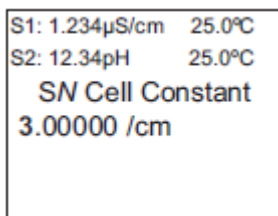


6.5.4 Enter a cell constant

Figure 6-36 displays the screen from which you can enter the cell constant.

Figure 6-36: Cell Constant Screen



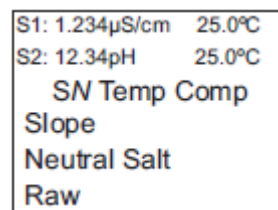
S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Cell Constant
3.00000 /cm

The default value is displayed in bold type. Refer to Figure 6-31 to enter the cell constant.

6.5.5 Select temperature compensation

Figure 6-37 displays the screen from which you can select the temperature compensation.

Figure 6-37: Temperature Compensation Screen



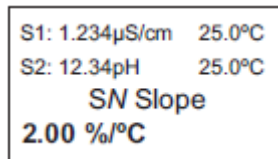
S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Temp Comp
Slope
Neutral Salt
Raw

Refer to Figure 6-31 to select the temperature compensation.

6.5.6 Enter slope

Figure 6-38 displays the screen on which you can enter the conductivity/temperature slope.

Figure 6-38: Slope Screen



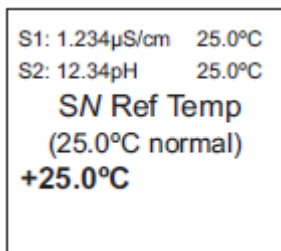
S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Slope
2.00 %/°C

The default value is displayed in bold type. Refer to Figure 6-31 to enter the slope.

6.5.7 Enter the reference temperature

Figure 6-39 displays the screen on which you can manually enter the reference temperature.

Figure 6-39: Reference Temperature Screen

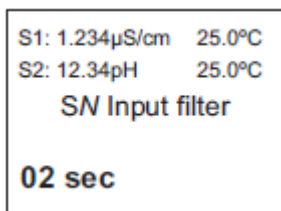


The default value is displayed in bold type. Refer to Figure 6-31 to enter the reference temperature.

6.5.8 Enter input filter value

Figure 6-40 displays the screen on which you can enter the input filter time in seconds.

Figure 6-40: Input Filter Screen

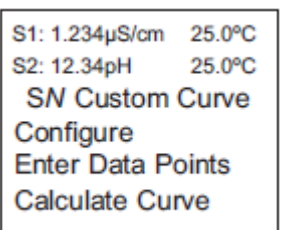


The default value is displayed in bold type. Refer to Figure 6-31 to enter the input filter time.

6.5.9 Create custom curve

Figure 6-41 displays the screen from which you can create a custom curve to convert conductivity to concentration.

Figure 6-41: Custom Curve Screen



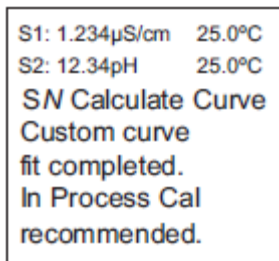
Refer to Figure 6-31 to complete this task.

Procedure

Enter the custom curve data and press **ENTER**.

The display confirms the determination of a custom curve fit to the entered data by displaying [Figure 6-42](#).

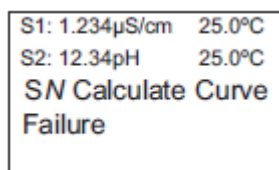
Figure 6-42: Calculate Curve Screen



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Calculate Curve
Custom curve
fit completed.
In Process Cal
recommended.

If the custom curve fit is not completed or is unsuccessful, [Figure 6-43](#) appears and the transmitter returns to the screen shown in [Figure 6-41](#).

Figure 6-43: Curve Failure Screen



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Calculate Curve
Failure

6.6 Program chlorine measurement

With a chlorine measurement board installed, the transmitter can measure any of four variants of chlorine.

- Free chlorine
- Total chlorine
- Monochloramine
- pH-independent free chlorine

6.6.1 Program free chlorine measurement

Configure the Rosemount 1056 transmitter for free chlorine measurement using amperometric chlorine sensors.

Figure 6-44: Chlorine Measurements Flow Diagram

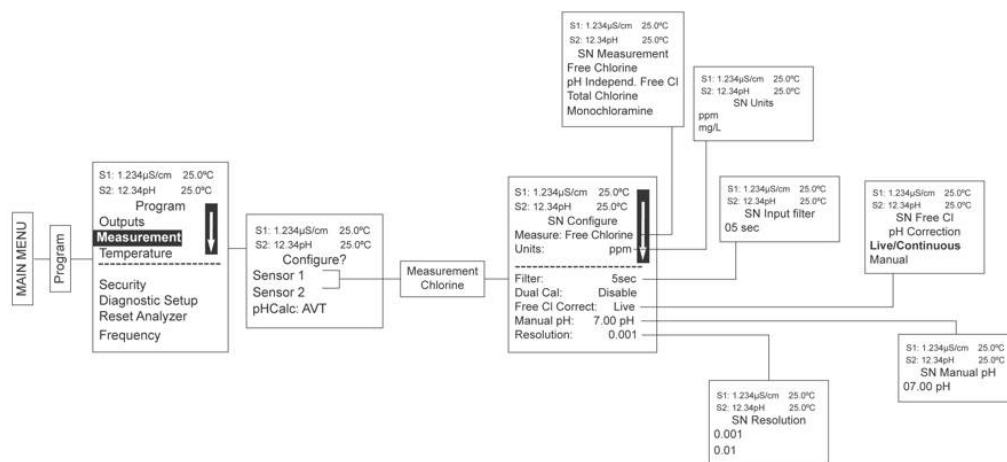


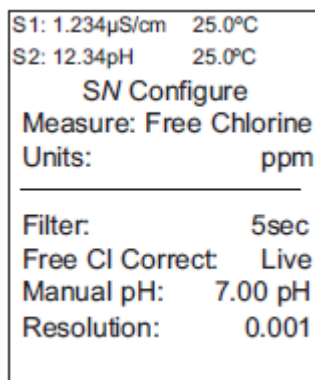
Figure 6-44 is a detailed flow diagram to guide you through all basic programming and configuration functions.

To configure the measurement board for free chlorine:

Procedure

1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to free chlorine. Press **ENTER**.
Figure 6-45 appears; factory default settings are shown.

Figure 6-45: Configure Free Chlorine Screen

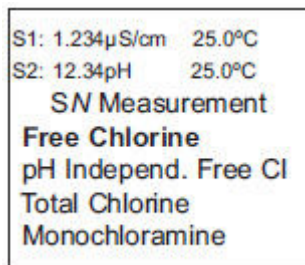


5. To change any setting, scroll to the desired item and press **ENTER**.

Select measurement type

Figure 6-46 displays the screen from which you can select the measurement type.

Figure 6-46: Measurement Screen



The default value is displayed in bold type.

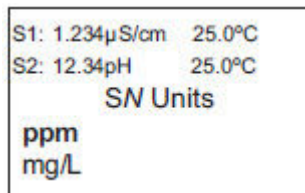
Procedure

1. Select Free Chlorine.
2. Press **ENTER**.

Select measurement unit

Figure 6-47 displays the screen from which you can select a measurement unit.

Figure 6-47: Units Screen



The default value is displayed in bold type.

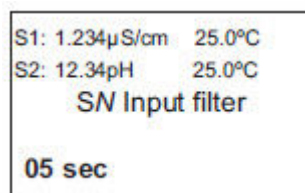
Procedure

Refer to Figure 6-44 to select a measurement unit.

Enter input filter value

Figure 6-48 displays the screen on which you can enter the input filter value for free chlorine in seconds.

Figure 6-48: Input Filter Screen



The default value is displayed in bold type.

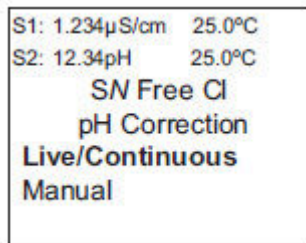
Procedure

Refer to [Figure 6-44](#) to enter an input filter value.

Select pH correction

[Figure 6-49](#) displays the screen from which you can select live/continuous pH correction or manual pH correction.

Figure 6-49: Free Chlorine pH Correction Screen



The default value is displayed in bold type.

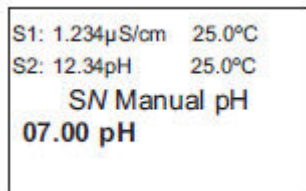
Procedure

Refer to [Figure 6-44](#) to select the pH correction.

Enter pH correction manually

[Figure 6-50](#) displays the screen on which you can manually enter the pH value of the measured process liquid.

Figure 6-50: Manual pH Screen



The default value is displayed in bold type.

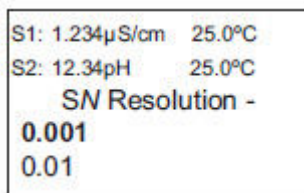
Procedure

Refer to [Figure 6-44](#) to enter a pH value manually.

Select display resolution

Figure 6-51 displays the screen from which you can select a display resolution.

Figure 6-51: Resolution Screen



The default value is displayed in bold type.

Procedure

Refer to Figure 6-44 to select a display resolution.

6.6.2 Program total chlorine measurement

Configure the transmitter for total chlorine measurement using amperometric chlorine sensors.

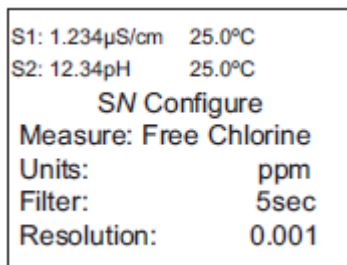
Figure 6-44 is a detailed flow diagram for programming all chlorine measurements.

To configure the chlorine measurement board for total chlorine:

Procedure

1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to chlorine. Press **ENTER**.
Figure 6-52 will appear; factory default settings are shown.

Figure 6-52: Configure Chlorine Screen



5. To change any setting, scroll to the desired item and press **ENTER**.

Select measurement type

Figure 6-53 displays the screen from which you can select the type of chlorine measurement.

Figure 6-53: Measurement Screen



The default value is displayed in bold type.

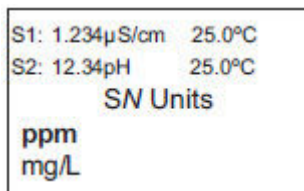
Procedure

Refer to Figure 6-44 to select a measurement type.

Select measurement units

Figure 6-54 displays the screen from which you can select measurement units as ppm or mg/L.

Figure 6-54: Units Screen



The default value is displayed in bold type.

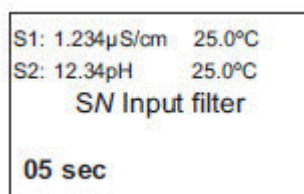
Procedure

Refer to Figure 6-44 to select measurement units.

Enter input filter value

Figure 6-55 displays the screen on which you can enter the input filter value in seconds.

Figure 6-55: Input Filter Screen



The default value is displayed in bold type.

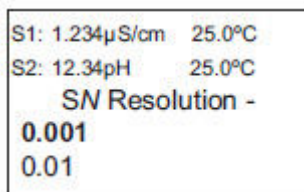
Procedure

Refer to [Figure 6-44](#) to enter the input filter value.

Select display resolution

[Figure 6-56](#) displays the screen from which you can select the display resolution.

Figure 6-56: Resolution Screen



The default value is displayed in bold type.

Procedure

Refer to [Figure 6-44](#) to select the display resolution.

6.6.3

Program monochloramine measurement

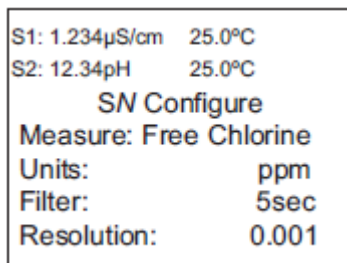
Configure the transmitter to measure monochloramine using amperometric chlorine sensors.

To configure the chlorine measurement board for monochloramine:

Procedure

1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to chlorine. Press **ENTER**.
[Figure 6-57](#) appears; factory default settings are shown.

Figure 6-57: Configure Chlorine Screen

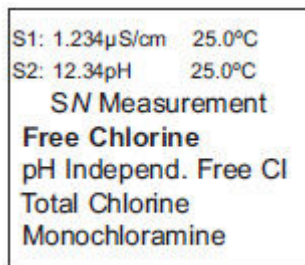


5. To change any settings, scroll to the desired item and press **ENTER**.

Select measurement type

Figure 6-58 displays the screen from which you can select the type of chlorine to measure.

Figure 6-58: Measurement Screen



The default value is displayed in bold type.

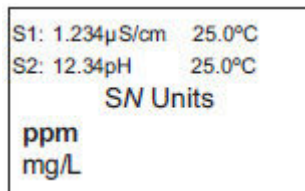
Procedure

Refer to Figure 6-44 to select the monochloramine measurement type.

Select measurement units

Figure 6-59 displays the screen from where you can select measurement units: ppm or mg/L.

Figure 6-59: Units Screen



The default value is displayed in bold type.

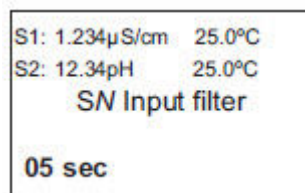
Procedure

Refer to Figure 6-44 to select measurement units.

Enter input filter value

Figure 6-60 shows the screen on which you can enter the input filter value in seconds.

Figure 6-60: Input Filter Screen



The default value is displayed in bold type.

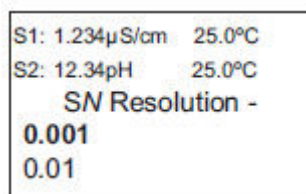
Procedure

Refer to [Figure 6-44](#) to enter the input filter value.

Select display resolution

[Figure 6-61](#) displays the screen from which you can enter the display resolution.

Figure 6-61: Resolution Screen



The default value is displayed in bold type.

Procedure

Refer to [Figure 6-44](#) to select the display resolution.

6.6.4 Program pH-independent free chlorine measurement

Configure the transmitter to measure pH-independent free chlorine using amperometric chlorine sensors.

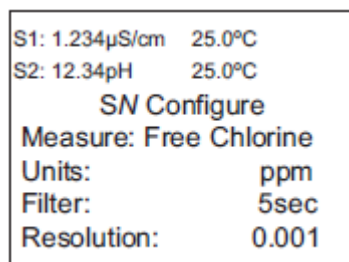
See [Figure 6-44](#) to guide you through configuring the transmitter to measure pH-independent free chlorine.

To configure the chlorine measurement board for pH-independent free chlorine:

Procedure

1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to chlorine. Press **ENTER**.
[Figure 6-62](#) appears; factory default settings are shown.

Figure 6-62: Configure Chlorine Measurement Screen

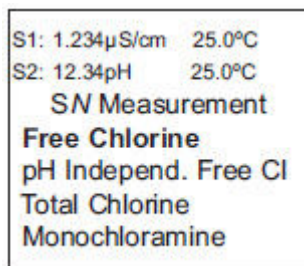


Select the pH-independent free chlorine measurement

Procedure

1. From the **Configure Chlorine** screen, select Measurement.
[Figure 6-63](#) appears. The default value is displayed in bold text.

Figure 6-63: Measurement Screen



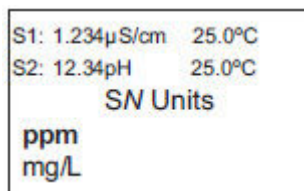
2. Select pH Independ. Free Cl.

Select measurement units

Procedure

1. From the **Configure Chlorine** screen, select Units.
[Figure 6-64](#) appears. The default value is displayed in bold type.

Figure 6-64: Units Screen



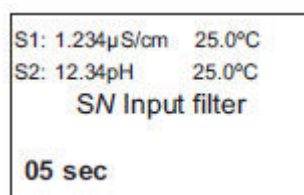
2. Refer to [Figure 6-44](#) to select units.

Enter input filter value

Procedure

1. From the **Configure Chlorine** screen, select Filter.
[Figure 6-65](#) appears. The default value is displayed in bold type.

Figure 6-65: Input Filter Screen



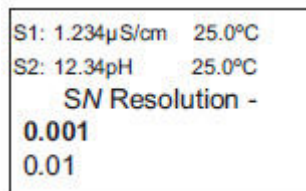
2. Refer to [Figure 6-44](#) to enter the input filter value in seconds.

Select display resolution

Procedure

1. From the **Configure Chlorine** screen, select Resolution. [Figure 6-66](#) appears. The default value is displayed in bold type.

Figure 6-66: Resolution Screen



2. Refer to [Figure 6-44](#) to select a display resolution.

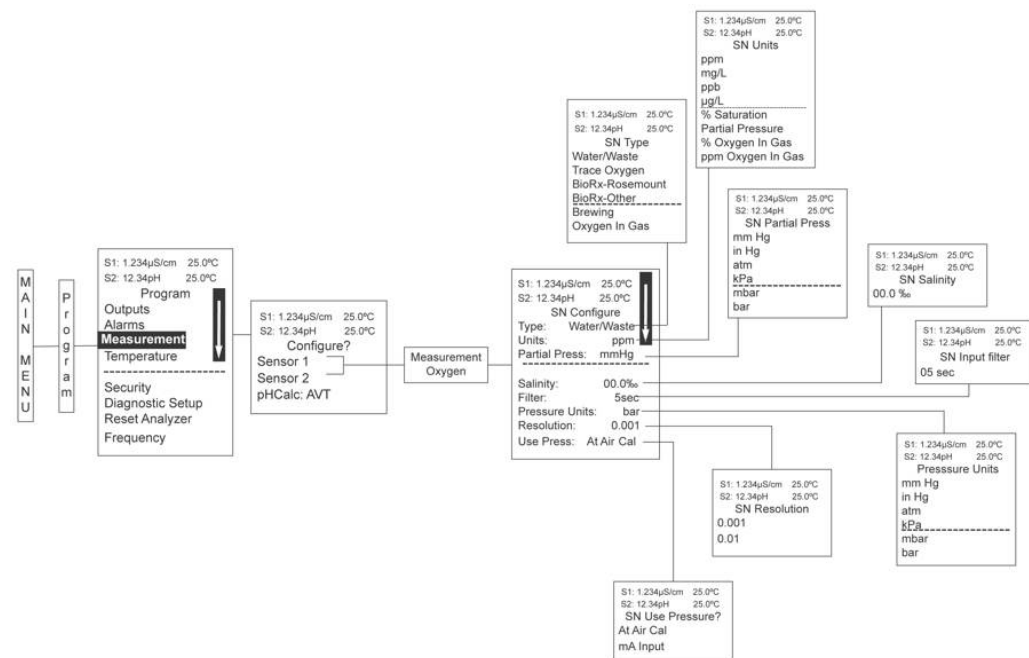
6.7

Program oxygen measurement

You can configure the Rosemount 1056 transmitter to measure dissolved and gaseous oxygen using amperometric oxygen sensors.

[Figure 6-67](#) is a detailed diagram for oxygen programming to guide you through all basic programming and configuration functions.

Figure 6-67: Programming Oxygen Measurement



To configure the oxygen measurement board.

Procedure

1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to oxygen. Press **ENTER**.
[Figure 6-68](#) appears; factory default settings are shown.

Figure 6-68: Configure Oxygen Screen

S1: 1.234µS/cm	25.0°C
S2: 12.34pH	25.0°C
SN Configure	
Type:	Water/Waste
Units:	ppm
Partial Press:	mmHg
Salinity:	00.0‰
Filter:	5sec
Pressure Units:	bar
Use Press:	At Air Cal
Custom Setup	

5. To change a setting, scroll to the desired item and press **ENTER**.

6.7.1 Select oxygen measurement application

Procedure

1. From the **Configure Oxygen** screen, select Type.
[Figure 6-69](#) appears.

Figure 6-69: Type Screen

S1: 1.234µS/cm	25.0°C
S2: 12.34pH	25.0°C
SN Type	
Water/Waste	
Trace Oxygen	
BioRx-Rosemount	
BioRx-Other	
Brewing	
Oxygen In Gas	

2. Refer to [Figure 6-67](#) to select the application.

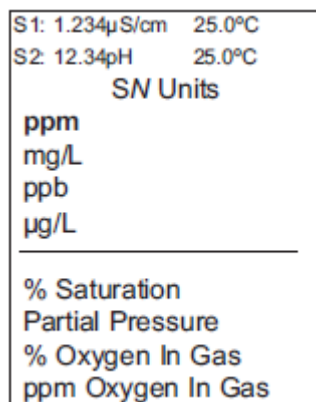
6.7.2 Select measurement units

The default value is displayed in **bold type**.

Procedure

1. From the **Configure Oxygen** screen, select Units.
[Figure 6-70](#) appears.

Figure 6-70: Units Screen



Measurement unit options are:

- ppm
- mg/L
- ppb
- µg/L
- % Saturation
- Partial Pressure
- % Oxygen in Gas
- ppm Oxygen in Gas

2. Refer to [Figure 6-67](#) to select a measurement unit.

6.7.3 Select partial pressure units

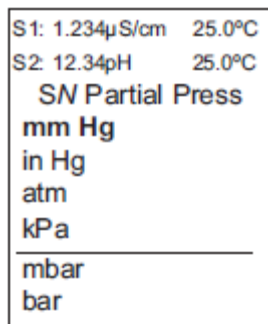
If you select Partial Pressure as the measurement unit on the **Units** screen, you need to select the partial pressure measurement units.

Procedure

1. From the **Configure Oxygen** screen, select Units.
The **Units** screen appears.

2. Select Partial Pressure.
[Figure 6-71](#) appears.

Figure 6-71: Partial Pressure Screen



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Partial Press
mm Hg
in Hg
atm
kPa
mbar
bar

Partial pressure options are:

- mm Hg
- in Hg
- atm (atmospheric)
- kPa
- mbar
- bar

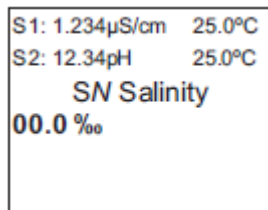
3. Refer to [Figure 6-67](#) to select a partial pressure unit.

6.7.4 Enter salinity

Procedure

1. From the **Configure Oxygen** screen, select Salinity.
[Figure 6-72](#) appears.

Figure 6-72: Salinity Screen



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Salinity
00.0 ‰

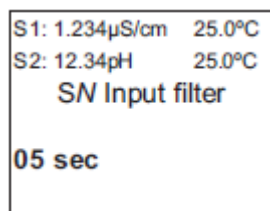
2. Enter the percentage of salinity in the process liquid.
Refer to [Figure 6-67](#).

6.7.5 Enter input filter value

Procedure

1. From the **Configure Oxygen** screen, select Filter.
[Figure 6-73](#) appears.

Figure 6-73: Input Filter Screen



2. Refer to [Figure 6-67](#) to enter the input filter value in seconds.

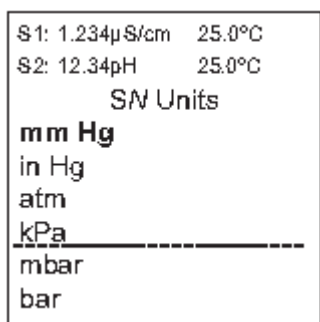
6.7.6 Select atmospheric pressure units

Select atmospheric pressure units to determine how the transmitter will display atmospheric pressure measured by the pressure transducer on the oxygen measurement board.

Procedure

1. From the **Configure Oxygen** screen, select Pressure Units.
[Figure 6-74](#) appears.

Figure 6-74: Units Screen



Pressure unit options are:

- mm Hg
- in Hg
- atm (atmospheric)
- kPa
- mbar
- bar

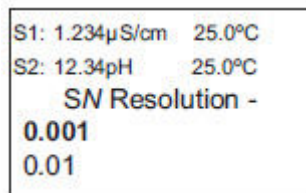
2. Refer to [Figure 6-67](#) to select the atmospheric pressure unit.

6.7.7 Enter display resolution

Procedure

1. From the **Oxygen Configure** screen, select Resolution.
[Figure 6-75](#) appears.

Figure 6-75: Resolution Screen



S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Resolution -
0.001
0.01

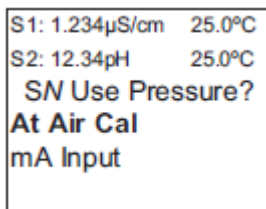
2. Refer to [Figure 6-67](#) to select the display resolution.

6.7.8 Select oxygen atmospheric pressure source

Procedure

1. From the **Oxygen Configure** screen, select Use Press.
[Figure 6-76](#) appears.

Figure 6-76: Use Pressure Screen



S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Use Pressure?
At Air Cal
mA Input

2. Refer to [Figure 6-67](#) to select the atmospheric pressure source.

6.8 Program ozone measurement

You can configure the Rosemount 1056 transmitter to measure ozone using amperometric ozone sensors.

Figure 6-77: Ozone Measurement Flow Diagram

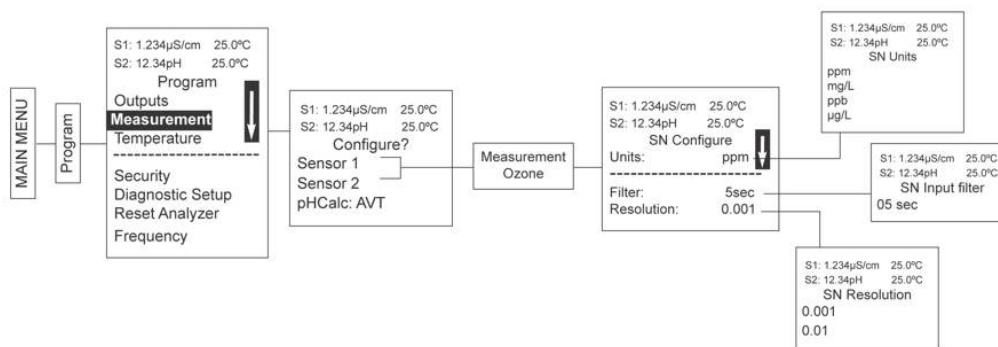


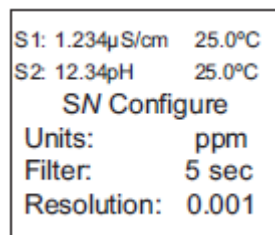
Figure 6-77 is a detailed flow diagram for ozone programming to guide you through all basic programming and configuration functions.

To configure the ozone measurement board:

Procedure

1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to ozone. Press **ENTER**.
Figure 6-78 appears; factory default settings are shown.

Figure 6-78: Configure Ozone Screen



5. To program any displayed function, scroll to the desired item and press **ENTER**.

Note

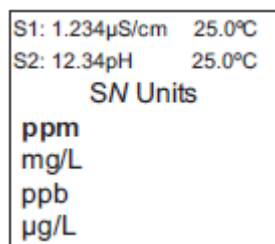
The transmitter automatically detects ozone measurement boards. You don't need to select a measurement type.

6.8.1 Select measurement units

Procedure

1. From the **Ozone Configure** screen, select Units.
[Figure 6-79](#) appears.

Figure 6-79: Units Screen



Ozone measurement unit options are:

- ppm
- mg/L
- ppb
- µg/L

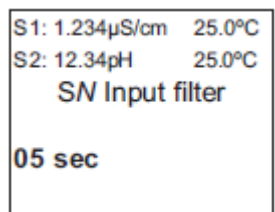
2. Refer to [Figure 6-77](#) to select a measurement unit.

6.8.2 Enter input filter value

Procedure

1. From the **Ozone Configure** screen, select Filter.
[Figure 6-80](#) appears.

Figure 6-80: Input Filter Screen



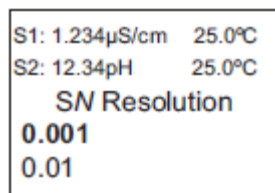
2. Refer to [Figure 6-77](#) to enter the input filter value in seconds.

6.8.3 Select display resolution

Procedure

1. From the **Ozone Configure** screen, select Resolution.
[Figure 6-81](#) appears.

Figure 6-81: Resolution Screen



- Refer to Figure 6-77 to select the display resolution.

6.9 Program turbidity measurement

Configure the Rosemount 1056 to measure turbidity.

Figure 6-82: Turbidity Flow Diagram

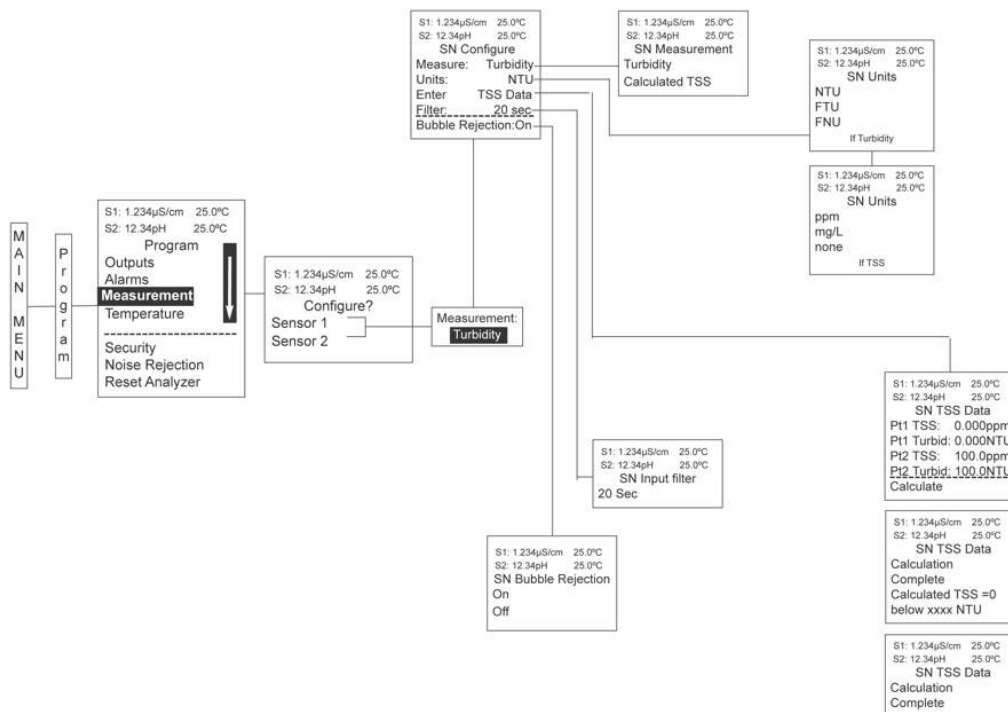


Figure 6-82 is a detailed flow diagram for turbidity programming; use it to guide you through all basic programming and configuration functions.

To configure the turbidity measurement board:

Procedure

- Press **MENU**.
- Scroll down to **Program**. Press **ENTER**.
- Scroll down to **Measurement**. Press **ENTER**.

4. Select Sensor 1 or Sensor 2 corresponding to turbidity. Press **ENTER**.
[Figure 6-83](#) appear; factory default settings are shown.

Figure 6-83: Configure Turbidity Screen

```

S1: 1.234µS/cm  25.0°C
S2: 12.34pH     25.0°C
  SN Configure
Measure:   Turbidity
Units:     NTU
Enter TSS Data
Filter:     20sec
-----
Bubble Rejection: On
  
```

5. To change a setting, scroll to the desired item and press **ENTER**.

6.9.1 Select turbidity measurement

The display screen for selecting the measurement is shown.

```

S1: 1.234µS/cm  25.0°C
S2: 12.34pH     25.0°C
  SN Measurement
Turbidity
Calculated TSS
  
```

The default value is displayed in **bold type**.

Procedure

Refer to [Figure 6-82](#) to complete this function.

6.9.2 Select turbidity units

The display screen for selecting the measurement units is shown.

```

S1: 1.234µS/cm  25.0°C
S2: 12.34pH     25.0°C
  SN Units
NTU
FTU
FNU
  
```

The default value is displayed in **bold type**.

Procedure

Refer to [Figure 6-82](#) to complete this function.

If you select the total suspended solids (TSS) calculation, the following screen will be displayed.

```

S1: 1.234µS/cm  25.0°C
S2: 12.34pH     25.0°C
      SN Units
ppm
mg/L
none
    
```

6.9.3 Enter TSS Data

The display screen for selecting total suspended solids (TSS) data is shown.

```

S1: 1.234µS/cm  25.0°C
S2: 12.34pH     25.0°C
      SN TSS Data
Pt1 TSS: 0.000ppm
Pt1 Turbid: 0.000NTU
Pt2 TSS: 100.0ppm
Pt2 Turbid: 100.0NTU
-----
Calculate
    
```

The default values are displayed.

Procedure

1. Refer to [Figure 6-82](#) to complete this function.

Note

Based on user-entered NTU data, calculating TSS as a straight line curve could cause TSS to go below zero. The following screen lets you know that TSS will become zero below a certain NTU value.

```

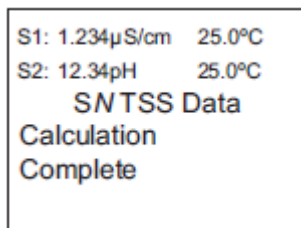
S1: 1.234µS/cm  25.0°C
S2: 12.34pH     25.0°C
      SN TSS Data
Calculation Complete
Calculated TSS = 0 below
xxxx NTU
    
```

[Figure 6-84](#) shows the potential for calculated TSS to go below zero.

Figure 6-84: TSS and Turbidity

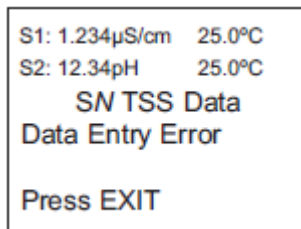
- A. Normal case: TSS is always a positive number when turbidity is a positive number.
- B. Abnormal case: TSS can be a negative number when turbidity is a positive number.

2. After entering TSS data, press **ENTER**.
The display confirms the determination of a TSS straight line curve fit to the entered NTU/turbidity data by displaying this screen:



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SNTSS Data
Calculation
Complete

The following screen may appear if TSS calculation is unsuccessful.

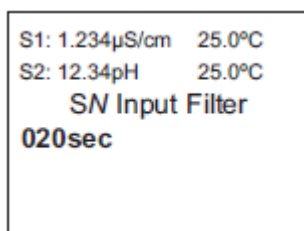


S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN TSS Data
Data Entry Error
Press EXIT

If you see this screen, you need to re-enter NTU and TSS data.

6.9.4 Enter turbidity input filter value

The display screen for entering the input filter value in seconds is shown.



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Input Filter
020sec

The default value is displayed in **bold type**.

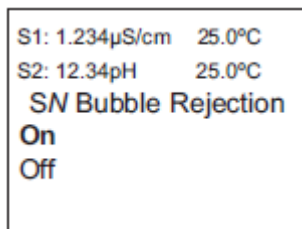
Procedure

Refer to [Figure 6-82](#) to complete this function.

6.9.5 Enable bubble rejection

Bubble rejection is an internal software algorithm that characterizes turbidity readings as bubbles as opposed to true turbidity of the sample. With bubble rejection enabled, these erroneous readings are eliminated from the live measurements shown on the display and transmitted via the current outputs.

The display screen for selecting bubble rejection is shown.



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Bubble Rejection
On
Off

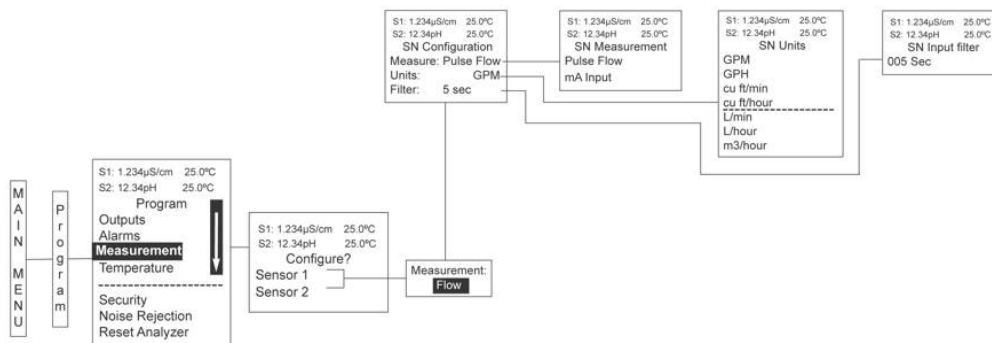
Procedure

Refer to [Figure 6-82](#) to complete this function.

6.10 Program flow measurement

You can configure the transmitter to measure flow using a compatible pulse flow sensor.

Figure 6-85: Flow Measurement Diagram



To configure the flow measurement board:

Procedure

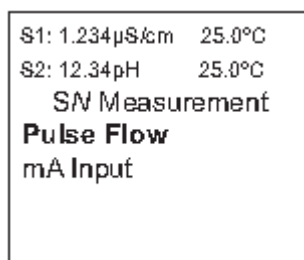
1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to flow. Press **ENTER**.

6.10.1 Select measurement type

Procedure

1. From the **Configure Pulse Flow** screen, select Measure.
[Figure 6-86](#) appears. The default measurement is displayed in bold type.

Figure 6-86: Measurement Screen



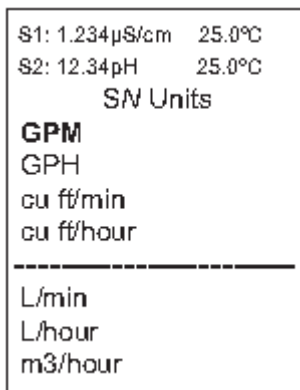
2. Refer to [Figure 6-85](#) to select a measurement type.

6.10.2 Select measurement units

Procedure

1. From the **Configure Pulse Flow** screen, select Units.
[Figure 6-87](#) appears. The default measurement unit is displayed in bold type.

Figure 6-87: Unit Screen



Flow unit options are:

- GPM
- GPH
- cu ft/min
- cu ft/hour
- L/min
- L/hour
- m3/hour

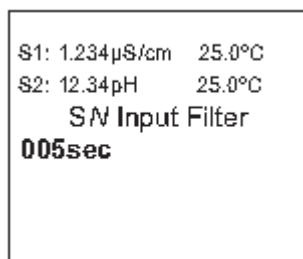
2. Refer to [Figure 6-85](#) to select a measurement unit.

6.10.3 Enter input filter value

Procedure

1. From the **Configure Pulse Flow** screen, select Filter.
Figure 6-88 appears. The default value is displayed in bold type.

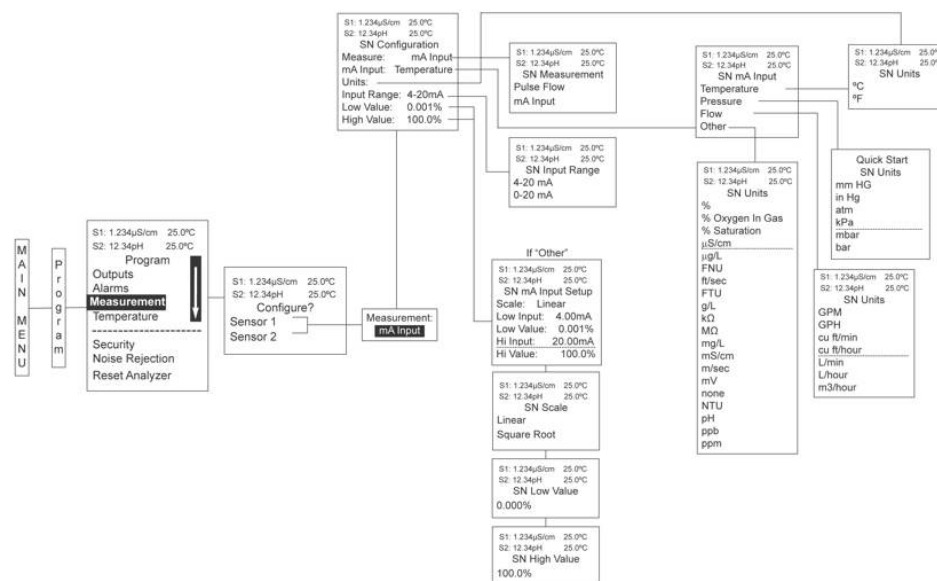
Figure 6-88: Input Filter Screen



2. Refer to **Figure 6-85** to enter an input filter value in seconds.

6.11 Program current input measurement

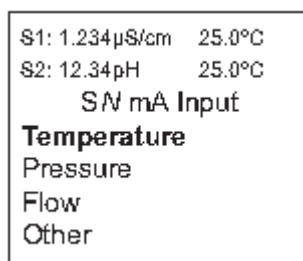
Figure 6-89: Current Input Programming Flow Diagram



Procedure

1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to the current input. Press **ENTER**.
The factory default is Pulse Flow, not mA Input.
5. To enable the current input functionality, override the factory default and select mA Input.
[Figure 6-90](#) appears. The default measurement type is displayed in bold font.

Figure 6-90: mA Input Screen



mA input options are:

- Temperature
- Pressure
- Flow
- Other

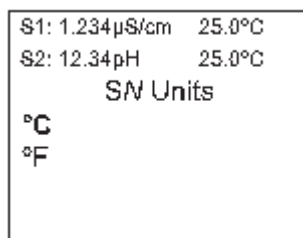
6. Refer to [Figure 6-89](#) to select an input type.

6.11.1 Select measurement units

Procedure

1. From the **Pulse Flow Configure** screen, select Units.
 - If you selected Temperature as the measurement type, [Figure 6-91](#) appears.

Figure 6-91: Temperature Units Screen



- If you selected Pressure as the measurement type, [Figure 6-92](#) appears.

Figure 6-92: Pressure Units Screen

S1: 1.234 μ S/cm	25.0°C
S2: 12.34pH	25.0°C
SN Units	
mm Hg	
in Hg	
atm	
kPa	

mbar	
bar	

- If you selected Flow as the measurement type, [Figure 6-93](#) appears.

Figure 6-93: Flow Units Screen

S1: 1.234 μ S/cm	25.0°C
S2: 12.34pH	25.0°C
SN Units	
GPM	
GPH	
cu ft/min	
cu ft/hour	

L/min	
L/hour	
m ³ /hour	

- If you select Other as the measurement type, [Figure 6-94](#) appears.

Figure 6-94: Other Units Screen

S1: 1.234 μ S/cm	25.0°C
S2: 12.34pH	25.0°C
SN Units	
%	
% Saturation	
pH	
mV	

You can also select from the following units:

- μ S/cm
- mS/cm
- M Ω -cm
- k Ω -cm
- ppm
- ppb

- $\mu\text{g/L}$
- mg/L
- g/L
- NTU
- FTU
- FNU
- ft/sec
- m/sec
- none

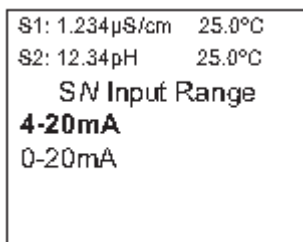
2. Scroll to the unit of your choice and press **ENTER**.

6.11.2 Select input range

Procedure

1. From the **Pulse Flow Configure** screen, select Input Range.
[Figure 6-95](#) appears.

Figure 6-95: Input Range Screen



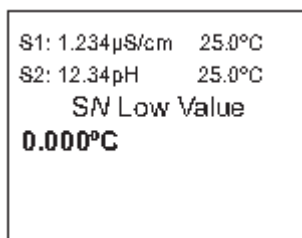
2. Refer to [Figure 6-89](#) to select an input range.

6.11.3 Enter low value

Procedure

1. From the **Puls Flow Configure** screen, select Low Value.
[Figure 6-96](#) appears. The default value is displayed in bold type.

Figure 6-96: Low Value Screen



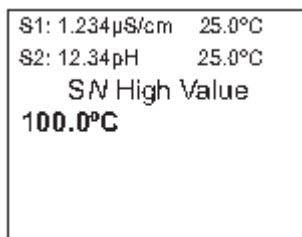
2. Refer to [Figure 6-89](#) to enter a low temperature value.

6.11.4 Enter high value

Procedure

1. From the **Pulse Flow Configure** screen, select High Value.
[Figure 6-97](#) appears. The default value for temperature is displayed in bold type.

Figure 6-97: High Value Screen



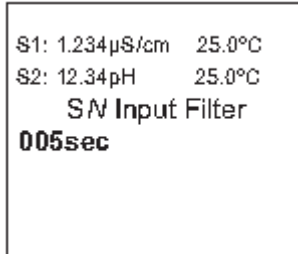
2. Refer to [Figure 6-89](#) to enter the high temperature value.

6.11.5 Enter input filter value

Procedure

1. From the **Pulse Flow Configure** screen, select Filter.
[Figure 6-98](#) appears.

Figure 6-98: Input Filter Screen



2. Refer to [Figure 6-89](#) to enter an input filter value in seconds.

3. Select Sensor 1 or Sensor 2 corresponding to pH. Press **ENTER**.
4. Select pH. Press **ENTER**.

Figure 7-2: pH calibration screen

S1: 1.234 μ S/cm	25.0°C
S2: 12.34pH	25.0°C
SN pH Cal	
Buffer Cal	
Standardize	
Slope:	59.16mV/pH
Offset:	600 mV

5. If desired, change the auto calibration criteria.

Figure 7-3: Set up Auto Calibration Screen

S1: 1.234 μ S/cm	25.0°C
S2: 12.34pH	25.0°C
SN Setup	
Stable Time:	10 sec
Stable Delta:	0.02 pH
Buffer:	Standard

You can adjust the following:

- Stabilization time (default 10 seconds)
- Stabilization pH value (default 0.02 pH)
- Type of buffer used for auto calibration (default is standard, non-commercial buffers)

The transmitter recognizes the following commercial buffer tables:

- Standard (NIST plus pH 7)
- DIN 19267
- Ingold
- Merck

Figure 7-4 appears if the auto calibration is successful:

Figure 7-4: pH Auto Calibration Screen

S1: 1.234 μ S/cm	25.0°C
S2: 12.34pH	25.0°C
SN pH Auto Cal	
Slope:	59.16 mV/pH
Offset:	60 mV

Figure 7-5 through Figure 7-7 may appear if the auto calibration is unsuccessful.

Figure 7-5: High Slope Error

```
S1: 1.234µS/cm  25.0°C
S2: 12.34pH    25.0°C
  SN pH Auto Cal
High Slope Error
Calculated: 62.11 mV/pH
Max: 62.00 mV/pH
Press EXIT
```

Figure 7-6: Low Slope Error

```
S1: 1.234µS/cm  25.0°C
S2: 12.34pH    25.0°C
  SN pH Auto Cal
Low Slope Error
Calculated: 39.11mV/pH
Min: 40.00 mV/pH
Press EXIT
```

Figure 7-7: Offset Error

```
S1: 1.234µS/cm  25.0°C
S2: 12.34pH    25.0°C
  SN pH Auto Cal
Offset Error
Calculated:  61.22mV
Max:        60.00mV
Press EXIT
```

7.1.1 Calibrate pH sensors manually

Use manual calibration only if using non-standard buffers. Otherwise, use auto calibration. Auto calibration avoids common pitfalls and reduces errors.

Figure 7-8: Manual Calibration Screen

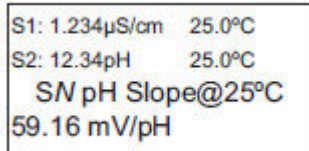
```
S1: 1.234µS/cm  25.0°C
S2: 12.34pH    25.0°C
  SN pH Manual Cal
Buffer 1
Buffer 2
```

7.1.2 Enter a known slope value for pH sensors

Procedure

If you know the electrode slope from other measurements, enter it directly in the transmitter.

Enter the slope as the slope at 77.0 °F (25 °C).



S1: 1.234μS/cm 25.0°C
S2: 12.34pH 25.0°C
SN pH Slope@25°C
59.16 mV/pH

7.1.3 Standardize pH sensors

You can change the pH measured by the transmitter to match the reading from a second or referee instrument. The process of making the two readings agree is called standardization.

During standardization, the difference between the two pH values is converted to the equivalent voltage. The voltage, called the referee offset, is added to all subsequent measured cell voltages before they are converted to pH. If you place a standardized sensor in a buffer solution, the measured pH will differ from the buffer pH by an amount equivalent to the standardization offset.

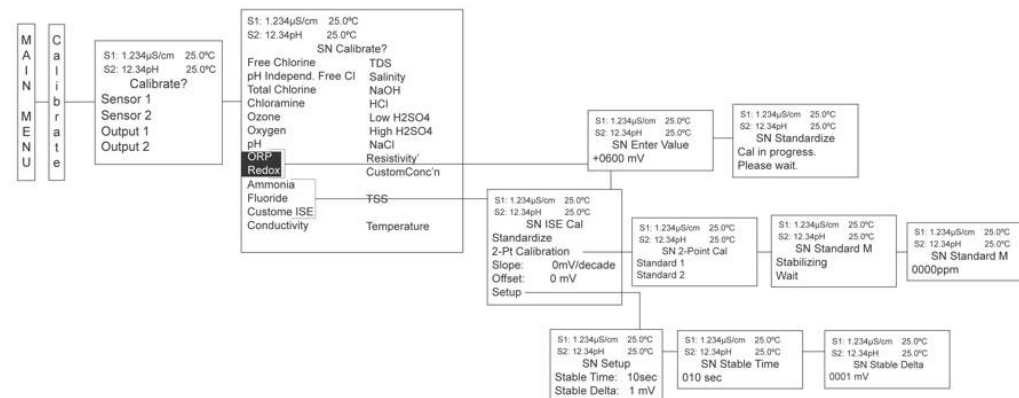


S1: 1.234μS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Enter Value
07.00pH

7.2 Calibrate oxidation reduction potential (ORP) sensors

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

Figure 7-9: Calibrate ORP menu tree



Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to ORP. Press **ENTER**.

```

S1: 1.234µS/cm  25.0°C
S2: 12.34pH    25.0°C
  SN Calibrate?
  ORP
  Temperature
  
```

4. Select ORP. Press **ENTER**.

```

S1: 1.234µS/cm  25.0°C
S2: 12.34pH    25.0°C
  SN Enter Value
  +0600 mV
  
```

Figure 7-10 may appear if ORP calibration is unsuccessful.

Figure 7-10: Offset Error

```

S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Standardize
Offset Error
Calculated: 61.22mV
Max: 60.00mV
Press EXIT
    
```

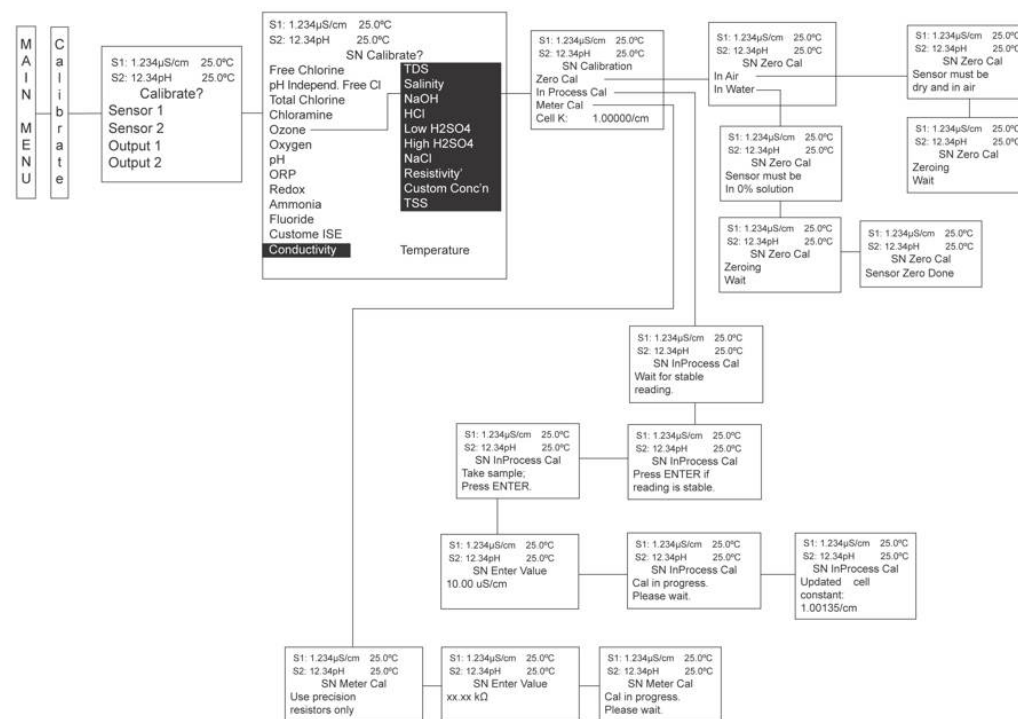
7.3

Calibrate contacting conductivity sensors

Placing a new conductivity sensor in service

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

Figure 7-11: Calibrate conductivity sensors menu tree



Calibrating an in-service conductivity sensor

After a conductivity sensor has been in service for a period of time, you may need to recalibrate it. There are three ways to calibrate a conductivity sensor:

1. Use a standard instrument and sensor to measure the conductivity of the process stream. You don't need to remove the sensor from the process piping. The temperature correction used by the standard instrument may not exactly match

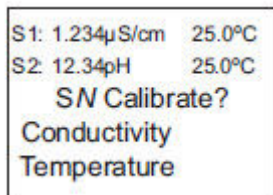
the temperature correction used by the Rosemount 1056. To avoid errors, turn off temperature correction in both the transmitter and the standard instrument.

2. Place the sensor in a solution of known conductivity and make the transmitter reading match the conductivity of the standard solution. Use this method if you can easily remove the sensor from the process piping and have a standard available. Be careful using standard solutions with conductivity less than 100 $\mu\text{S}/\text{cm}$. Low conductivity standards are highly susceptible to atmospheric contamination. Avoid calibrating sensors with 0.01/cm cell constants against conductivity standards with conductivity greater than 100 $\mu\text{S}/\text{cm}$. The resistance of these solutions may be too low for an accurate measurement.
3. To calibrate a 0.01/cm sensor, check it against a standard instrument and another 0.01/cm sensor while both sensors are measuring water with conductivity between 5 and 10 $\mu\text{S}/\text{cm}$. To avoid drift caused by absorption of atmospheric carbon dioxide, saturate the sample with air before taking measurements.
To ensure adequate flow past the sensor during calibration, take the sample downstream from the sensor. For best results, use a flow-through standard cell. If the process temperature varies greatly from the ambient temperature, keep the connecting lines short and insulate the flow cell.

To calibrate the Rosemount 1056 with an attached conductivity sensor:

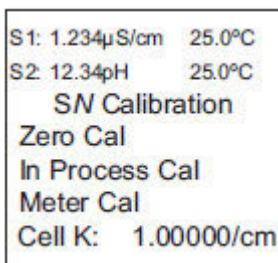
Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to conductivity. Press **ENTER**.



S1: 1.234 $\mu\text{S}/\text{cm}$ 25.0°C
S2: 12.34pH 25.0°C
SN Calibrate?
Conductivity
Temperature

4. To calibrate conductivity or temperature, scroll to the desired item and press **ENTER**.



S1: 1.234 $\mu\text{S}/\text{cm}$ 25.0°C
S2: 12.34pH 25.0°C
SN Calibration
Zero Cal
In Process Cal
Meter Cal
Cell K: 1.00000/cm

5. Enter a cell constant only if you are installing the sensor for the first time, replacing the probe, or troubleshooting.

This procedure sets up the transmitter for the probe type connected to it. Each type of probe has a specific cell constant.

S1: 1.234 μ S/cm	25.0°C
S2: 12.34pH	25.0°C
SN Cell Constant	
1.00000 /cm	

7.3.1 Zero the transmitter

The purpose of zeroing the transmitter is to compensate for small offsets to the conductivity signal that are present even when there is no conductivity to be measured. This procedure is affected by the length of extension cable. Always repeat it if you make any changes in the extension cable or sensor.

Prerequisites

⚠ CAUTION

Ensure that the probe is dry.

S1: 1.234 μ S/cm	25.0°C
S2: 12.34pH	25.0°C
SN Zero Cal	
In Air	
In Water	

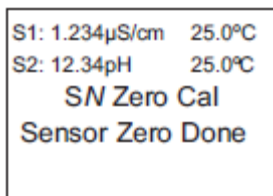
Procedure

1. Zero the transmitter by electrically connecting the conductivity probe as it will actually be used and placing the measuring portion of the probe in the air.
2. Select Zero Cal from the **Conductivity Calibration** screen.

S1: 1.234 μ S/cm	25.0°C
S2: 12.34pH	25.0°C
SN Zero Cal	
In Air	
In Water	

If zero calibration is successful, [Figure 7-12](#) appears.

Figure 7-12: Successful Zero Calibration



The transmitter returns to the **Conductivity Calibration** screen.

If zero calibration is unsuccessful, [Figure 7-13](#) may appear.

Figure 7-13: Zero Calibration Unsuccessful



7.3.2 Calibrate the sensor in a conductivity standard (In Process Cal)

Use this procedure to check and correct the transmitter's conductivity reading to ensure it is accurate. To do this, calibrate the sensor and transmitter against a solution of known conductivity.

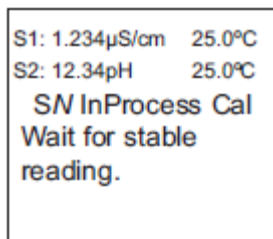
Prerequisites

- Clean the probe.
- If necessary, check and standardize the temperature reading using a calibrated thermometer.

Procedure

1. Submerge the probe in a sample of known conductivity.
2. If necessary, adjust the displayed value to correspond to the conductivity value of the sample.
3. Turn temperature correction off and use the conductivity of the standard.

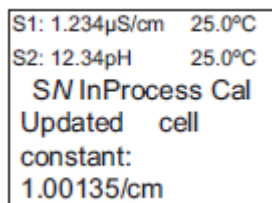
4. Select In Process Cal from the **Conductivity Calibration** screen.



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN InProcess Cal
Wait for stable
reading.

If in process calibration is successful, [Figure 7-14](#) appears and the transmitter returns to the **Conductivity Calibration** screen.

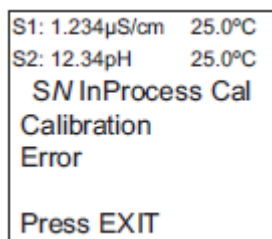
Figure 7-14: In Process Calibration Successful



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN InProcess Cal
Updated cell
constant:
1.00135/cm

If in process calibration is unsuccessful, [Figure 7-15](#) may appear.

Figure 7-15: Calibration Error



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN InProcess Cal
Calibration
Error
Press EXIT

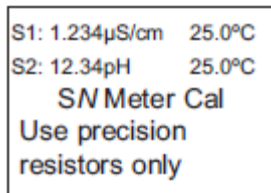
7.3.3 Calibrate the sensor to a laboratory instrument (Meter Cal)

Use this procedure to check and correct the conductivity reading of the transmitter using a laboratory conductivity instrument.

Procedure

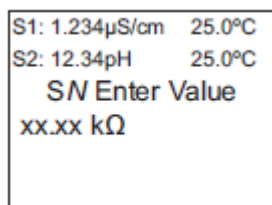
1. Submerge the conductivity probe in a bath.
2. Measure the conductivity of a grab sample of the same bath water with a separate laboratory instrument.
3. Adjust the transmitter reading to match the conductivity reading of the lab instrument.

4. Select Meter Cal from the **Conductivity Calibration** screen.



S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Meter Cal
Use precision
resistors only

5. Press **ENTER**.
The display shows the live value measured by the sensor.

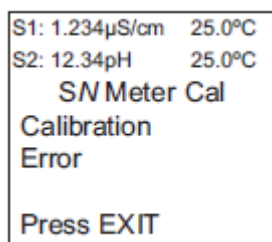


S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Enter Value
xx.xx kΩ

If the meter calibration is successful, the screen returns to the **Conductivity Calibration** screen.

If meter calibration is unsuccessful, [Figure 7-16](#) appears.

Figure 7-16: Meter Calibration Error



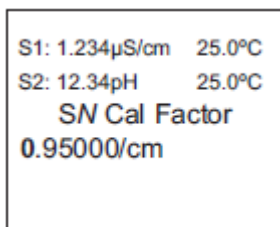
S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Meter Cal
Calibration
Error
Press EXIT

7.3.4 Enter calibration factor

If you selected 4-electrode for the sensor type in the **Quick Start** menus upon initial installation and power up, you need to enter a cell constant and a calibration factor into the transmitter.

The cell constant is needed to convert measured conductance to conductivity as it is displayed on the transmitter screen. The calibration factor entry is needed to increase the accuracy of the live conductivity readings, especially at low conductivity readings below 20 µS/cm. Both the cell constant and the cal factor are printed on the tag attached to the four-electrode sensor/cable.

If necessary after initial installation and start-up, enter the calibration factor as printed on the sensor tag.

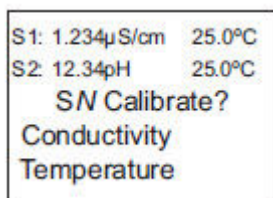


S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Cal Factor
0.95000/cm

7.4 Calibrate toroidal conductivity sensors

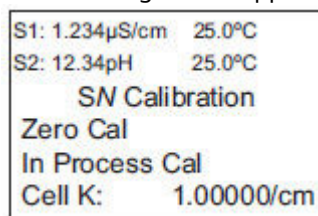
Procedure

1. Press **MENU**.
2. Select Calibrate.
3. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to toroidal conductivity.
5. Press **ENTER**.
The following screen appears.



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Calibrate?
Conductivity
Temperature

6. Select Conductivity.
The following screen appears.



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Calibration
Zero Cal
In Process Cal
Cell K: 1.00000/cm

Postrequisites

The following sections show the initial display screen that appears for each calibration routine. Use the live screen prompts to complete calibration.

7.4.1 Entering cell constant

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

Enter the cell constant:

- When you install the transmitter for the first time
- When you replace the probe
- When troubleshooting

Setting up the cell constant sets up the transmitter for the probe type connected to it. Each type of probe has a specific cell constant.

For toroidal conductivity sensors, the default value is 3.00000/cm.

```
S1: 1.234µS/cm  25.0°C
S2: 12.34pH    25.0°C
SN Cell Constant
3.00000 /cm
```

7.4.2 Zero toroidal conductivity sensor

This procedure is used to compensate for small offsets in the conductivity signal that are present even when there is no conductivity to be measured.

This procedure is affected by the length of extension cable. Always repeat it after making any changes in extension cable or sensor.

Procedure

1. Electrically connect the conductivity probe as it will actually be used and place the measuring portion of the probe in air.
2. From the **Conductivity Calibration** screen, select Zero Cal.
The following screen appears.

```
S1: 1.234µS/cm  25.0°C
S2: 12.34pH    25.0°C
SN Zero Cal
In Air
In Water
```

If zero calibration is successful the following screen appears.

```
S1: 1.234µS/cm  25.0°C
S2: 12.34pH    25.0°C
SN Zero Cal
Sensor Zero Done
```

The screen returns to the **Conductivity Calibration** menu.

The following screen may appear if the zero calibration is unsuccessful.

```
S1: 1.234µS/cm  25.0°C
S2: 12.34pH    25.0°C
SN Zero Cal
Sensor Zero Fail
Offset too high
Press EXIT
```

7.4.3 Calibrate toroidal conductivity sensor in a conductivity standard (in process calibration)

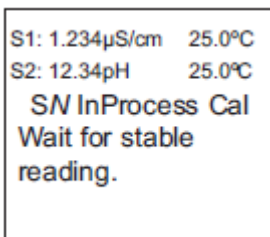
This procedure is used to check and correct the conductivity reading of the Rosemount 1056 to ensure that the reading is accurate.

Prerequisites

Clean the probe and check and standardize the temperature reading before performing this procedure.

Procedure

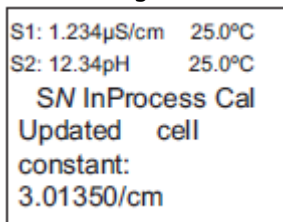
1. Submerge the probe in a sample of known conductivity.
2. Select In Process Cal from the **Conductivity Calibration** screen.
The following screen appears.



S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN InProcess Cal
Wait for stable
reading.

3. Adjust the displayed value on the transmitter, if necessary, to correspond to the conductivity value of the sample.

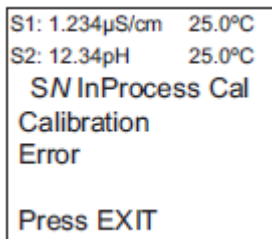
The following screen will appear if in process calibration is successful.



S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN InProcess Cal
Updated cell
constant:
3.01350/cm

The screen returns to the **Conductivity Calibration** menu.

The following screen may appear if in process calibration is unsuccessful.



S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN InProcess Cal
Calibration
Error
Press EXIT

The screen returns to the **Conductivity Calibration** menu.

7.5 Chlorine calibration

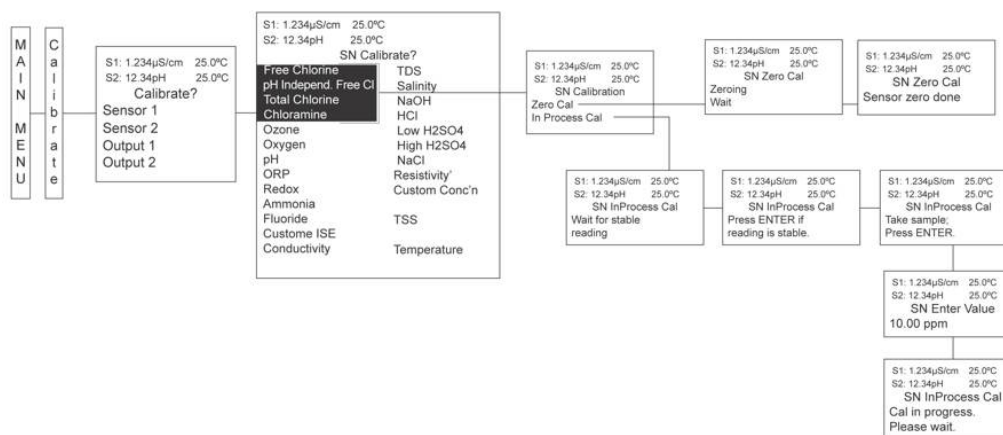
With a chlorine measurement board and the appropriate sensor, the transmitter can measure any of the four variants of chlorine.

- Free chlorine
- Total chlorine
- Monochloramine
- pH-independent free chlorine

The following calibration routines are covered in the family of supported chlorine sensors:

- Air calibration
- Zero calibration
- In process calibration

Figure 7-17: Calibrate chlorine menu tree



7.5.1 Calibrate free chlorine sensors

A free chlorine sensor generates a current directly proportional to the concentration of free chlorine in the sample. Calibrating the sensor requires exposing it to a solution containing no chlorine (zero standard) and to a solution containing a known amount of chlorine (full-scale standard).

Zero calibration is necessary, because chlorine sensors, even when no chlorine is present in the sample, generate a small current called the residual current. The transmitter compensates for the residual current by subtracting it from the measured current before converting the result to a chlorine value. Zero new sensors before placing them in service and whenever you replace the electrolyte solution.

Either of the following makes a good zero standard:

- Deionized water containing about 500 ppm sodium chloride. Dissolve 0.02 oz (0.5 g) of table salt in one liter of water.

⚠ CAUTION

Do not use deionized water alone for zeroing the sensor.
The conductivity of the zero water must be greater than 50 $\mu\text{S}/\text{cm}$.

- Tap water known to contain no chlorine. Expose tap water to bright sunlight for at least 24 hours.

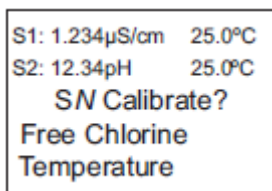
The purpose of in process calibration is to establish the slope of the calibration curve. Because stable chlorine standards do not exist, calibrate the sensor against a test run on a grab sample of the in process liquid. Several manufacturers offer portable test kits for this purpose. Observe the following precautions when taking and testing the grab sample:

- Take the grab sample from a point as close to the sensor as possible. Be sure that taking the sample does not alter the flow of the sample to the sensor. It is best to install the sample tap just downstream from the sensor.
- Chlorine solutions are unstable. Run the test immediately after taking the sample. Try to calibrate the sensor when the chlorine concentration is at the upper end of the normal operating range.

To calibrate free chlorine:

Procedure

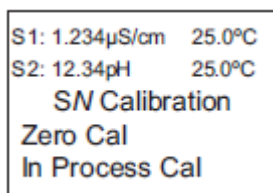
1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to free chlorine. Press **ENTER**.
4. Select Free Chlorine. Press **ENTER**.



S1: 1.234 $\mu\text{S}/\text{cm}$ 25.0°C
S2: 12.34pH 25.0°C
SN Calibrate?
Free Chlorine
Temperature

After you select Free Chlorine, [Figure 7-18](#) appears.

Figure 7-18: Calibration Screen



S1: 1.234 $\mu\text{S}/\text{cm}$ 25.0°C
S2: 12.34pH 25.0°C
SN Calibration
Zero Cal
In Process Cal

Related information

[Zero sensor](#)

[Calibrate sensor in process](#)

7.5.2 Calibrate total chlorine sensors

Total chlorine is the sum of free and combined chlorine.

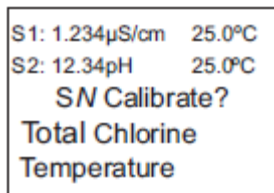
The continuous determination of total chlorine requires two steps. First, the sample flows into a conditioning system (TCL) where a pump continuously adds acetic acid and potassium iodide to the sample. The acid lowers the pH, which allows total chlorine in the sample to quantitatively oxidize the iodide in the reagent to iodine. In the second step, the treated sample flows to the sensor. The sensor is a membrane-covered amperometric sensor, whose output is proportional to the concentration of iodine. Because the concentration of iodine is proportional to the concentration of total chlorine, you can calibrate the transmitter to read total chlorine. Because the sensor really measures iodine, calibrating the sensor requires exposing it to a solution containing no iodine (zero standard) and to a solution containing a known amount of iodine (full-scale standard).

Zero calibration is necessary because the sensor, even when no iodine is present, generates a small current called the residual current. The transmitter compensates for the residual current by subtracting it from the measured current before converting the result to a total chlorine value. Zero new sensors before placing them in service and whenever you replace the electrolyte solution. The best zero standard is deionized water.

Measure in process calibration with the Rosemount TCL Total Chlorine Sample Conditioning System.

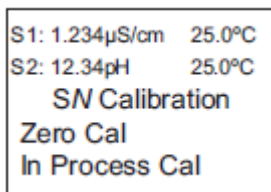
Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to total chlorine. Press **ENTER**.
4. Select Total Chlorine. Press **ENTER**.



S1: 1.234μS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Calibrate?
Total Chlorine
Temperature

5. To calibrate total chlorine or temperature, scroll to the desired item and press **ENTER**.



S1: 1.234μS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Calibration
Zero Cal
In Process Cal

Related information

[Zero sensor](#)

[Calibrate sensor in process](#)

7.5.3 Calibrate pH-independent free chlorine sensors

A free chlorine sensor generates a current directly proportional to the concentration of free chlorine in the sample. Calibrating the sensor requires exposing it to a solution

containing no chlorine (zero standard) and to a solution containing a known amount of chlorine (full-scale standard).

Zero calibration is necessary because chlorine sensors, even when no chlorine is in the sample, generate a small current called the residual current. The transmitter compensates for the residual current by subtracting it from the measured current before converting the result to a chlorine value. Zero new sensors before placing them in service and whenever you change the electrolyte solution.

Either of the following makes a good zero standard:

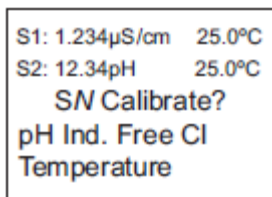
- Deionized water
- Tap water known to contain no chlorine. Expose tap water to bright sunlight for at least 24 hours.

Use a pH-independent free chlorine sensor to measure pH-independent free chlorine.

To calibrate pH-independent free chlorine:

Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to pH-independent free chlorine. Press **ENTER**.
4. Select pH Ind. Free Cl. Press **ENTER**.



5. To calibrate pH-independent free chlorine or temperature, scroll to the desired item and press **ENTER**.

Related information

[Zero sensor](#)

[Calibrate sensor in process](#)

7.5.4 Calibrate monochloramine sensors

A monochloramine sensor generates a current directly proportional to the concentration of monochloramine in the sample. To calibrate the sensor, expose it to a solution containing no monochloramine (zero standard) and to a solution containing a known amount of monochloramine (full-scale standard).

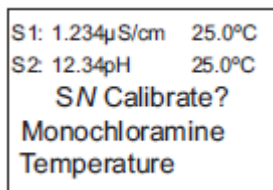
Zero calibration is necessary because monochloramine sensors, even when no monochloramine is in the sample, generate a small current called the residual or zero current. The transmitter compensates for the residual current by subtracting it from the measured current before converting the result to a monochloramine value.

To calibrate monochloramine:

Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.

3. Select Sensor 1 or Sensor 2 corresponding to monochloramine. Press **ENTER**.
4. Select Monochloramine. Press **ENTER**.

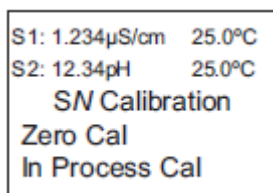


S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Calibrate?
Monochloramine
Temperature

5. To calibrate monochloramine or temperature, scroll to the desired item and press **ENTER**.

After you select Monochloramine, [Figure 7-19](#) appears.

Figure 7-19: Calibration Screen



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Calibration
Zero Cal
In Process Cal

Related information

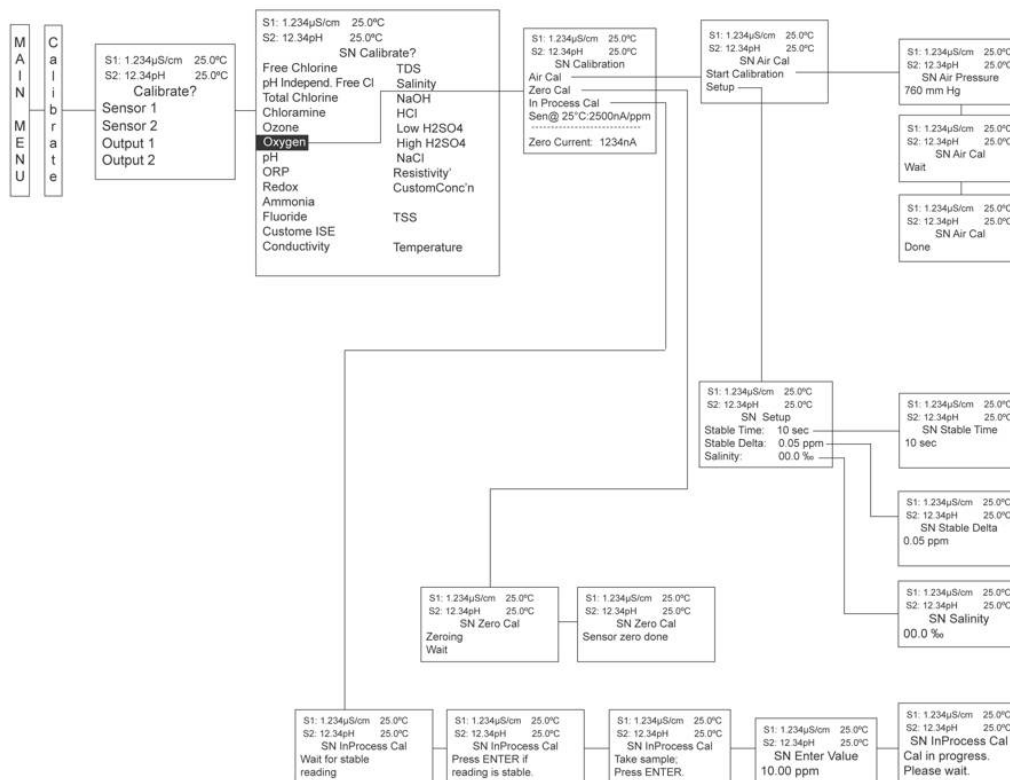
[Zero sensor](#)

[Calibrate sensor in process](#)

7.6 Calibrate oxygen sensors

Oxygen sensors generate a current directly proportional to the concentration of dissolved oxygen in the sample. To calibrate an oxygen sensor, you must expose it to a solution

Figure 7-20: Calibrate oxygen sensor menu tree



The purpose of in process calibration is to establish the slope of the calibration curve. Because the solubility of atmospheric oxygen in water as a function of temperature and barometric pressure is well known, the natural choice for a full-scale standard is air-saturated water. However, air-saturated water is difficult to prepare and use, so the universal practice is to use air for calibration. From the point of view of the oxygen sensor, air and air-saturated water are identical. The equivalence comes about because the sensor really measures the chemical potential of oxygen. Chemical potential is the force that causes oxygen molecules to diffuse from the sample into the sensor where they can be measured. It is also the force that causes oxygen molecules in air to dissolve until the water is saturated with oxygen. Once the water is saturated, the chemical potential of oxygen in the two phases (air and water) is the same.

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rate depends on the difference in chemical potential between oxygen in the sensor and oxygen in the sample. An electrochemical reaction, which destroys any oxygen molecules entering the sensor, keeps the concentration (and the chemical potential) of the oxygen inside the sensor equal to zero. Therefore, the chemical potential of oxygen in the sample alone determines the diffusion rate and the sensor current.

When you calibrate the sensor, the chemical potential of oxygen in the standard determines the sensor current. Whether the sensor is calibrated in air or air-saturated water is immaterial. The chemical potential of oxygen is the same in either phase. Normally, to make calculating solubility in common units (like ppm dissolved oxygen) simpler, it is convenient to use water-saturated air for calibration. Automatic air calibration is standard. Simply expose the sensor to water-saturated air. The transmitter measures the sensor current. When the current is stable, the transmitter stores the current and measures the temperature using a temperature element inside the oxygen sensor. Enter the barometric pressure.

From the temperature, the transmitter calculates the saturation vapor pressure of water. Next, it calculates the pressure of dry air by subtracting the vapor pressure from the barometric pressure. Using the fact that dry air always contains at least 20.95 percent oxygen, the transmitter calculates the partial pressure of oxygen. Once the transmitter knows the partial pressure of oxygen, it uses the Bunsen coefficient to calculate the equilibrium solubility of atmospheric oxygen in water at the prevailing temperature. At 77.0 °F (25 °C) and 29.92 in (760 mm) Hg, the equilibrium solubility is 8.24 ppm. Often, it is too difficult or messy to remove the sensor from the process liquid for calibration. In this case, you can calibrate the sensor against a measurement made with a portable laboratory instrument. The laboratory instrument typically uses a membrane-covered amperometric sensor that has been calibrated against water-saturated air.

To calibrate oxygen:

Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to oxygen. Press **ENTER**.
4. Select Oxygen. Press **ENTER**.

```
S1: 1.234µS/cm 25.0°C
S2: 12.34pH    25.0°C
  SN Calibrate?
Oxygen
Temperature
```

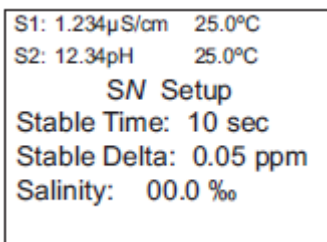
5. To calibrate oxygen or temperature, scroll to the desired item and press **ENTER**.

```
S1: 1.234µS/cm 25.0°C
S2: 12.34pH    25.0°C
  SN Calibration
Air Cal
Zero Cal
In Process Cal
Sen@ 25°C:2500nA/ppm
Zero Current: 1234nA
```

6. Select Air Cal to adjust air calibration criteria.

You can adjust the following:

- Stabilization time (default 10 sec)
- Stabilization pH value (default 0.05 ppm)
- Salinity of the solution to be measured (default 00.0 parts per thousand)



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Setup
Stable Time: 10 sec
Stable Delta: 0.05 ppm
Salinity: 00.0 ‰

Related information

[Zero sensor](#)

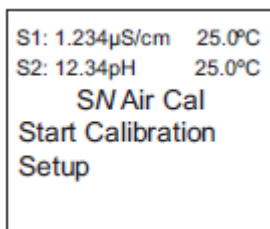
[Calibrate sensor in air](#)

[Calibrate sensor in process](#)

7.6.1 Calibrate sensor in air

Procedure

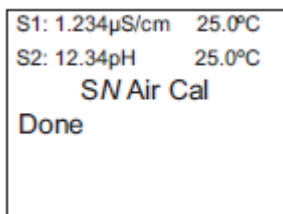
From the **Oxygen Calibration** screen, select Air Cal.



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Air Cal
Start Calibration
Setup

If air calibration is successful, [Figure 7-21](#) appears.

Figure 7-21: Air Cal Done

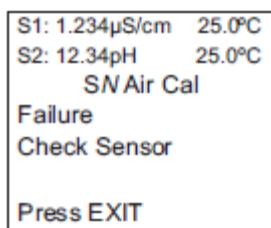


S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Air Cal
Done

The transmitter returns to the **Amperometric Calibration** screen.

If air calibration is unsuccessful, [Figure 7-22](#) appears.

Figure 7-22: Air Cal Failure

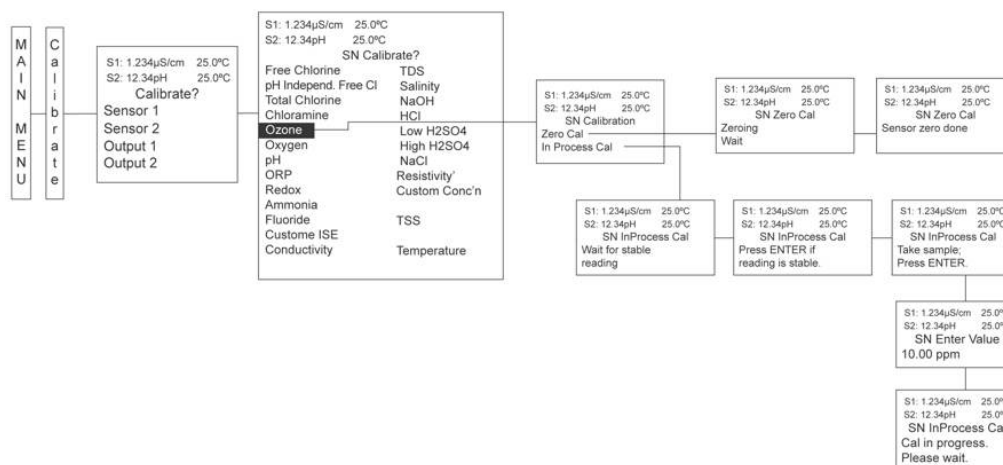


The transmitter returns to the **Amperometric Calibration** screen.

7.7 Calibrate ozone sensors

An ozone sensor generates a current directly proportional to the concentration of ozone in the sample. To calibrate an ozone sensor, you must expose it to a solution containing no ozone (zero standard) and to a solution containing a known amount of ozone (full-scale standard).

Figure 7-23: Calibrate ozone sensor menu tree



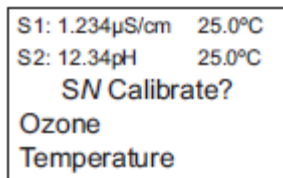
Zero calibration is necessary because ozone sensors, even when no ozone is in the sample, generate a small current called the residual or zero current. The transmitter compensates for the residual current by subtracting it from the measured current before converting the result to an ozone value. Zero new sensors before placing them in service and whenever you replace the electrolyte solution. The best zero standard is deionized water.

To calibrate ozone:

Procedure

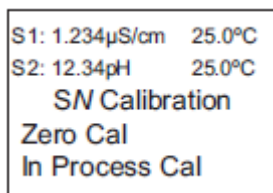
1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to ozone. Press **ENTER**.

4. Select Ozone. Press **ENTER**.



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Calibrate?
Ozone
Temperature

5. To calibrate ozone or temperature, scroll to the desired item and press **ENTER**.



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Calibration
Zero Cal
In Process Cal

Related information

[Zero sensor](#)

[Calibrate sensor in process](#)

7.8 Zero sensor

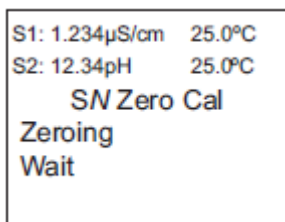
This procedure applies to amperometric sensors only.

Prerequisites

Run the sensor in the zero solution for at least two hours before zeroing.

Procedure

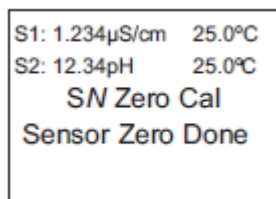
From the **Calibration** screen, select Zero Cal.



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Zero Cal
Zeroing
Wait

If zero calibration is successful, [Figure 7-24](#) appears.

Figure 7-24: Zero Calibration Successful

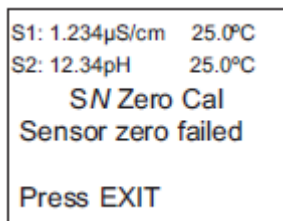


S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Zero Cal
Sensor Zero Done

The transmitter returns to the **Amperometric Calibration** screen.

If zero calibration is unsuccessful, [Figure 7-25](#) may appear.

Figure 7-25: Zero Failed



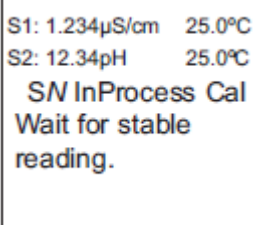
S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN Zero Cal
Sensor zero failed
Press EXIT

The transmitter returns to the **Amperometric Calibration** screen.

7.9 Calibrate sensor in process

Procedure

From the **Calibration** screen, select In Process Cal.

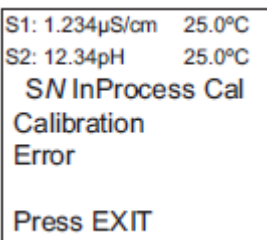


S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN InProcess Cal
Wait for stable
reading.

If the in process calibration is successful, the transmitter returns to the **Calibration** screen.

If calibration is unsuccessful, [Figure 7-26](#) may appear.

Figure 7-26: Calibration Error



S1: 1.234 μ S/cm 25.0°C
S2: 12.34pH 25.0°C
SN InProcess Cal
Calibration
Error
Press EXIT

The transmitter returns to the **Amperometric Calibration** screen.

7.10 Calibrate temperature

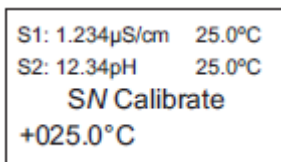
Most liquid analytical measurements (except oxidation reduction potential [ORP]) require temperature compensation. The transmitter automatically compensates for temperature by applying internal temperature correction algorithms. You can also turn off temperature

correction. If you turn temperature correction off, the transmitter uses the manual temperature you enter in all temperature correction calculations.

To calibrate temperature:

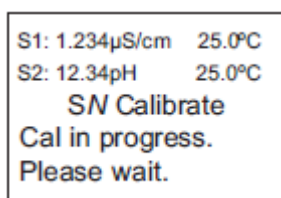
Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to the desired measurement. Press **ENTER**.
4. Select Temperature. Press **ENTER**.



S1: 1.234μS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Calibrate
+025.0°C

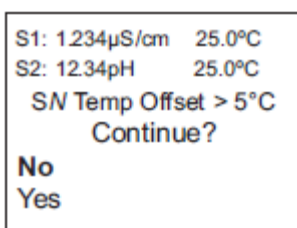
5. The transmitter calibrates temperature.



S1: 1.234μS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Calibrate
Cal in progress.
Please wait.

6. If the temperature offset is greater than 5 °C from the default value, [Figure 7-27](#) may appear.

Figure 7-27: Temperature Offset Screen



S1: 1.234μS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Temp Offset > 5°C
Continue?
No
Yes

7. To continue, select Yes. To suspend the operation, select No.

If the temperature calibration is successful, the transmitter returns to the **Calibration** screen.

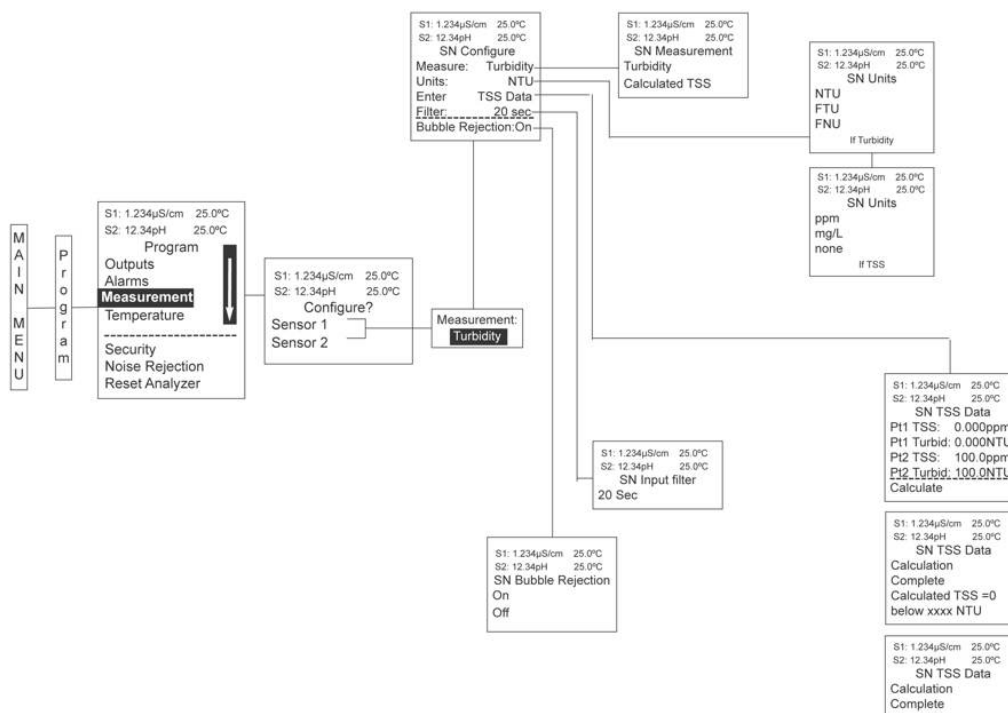
Related information

[Enter temperature compensation](#)

7.11 Calibrate turbidity

You can calibrate the turbidity sensor against a user-prepared standard as a two-point calibration with deionized water, against a 20 NTU user-prepared standard as a single point calibration, and against a grab sample using a reference turbidimeter.

Figure 7-28: Turbidity Flow Diagram



Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to turbidity. Press **ENTER**.
4. Select Turbidity. Press **ENTER**.

Figure 7-29: Calibrate Turbidity Screen

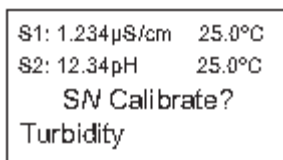
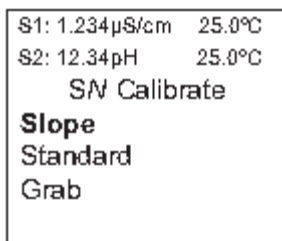


Figure 7-30: Select Calibration Type Screen



```
S1: 1.234μS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Calibrate
Slope
Standard
Grab
```

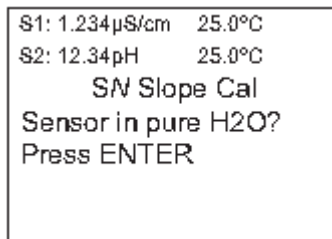
7.11.1 Conduct a two-point calibration

Conduct a two-point calibration of the turbidity sensor against a user-prepared 20 NTU standard.

Procedure

1. Immerse the sensor in filtered water having very low turbidity and measure the sensor output.
2. Increase the turbidity of the filtered water by a known amount (typically 20 NTU) and measure the sensor output again.
3. On the transmitter, select Slope.

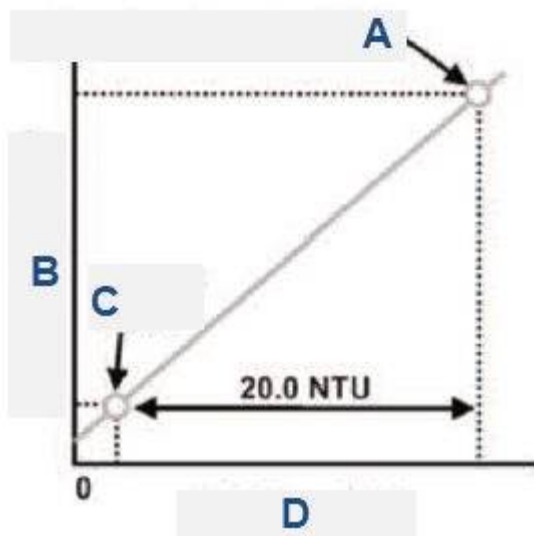
Figure 7-31: Slope Calibration Screen



```
S1: 1.234μS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Slope Cal
Sensor in pure H2O?
Press ENTER
```

The transmitter takes the two measurements, applies a linear correction (if necessary), and calculates the sensitivity. Sensitivity is the sensor output (in mV) divided by turbidity. A typical new sensor has a sensitivity of about 10 mv. As the sensor ages, the sensitivity decreases. [Figure 7-32](#) illustrates how turbidity two-point calibration works.

Figure 7-32: Turbidity Two-Point Calibration

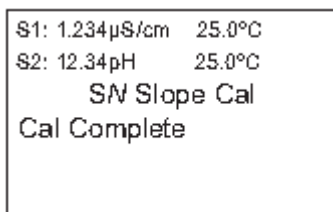


- A. Filtered water + 20.0 ntu
- B. Sensor signal, mV
- C. Filtered water
- D. Turbidity, NTU

Before beginning the calibration, the transmitter does a dark current measurement. Dark current is the signal generated by the detector when no light is falling on it. The transmitter subtracts the dark current from the raw scattered light signal and converts the result to turbidity. In highly filtered samples, which scatter little light, the dark current can be a substantial amount of the signal the sensor generates.

Figure 7-33 appears if the slope calibration is successful.

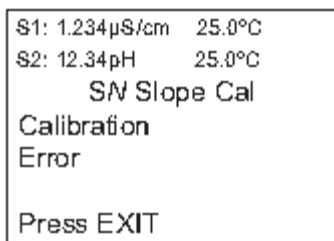
Figure 7-33: Slope Cal Complete Screen



The screen then returns to the **Turbidity Calibration** screen.

Figure 7-34 may appear if the slope calibration is unsuccessful.

Figure 7-34: Slope Calibration Error Screen



```
S1: 1.234 μS/cm  25.0°C
S2: 12.34 pH    25.0°C
      SN Slope Cal
Calibration
Error
Press EXIT
```

7.11.2 Calibrate against a standard

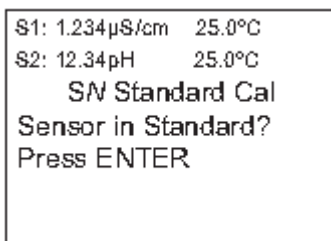
You can also calibrate a turbidity sensor against a commercial standard.

Stable 20.0 ntu standards are available from a number of sources. Filtered deionized water is not required for this type of calibration.

Procedure

1. On the transmitter, select Standard from the **Calibration** screen.

Figure 7-35: Standard Calibration Screen

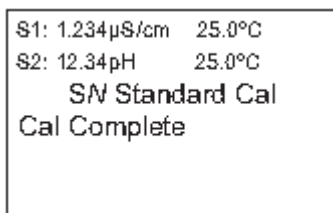


```
S1: 1.234 μS/cm  25.0°C
S2: 12.34 pH    25.0°C
      SN Standard Cal
Sensor in Standard?
Press ENTER
```

2. Put the sensor in the standard and press **ENTER** on the transmitter.
Before beginning the calibration, the transmitter does a dark current measurement. Dark current is the signal generated by the sensor even when no light is falling on it. The transmitter subtracts the dark current from the raw scattered light signal and converts the result to turbidity. In highly filtered samples, which scatter little light, the dark current can be a substantial amount of the signal the sensor generates.

Figure 7-36 appears if the standard calibration is successful.

Figure 7-36: Standard Calibration Complete Screen



```
S1: 1.234 μS/cm  25.0°C
S2: 12.34 pH    25.0°C
      SN Standard Cal
Cal Complete
```

The transmitter returns to the **Turbidity Calibration** screen.

Figure 7-37 may appear if the standard calibration is unsuccessful.

Figure 7-37: Standard Calibration Error Screen



S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Standard Cal
Calibration
Error
Press EXIT

7.11.3 Conduct a grab calibration

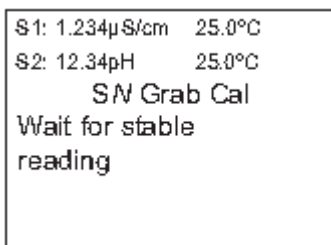
You can calibrate the turbidity sensor against the turbidity reading from another sensor.

The transmitter treats the value you enter as though it were the true turbidity of the sample. Therefore, grab sample calibration changes the sensitivity; it does not apply an offset to the reading.

Procedure

1. On the transmitter's **Calibration** screen, select Grab.

Figure 7-38: Grab Calibration Screen

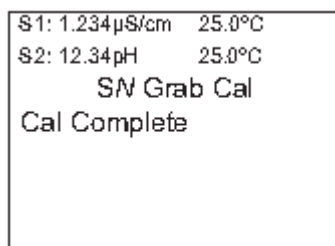


S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Grab Cal
Wait for stable
reading

2. Enter the turbidity reading into the transmitter.

Figure 7-39 appears if the grab calibration is successful.

Figure 7-39: Grab Calibration Complete



S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Grab Cal
Cal Complete

The transmitter returns to the **Turbidity Calibration** screen.

Figure 7-40 may appear if the grab calibration is unsuccessful.

Figure 7-40: Grab Calibration Error

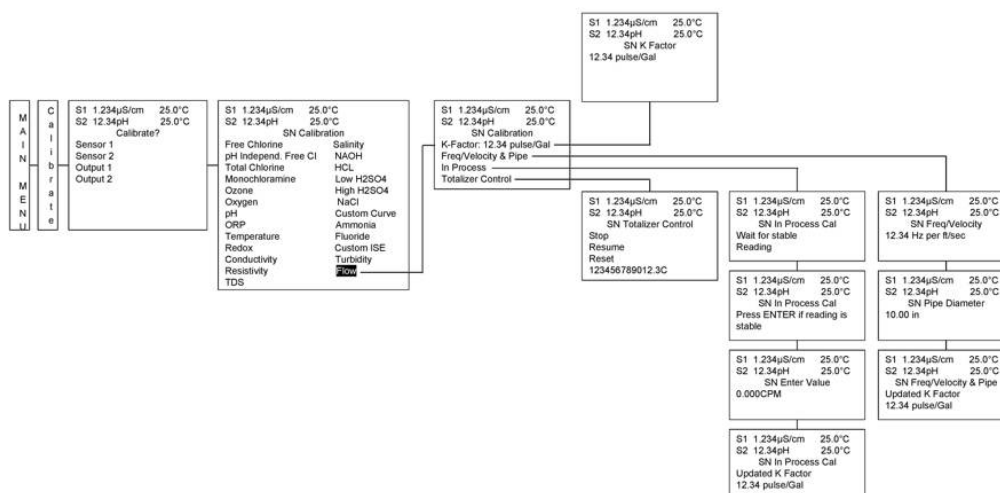
```
S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
    SN Grab Cal
Calibration
Error

Press EXIT
```

7.12 Calibrate pulse flow sensors

If flow signal boards are installed in the transmitter, you can wire a variety of pulse flow sensors to the flow signal input board to measure flow volume, total volume, and flow difference. The transmitter flow signal board supports flow sensors that are self-driven (powered by the rotation of the impeller paddle-wheel).

Figure 7-41: Pulse Flow Sensor Calibration Diagram

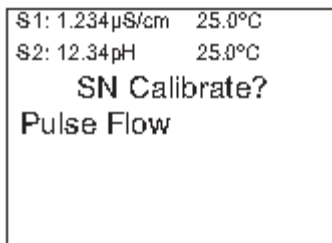


Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to Flow. Press **ENTER**.

4. Select Pulse Flow. Press **ENTER**.
[Figure 7-42](#) appears.

Figure 7-42: Calibrate Pulse Flow Screen



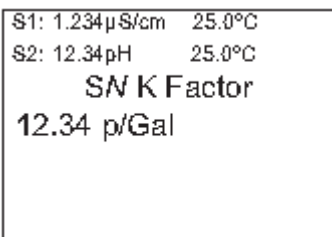
S1: 1.234 μ S/cm 25.0°C
S2: 12.34 pH 25.0°C
SN Calibrate?
Pulse Flow

7.12.1 Calibrate pulse flow with K factor

Procedure

1. From the **Pulse Flow Calibration** screen, select K Factor.
[Figure 7-43](#) appears.

Figure 7-43: K Factor Screen



S1: 1.234 μ S/cm 25.0°C
S2: 12.34 pH 25.0°C
SN K Factor
12.34 p/Gal

2. Enter the known K factor provided with the flow sensor specifications.
The transmitter returns to the **Pulse Flow Calibration** screen, showing the updated K factor.

7.12.2 Calibrate pulse flow with frequency/velocity ratio and pipe diameter

Procedure

1. From the **Pulse Flow Calibration** screen, select Freq/Velocity & Pipe.
[Figure 7-44](#) appears.

Figure 7-44: Freq/Velocity Screen

S1: 1.234 μ S/cm	25.0°C
S2: 12.34 pH	25.0°C
SN Freq/Velocity	
12.34 Hz per ft/sec	

2. Enter the frequency/velocity ratio.
[Figure 7-45](#) appears.

Figure 7-45: Pipe Diameter Screen

S1: 1.234 μ S/cm	25.0°C
S2: 12.34 pH	25.0°C
SN Pipe Diameter	
10.00 in	

3. Enter the pipe diameter.

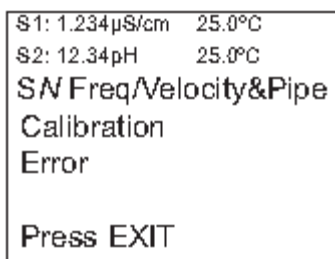
If the entries are successful, [Figure 7-46](#) appears.

Figure 7-46: Updated Calibration Screen

S1: 1.234 μ S/cm	25.0°C
S2: 12.34 pH	25.0°C
SN Freq/Velocity&Pipe	
Updated K Factor	
12.34 p/Gal	

If the results are unsuccessful, [Figure 7-47](#) may appear.

Figure 7-47: Freq/Velocity&&Pipe Calibration Error Screen



```
S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN Freq/Velocity&Pipe
Calibration
Error
Press EXIT
```

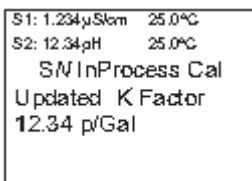
7.12.3 Calibrate pulse flow in process

Procedure

1. From the **Pulse Flow Calibration** screen, select In Process.
2. Enter the in process calibration.

If the entry is successful, [Figure 7-48](#) appears.

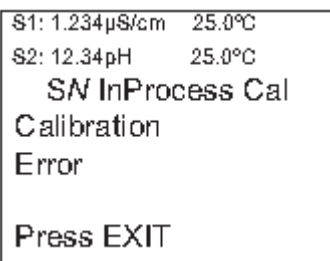
Figure 7-48: In Process Calibration Updated Screen



```
S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN InProcess Cal
Updated K Factor
12.34 p/Gal
```

If the entry is unsuccessful, [Figure 7-49](#) may appear.

Figure 7-49: In Process Calibration Error Screen



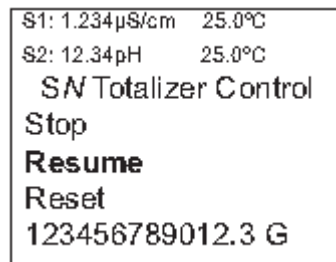
```
S1: 1.234µS/cm 25.0°C
S2: 12.34pH 25.0°C
SN InProcess Cal
Calibration
Error
Press EXIT
```

7.12.4 Calibrate pulse flow with totalizer control

Procedure

1. From the **Pulse Flow Calibration** screen, select Totalizer Control.
[Figure 7-50](#) appears.

Figure 7-50: Totalizer Control Screen



2. To suspend the totalizer, select Stop. To re-enable the totalizer, select Resume. To reset the totalizer count to zero, select Reset.
The live totalizer count result is displayed at the bottom of the **Totalizer Control** screen.

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