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Let's Solve Water

Connecting ProSample to Rain Gauge

USING SDI-12 OUTPUT

INTRODUCTION

In this guide, a user will learn how to set up a connection between the **H-3401 rain gauge** and the **ProSample**, how to choose an output parameter to use as a trigger, how to set up a trigger event, and how to program the ProSample to use the trigger event.

SAMPLING SCENARIOS

A user may wish to collect a sample once every specified time unit before or after a rain event begins. For example, a baseflow study may desire to collect streamwater quality data before a large rain event takes place. A stormwater study, on the other hand, may want to collect only streamwater quality data affected by rainfall runoff. The example in the graph shown below shows how a time-paced stormwater sampling event may take place. The user wants to collect stormwater information after 0.3 inches of precipitation has occurred and wants to collect one 250 mL sample every 15 minutes until all 24 bottles in the carousel have a sample collected.

Figure 1: ProSample PM-12 and H-3401 rain gauge
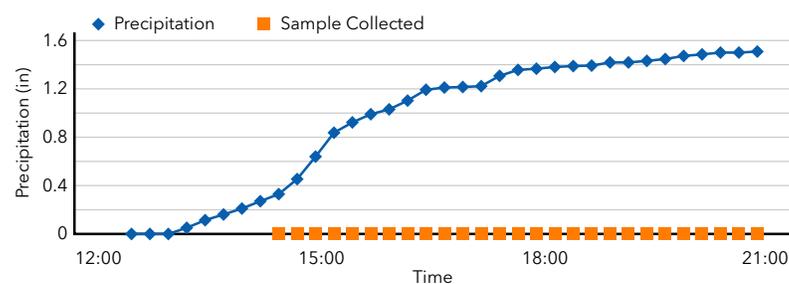
Interested in using the ProSample in other scenarios?
How-to guides are available at YSI.com/ProSample.

THINGS YOU WILL NEED

- ProSample P-12 or PM-12
- WaterLOG H-3401 or H-340 SDI-12 Rain Gauge
- ProSample SDI-12 Cable with Flying Leads
- Small Flathead Screwdriver (and, If using H-3401, Phillip's head Screwdriver)
- *Optional: Solar Panel, Regulator, and Battery*

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CONNECTING THE H-3401 RAIN GAUGE

1 Screw the SDI-12 Cable with Flying Lead on to the bottom connection plug on the back of the ProSample pump head.

2 If connecting to the H-3401, loosen the screws on the rain gauge housing and twist the housing and pull up vertically to expose the base. If connecting to the H-340, undo the clasps and lift the housing off of the base vertically. By removing the rain gauge housing, the terminal blocks will be exposed for the wiring in the next step

3 Connect the ends of the Flying Lead to the rain gauge as shown in the diagrams below using the small flathead screwdriver to loosen and tighten the screws on the H-3401 or to flip the slides open on the H-340.

4 The rain gauge can be connected to a 12V battery, regulator, and solar panel if desired for long term deployment.

NOTE: Not all of the wires from the SDI-12 Cable will fit into the small wiring hole on the bottom of the rain gauge. Be sure to tie back or clip exposed wires and use waterproof tape to protect the ends.

NOTE: No setup is needed in the rain gauge. The ProSample will recognize the rain gauge as an SDI-12 device without programming an address into the sampler.

Figure 3: SDI-12 connectors are located on the back of the ProSample pump head.
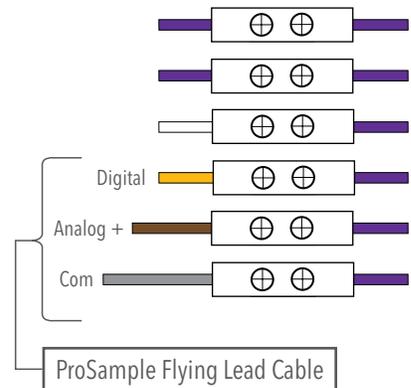
Figure 4: Wiring diagram for H-340 rain gauge. Wires shown as purple are already connected.
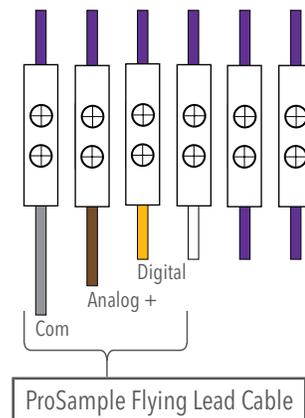
Figure 5: Wiring diagram for H-3401 rain gauge. Wires shown as purple are already connected.

PROSAMPLE SETUP

Verifying the Connection

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

```
MAIN MENU      ▭
🕮 DATA MEMORY        ▲
🔧 DIAGNOSTICS/TEST
◈ SETUP
20.02.2019    14:41:19
```
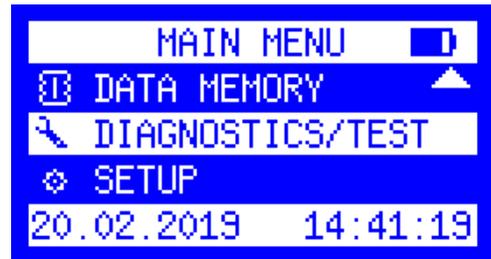
2   Select **Probe** and view the information collected about the rain gauge by the ProSample.

    a. The ProSample sends an "I" command to the SDI device upon connection and the device responds back with what the attached device is.

```
🔧 DIAGNOSTICS/TEST
ⓘ VERSION INFO      ▲
ⓘ MEASUREMENT INPUTS
ⓘ PROBE
BACK ↻        NEXT ↵
```

```
⩔ PROBE
SDI-12
13    DAA H-340100B8H
```

3   From the **Diagnostics/Test** menu, select **Measurement Inputs**. Perform one tip on the rain gauge and wait approximately 10 seconds for the reading to appear.

```
🔧 DIAGNOSTICS/TEST
ⓘ VERSION INFO      ▲
ⓘ MEASUREMENT INPUTS
ⓘ PROBE
BACK ↻        NEXT ↵
```

```
⩔ MEASUREMENT INPUTS
     0.0090 ft (0)
—
—
—
```
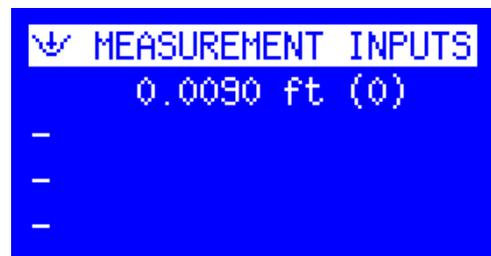
Setting Up the Trigger Point

1. Return to the Main Menu, and choose the **Setup** menu.

```
MAIN MENU      ▮▯
⊞ DATA MEMORY      ▲
🔧 DIAGNOSTICS/TEST
⚙ SETUP
20.02.2019   14:47:50
```
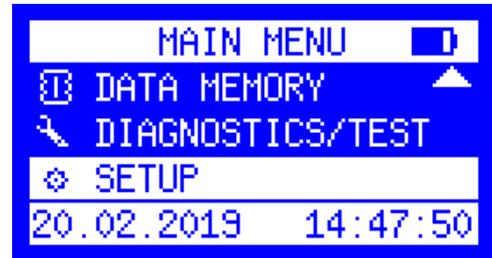
2. Select the **System Settings** menu.

```
⚙ SETTINGS
🕔 DATE/TIME
🗓 SYSTEM SETTINGS
💤 SLEEP MODE      ▼
BACK  ↺      NEXT  ↵
```

3. Select **Measurement Inputs**.

```
🗓 SYSTEM SETTINGS
≋ MEASUREMENT INPUTS
🔍 LANGUAGE
↳ DISTRIBUTOR      ▼
BACK  ↺      NEXT  ↵
```

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

```
🔽 TRIGGER (CH) ◀ 2 ▶
NOT CONFIGURED
–


CONFIGURE  ↵
```
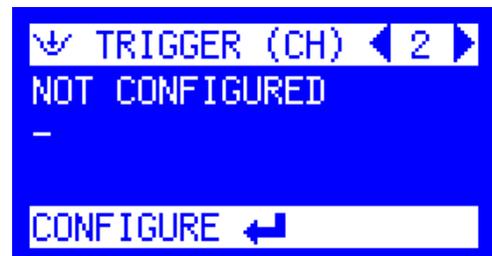
5. Select the SDI-12 Channel that will be used as the trigger and select **Choice**.
   a. The rain gauge offers 5 channels:
      i.   Rainfall accumulation since last measurement
      ii. Number of raw bucket tips since last measurement
      iii. Total rainfall accumulation since reset
      iv. Total rainfall accumulation today (since midnight, unless changed in rain gauge)
      v.   Total rainfall accumulation yesterday

```
🔽 INPUT CHANNEL 2
 SDI-12 CHANNEL 2   ▲
 SDI-12 CHANNEL 3
 SDI-12 CHANNEL 4   ▼
BACK  ↺   CHOICE  ↵
```

6. Select a unit to display.
   NOTE: The unit is arbitrary. Choosing an incorrect unit will not make a difference on the value displayed on the ProSample. For example, if a user incorrectly selects pH, the value that appears on the ProSample after channel setup is complete will be correct but the unit will appear incorrectly.

```
🔽 UNIT CHANNEL 2
 m                 ▲
 ft
 psi               ▼
BACK  ↺   CHOICE  ↵
```

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

    a. **High Setpoint** – any measurement value higher than the High Setpoint will cause a sample to be taken. High Setpoint example: Want to trigger a sample when the value is above 0.3 inches. Enter 0.3 as the value.

    b. **Low Setpoint** – any measurement value lower than the Low Setpoint will cause a sample to be taken. Low Setpoint example: Want to trigger a sample when the value is below 0.3 inches. Enter 0.3 as the value.

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

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

9 Enter a Deadband value, if desired, and select **Choice**.

    a. **High Setpoint Deadband** – the value which the signal must fall below before sampling will stop.

    b. **Low Setpoint** – the value which the signal must rise above before sampling will stop.

    c. If the event should be disabled at the same value it was enabled, the Deadband would be 0.0.
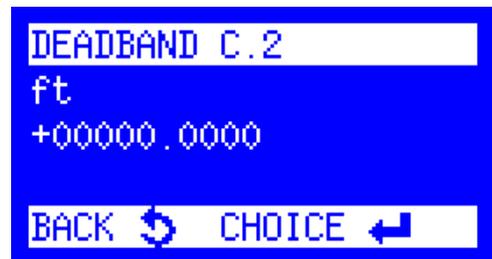
10 On the Trigger Channel menu, the user must choose between **Event** or a previously created program numbered 1-12. The next sections will describe how to set up a Time-paced or Event-time-paced program for selection in this menu.

    a. If **Event** sampling is selected, the program will run only when the setpoint criteria is met and will disable if the criteria is no longer met.

    b. If a program is selected, once the setpoint criteria is met, the program will continue to run even after the setpoint criteria is no longer met.

All SDI-12 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

TIME-PACED SAMPLE USING SPECIFIC PROGRAM

If a specific program (such as "Start Prog. 1") was selected in the ProSample Setup section, please follow these steps to ensure that the ProSample will properly collect a sample.

In this instance, after a trigger value has been reached based on the conditions set in the Trigger Channel menu, a user-specified time-paced program will begin. For example, a sample should be collected every 15 minutes after 0.3" of rain have accumulated.
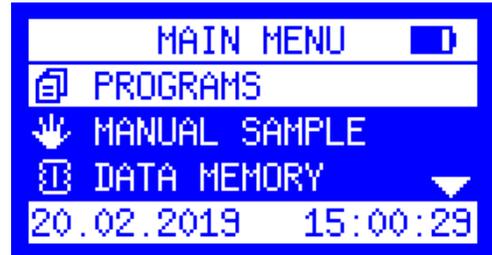
1 From the Main Menu, select **Programs**.

```
MAIN MENU        ▭
🗐 PROGRAMS
✋ MANUAL SAMPLE
🎛 DATA MEMORY          ▼
20.02.2019    15:00:29
```

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

```
       🗐 PROGRAMS
🕐 STATUS/STOP
🏳 START
🔁 CHANGE
BACK 🔄        NEXT ↵
```

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

```
PROGRAM NO.     ◀ 1 ▶
🕐 TIME
INTERVAL:        00:02
FILL TIME:      001:00
BACK 🔄        NEXT ↵
```

4 On the Program Mode screen, choose **Time** by highlighting it and selecting **Next**.

```
PROGRAM 1 MODE
✔ 🕐 TIME
   ⫿⫿ FLOW DIGITAL
   ⋀ FLOW ANALOG       ▼
BACK 🔄        NEXT ↵
```

5 Enter a sampling time interval and select **Next**.

```
🕐 SAMPLING INTERVAL
MIN.2min    MAX.99:59h
00:15 hh:mm

BACK 🔄        NEXT ↵
```

6 Enter a sample volume to be collected during each time interval and select **Next**.

```
🕐 SAMPLE VOLUME
MIN. 100    MAX.    500
00250 ml


BACK ↻          NEXT ↵
```

7 Enter a bottle fill time. Select **Next**.
   a. **Composite Bottle** (one large bottle with no distributor arm needed) - Bottle fill time determines how long the program will run.
   Example: If Sampling Interval is set to 15 minutes, Sample Volume is set to 100mL, Bottle Fill Time is set to 2 hours, then the ProSample will collect 100mL of sample every 15 minutes for 2 hours resulting in 800mL collected.
   b. **Discrete Bottles** (individual bottles, distributor arm is installed) – Bottle fill time determines how many times each bottle in the program will be filled.
   Example: If Sampling Interval is 15 minutes, Sample Volume is 100mL, and Bottle Fill Time is 15 minutes, then each bottle is only filled once and each bottle will have 100mL of sample. The length of the program is determined by the number of bottles that will be filled.
   Example 2: Sampling Interval is 15 minutes, Sample Volume is 100mL, Bottle Fill Time is 45 minutes. Each bottle will be filled 3 times and each bottle will contain 300mL.

```
🕐 BOTTLE FILL TIME
hhh:mm   000:02-168:00
000:15 hhh:mm


BACK ↻          NEXT ↵
```

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

```
        INFO
SETTINGS COMPLETE
MORE SETTINGS


END ↵
```

9 Do not start the program manually. The program will start automatically if the trigger criteria is met from the previous steps. Once the trigger criteria has been reached, the program will run until the allotted time has been reached.

NOTE: *When viewing the* **Status/Stop** *screen, the program will say* **Inactive** *or* **Active** *depending on the trigger Setpoint that was set up previously. When the trigger condition goes above the High Setpoint, the status will switch from* **Inactive** *to* **Active** *and the time-paced sampling will begin. When the trigger condition is below the Low Setpoint, time-paced sampling will occur and show* **Active** *until the value is above the Low Setpoint and then sampling will cease and the status screen will show* **Inactive***.*

```
🕐 PROGRAM ◄ 1 ►   ▭
STATUS: ACTIVE



↵ FOR MORE OPTIONS
```

```
🕐 PROGRAM ◄ 1 ►   ▭
STATUS: INACTIVE



BACK ↺
```

TIME-PACED SAMPLE TRIGGERED BY EVENT

If "Event" was selected in the ProSample Setup section, please follow these steps to ensure that the ProSample will properly collect a sample. It is recommended to only use Event for an SDI connection if no other device is attached that will use the Event tag. A program set to trigger in Event mode will only run while the setpoint criteria is met.

In this instance, after a trigger value has been reached based on the conditions set in the Trigger Channel menu, an Event Time program will begin. For example, a sample should be collected every 30 minutes after 0.3" of rain have accumulated.
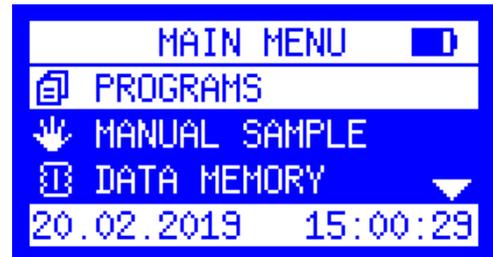
1 From the Main Menu, select **Programs**.

```
MAIN MENU        ▭▮
🗗 PROGRAMS
✋ MANUAL SAMPLE
🔢 DATA MEMORY        ▼
20.02.2019    15:00:29
```

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

```
       🗗 PROGRAMS
⏱ STATUS/STOP
⚑ START
↩ CHANGE
BACK ↺           NEXT ↵
```

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

```
PROGRAM NO.    ◀ 1 ▶
🕐 TIME
INTERVAL:         00:02
FILL TIME:       001:00
BACK ↺           NEXT ↵
```

4 On the Program Mode screen, choose **Event Time** by highlighting it and selecting **Next**.

```
PROGRAM 1 MODE
   ∿ FLOW ANALOG       ▲
✔ ◙ EVENT TIME
   🏛 EVENT DIGITAL     ▼
BACK ↺           NEXT ↵
```

5 Enter a sampling time interval and select **Next**.

```
🕐 SAMPLING INTERVAL
MIN.2min    MAX.99:59h
00:15 hh:mm

BACK ↺           NEXT ↵
```

6 Enter a sample volume to be collected during each time interval and select **Next**.

```
🕐 SAMPLE VOLUME
MIN. 100    MAX.    500
00250 ml


BACK ↻          NEXT ↵
```

7 Enter a bottle fill time. Select **Next**.
   a. **Composite Bottle** (one large bottle with no distributor arm needed) - Bottle fill time determines how long the program will run.
   Example: If Sampling Interval is set to 15 minutes, Sample Volume is set to 100mL, Bottle Fill Time is set to 2 hours, then the ProSample will collect 100mL of sample every 15 minutes for 2 hours resulting in 800mL collected.
   b. **Discrete Bottles** (individual bottles, distributor arm is installed) – Bottle fill time determines how many times each bottle in the program will be filled.
   Example: If Sampling Interval is 15 minutes, Sample Volume is 100mL, Bottle Fill Time is 45 minutes. Each bottle will be filled 3 times and each bottle will contain 300mL.

```
🕐 BOTTLE FILL TIME
hhh:mm   000:02-168:00
000:15 hhh:mm


BACK ↻          NEXT ↵
```

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

```
       INFO
SETTINGS COMPLETE
MORE SETTINGS


END ↵
```

9 Highlight **Start** and select **Next**.

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

10 Select the program that was just created by scrolling through the programs and click **Next**.

```
PROGRAM START  ◀ 1 ▶
▣ EVENT TIME
INTERVAL:        00:15
FILL TIME:      000:15
BACK ↻          NEXT ↵
```

11 A choice of **Immediately**, **Date/Time**, and **Weekday/Time** will be available. Select the desired program start time and select **Next**.

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

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

```
PRG. 1 END:
AFTER 1 RUN
AFTER X RUNS
CONTINUOUS OPERATIO▼
BACK ↻          NEXT ↵
```
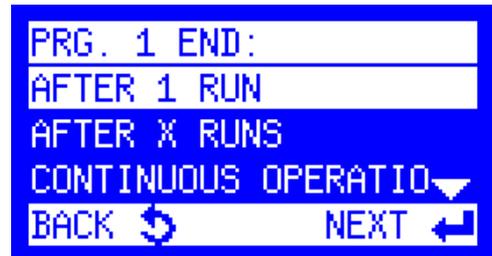
13 The ProSample will indicate that the program is started, however, sample collection will not begin until the event trigger criteria has been met. The program will run until a user tells the program to Stop or until all bottles are full.

After following the setup steps for the H-340/3401 SDI rain gage, 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 perform tips on the rain gage until the trigger point is reached and the sampler will trigger accordingly. Stop the program before any water is pulled into the sample bottles. Disconnect one of the power wires from the rain gage for five seconds to force reset all of the internal rain gage values to zero and then reconnect the power. After the sampler recognizes that the rain gage has been connected back to the unit, restart the program.

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/rain-gauge**.

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