Connecting ProSample to Amazon

VOLUME MODULATION

INTRODUCTION

In this guide, a user will learn how to set up a connection between the **Amazon bubbler** and the **ProSample**, how to calibrate the 4-20 mA current loop, how to set up a trigger event, and how to program the ProSample to use the trigger event.

VOLUME MODULATION

Volume modulation means that the sample volume collected will change based on a parameter changing. In the case of a connection with a bubbler, the sample volume collected will be dependent on the current flow at the site. For example, a threshold could be set so that samples are collected once water level reaches 5.0 feet. The flow at 5 feet could correspond to a sample volume of 300 mL to be collected. The flow at 7 feet could correspond to a sample volume of 500 mL to be collected. Once the water level goes back below 5 feet, the sampler would stop collecting samples.

Figure 1: ProSample PM-12 and Amazon Bubbler
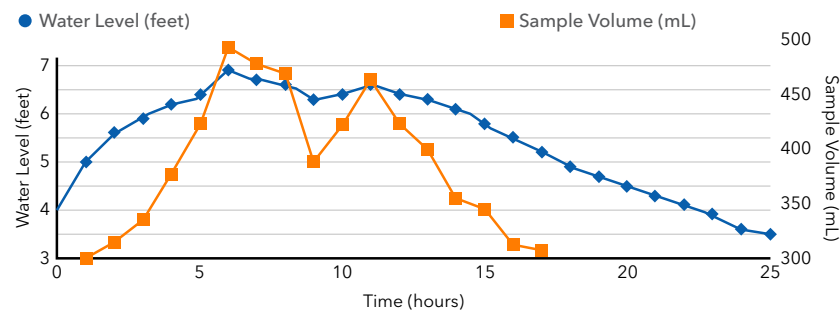
Interested in using the ProSample and Amazon in other scenarios? How-to guides are available at YSI.com/ProSample.

THINGS YOU WILL NEED

- ProSample
- Amazon Bubbler
- Flow Signal Cable
- (2) 12 V Batteries
- Additional Wire
- Wire Strippers/Cutters
- *Optional: Power Supply for Battery (Solar Panel, Regulator)*

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ASSEMBLING THE 4-20 mA CURRENT LOOP

A 4-20 mA current loop must be set up because the ProSample battery does not provide enough power to the Amazon for the current to travel through the loop for the full range of 4-20 mA.

1 Connect the Amazon power terminal blocks to the first 12 V battery.

2 Connect the regulator to the battery, and then the solar panel to the regulator. *If not using a solar panel and regulator, skip this step.*

Figure 2: Wiring diagram for a ProSample to an Amazon Bubbler.

3 Connect Flow Signal Cable to the Signal-Input port on ProSample.
   a. This is the only port available on the P and PM.
   b. This is the top port on the P-12 and PM-12.
   c. Align the notch in the cable with the connector plug.

4 Connect the grey wire on the Flow Signal Cable to the negative terminal on the second 12 V battery.
   a. Note: The 4-20 mA Current Loop needs to maintain close to 24 V in order for enough current to run through the circuit, so a solar panel should be used if the sampler is to be deployed for an extended duration.
   b. Additional wiring can be exposed by cutting back the outside layer of the flow signal cable. Be sure to avoid cutting the internal wires.
   c. An additional option if the wire length is not long enough to connect to the battery is to cut a portion of wire long enough to reach the battery and splice the wires together.

5 Connect the brown wire on the Flow Signal Cable to the 4-20 mA (-) terminal port.

6 Cut a piece of wire long enough to go from the positive terminal on the second 12 V battery to the 4-20 mA (+) port and install the wire.

After this setup takes place, there will be enough power from the ProSample and the battery to allow for enough current to travel through the loop.

Wire Color	Input Signal
Brown	Analog +
White	Analog -
Grey	Com
Yellow	Digital
Green	Event

Figure 3: Flow signal cable and wiring information.

AMAZON SETUP

1 From the menu, select **4 to 20 mA Menu**.

2 Adjust the Min Level and Max Level to the possible readings that may occur.

In the example scenario listed above, the stream bottom may be at 0.0 feet, which would be the minimum possible water level. The maximum possible water level may be 10 feet based on historically recorded flooding.
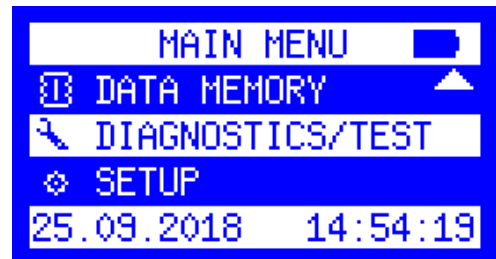

PROSAMPLE SETUP

Verifying the Connection
Before programming the sampler, a user should ensure that the Amazon 4-20 mA signal is being recognized by the ProSample. This series of steps explains how to verify this connection.

1 From the Main Menu, select **Diagnostics/Test**.

```
        MAIN MENU      ▮
▥ DATA MEMORY          ▲
🔧 DIAGNOSTICS/TEST
⊘ SETUP
25.09.2018      14:54:19
```

2 Select **Analog Inputs**.

```
🔧 DIAGNOSTICS/TEST
⬆ DIGITAL INPUTS      ▲
🗸 ANALOG INPUTS
ⓘ VERSION INFO        ▼
BACK 🔄       NEXT ⏎
```

3 If the stage has been set on the Amazon and is in between the Minimum and Maximum levels, the Analog 1 reading will be between 4 and 20 mA.

```
🗸 ANALOG INPUT 1
ANALOG 1:        13.6 mA
WATER SENSOR 1:        0
WATER SENSOR 2:        0
BACK 🔄     SCROLL ⬍
```
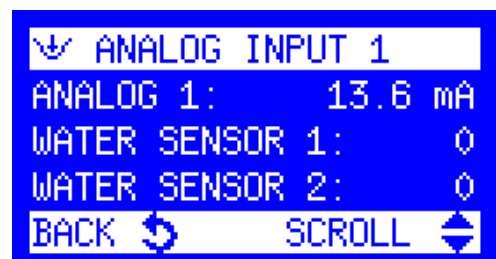
If the reading is 0.0 mA, verify that all of the connections are tight, there is power, and the water level currently being measured by the Amazon is greater than the value that was set up in the Amazon.

Calibrating the 4-20 mA Connection

The ProSample 4-20 mA channel needs to be calibrated in order to ensure that the ProSample correctly reads the current input coming from the Amazon.

1   Go back to the Main Menu, select **Setup**.

```
       MAIN MENU       ▭
 ⊞ DATA MEMORY          ▲
 ⚒ DIAGNOSTICS/TEST
 ◎ SETUP
25.09.2018      15:06:58
```

2   Select **System Settings**.

```
        ◎ SETTINGS
 📅 DATE/TIME
 ▦ SYSTEM SETTINGS
 ▣ SLEEP MODE          ▼
BACK ↺         NEXT ↵
```

3   Select **Analog Signal**.

```
 ▦ SYSTEM SETTINGS
 ✓ FAULT SIGNAL        ▲
 ≋ ANALOG SIGNAL
 ▯ DISPLAY             ▼
BACK ↺         NEXT ↵
```

4   Choose **Analog 4-20 mA**.

```
 ≋ CALIBRATION
✔ANALOG 4-20 mA
  ANALOG 0-20 mA

BACK ↺         NEXT ↵
```

5   Select **Calibration**.

```
 ≋ ANALOG SIGNAL
✔ANALOG 4-20 mA
  ANALOG 0-20 mA
  CALIBRATION
BACK ↺         NEXT ↵
```

6   Make sure **Analog 4-20 mA** is checked, select **Next**.

```
 ≋ ANALOG SIGNAL
✔ANALOG 4-20 mA
  ANALOG 0-20 mA
  CALIBRATION
BACK ↺         NEXT ↵
```

7 Change the level on the Amazon to the Minimum Level from the Amazon Setup steps.

```
CALIBRATE 4-20mA
CONNECT 4 mA
MEASURED VALUE:   4.0
mA
CONFIRM WITH  ↵
```

8 On the ProSample screen, the Measured Value should be near 4.0 mA. Select **Confirm**.
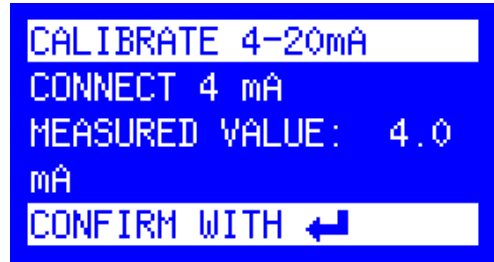
9 Change the level on the Amazon to the Maximum Level from the Amazon Setup steps.

```
CALIBRATE 4-20mA
CONNECT 20 mA
MEASURED VALUE: 20.0
mA
CONFIRM WITH  ↵
```

10 On the ProSample screen, the Measured Value should be near 20.0 mA. Select **Confirm**.

```
CALIBRATE 4-20mA
CALIBRATION DONE!
MEASURED VALUE: 20.0
CALIBRATED: 20.0 mA
CONTINUE WITH  ↵
```
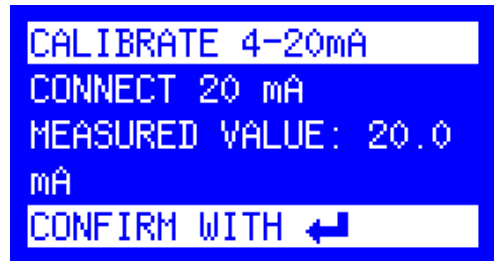
11 The calibration completed screen will appear. Select **Continue**.
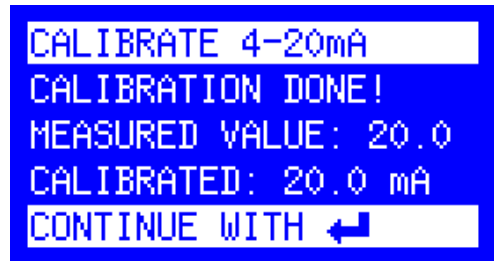
***TROUBLESHOOTING TIP**: If the measured value during the 20 mA calibration does not stabilize, there is not enough power running through the current loop and additional power needs to be inserted into the loop, or a charging system like a solar panel and regulator needs to be connected to the system if an appropriate battery size has already been installed.

Setting Up the Trigger Point
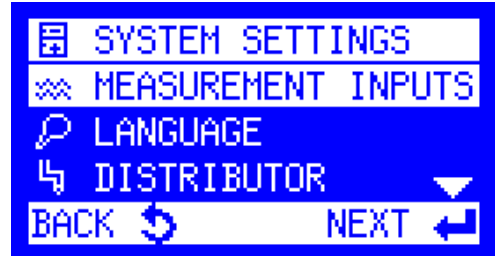
The next step in programming the ProSample is to set up a trigger threshold that will cause a sampling program to initiate. First, the maximum and minimum water levels will be programmed into the ProSample, mimicking the values that were set up in the Amazon earlier. Then, a water level value that sampling will start at will be programmed into the sampler. In this example, that trigger threshold is a water level of 5 feet.

1   Return to the System Setting menu, select **Measurement Inputs**.

```
┌─────────────────────────────┐
│ 🗄 SYSTEM SETTINGS           │
│ ⧑ MEASUREMENT INPUTS        │
│ 𝒫 LANGUAGE                  │
│ ᔐ DISTRIBUTOR        ▼      │
│ BACK ↻          NEXT ⏎      │
└─────────────────────────────┘
```

2   Choose the Channel for input by scrolling left and right. When the correct channel is displayed, select **Configure**.

```
┌─────────────────────────────┐
│ ⩗ TRIGGER (CH) ◀ 2 ▶        │
│ NOT CONFIGURED              │
│ _                           │
│                             │
│ CONFIGURE ⏎                 │
└─────────────────────────────┘
```
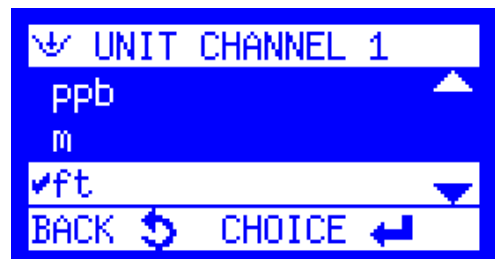
3   Select the Analog Channel that the Amazon is connected to and select **Choice**.

```
┌─────────────────────────────┐
│ ⩗ INPUT CHANNEL 1           │
│ ✔NONE                       │
│  ANALOG 1                   │
│  ANALOG 2            ▼      │
│ BACK ↻    CHOICE ⏎          │
└─────────────────────────────┘
```

4   Choose the units and select **Choice**.

```
┌─────────────────────────────┐
│ ⩗ UNIT CHANNEL 1            │
│  ppb                 ▲      │
│  m                          │
│ ✔ft                  ▼      │
│ BACK ↻    CHOICE ⏎          │
└─────────────────────────────┘
```

5   Enter the value of the 4 mA output – Minimum Value from Amazon Setup – select **Next**.

       In this example, our minimum water level value should be 0.0 feet since that is the value recorded by the Amazon when a 4mA signal is sent.

```
┌─────────────────────────────┐
│ ⩗ VALUE 0/4mA ft            │
│                             │
│ +00000.0000                 │
│                             │
│ BACK ↻      NEXT ⏎          │
└─────────────────────────────┘
```

6 Enter the value of the 20 mA output – Maximum Value from Amazon Setup – select **Next**.

> In this example, our maximum water level value should be 10.0 feet since that is the 20mA output stage in the Amazon.

```
⬇ VALUE 20mA ft

+00010.0000

BACK ↩    NEXT ↩
```

7 Select a Limit Value – High Setpoint, Low Setpoint, No Detection.

    a. **High Setpoint** – If a user wants to collect a sample after a water level goes above a certain value, this option will be selected. For example, if a user wants to collect a sample when the value goes above 5 feet, 'high setpoint' would be selected and 5.0 entered as the value.

    b. **Low Setpoint** – If a user wants to collect a sample after a water level goes below a certain value, this option will be selected. For example, if a user wants to collect a sample when the value goes below 5 feet, 'low setpoint' would be selected and 5.0 entered as the value.

    c. **No Detection** – There is no threshold determined for collecting a sample.

```
⬇ LIMIT VALUE CHANNE
 LOW SETPOINT
 HIGH SETPOINT
✔NO DETECTION
BACK ↩    CHOICE ↩
```

8 If High or Low Setpoint is chosen, enter the threshold value, select **Choice**.

```
HIGH SETPOINT C.1
ft
+00005.0000

BACK ↩    CHOICE ↩
```
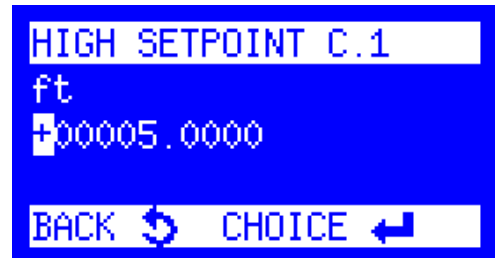
9 Enter a Deadband value, if desired, and select **Choice**.

    a. **High Setpoint Deadband** – This is the calculated value which the signal must fall below before sampling will stop. For example, sampling starts when the water level goes above 5 feet but a user does not want the sampling to stop until the water level reaches 4.8 feet. The difference between the starting trigger point and the sampling event ending is -0.2 feet. Therefore, the high setpoint deadband would be -0.2 feet.

    b. **Low Setpoint Deadband** – This is the calculated value which the signal must rise above before sampling will stop. For example, sampling starts when the water level goes below 5 feet but a user does not want the sampling to stop until the water level rises above 5.4 feet. The difference between the starting trigger point and the sampling event ending is +0.4 feet. Therefore, the low setpoint deadband would be 0.4 feet.

    c. If the event should be disabled at the same value it was enabled, the Deadband would be 0.0 feet.

```
DEADBAND C.1
ft
+00000.2000


BACK ⟳    CHOICE ⏎
```
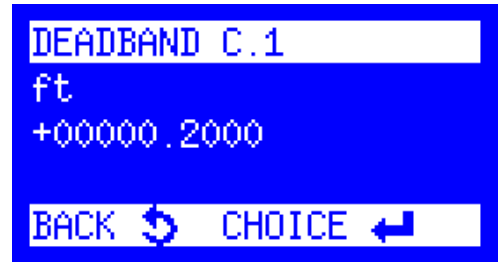
10 On the Trigger Channel menu, select **Event**. This will allow channel 1 to be used as an event trigger when programming the sampler.

```
⤳ TRIGGER CHANNEL 1
✔EVENT
  START PROG. 1
  START PROG. 2      ▼
BACK ⟳    CHOICE ⏎
```

All analog setups have now been completed. The next section will explain how to set up a sampling program using the event trigger that has just been programmed.
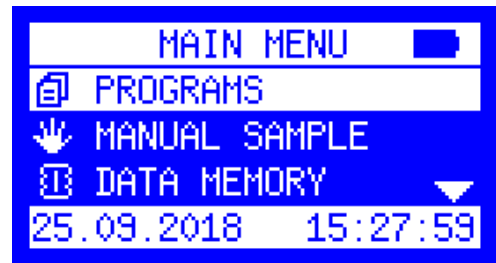
FLOW-PACED SAMPLE TRIGGERED BY EVENT

In this sampling scenario, the Amazon level triggers the sample collection to start and stop, but samples are collected on a time interval and at a volume dependent on the level.

1   From the Main Menu, select **Programs**.

```
      MAIN MENU    ▬
 🗐 PROGRAMS
 ✋ MANUAL SAMPLE
 ⏲ DATA MEMORY        ▼
25.09.2018    15:27:59
```

2   Highlight **Change** and select **Next**.

```
      🗐 PROGRAMS
 ⏱ STATUS/STOP
 ⚑ START
 ↻ CHANGE
BACK ↩        NEXT ↵
```

3   Choose the program to change by scrolling right and left, then select **Next**.

```
PROGRAM NO.      ◀ 1 ▶
 🕐 TIME
INTERVAL:        00:06
FILL TIME:      002:00
BACK ↩        NEXT ↵
```

4   Choose **Variable Time** for the program type, then select **Next**.

```
PROGRAM 1 MODE
  📊 EVENT ANALOG    ▲
  VR VARIABLE TIME
  ♫ BATCH SAMPLING
BACK ↩        NEXT ↵
```

5   Choose the units to measure, then select **Next**.

```
VR UNIT
  l/s
  m3/h
✔m3/s
BACK ↩        NEXT ↵
```

6   Set the flow rate at 20mA, then select **Next**.

```
VR SET FLOW
AT 20 mA
00050 m3/s

BACK ↩        NEXT ↵
```
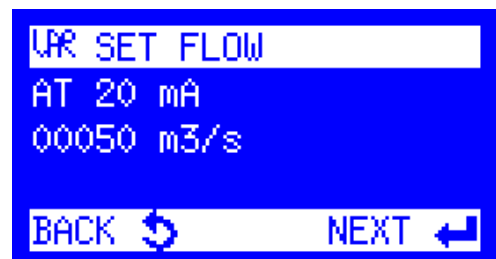
7 Set the Sampling Time Interval, and select **Next**.

```
VAR SAMPLE INTERVAL


00:15 hh:mm


BACK ↺        NEXT ↵
```
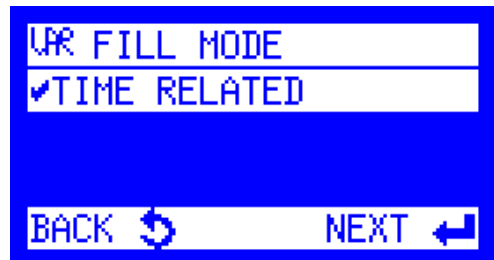
8 Set the Sample Volume to be collected at the 20 mA level, click **Next**. The volume of the sample collected will be prorated from 0 mL at 4 mA up to the sample volume entered here for 20mA.

```
VAR SAMPLE VOLUME 20mA


0200 ml AT 20 mA


BACK ↺        NEXT ↵
```

9 Select **Next** on the Time Related Fill Mode.

```
VAR FILL MODE
✓TIME RELATED




BACK ↺        NEXT ↵
```

10 Set the Fill Time. This should be how long the sample will run to fill the bottle or to encompass the needs of the sample event. Select **Next**.

```
VAR FILL TIME


012:00 hhh:mm


BACK ↺        NEXT ↵
```

11 Enter the Max Sample Volume. This volume will be per bottle, so if a 20 L bottle is used, max could be 20,000 mL. If 24 1000 mL bottles are used, 1000 mL could be max. Select **Next**.

```
VAR MAX. SAMPLE VOLUME


10000 ml/BOTTLE MAX.


BACK ↺        NEXT ↵
```

12 Choose whether to Drop Samples or Switch to Next Bottle. Select **Next**.
   a. **Drop Samples** is for composite
   b. **Switch Bottles** is for discrete

```
VAR FUNCTION
✓DROP SAMPLES
  SWITCH TO NEXT BOTTL


BACK ↺        NEXT ↵
```

13 Selecting **Settings Complete** will return the user to the Programs menu.

```
         INFO
SETTINGS COMPLETE
MORE SETTINGS

END  ↵
```

14 Highlight **Start** and select **Next**.

```
       PROGRAMS
  STATUS/STOP
  START
  CHANGE
BACK  ↺        NEXT  ↵
```

15 Choose the program that was just made by scrolling through the programs and select **Next**.

```
PROGRAM START  ◀ 1 ▶
    VARIABLE TIME
INTERVAL:      00:15
FILL TIME:    012:00
BACK  ↺        NEXT  ↵
```
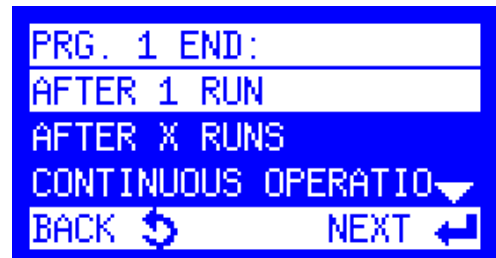
16 A selection between **Immediately**, **Date/Time**, and **Weekday/Time** will be made. Highlight the choice and select **Next**.

```
PROGRAM START PRG. 1
IMMEDIATELY
DATE/TIME
WEEKDAY/TIME
BACK  ↺        NEXT  ↵
```

17 Determine when the program will end and select **Next**.

```
PRG. 1 END:
AFTER 1 RUN
AFTER X RUNS
CONTINUOUS OPERATIO▾
BACK  ↺        NEXT  ↵
```

18 The ProSample will indicate that the program is started. The program will run until a user tells the program to Stop or until all bottles are filled.

```
   PROGRAM  ◀ 1 ▶  ▬
STATUS: ACTIVE



↵ FOR MORE OPTIONS
```

After following the setup steps for the Amazon and ProSample, and subsequently setting up a trigger point, a user will likely want to test the program to ensure that it will work correctly before leaving the sampler. To do this, manually change the stage in the Amazon by going into the Bubbler menu tab and adjusting the current level. This will change the 4-20mA reading and will trigger the sampler accordingly. After testing the program, stop the program and restart it to ensure that the forced sample start does not get included in sample counts.

Following the approach in the steps listed above will ensure that the ProSample collects samples in a timely and accurate manner based on current conditions at a sampling location. Videos and additional written documentation are available online at **YSI.com/ProSample** and **YSI.com/Amazon**.

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