



**SONARtrac<sup>®</sup>**  
**PROCESS MONITORING**  
**SYSTEM**  
**QUICK START GUIDE**





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# 1 INTRODUCTION

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## 1.1 Purpose

The purpose of this document is to provide an overview of the CiDRA SONARtrac system startup and operation. It is not intended to replace reading the full manual.

This overview and the installation manual are intended to be general installation guides for the SONARtrac Process Monitoring Systems. They are not intended to cover the installation details for every process due to the wide variety of applications and processes on which the system can be used. In all cases, local safety and operating practices should take precedence over instructions contained within these documents.

## 1.2 Sensor Head Description and Function

The SONARtrac sensor head contains no moving parts. The sensor head includes a sensor band and a fiberglass or stainless steel cover assembly to protect the sensor band. The sensor band is wrapped around and clamped onto the process pipe. A multi-conductor cable electrically connects the sensors to an electronic module mounted in the cover assembly. Signals from the electronic module exit through a connector mounted to the outer surface of the cover assembly.

## 1.3 Transmitter Description and Function

The SONARtrac transmitter receives electrical signals from the sensor head. The signals are processed using sonar array processing firmware that displays the calculated results on an integral LCD screen. Results can be transmitted using the 4–20mA analog output, pulse output, alarm output, MODBUS / RTU RS-485/232 interface or optional Foundation Fieldbus™. The electronic assembly is housed in a rugged NEMA 4X enclosure.

## 1.4 CiDRA Corporation Contact Information

CiDRA Corporation  
50 Barnes Park North  
Wallingford, CT, USA 06492

Telephone: 1-203-265-0035  
1-877-243-7277 (US and Canada)

Email: [www.cidra.com](http://www.cidra.com)

Sales Support: [sales@cidra.com](mailto:sales@cidra.com)

Customer and Technical Support: [customersupport@cidra.com](mailto:customersupport@cidra.com)

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## 2 TRANSMITTER LAYOUT

### 2.1 Transmitter Illustration

The following figure illustrates the SONARtrac transmitter.

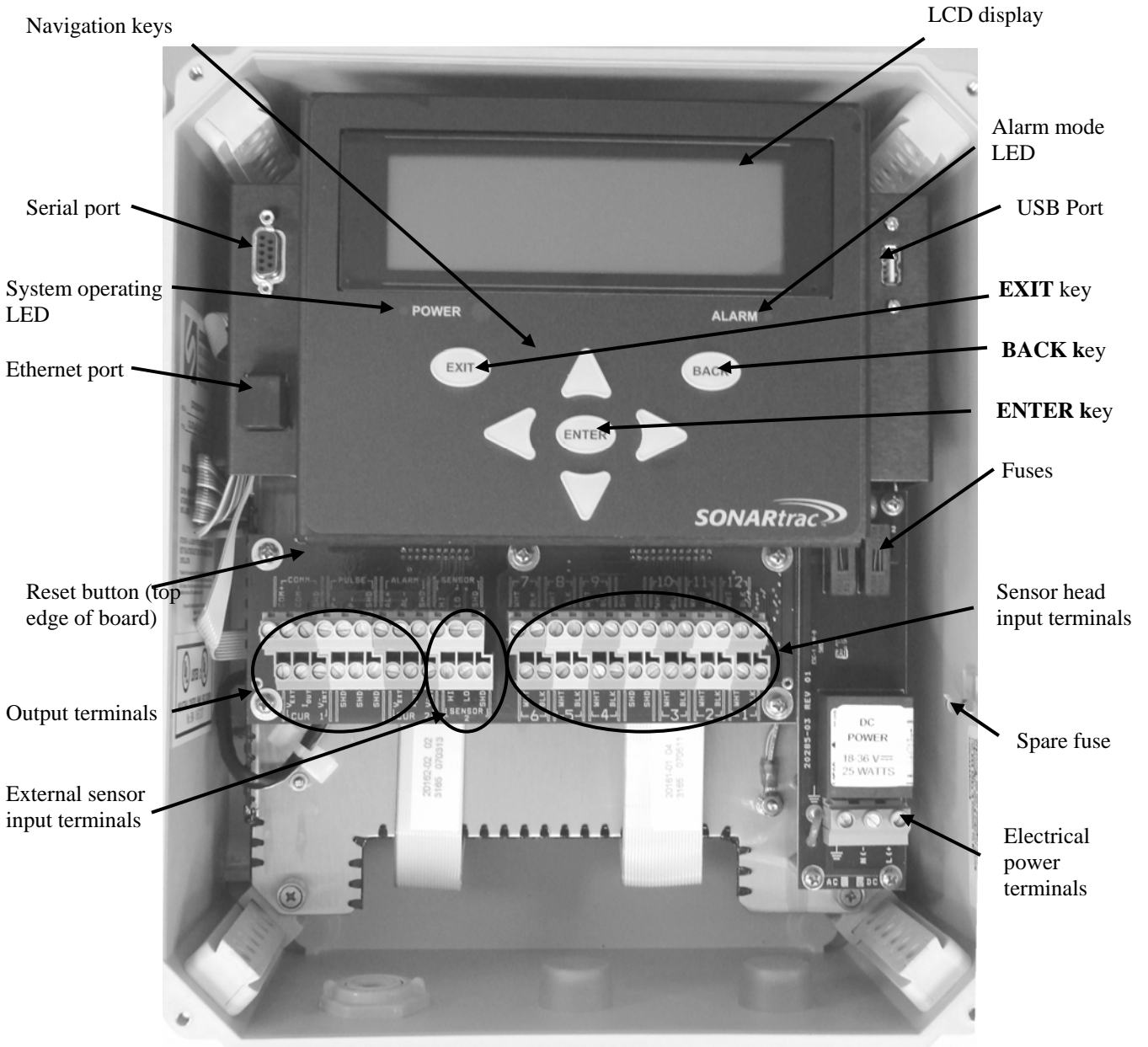


Figure 1 Transmitter Layout: Transmitters With Non-Pluggable Terminal Blocks

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Key	Operational Mode	Menu Mode		Dialog Box
		Navigation	Editing	
Up ▲	Enter Menu Mode	Cycle Menu Item	Change current value at cursor position	Exit Dialog
Down ▼	Enter Menu Mode	Cycle Menu Item	Change current value at cursor position	Exit Dialog
Left ◀	Enter Menu Mode	NA	Change cursor position	Exit Dialog
Right ▶	Enter Menu Mode	NA	Change cursor position	Exit Dialog
EXIT	Clears Alarm	Exit Menu	Exit Menu	Exit Dialog
BACK	Enter Menu Mode	Exit Menu from Main Menu or back up one level in menu tree	Exit editing mode without saving	Exit Dialog
ENTER	Enter Menu Mode	Change menu level or start editing	Exit editing mode and save current value	Exit Dialog

Table 1 Keypad Functions in Operational and Menu Modes

## 3.2 Initial Diagnostic Checks

### 3.2.1 Process On-Line

The SONARtrac meter can be installed and configured with the process in operation. Ideally, configuration is made with the process operating at normal flow rates and operating conditions.

If the process is on-line (flowing) the following system checks should be made.

#### 3.2.1.1 Sensor Test

A Sensor Test all 'ON' sensors. (Individual sensors may be turned off in the 'Customize>Sensor Setup>State' menu. Sensors should never be turned off unless directed to do so by Technical Support Personnel.) The test will take several seconds to perform. After the test is completed, the screen will display test results.

A Sensor Test is made as follows:

- Press any key except 'EXIT' on the keypad to enter the 'Menu Mode'.
- The 'Basic Config' menu is displayed on Line 1 of the display.
- Press the ↓ key to scroll to the 'Diagnostics' menu on Line 1. Press the 'ENTER' key to access the options available under that menu.
- 'Sensor Check' will appear on Line 2 of the display.

- Press the '**ENTER**' key to start the sensor test. Each of the sensors will be tested. If any sensor does not PASS, repeat the test. Individual sensor faults will be displayed on the display and along with the recommended corrective action.
- Perform any recommended corrective measures and perform a Sensor Test. Repeat as necessary
- Press the '**EXIT**' key to return to 'Operational Mode'.

### 3.2.1.2 Gain

An electronic '**Gain**' (amplification) is applied to the sensor outputs. Transmitter based gain control functions are provided through three sub-menus – '**AUTOSET GAIN**', '**CHECK/SET GAIN**', and '**TEST GAIN**'. Gain adjustments should be made to the system when the process is operating "normally".

The sensor head pre-amplifier gain sub-menus is accessed as follows:

#### 3.2.1.2.1 Autoset Gain

'**Autoset Gain**' performs an automatic test and adjustment of the pre-amplifier gain setting. It automatically cycles through pre-determined gain settings in order to find the optimal gain setting based on the flow conditions at that time.

Autoset Gain is accessed as follows:

- Press any key except '**EXIT**' on the keypad to enter the 'Menu Mode'.
- The '**Basic Config**' menu is displayed on Line 1 of the display.
- Press the ↓ key to scroll to the '**Diagnostics**' menu on Line 1. Press the '**ENTER**' key to access the options available under that menu.
- '**Sensor Check**' will appear on Line 2 of the display.
- Press the ↓ key to scroll to '**Gain**' on Line 2 of the display.
- Press the '**ENTER**' key to access the options available under that menu.
- '**Autoset Gain**' will appear on Line 3 of the display.
- Press the '**ENTER**' key and '**Autoset Gain**' will start. The gain will automatically be set to its optimal setting.

If the message reads "Insufficient Gain Detected..." or "Excessive Gain Detected..." rerun the test. If that message is repeated, contact CiDRA Technical Support.

- Press the '**EXIT**' key to return to 'Operational Mode'.

### 3.2.1.2.2 Check / Set Gain

Check / Set Gain allows the user to check the current gain setting in the pre-amplifier and to manually set it to one of four settings 1, 4.65, 21.55, and 98.65.

- Press any key except **'EXIT'** on the keypad to enter the 'Menu Mode'.
- The **'Basic Config'** menu is displayed on Line 1 of the display.
- Press the ↓ key to scroll to the **'Diagnostics'** menu on Line 1. Press the **'ENTER'** key to access the options available under that menu.
- **'Sensor Check'** will appear on Line 2 of the display.
- Press the ↓ key to scroll to **'Gain'** on Line 2 of the display.
- Press the **'ENTER'** key to access the options available under that menu.
- **'Autoset Gain'** will appear on Line 3 of the display.
- Press the ↓ key to scroll to **'Check/Set Gain'** on Line 3 of the display.
- Press the **'ENTER'** key and **'Gain=XXXX Set=YYYY'** will appear on Line 4 of the display.
- Press the **'ENTER'** key and the **'Set'** value will be highlighted.
- Press the ↓ key to scroll to a new **'Set'** value.
- Press the **'ENTER'** key and the **'Set'** value will be entered in the pre-amplifier.
- Press the **'EXIT'** key to return to 'Operational Mode'.

### 3.2.1.2.3 Test Gain

**'Test Gain'** performs a test of the system electronics to determine if the gain setting is optimal. Test results inform the user if the gain is correct, or, if there is too much or too little gain; however, it does not reset the gain. Resetting gain must be done using the **'Autoset Gain'** or **'Check / Set Gain'** commands. **'Test Gain'** should be run while the process is operating at normal conditions to avoid getting an incorrect gain value.

- Press any key except **'EXIT'** on the keypad to enter the 'Menu Mode'.
- The **'Basic Config'** menu is displayed on Line 1 of the display.
- Press the ↓ key to scroll to the **'Diagnostics'** menu on Line 1. Press the **'ENTER'** key to access the options available under that menu.
- **'Sensor Check'** will appear on Line 2 of the display.
- Press the ↓ key to scroll to **'Gain'** on Line 2 of the display.

- Press the '**ENTER**' key to access the options available under that menu.
- '**Autoset Gain**' will appear on Line 3 of the display.
- Press the ↓ key to scroll to '**Test Gain**' on Line 3 of the display.
- Press the '**ENTER**' key and '**Test Gain**' will start. Results will be shown on the display. Take appropriate action.
- Press the '**EXIT**' key to return to 'Operational Mode'.

### 3.2.1.3 Sensor Max / Min

A sensor Max / Min Test is performed as follows:

- Press any key except '**EXIT**' on the keypad to enter the 'Menu Mode'.
- The '**Basic Config**' menu is displayed on Line 1 of the display.
- Press the ↓ key to scroll to the '**Info**' menu on Line 1. Press the '**ENTER**' key to access the options available under that menu.
- '**Revisions**' will appear on Line 2 of the display.
- Press the ↓ key to scroll to '**Sensor Max / Min**' on Line 2 of the display.
- Press the '**ENTER**' key and a series of values will be displayed.

The current sensor minimum and maximum measurements as well as the peak sensor values since the last peak history reset will be displayed. A '!' at the start of a line indicates that the sensor is currently overloaded. This may indicate the sensor is not working properly or the pre-amplifier gain is too high and should be reduced. Pressing the '**ENTER**' key will refresh the display. Pressing the '→' arrow key will display a prompt to erase the sensor peak history. Press the '→' arrow again to erase the peak values.

Sensors typically have peak values of -32768 and +32767. Values within the range of about -/+2000 to -/+8000 are considered to be "ideal" when the process is operating at normal conditions. **Note:** In most cases the SONARtrac system will operate properly outside of the "ideal" range of values.

Sensor minimum and maximum values should be within about +/- 30% of each other. If one or more sensors are outside of these values, contact CiDRA Technical Support.

- Press the '**EXIT**' key to return to 'Operational Mode'.
- If the '**Sensor Max / Min**' values are outside of their "ideal" range adjust the gain per the procedures in Section 3.2.1.2.

### 3.2.2 Process Off-Line

Some times the SONARtrac system is installed with the process off-line. In this case, it is not possible to verify the proper gain setting in the transmitter.

If the process is off-line (not flowing) the following system checks should be made.

#### 3.2.2.1 Sensor Test

A Sensor Test all 'ON' sensors. (Individual sensors may be turned off in the 'Customize>Sensor Setup>State' menu. Sensors should never be turned off unless directed to do so by Technical Support Personnel.) The test will take several seconds to perform. After the test is completed, the screen will display test results.

A Sensor Test is made as follows:

- Press any key except 'EXIT' on the keypad to enter the 'Menu Mode'.
- The 'Basic Config' menu is displayed on Line 1 of the display.
- Press the ↓ key to scroll to the 'Diagnostics' menu on Line 1. Press the 'ENTER' key to access the options available under that menu.
- 'Sensor Check' will appear on Line 2 of the display.
- Press the 'ENTER' key to start the sensor test. Each of the sensors will be tested. If any sensor does not PASS, repeat the test. Individual sensor faults will be displayed on the display and along with the recommended corrective action.
- Perform any recommended corrective measures and perform a Sensor Test. Repeat as necessary
- Press the 'EXIT' key to return to 'Operational Mode'.

## 3.3 Operating Menu Setup

### 3.3.1 VF-100 System Initial Setup

In order to conduct measurements, the '**Basic Config**' setup must be completed. If power goes off, this setup will remain in memory and does not have to be re-entered.

- Press any key except '**EXIT**' on the keypad to enter the 'Menu Mode'.
- When '**Basic Config**' menu is displayed on Line 1 of the display press the '**ENTER**' key to enter the options available under that menu.
- **Sensor Serial #**' will appear on Line 2 of the display. Press the '**ENTER**' key and the current sensor serial number entered in the transmitter will be displayed on Line 4 of the display. The user can then use the arrow keys (↑ and ↓ to scroll through the values and ← and → to change position) to enter the sensor band serial number found on the sticker attached to the sensor band. Once all digits are entered, press the '**ENTER**' key to save to memory. '→**Sensor Serial #**' will again be displayed on Line 2.
- Next, press the ↓ key to scroll to the '**Pipe Size**' menu on Line 2. Press the '**ENTER**' key to access the options available under that menu. Note: it is necessary to select only one of the following options.
- The first choice on the '**Pipe Size**' menu is '→**ID / Wall**' shown on Line 3 of the display. If this value is known it can be entered here. Press the '**ENTER**' key and the current saved inner diameter and wall thickness will be shown on Line 4 of the display. Use the arrow keys (↑ and ↓ to scroll through the values and ← and → to change character) to enter the pipe inner diameter. Units can be inches or millimeters. Once all digits are entered, press the '**ENTER**' key to save the value to memory.
- The second choice on the '**Pipe Size**' menu is '**Size/Sched**' (pipe Size / Schedule). If this value is known, press the '**ENTER**' key. Use the arrow keys to enter the values and then press the '**ENTER**' key to save to memory.
- The third choice on the '**Pipe Size**' menu is '**OD / Wall**' displayed on Line 3. Use the arrow keys (↑ and ↓ to scroll through the values and ← and → to change character) to enter the pipe outer diameter. Units can be inches or millimeters. Once all digits are entered, press the '**ENTER**' key to save the value to memory.  
**Note:** Once a pipe size has been entered, re-entering the '**Pipe Size**' menu and selecting '**Size/Sched**' may cause errors in scaled output values.

- Following the entering of 'Pipe Size' press the '**BACK**' key and '→**Pipe Size**' will be displayed on Line 2. At this point the user can either press the '**ENTER**' key to re-enter the '**Pipe Size**' menu or press the ↓ key to move to the next menu item.
- Pressing the ↓ key will next display '→**Fluid Properties**' on Line 2. Press the '**ENTER**' key and '→**Specific Gravity**' will appear on Line 3 and the current value on Line 4. To change the Line 4 value press '**ENTER**' and use the arrow keys to enter the new value. Water at 25 °C (0.997) is the default. Appendix E lists values for water at various temperatures. Once the new value has been entered on Line 4, press '**ENTER**'.
- If no change is made (or after a change in Specific Gravity has been made) pressing the ↓ key will next display '→**Viscosity (Pa s)**' on Line 3 and the current value on Line 4. To change the Line 4 value press '**ENTER**' and use the arrow keys to enter the new value. Water at 25 °C ( $8.9008 \text{ e}^{-04}$ ) is the default. Appendix E lists values for water at various temperatures. Once the new value has been entered on Line 4, press '**ENTER**'.
- Pressing the ↓ key will next display '→**Calibration**' on Line 2. Press the '**ENTER**' key and '→**C0**' will appear on Line 3 and a numerical value on Line 4. Press the '**ENTER**' key and use the **arrow keys** to enter the calibration factors that will accompany the sensor. Once the 'C0' value is entered press the '**ENTER**' key to store that value to memory. Line 3 will show '→**C0**'; press the ↓ key to move to '→**C1**', press '**ENTER**', and use the **arrow keys** to enter 'C1' values. Once the values are entered, press '**ENTER**' and press the ↓ key to move to '→**C2**' and enter those values and press '**ENTER**' and the '**BACK**' key.
- The display will show '→**Calibration**' on Line 2. Press the ↓ key to scroll to '→**Flow Direction**' on Line 2. If it is necessary to change the flow direction (if the sensor was installed with the Flow Direction arrow on the band opposite the actual flow direction within the pipe or the process flow has changed direction) press the '**ENTER**' key and toggle the ↑ or ↓ to change flow direction. Once changed press the '**ENTER**' key.
- Press the ↓ key to scroll to '→**Set Date/Time**' on Line 2. Press the '**ENTER**' key and the current saved date and time will be displayed on Line 4 of the display. Use the arrow keys (↑ and ↓ to scroll through the values and ← and → to change character) to enter the date and time. **Note:** Time is in 24 hour format. Once the date and time have been set press the '**ENTER**' key.
- Press the ↓ key to scroll to '→**Set Date Format**' on Line 2. Press the '**ENTER**' key and the current date format will be displayed on Line 4 of the display. Use the arrow keys (↑ and ↓) to scroll to the

desired format. Press the '**ENTER**' key to set the desired date format followed by the '**BACK**' key.

- At this point '**Basic Config**' is displayed on Line 1 of the display. The user can re-enter this menu if desired by pressing the '**ENTER**' key or by pressing the ↑ or ↓ arrows to move to other Level 1 menus.
- Press the '**EXIT**' key to return to 'Operational Mode'.

Entry of inputs to the other Level 1 menus is by the same process as used in 'Basic Config'.

### 3.3.2 VF/GVF-100 System Initial Setup

In order to conduct measurements, the '**Basic Config**' setup must be completed. If power goes off, this setup will remain in memory and does not have to be re-entered.

- Press any key except '**EXIT**' on the keypad to enter the 'Menu Mode'.
- When '**Basic Config**' menu is displayed on Line 1 of the display press the '**ENTER**' key to enter the options available under that menu.
- '→**Sensor Serial #**' will appear on Line 2 of the display. Press the '**ENTER**' key and the current sensor band serial number entered in the transmitter will be displayed on Line 4 of the display. The user can then use the arrow keys (↑ and ↓ to scroll through the values and ← and → to change position) to enter the sensor serial number. Once all digits are entered, press the '**ENTER**' key to save to memory. '→**Sensor Serial #**' will again be displayed on Line 2.
- Next, press the ↓ key to scroll to the '**Pipe Size**' menu on Line 2. Press the '**ENTER**' key to access the options available under that menu. Note: it is necessary to select only one of the following options.
- The first choice on the '**Pipe Size**' menu is '→**ID / Wall**' shown on Line 3 of the display. If this value is known it can be entered here. Press the '**ENTER**' key and the current saved inner diameter and wall thickness will be shown on Line 4 of the display. Use the arrow keys (↑ and ↓ to scroll through the values and ← and → to change character) to enter the pipe inner diameter. Units can be inches or millimeters. Once all digits are entered, press the '**ENTER**' key to save the value to memory.
- The second choice on the '**Pipe Size**' menu is '**Size/Sched**' (pipe Size / Schedule). If this value is known press the '**ENTER**' key. Use the arrow keys to enter the values and then press the '**ENTER**' key to save to memory.

- The third choice on the '**Pipe Size**' menu is '**OD / Wall**' displayed on Line 3. Use the arrow keys (↑ and ↓ to scroll through the values and ← and → to change character) to enter the pipe inner diameter. Units can be inches or millimeters. Once all digits are entered, press the '**ENTER**' key to save the value to memory.
- Following the entering of 'Pipe Size' press the '**BACK**' key and '→**Pipe Size**' will be displayed on Line 2. At this point the user can either press the '**ENTER**' key to re-enter the '**Pipe Size**' menu or press the ↓ key to move to the next menu item.
- Pressing the ↓ key will next display '→**Pipe Material**' on Line 2. Press the '**ENTER**' key and the pipe modulus for Steel, PVC, or Stainless Steel (SS) pipe or 'Custom' will be displayed. Use the ↑ and ↓ arrow keys to scroll through the list of values. Press '**ENTER**' to select the material that corresponds to the pipe material. Selecting Steel, PVC, or SS will automatically enter the modulus for the selected pipe material. Selecting 'Custom' allows the user to enter the modulus of other pipe materials using the arrow keys (↑ and ↓ to scroll through the values and ← and → to change character). Press the '**ENTER**' key to set the new value.
- If no change is made (or after a change in Pipe Material has been made) pressing the ↓ key will next display '→**Fluid Properties**' on Line 2. Press the '**ENTER**' key and '→**Specific Gravity**' will appear on Line 3 and the current value on Line 4. To change the Line 4 value press '**ENTER**' and use the arrow keys to enter the new value. Water at 25 °C (0.997) is the default. Appendix E lists values for water at various temperatures. Once the new value has been entered on Line 4, press '**ENTER**'.
- If no change is made (or after a change in Specific Gravity has been made) pressing the ↓ key will next display '→**SOS**' on Line 3 and the current value on Line 4. To change the Line 4 value press '**ENTER**' and use the arrow keys to enter the new value. Water at 25 °C (4910.4 ft/s) is the default. Appendix E lists values for water at various temperatures. Once the new value has been entered on Line 4, press '**ENTER**'.
- If no change is made (or after a change in Specific Gravity has been made) pressing the ↓ key will next display '→**Viscosity (Pa s)**' on Line 3 and the current value on Line 4. To change the Line 4 value press '**ENTER**' and use the arrow keys to enter the new value. Water at 25 °C ( $8.9008 \times 10^{-04}$ ) is the default. Appendix E lists values for water at various temperatures. Once the new value has been entered on Line 4, press '**ENTER**'.
- Once the Fluid Properties have been entered press the '**BACK**' key and ↓ key and '→**Pressure**' will be displayed on Line 2 and the current process pressure setting on Line 4. Note: The units are PSig. To change the Line 4 value press '**ENTER**' and use the

arrow keys to enter the new value. This will result in a fixed pressure being used for GVF calculations. If a Pressure Transducer will be used to input process pressure into the transmitter, it is not necessary to enter a pressure.

- Pressing the ↓ key will next display '→**Temperature**' on Line 2 and the current process temperature setting on Line 4. Note: The units are user selectable as degrees C or F. To change the Line 4 value press '**ENTER**' and use the arrow keys to enter the new value. This will result in a fixed temperature being used for GVF calculations. If a Temperature Transducer will be used to input process temperature into the transmitter, it is not necessary to enter a pressure.
- Pressing the ↓ key will next display '→**Pressure Sel**' on Line 2. If an external pressure sensor will not be used to input pressure to the transmitter, '**Fixed**' appears on line 4. If set to '**Fixed**' pressure input, use the ↓ key to scroll to the next menu item. However, if an external pressure sensor will be used to input pressure to the transmitter press '**ENTER**' and use the ↓ key to select either '**Sensor #1**' or '**Sensor #2**'. ('Sensor #1' or 'Sensor #2' refers to the sensor input the temperature transducer is wired to on the terminal block in the transmitter enclosure.) If the Modbus input is to be used to input pressure to the transmitter use the ↓ key to select '**Protocol**'. Once the selection is made, press '**ENTER**'.
- Pressing the ↓ key will next display '→**Temperature Sel**' on Line 2. If an external temperature sensor will not be used to input temperature to the transmitter, '**Fixed**' appears on line 4. If using '**Fixed**' temperature input, use the ↓ key to scroll to the next menu item. However, if an external temperature sensor will be used to input pressure to the transmitter press '**ENTER**' and use the ↓ key to select either '**Sensor #1**' or '**Sensor #2**'. ('Sensor #1' or 'Sensor #2' refers to the sensor input the temperature transducer is wired to on the terminal block within the transmitter box.) If the Modbus input is to be used to input pressure to the transmitter use the ↓ key to select '**Protocol**'. Once the selection is made, press '**ENTER**'.
- Pressing the ↓ key will next display '→**Altitude**' on Line 2 and the selected value above (or below) sea level on Line 4. To change the Line 4 value press '**ENTER**' and use the arrow keys to enter the new value. Note: if an external pressure transducer that reads pressure in 'absolute' value (e.g. PSla, BARa, or KPaa) is used, an altitude correction is not necessary.

- Pressing the ↓ key will next display '→**Calibration**' on Line 2. Press the '**ENTER**' key and '→**C0**' will appear on Line 3 and a numerical value on Line 4. Press the '**ENTER**' key and use the **arrow keys** to enter the calibration factors that will accompany the sensor. Once the 'C0' value is entered press the '**ENTER**' key to store that value to memory. Line 3 will show '→**C0**'; press the ↓ key to move to '→**C1**', press '**ENTER**', and use the **arrow keys** to enter 'C1' values. Once the values are entered, press '**ENTER**' and press the ↓ key to move to '→**C2**' and enter those values and press '**ENTER**' and the '**BACK**' key.
- The display will show '→**Calibration**' on Line 2. Press the ↓ key to scroll to '→**Flow Direction**' on Line 2. If it is necessary to change the flow direction (if the sensor was installed with the Flow Direction arrow on the band opposite the actual flow direction within the pipe or the process flow has changed direction) press the '**ENTER**' key and toggle the ↑ or ↓ to change flow direction. Once changed press the '**ENTER**' key.
- The display will show '→**Flow Direction**' on Line 2. Press the ↓ key to scroll to '**OP Mode**'. If '**Flow/GVF/SOS**' is not displayed, press the '**ENTER**' key and then scroll using the ↓ key to select '**Flow/GVF/SOS**'. Then press the '**ENTER**' key.
- Press the ↓ key to scroll to '→**Set Date/Time**' on Line 2. Press the '**ENTER**' key and the current saved date and time will be displayed on Line 4 of the display. Use the arrow keys (↑ and ↓ to scroll through the values and ← and → to change character) to enter the date and time. **Note:** Time is in 24 hour format. Once the date and time have been set press the '**ENTER**' key.
- Press the ↓ key to scroll to '→**Set Date Format**' on Line 2. Press the '**ENTER**' key and the current date format will be displayed on Line 4 of the display. Use the arrow keys (↑ and ↓) to scroll to the desired format. Press the '**ENTER**' key to set the desired date format followed by the '**BACK**' key.
- At this point '**Basic Config**' is displayed on Line 1 of the display. The user can re-enter this menu if desired by pressing the '**ENTER**' key or by pressing the ↑ or ↓ arrows to move to other Level 1 menus.
- Press the '**EXIT**' key to return to 'Operational Mode'.

Entry of inputs to the other Level 1 menus is by the same process as used in 'Basic Config'.

# 4 HART COMMUNICATIONS

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## 4.1 Introduction

The SONARtrac transmitter implementation of HART supports HART Universal Command Revisions 5 and 6 as well as multi-drop, with a configurable Polling Address. It does not support Burst Mode at this time. The SONARtrac transmitter will appear as a GENERIC device on the HART Model 275 Handheld, for example. Most commands are either Universal or Common Practice commands; therefore, the SONARtrac transmitter will work with a host that can communicate with a generic device.

DDL files exist, but have not been submitted to the HART Communication Foundation (HCF) as of this time.

## 4.2 Setup

### 4.2.1 Internal Vs External Current Source

The 4-20mA current setting is the most important configuration setting for the HART interface. Either Internal or External power may be selected.

Most of the other HART configuration settings will typically not be changed.

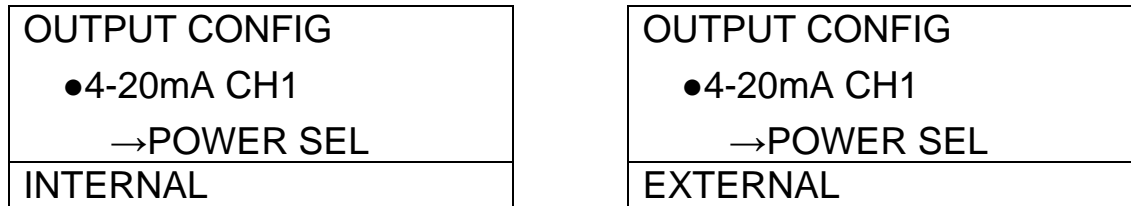


Figure 3 SONARtrac Front Panel Menu Power Select Setting Internal and External

### 4.2.2 4-20mA Transmitter and DCS Connections

Connect to the appropriate terminals on the transmitter connector board.

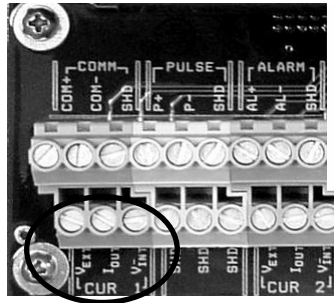


Figure 4 Transmitter Connector Board 4-20mA Connections

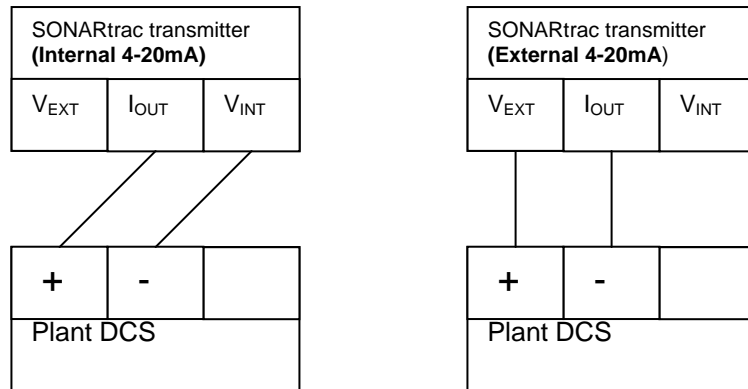


Figure 5 Transmitter to DCS Wiring for Internal and External Power Select

### 4.2.3 Fisher-Rosemount Model 275 Handheld HART Terminal

The polarity is unimportant for the Model 275; however, the SONARtrac power select **MUST** be **Internal**. The value of R must be 250 ohms.

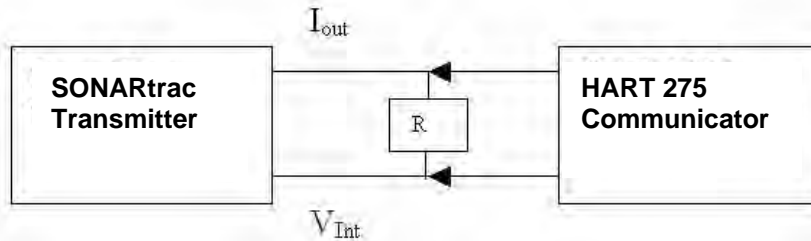


Figure 6 SONARtrac Transmitter and HART 275 Communicator

#### 4.2.4 HART Activity Indicator

When the SONARtrac receives a valid HART message, an indicator will appear on the lower right of the SONARtrac display. This indicator will be removed if another message is not received in 10 seconds.

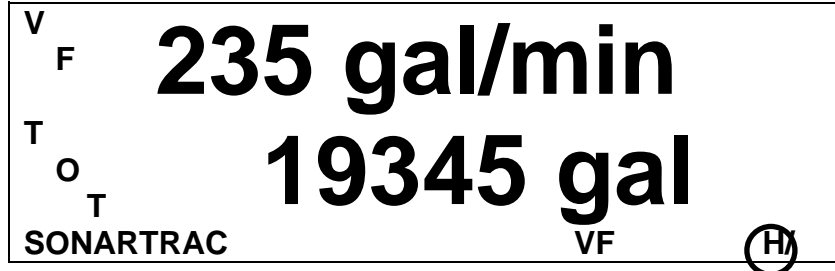


Figure 7 Transmitter Indicator of HART Activity

#### 4.2.5 Transmitter Front Panel Menu Inputs

The following HART options are available from the transmitter front panel.

##### 4.2.5.1 Universal Command Revision

The most generally deployed HART Revision is 5, the SONARtrac default HART Protocol Revision. In the case where the SONARtrac transmitter must communicate with a Revision 6 HART Master, this option may be changed to 6.

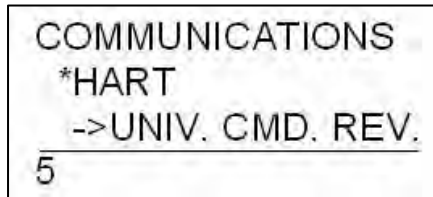


Figure 8 HART Universal Command Revision

##### 4.2.5.2 Polling Address

When using a Point to Point topology, leave the Polling Address at 0. If using Multi-Drop, set the Polling Address to a number unique from any other HART devices on the Multi-Drop loop.

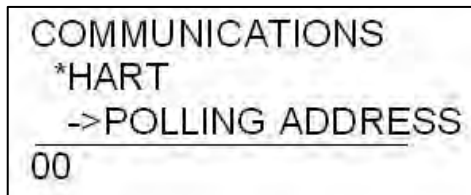


Figure 9 HART Polling Address

### 4.2.5.3 Preambles/Response Preambles

The number of Preambles or Response Preambles should not need to be changed unless the 4-20mA current loop is noisy. The maximum preambles setting is 20.

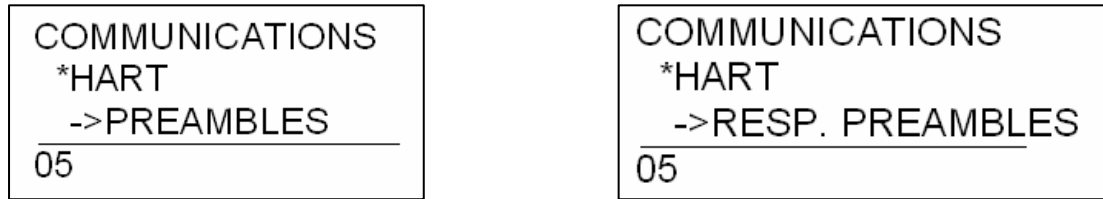


Figure 10 HART Preambles and Response Preambles

### 4.2.6 Transmitter Configuration File HART Settings

In addition to the transmitter front panel inputs, the following inputs can be made through one of the SONARtrac Utility Programs.

#### 4.2.6.1 Description

Any string of 16 valid HART characters. This is used to describe the transmitter application, tag number, or any other information the customer may wish.

#### 4.2.6.2 Date

Date field readable by the attached HART master. This can be used to save an installation date for example.

#### 4.2.6.3 Tag

Any string of 8 valid HART characters. This string will appear on the display of the Model 275 HART communicator.

#### 4.2.6.4 Long Tag

Any string of 40 valid HART characters. Used in HART Universal Command Rev 6 as a HART identifier.

#### 4.2.6.5 Message

Any string of 32 HART characters. This string is shown on the lower left of the SONARtrac display, and may be used to identify the installation.

#### 4.2.6.6 Device Serial Number

3 digit serial number of the transmitter.

#### 4.2.6.7 Final Assembly

Three (3) digit final assembly number of the transmitter.

#### 4.2.6.8 Damping

Currently not used.

#### **4.2.6.9 PV Trim**

Value subtracted from the HART 'Primary Variable' (i.e. VF).

### **4.3 HART Troubleshooting**

#### **4.3.1 HART Master Does Not Connect to SONARtrac**

##### **4.3.1.1 The HART Activity Icon Does NOT Appear on Display**

- Check the Internal/External POWER SEL setting for 4-20mA CH 1.
- Check that the Universal Command Rev matches the master.
- Check the polling address – 0 if Point to Point, unique if multi-drop.

##### **4.3.1.2 The HART Activity Icon DOES Appear on Display**

- Check that the Universal Command Rev matches the master.
- Check the polling address – 0 if Point to Point, unique if multi-drop.

#### **4.3.2 Primary Value Read Using HART Does Not Match SONARtrac**

- Check that the PV Trim value is 0.

#### **4.3.3 Connection to SONARtrac Is Intermittent**

- Increase the PREAMBLES or RESP. PREAMBLES on SONARtrac transmitter.

## 4.4 HART Commands

The following is a list of supported HART commands.

Command	Name	HART 5 or 6	Supported by CiDRA
	<b>Universal Commands</b>		
0	Read unique identifier	HART 5 & 6	YES
1	Read primary variable	HART 5 & 6	YES
2	Read current and percent of range	HART 5 & 6	YES
3	Read current and four (predefined) dynamic variables	HART 5 & 6	YES
4	Reserved	HART 5 & 6	YES
5	Reserved	HART 5 & 6	YES
6	Write polling address	HART 5 & 6	YES
7	Read loop configuration	HART 6	YES
8	Read dynamic variable families	HART 6	YES
9	Read Device Variables with Status	HART 6	YES
11	Read unique identifier associated with tag	HART 5 & 6	YES
12	Read message	HART 5 & 6	YES
13	Read tag, descriptor, date	HART 5 & 6	YES
14	Read PV sensor information	HART 5 & 6	YES
15	Read output information	HART 5 & 6	YES
16	Read final assembly number	HART 5 & 6	YES
17	Write message	HART 5 & 6	YES
18	Write tag, descriptor, date	HART 5 & 6	YES
19	Write final assembly number	HART 5 & 6	YES
20	Read long tag	HART 6	YES
21	Read unique ID associated with long tag	HART 6	YES
22	Write long tag	HART 6	YES
	<b>Common Practice Commands</b>		
33	Read transmitter variables	HART 5 & 6	YES
34	Write damping value	HART 5 & 6	YES
35	Write range values	HART 5 & 6	YES
36	Set upper range value (= push SPAN button)	HART 5 & 6	YES
37	Set lower range value (= push ZERO button)	HART 5 & 6	YES
38	Reset "configuration changed" flag	HART 5 & 6	YES
39	EEPROM control	HART 5 & 6	NO
40	Enter/exit fixed current mode	HART 5 & 6	YES
41	Perform device self- test	HART 5 & 6	YES
42	Perform master reset	HART 5 & 6	YES
43	Set (trim) PV zero	HART 5 & 6	YES
44	Write PV units	HART 5 & 6	YES
45	Trim DAC zero	HART 5 & 6	YES
46	Trim DAC gain	HART 5 & 6	YES
47	Write transfer function	HART 5 & 6	YES
48	Read additional device status	HART 5 & 6	YES
49	Write PV sensor serial number	HART 5 & 6	YES

50	Read dynamic variable assignments (4.1)	HART 5 & 6	NO
51	Write dynamic variable assignments (4.1)	HART 5 & 6	NO
52	Set transmitter variable zero (4.1)	HART 5 & 6	NO
53	Write transmitter variable units (4.1)	HART 5 & 6	YES
54	Read transmitter variable information (4.1)	HART 5 & 6	NO
55	Write transmitter variable damping value (4.1)	HART 5 & 6	NO
56	Write transmitter variable sensor serial number (4.1)	HART 5 & 6	NO
57	Read unit tag, descriptor, date (5.0)	HART 5 & 6	NO
58	Write unit tag, descriptor, date (5.0)	HART 5 & 6	NO
59	Write number of response preambles (5.0)	HART 5 & 6	YES
60	Read analogue output and percent of range (5.1)	HART 5 & 6	NO
61	Read dynamic variables and PV analogue output (5.1)	HART 5 & 6	NO
62	Read analogue outputs (5.1)	HART 5 & 6	NO
63	Read analogue output information (5.1)	HART 5 & 6	NO
64	Write analogue output additional damping value (5.1)	HART 5 & 6	NO
65	Write analogue output range values (5.1)	HART 5 & 6	NO
66	Enter/exit fixed analogue output mode (5.1)	HART 5 & 6	NO
67	Trim analogue output zero (5.1)	HART 5 & 6	NO
68	Trim analogue output gain (5.1)	HART 5 & 6	NO
69	Write analogue output transfer function (5.1)	HART 5 & 6	NO
70	Read analogue output endpoint values (5.1)	HART 5 & 6	NO
71	Lock device	HART 6	NO
72	Squawk	HART 6	YES
73	Find device	HART 6	YES
74	Read I/O system capabilities	HART 6	NO
75	Poll sub-device	HART 6	NO
76	Read Lock Device State	HART 6	YES
79	Write device variable	HART 6	NO
80	Read device variable trim points	HART 6	NO
81	Read device variable trim guidelines	HART 6	NO
82	Write device variable trim point	HART 6	NO
83	Reset device variable trim	HART 6	NO
105	Read Burst Mode Configuration	HART 6	NO
106	Flush delayed responses	HART 6	NO
107	Write burst mode transmitter variables (for Command #33) (5.1)	HART 5 & 6	NO
108	Write burst mode command number (5.0)	HART 5 & 6	NO
109	Burst mode control (5.0)	HART 5 & 6	NO
110	Read all dynamic variables (5.0)	HART 5 & 6	NO
111	Transfer service control	HART 6	NO
112	Transfer service	HART 6	NO
113	Catch device variable	HART 6	NO
114	Read caught device variable	HART 6	NO
141	Clear Existing Alarm Condition (see Note 1)	HART 5 & 6	YES

Note 1: CiDRA specific command

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## CiDRA Corporation

**50 Barnes Park North  
Wallingford, CT 06492**

**(In U.S.): 877-cidra77  
Tel: 203-265-0035  
Fax: 203-294-4211**

**Visit CiDRA Online at: [www.cidra.com](http://www.cidra.com)**