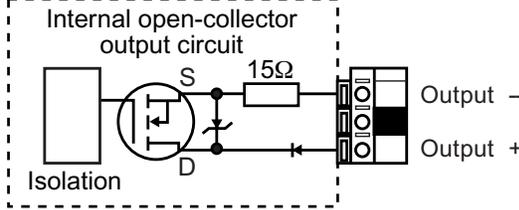
CDTX-90-1 Terminal connections

Terminals 3 and 4: Loop Power
 12-24 VDC ±10% system power and current loop output.
 Max. loop impedance:
 50 Ω max. @ 12 V
 325 Ω max. @ 18 V
 600 Ω max. @ 24 V

Terminals 7-10: Sensor input
 7 is conductivity input
 8 is temperature input
 9 is the isolated signal ground
 10 is the sensor earth ground



Terminals 1-2: Auxiliary power
 Provides DC power to measurement circuit. Required for all CDTX-90 systems.

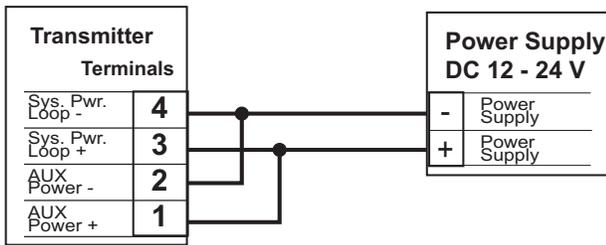


Terminals 5-6: Open-collector Output

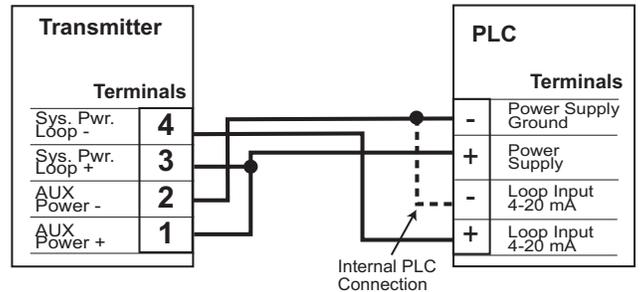
- A transistor output, programmable (see CALIBRATE menu) as High or Low setpoint with adjustable hysteresis and proportional pulse (to 400 pulses per minute maximum).
- May be disabled (Off) if not used.

CDTX-90-1 System Power/Loop Connections

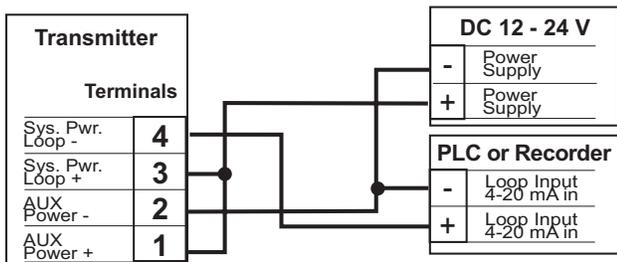
Stand-alone application, no current loop used



Connection to a PLC with built-in power supply

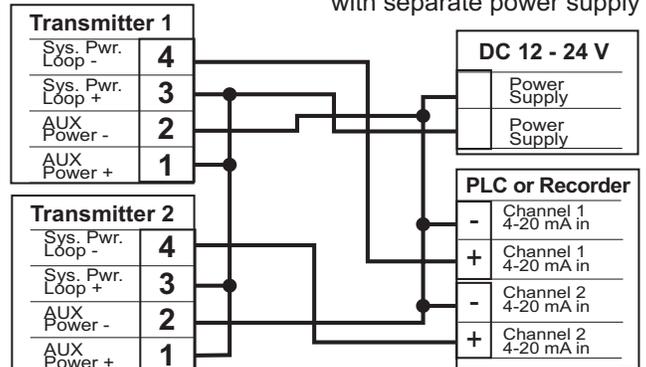


Connection to a PLC/Recorder, separate supply

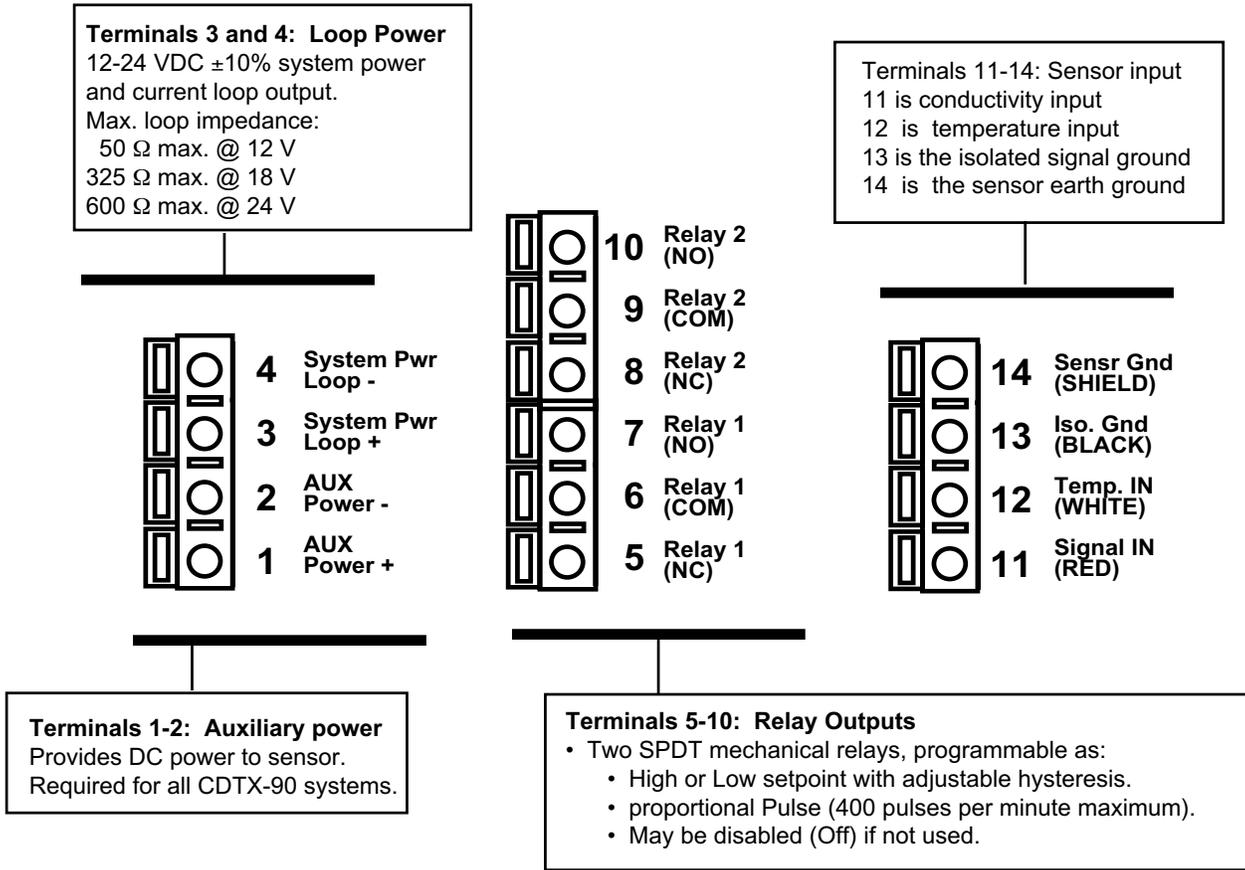


AUX power required for all CDTX-90 systems.

Example: Two transmitters connected to PLC/Recorder with separate power supply

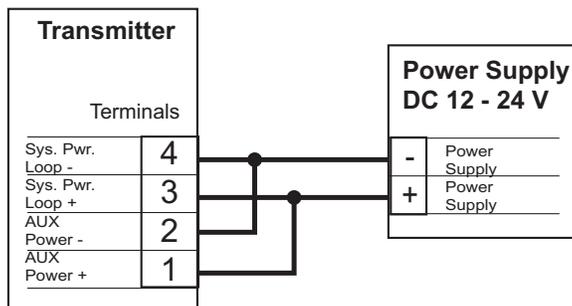


CDTX-90-2 Terminal Connections

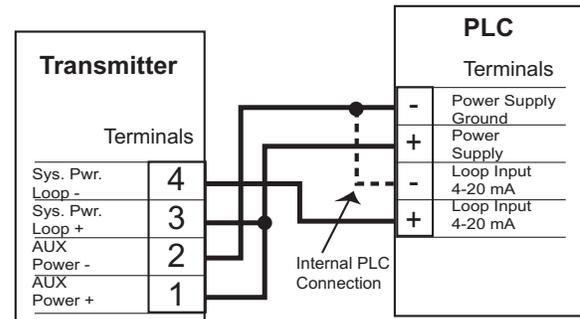


CDTX-90-2 System Power/Loop Connections

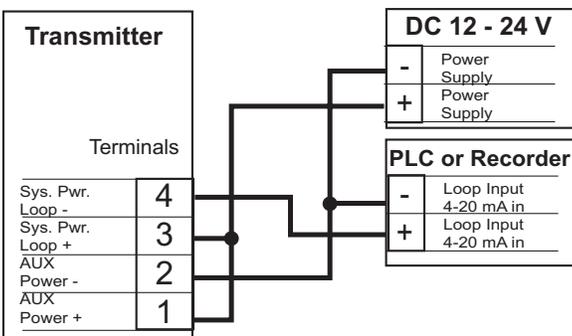
Stand-alone application, no current loop used



Connection to a PLC with built-in power supply

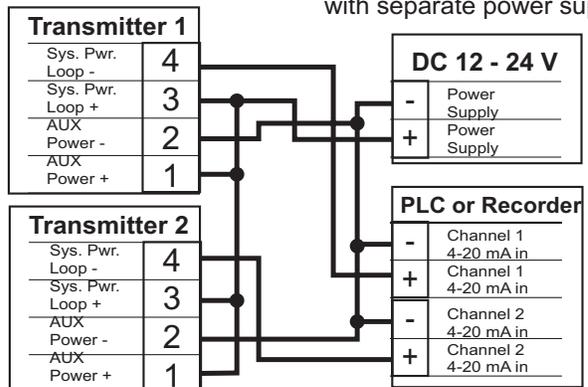


Connection to a PLC/Recorder, separate supply



AUX required for all CDTX-90 systems.

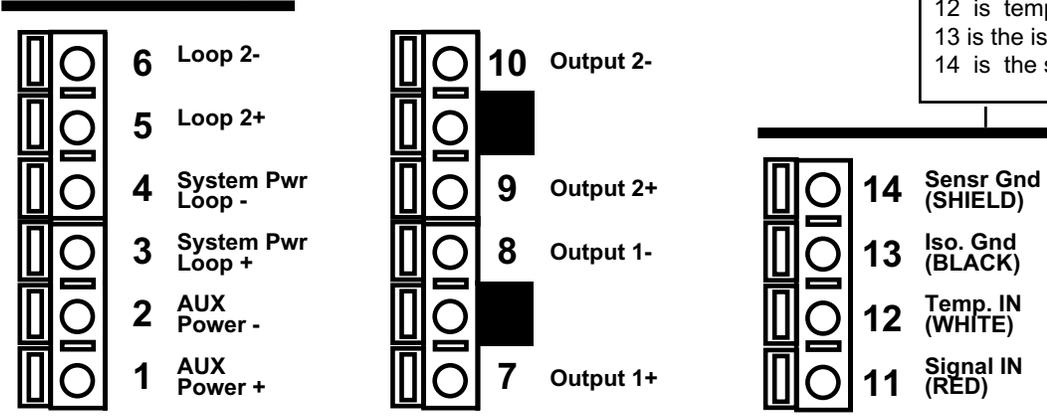
Example: Two transmitters connected to PLC/Recorder with separate power supply



CDTX-90-3 Terminal Connections

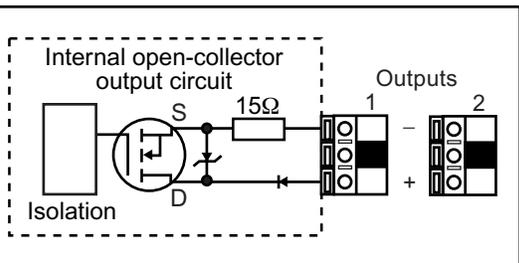
Terminals 3-6: Loop Power
 12-24 VDC $\pm 10\%$ system power and current loop output.
 Max. loop impedance:
 50 Ω max. @ 12 V
 325 Ω max. @ 18 V
 600 Ω max. @ 24 V

Terminals 11-14: Sensor input
 11 is conductivity input
 12 is temperature input
 13 is the isolated signal ground
 14 is the sensor earth ground



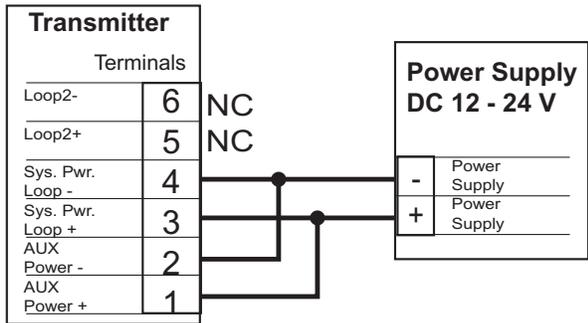
Terminals 1-2: Auxiliary power
 Provides DC power to measurement circuit. Required for all CDTX-90 systems.

Terminals 7-10: Open-collector Outputs
 • Two transistor outputs, programmable as:
 • High or Low setpoint with adjustable hysteresis
 • proportional pulse (to 400 pulses per minute maximum)
 • May be disabled (Off) if not used

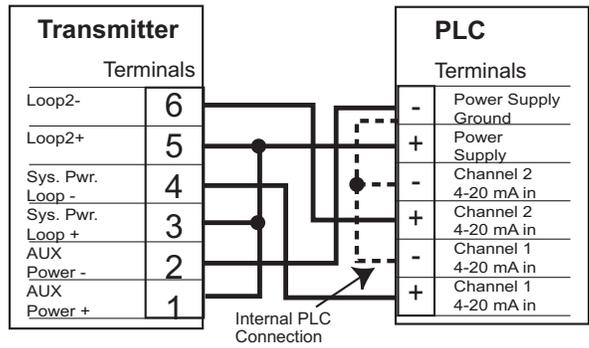


CDTX-90-3 System Power/Loop Connections

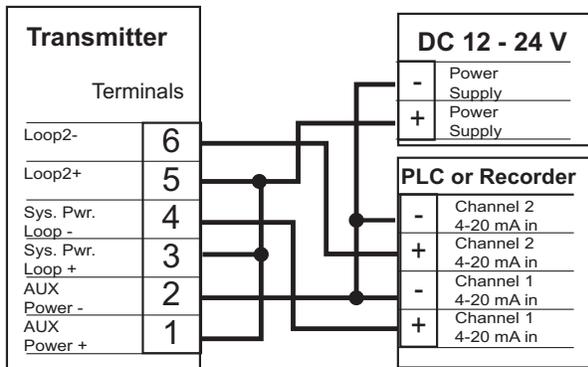
Stand-alone application, no current loop used



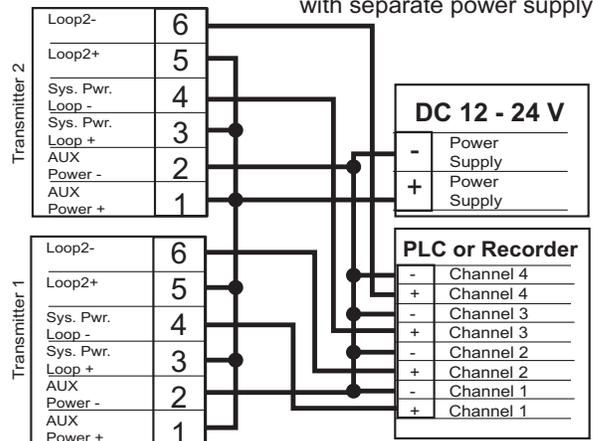
Connection to a PLC with built-in power supply



Connection to a PLC/Recorder, separate supply



Example: Two transmitters connected to PLC/Recorder with separate power supply



AUX power required for all CDTX-90 systems.

3.3 Relay and Open Collector Outputs

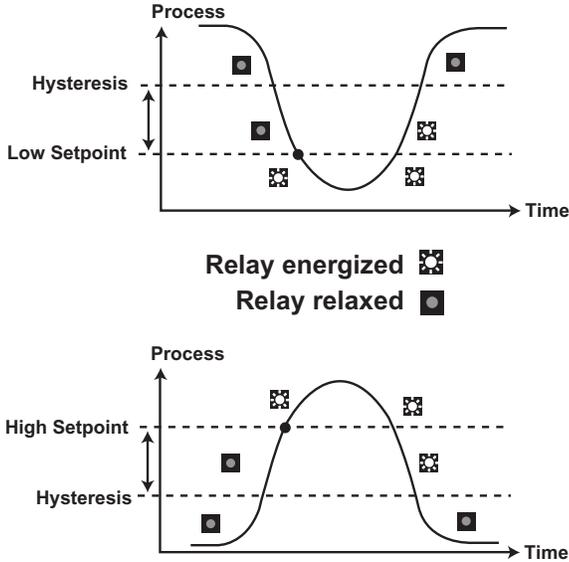
The Relay and Open Collector outputs can be used as a switch that responds when the process value moves above or below a setpoint, or they can be used to generate a pulsing signal with a rate proportional to the process value.

- **Low setpoint:**

Output triggers when process is less than the setpoint. The output will relax when the process moves above the setpoint plus the hysteresis value.

- **High setpoint:**

Output triggers when process is greater than the setpoint. The output will relax when the process moves below the setpoint plus the hysteresis value.



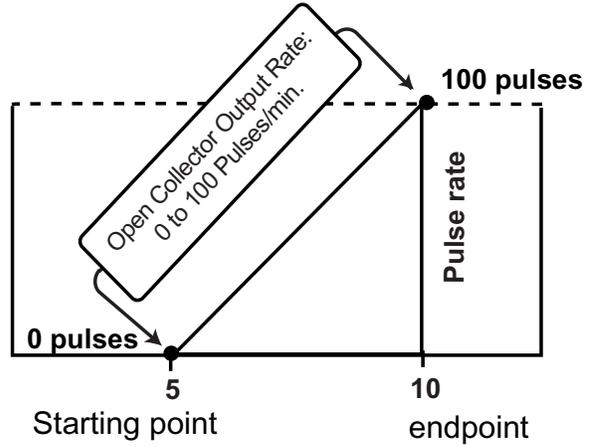
- **Proportional Pulsing**

The output will generate a 100 mS pulse at the rate defined by settings in the CALIBRATE menu.

In the example below:

- The output will be 0 pulses/min. when value is less than 5 μ S.
- The output will be 50 pulses/min. when value is 7.5 μ S.
- The output will be 100 when value is greater than 10 μ S.

The starting point, endpoint and maximum pulse rate are selectable in the CALIBRATE menu.

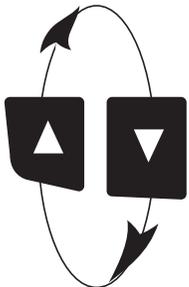


VIEW menu

- During normal operation, the transmitter displays the VIEW menu.
- When editing the CALIBRATE or OPTIONS menus, the transmitter will return to the VIEW menu if no activity occurs for 10 minutes.
- To select a VIEW display, press the UP or DOWN arrow keys. The selections will scroll in a continuous loop.
- Changing the VIEW display does not interrupt system operations.
- No key code is necessary to change display selection.
- Output settings cannot be edited from the VIEW menu.



CDTX-90 Series View Menu



Display	Description
123.45 μ S/cm +67.89 $^{\circ}$ C	Monitor the Conductivity and Temperature values from the sensor. This is the permanent display.

The VIEW displays below are temporary. The permanent display will return after 10 minutes

Loop Output: 13.75 mA	Monitor the Loop Current output.
Last CAL: 06-30-01	Check the Last Calibration date.

CDTX-90 Series Editing Procedure:

Step 1. Press and hold ENTER key:

- 2 seconds to select the CALIBRATE menu.
- 5 seconds to select the OPTIONS menu.

Step 2. The Key Code is UP-UP-UP-DOWN keys in sequence.

- After entering the Key Code, the display will show the first item in the selected menu.

Step 3. Scroll menu with UP or DOWN arrow keys.

Step 4. Press RIGHT ARROW key to select menu item to be edited.

- The first display element will begin flashing.

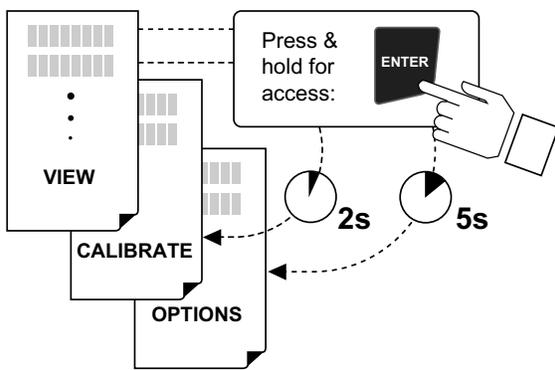
Step 5. Press UP or DOWN keys to edit the flashing element.

- RIGHT ARROW key advances the flashing element.

Step 6. Press ENTER key to save the new setting and return to Step 3.

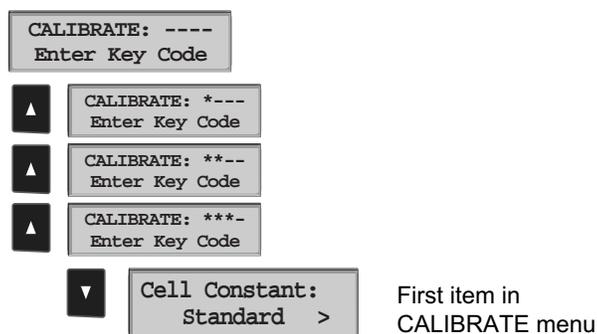
Notes on Step 1:

- The View Menu is normally displayed.
- The CALIBRATE and OPTIONS menus require a KEY CODE.



Notes on Step 2:

If no key is pressed for 5 minutes while display is showing "Enter Key Code", the display will return to the VIEW menu.

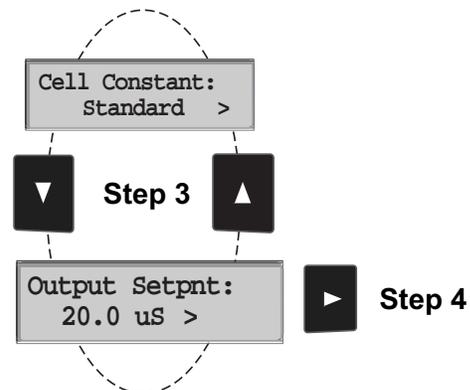


Notes on Steps 3 and 4:

- Refer to pages 8-13 for complete listing of menu items and their use.
- From the Step 3 display, pressing the UP and DOWN keys simultaneously will return the display to the VIEW menu.
- If no key is pressed for 10 minutes, display will also return to the VIEW menu.



Step 3: Finished Editing?
Press the UP and DOWN keys simultaneously after saving the last setting to return to normal operation.



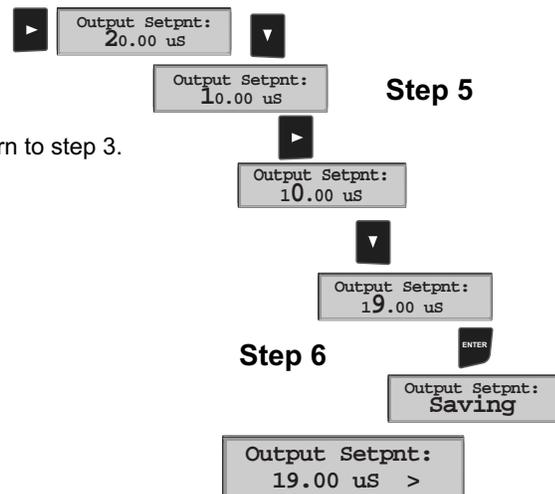
Notes on Steps 5 and 6:

- All output functions remain active during editing.
- Only the flashing element can be edited.
- RIGHT ARROW key advances the flashing element in a continuous loop.
- Edited value is effective immediately after pressing ENTER key.
- If no key is pressed for 10 minutes unit will restore the last saved value and return to step 3.
- Step 6 (pressing ENTER key) always returns you to Step 3.
- Repeat steps 3-6 until all editing is completed.

Step 5: Made an Error?

Press the UP and DOWN keys simultaneously while any element is flashing. This will recall the last saved value of the item being edited and return you to Step 3.





CDTX-90-1 Calibrate Menu

Display (Factory settings shown)	Description
Cell Constant: Standard >	Select CUSTOM only if you are connecting a certified conductivity sensor. Select STANDARD for all other systems.
Cell: Standard 1 >	For STANDARD sensors: Select from these options: 0.01, 0.1, 1.0, 10.0 or 20.0.
Cell: Custom 1.0000 >	For CUSTOM sensors: Enter the precise cell constant from the certificate provided with your sensor, or from the information label on the sensor.
Cond Units: uS >	Select from the following options: μ S, mS, k Ω , M Ω , PPM
PPM Factor: 2.00 >	If the Units selection is PPM, you can set the ratio of Total Dissolved Solids to μ S. See page 15 for additional information. The TDS factor can only be set in PPM.
Set: Temperature >	Adjust the temperature of the system based on an accurate external reference.
Set: Conductivity >	For use with STANDARD sensors: Perform this single-point wet calibration for most accurate results. Not required for CUSTOM sensors except for periodic system accuracy confirmation. Enter all zeroes to restore factory calibration to TEMP and COND settings.
Loop Source: Cond >	Select the input source to be associated with the current loop output: Conductivity or Temperature.
Loop Range: uS 0.0000 → 100.000 >	Select the minimum and maximum values for the current loop output. Be sure to modify this setting if you change the Cond. Units.
Output Source: Cond >	Select the source for the Open Collector output: Conductivity or Temperature
Output Mode: Low >	Select the mode of operation for the Open Collector output. Options available are High, Low or proportional Pulse. The signal may be disabled (Off) if not in use.
Output Setpnt: 10.0000 uS >	In Low or High Mode, this Open Collector output will be activated when the process reaches this value. Be sure to modify this setting if you change the Cond. Units.
Output Hys: 0.5000 uS >	The Open Collector output will be deactivated at Setpoint \pm Hysteresis, depending on High or Low Setpoint selection. (See details in section 3.3.)
Output Rng: uS 10.0000 → 40.0000 >	In Pulse mode, set the process values where the proportional pulse will start and where it will reach the maximum rate. Be sure to modify this setting if you change the Cond. Units.
Output PlsRate: 120 Pulses/Min >	In Pulse mode, set the maximum rate for the proportional Pulse output. The CDTX-90 will accept any value from 0 to 400.
Last CAL: 06-30-01 >	Use this "note pad" to record important dates, such as annual recertification or scheduled maintenance.

CDTX-90-1 Options Menu

Display (Factory settings shown)	Description
Contrast: 3 >	Adjust the LCD contrast for best viewing. A setting of 1 is lower contrast, 5 is higher. In general, select lower contrast if the display is in warmer ambient surroundings.
Cond Decimal: ****.* >	Set the decimal to the best resolution for your application. The display will automatically scale down to this restriction. Select *****, ****.*, ***.** **.* or *.*
Averaging Off >	OFF provides the most instantaneous response to process changes. Select LOW (4 sec) or HIGH (8 sec) averaging if your process experiences frequent or extreme fluctuations.
Loop Adjust: 4.00 mA >	Adjust the minimum and maximum current output. The display value represents the precise current output. Adjustment limits: • 3.80 mA < 4.00 mA > 5.00 mA • 19.00 mA < 20.00 mA > 21.00 ma Use this setting to match the system output to any external device.
Loop Adjust: 20.00 mA >	
Temp Display: °C >	Select °C or °F
Temperature Comp %: 2.00 >	Set the percent change in Conductivity caused by a 1°C change in temperature. May be from 0.00 to 10.00.
Output Active: Low >	Active HIGH: This setting is used to turn a device (pump, valve) ON at the setpoint. Active LOW: This setting is used to turn a device OFF at the setpoint.
Test Loop: >	Press UP and DOWN keys to manually order any output current value from 3.6 mA to 21.00 mA to test the output loop.
Test Output: >	Press UP and DOWN keys to manually toggle the Open Collector output state.

CDTX-90-2 Calibrate Menu

Display (Factory settings shown)	Description
Cell Constant: Standard >	Select CUSTOM only if you are connecting a certified conductivity sensor. Select STANDARD for all other systems.
Cell: Standard 1 >	For STANDARD sensors: Select from these options: 0.01, 0.1, 1.0, 10.0 or 20.0.
Cell: Custom 1.0000 >	For CUSTOM sensors: Enter the precise cell constant from the certificate provided with your sensor, or from the information label on the sensor.
Cond Units: μS >	Select from these options: μS , mS, k Ω , M Ω , PPM
PPM Factor: 2.00 >	If the Units selection is PPM, set the ratio of Total Dissolved Solids to μS . The maximum allowable is 3 μS = 1 PPM. The TDS factor can only be set in PPM.
Set: Temperature >	Adjust the temperature of the system based on an accurate external reference.
Set: Conductivity >	When using a h STANDARD sensor perform this single-point wet calibration for best accuracy. Not required for CUSTOM sensors except for periodic calibration checks.
Loop Source: Cond >	Select the input (Conductivity or Temperature) source to be associated with the current loop output:
Loop Range: μS 0.0000 → 100.000 >	Select the minimum and maximum values for the current loop output. Be sure to modify this setting if you change the Cond. Units.
Relay1 Source: Cond >	Select the source (Conductivity or Temperature) for this relay output:
Relay1 Mode: Low >	Select the mode of operation for the relay. Options available are High, Low or proportional Pulse. The relay may be disabled (Off) if not in use.
Relay1 Setpnt: 10.0000 μS >	In Low or High Mode, the relay will be activated when the process reaches this value. Be sure to modify this setting if you change the Cond. Units.
Relay1 Hys: μS 0.5000 >	The relay will be deactivated at Setpoint \pm Hysteresis, depending on High or Low Setpoint selection.
Relay1 Rng: μS 10.0000 → 40.0000 >	In Pulse mode, set the process values where the proportional pulse will start and where it will reach the maximum rate. Be sure to modify this setting if you change the Cond. Units.
Relay1 PlsRate: 120 Pulses/Min >	In Pulse mode, set the maximum rate for the proportional Pulse. The transmitter will accept any value from 0 to 400.
Last CAL: 06-30-01 >	Use this "note pad" to record important dates, such as annual recertification or scheduled maintenance.

CDTX-90-2 Options Menu

Display (Factory settings shown)	Description
Contrast: 3 >	Adjust the LCD contrast for best viewing. A setting of 1 is lower contrast, 5 is higher. In general, select lower contrast if the display is in warmer ambient surroundings.
Cond Decimal: ****.* >	Set the decimal to the best resolution for your application. The display will automatically scale down to this restriction. Select *****, ****.*, ***.*, **.* or *.*
Averaging: Off >	OFF provides the most instantaneous response to process changes. Select LOW (4 sec) or HIGH (8 sec) averaging if your process experiences frequent or extreme fluctuations.
Loop Adjust: 4.00 mA >	Adjust the minimum and maximum current output. The display value represents the precise current output. Adjustment limits: • 3.80 mA < 4.00 mA > 5.00 mA • 19.00 mA < 20.00 mA > 21.00 ma Use this setting to match the system output to any external device.
Loop Adjust: 20.00 mA >	
Temp Display: °C >	Select °C or °F.
Temperature Comp %: 2.00 >	Set the percent change in Conductivity caused by a 1°C change in temperature. May be from 0.00 to 10.00.
Test Loop: >	Press UP and DOWN keys to manually order any output current value from 3.6 mA to 21.00 mA to test the output loop.
Test Relay1: >	Press UP and DOWN keys to manually toggle the relay state.

CDTX-90-3 Calibrate Menu

Display (Factory settings shown)	Description
Cell Constant: Standard >	Select CUSTOM only if you are connecting a certified conductivity sensor. Select STANDARD for all other systems.
Cell: Standard 1 >	For STANDARD sensors: Select from these options: 0.01, 0.1, 1.0, 10.0 or 20.0.
Cell: Custom 1.0000 >	For CUSTOM sensors: Enter the precise cell constant from the certificate provided with your sensor, or from the information label on the sensor.
Cond Units: uS >	Select from the following options: μ S, mS, k Ω , M Ω , PPM
PPM Factor: 2.00 >	If the Units selection is PPM, you can set the ratio of Total Dissolved Solids to μ S. See section 3 of this manual for additional information. The TDS factor can only be set in PPM.
Set: Temperature >	Adjust the temperature of the system based on an accurate external reference.
Set: Conductivity >	For use with STANDARD sensors: Perform this single-point wet calibration for most accurate results. Not required for CUSTOM sensors except for periodic system accuracy confirmation. Enter all zeroes to restore factory calibration to TEMP and COND settings.
Loop1 Source: Cond >	Select the input source to be associated with the current loop output: Conductivity or Temperature
Loop1 Range: uS 0.0000 → 100.000 >	Select the minimum and maximum values for the current loop output. Be sure to modify this setting if you change the Cond. Units.
Output Source: Cond >	Select the source for the Open Collector output: Conductivity or Temperature
Output1 Mode: Low >	Select the mode of operation for the Open Collector output. Options available are High, Low or proportional Pulse. The signal may be disabled (Off) if not in use.
Output1 Setpnt: 10.0000 uS >	In Low or High Mode, this Open Collector output will be activated when the process reaches this value. Be sure to modify this setting if you change the Cond. Units.
Output1 Hys: 0.5000 uS >	The Open Collector output will be deactivated at Setpoint \pm Hysteresis, depending on High or Low Setpoint selection. (See details on page 4.)
Output1 Rng: uS 10.0000 → 40.0000 >	In Pulse mode, set the process values where the proportional pulse will start and where it will reach the maximum rate. Be sure to modify this setting if you change the Cond. Units.
Output1 PlsRate: 120 Pulses/Min >	In Pulse mode, set the maximum rate for the proportional Pulse output. The transmitter will accept any value from 0 to 400.
Last CAL: 06-30-01 >	Use this "note pad" to record important dates, such as annual recertification or scheduled maintenance.

Settings will repeat for Loop 2 and Output 2.

CDTX-90-3 Options Menu

Display (Factory settings shown)	Description
Contrast: 3 >	Adjust the LCD contrast for best viewing. A setting of 1 is lower contrast, 5 is higher. In general, select lower contrast if the display is in warmer ambient surroundings.
Cond Decimal: ****.* >	Set the decimal to the best resolution for your application. The display will automatically scale down to this restriction. Select *****., ****.*, ***.** **.* or * ****
Averaging Off >	OFF provides the most instantaneous response to process changes. Select LOW (4 sec) or HIGH (8 sec) averaging if your process experiences frequent or extreme fluctuations.
Loop1 Adjust: 4.00 mA >	Adjust the minimum and maximum current output. The display value represents the precise current output. Adjustment limits: • 3.80 mA < 4.00 mA > 5.00 mA • 19.00 mA < 20.00 mA > 21.00 ma Use this setting to match the system output to any external device.
Loop1 Adjust: 20.00 mA >	
Temp Display: °C >	Select °C or °F
Temperature Comp %: 2.00 >	Set the percent change in Conductivity caused by a 1°C change in temperature. May be from 0.00 to 10.00.
Output1 Active: Low >	Active HIGH: This setting is used to turn a device (pump, valve) ON at the setpoint. Active LOW: This setting is used to turn a device OFF at the setpoint.
Test Loop 1: >	Press UP and DOWN keys to manually order any output current value from 3.6 mA to 21.00 mA to test the output loop.
Test Output 1: >	Press UP and DOWN keys to manually toggle the Open Collector output state.

Settings will repeat for Loop 2 and Output 2.

Calibration Procedure

1. Requirements

The CDTX-90 Transmitter is factory calibrated using simulated input signals. System calibration will reduce errors caused by sensor wire lengths longer than the standard 15 ft. length. Wire lengths of 100 feet are acceptable; cable shield must be maintained through cable splice. Calibration may be done by known solution value (A), or by resistance simulation (B).

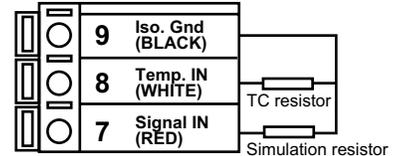
A) Calibration with NIST Traceable Solutions:

When using NIST traceable standards, ensure the sensor and test solution are at the solution temperature specified on the test solution label. Prevent contamination of the calibration solution. Thoroughly rinse the sensor in a small amount of test solution before placing in any test solution for calibration purposes.

B) Optional Verification with Precision Resistors:

The use of precision resistors ($\pm 0.1\%$) connected to the rear "Temp In", "Signal IN", and "Iso Gnd" terminals in place of the sensor, yields quick and accurate electronic instrument calibration. Calibration is completed as follows:

- 1) Select a standard cell constant based on desired range of operation.
- 2) Place a 1096 Ω (25°C) resistor between "Temp IN" and "Iso Gnd" terminals as shown.
Note: Temperature simulation errors can adversely effect calibration: 3.85 per °C.
- 3) Calculate the required simulation resistor that represents a value within the selected cell range. The formula for determining the required simulation resistance is:



$$\text{Resistance} = \frac{\text{Sensor Cell}}{\text{Desired conductivity (Siemens*)}} : \text{e.g.} \quad \frac{0.1 \text{ Cell}}{0.000020 \text{ (Siemens*)}} = 5,000 \Omega \text{ or } 5 \text{ K}\Omega$$

$$\text{Conductivity} = \frac{\text{Sensor Cell}}{\text{Simulation resistance } (\Omega)} : \text{e.g.} \quad \frac{0.1 \text{ Cell}}{100,000 (\Omega)} = 0.000001 \text{ Siemens*} \text{ or } 1 \mu\text{S/cm}$$

(*Conversion: 1 μS = 1 X 10⁻⁶ Siemens or 0.000001 Siemens)

- 4) Place the calculated simulation resistance between the "Signal IN" and "Iso Gnd" terminals as shown.
- 5) Set temperature and set conductivity. (Optional: Reset to factory calibration by entering zero as the "Set Conductivity" value.)

2. Temperature Coefficient

Conductivity measurement is highly dependent on temperature. Temperature dependence is expressed as the relative change per °C, commonly known as percent/°C change from 25°C, or slope of the solution.

Slopes can vary significantly depending on process solution type. The factory default temperature compensation factor is 2.00%/°C. Process solutions may require adjustment for maximum accuracy. To determine the optimum temperature compensation factor for a process:

1. Disable the temperature compensation % factor by entering 0.00.
2. Heat the sample solution close to the maximum process temperature. Place sensor in the sample solution allowing several minutes for stabilization. Access the VIEW menu and record the displayed temperature and conductivity values in the spaces provided:

Displayed temperature: T1 = _____ °C
 Displayed conductivity: C1 = _____ μS

(Do not use this procedure for solutions from 0.055 μS to 0.1 μS (10 M Ω to 18 M Ω). An internal pure water curve is used for these ranges. The factory default setting of 2.00%/°C should be used.)

3. Cool the sample solution close to the minimum process temperature. Place sensor in the sample solution allowing several minutes for stabilization. Record displayed temperature and conductivity values in the spaces provided:

Displayed temperature: T2 = _____ °C
 Displayed conductivity: C2 = _____ μS

(A 10% change in conductivity between steps 2 and 3 is recommended.)

4. Substitute recorded readings (steps 2 and 3) into the following formula:

$$\text{TC Slope} = \frac{100 \times (C1 - C2)}{(C2 \times (T1 - 25)) - (C1 \times (T2 - 25))}$$

Example: A sample solution has a conductivity of 205 μS @ 48°C. After cooling the solution, the conductivity was measured at 150 μS @ 23 °C. (C1 = 205, T1 = 48, C2 = 150, T2 = 23)

The TC is calculated as follows:

$$\text{TC Slope} = \frac{100 \times (205 - 150)}{(150 \times (48 - 25)) - (205 \times (23 - 25))} = \frac{5500}{3860} = 1.42\%/^{\circ}\text{C}$$

Parts Per Million (PPM) Factor

This feature is only applicable when PPM display units are selected. The programmable PPM Factor is adjustable from 0.01 to 3.00 (factory default = 2.00). Determine the best PPM Factor for a process solution by calculating the solution's conductivity (µS) and the percent of total dissolved solids (PPM).

$$\text{PPM Factor} = \frac{\text{Solution conductivity } (\mu\text{S})/\text{cm}}{\text{Total dissolved solids (PPM)}}$$

$$\text{TDS (PPM)} = \frac{\text{Solution conductivity } (\mu\text{S})/\text{cm}}{\text{PPM Factor}}$$

- Example:
- Solution conductivity = 400 µS/cm
 - TDS = 200 PPM (mg/L)

$$\text{PPM Factor} = \frac{400 \mu\text{S}/\text{cm}}{200 \text{ PPM}} = 2.00$$

Troubleshooting

Display Condition	Possible Causes	Suggested Solutions
"_ _ _ _"	Display is over range. This may be a normal condition if your process operates at/near the limits of the sensor range. kΩ or MΩ units selected & sensor is open.	Check sensor for correct range. Check Decimal setting in OPTIONS menu. Check Calibrate menu settings for incompatible SOURCE and RANGE values.
Value Must be less than 3	The PPM factor must be a value from 0.00 to 3.00	Set a PPM value less than 3.
Value must be greater than 0	Custom cell constant cannot be set to 0	Set cell constant to a value greater than 0
"Value must be 400 or less"	Pulse Rate cannot be greater than 400	set a pulse rate value less than 400
Display erratic, shows "0" or "-----" intermittently	Auxiliary Power not connected	Connect Auxiliary power
"Too much Error Check Sensor"	Defective or dirty/coated sensor Wiring error Fluid conductivity too low Defective temp element	Clean or replace sensor Check and correct wiring Replace sensor

Technical notes

If a Current Loop is locked at 3.6 mA, the problem is related to the temperature circuit:
This occurs only if the CDTX-90 detects a resistance from the temperature sensor that is less than 250Ω or greater than 2800Ω.

- Check the sensor wiring for open/short or poor connections on white (TEMP IN) and black (ISO GND)wires.
- The PT1000 temperature device in the sensor is defective.
- The transmitter is defective.

Auxiliary Power (terminals 1 and 2) must ALWAYS be connected for the CDTX-90 to operate.



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.

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