The Analog Sensor Port

The Analog Sensor Port is an easy-to-configure, flexible DC signal-conditioning option that can be factory-installed in the HOBO U30 Station. This two-channel port can accept, and provide excitation power to a wide range of Onset and third-party sensors with 0–20 V or 0–20 mA output, including devices with 4–20 mA current loop interface, and sensors with 0–2.5, 0–5, and 0–10 V DC output.

The Analog Sensor Port features input protection and signal filtering, as well as delta-sigma A/D conversion and factory calibration. This port features extremely low power operation, resulting in long battery life for unattended data logging applications. Precision electronics provide ±0.25% accuracy from 50 mV to full scale (FS).

Sensors connected to this Analog Sensor Port can be configured using HOBOware Pro. Configuration options include scaling parameters, and excitation power. See the HOBOware User's Manual for configuration details.

If your HOBO U30 Station does not have an Analog Sensor Port and you wish to upgrade to one, contact Onset Computer Corporation for information

Sensor Excitation

The Analog Sensor Port supports optional, user-configurable sensor excitation power and warm-up. Sensor excitation is a voltage output provided by the HOBO U30 Station to power a sensor that is connected to it. This power may be needed because the sensor is not self-powered, or because the sensor's power capacity cannot support a long deployment.

When sensor excitation is required, the logger can provide 12 V DC sensor excitation voltage up to 50 mA total for transducers that require external power for proper operation. The excitation voltage has a programmable warm-up time and is controlled by the Analog Sensor Port.

Excitation power can affect the battery life. If your sensor does not require it, you should not include it in the channel configuration.

Modes

Carefully select the sensor excitation mode that best meets your needs.

- Warm-up mode

    The logger supplies excitation power for a brief, user-programmable period prior to each measurement. This mode allows you to select the minimum warm-up time needed to allow for sensor stabilization, while conserving battery power.

    For example, if you specify a warm-up of one second and set the Logging Interval to one minute, the HOBO U30 Station will power the external sensor for one second, log a measurement, and then turn off the excitation power for the next 59 seconds.

    The warm-up time can be set from 5 milliseconds up to 120 seconds.

    NOTE: If the warm-up time selected is greater than the logging interval selected, the logger will interpret the excitation mode as continuous.

Connecting Analog Sensors

Refer to the specific sensor documentation for terminal connection details and use the pinout diagram on page 76 to connect a two- or three-wire sensor or transducer to the module's terminals.

Connect Analog Sensors to Analog Sensor Port
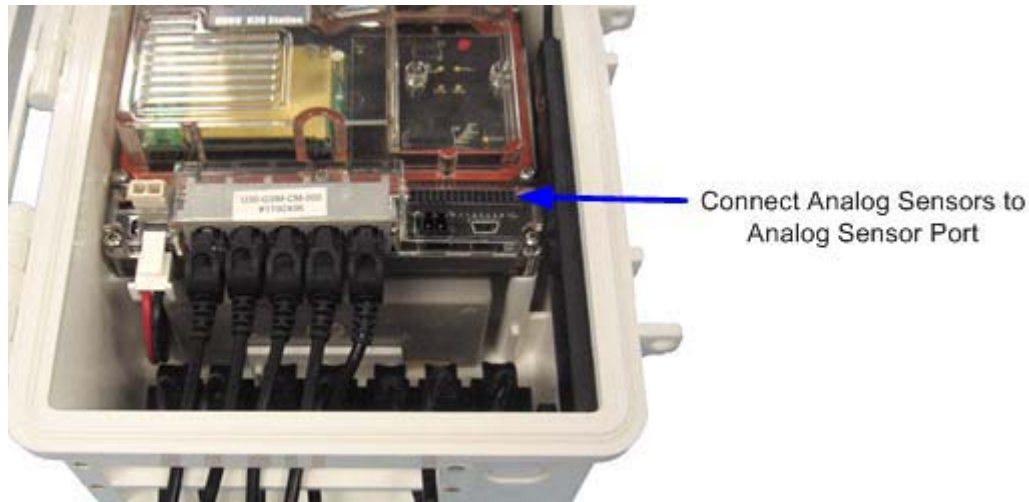
Steps

To make the connection:

1. Loosen the screw for each pin on the connector.

2. Insert the appropriate wire.

   Make sure all wires attached to the Analog Sensor Port are routed through the cable access opening.

3. Tighten the screw.

Note on Cables

To fit into the holes in the rubber cable channel, the ideal cable diameter is 0.157 in (4.0 mm). If the cable is too small, build up the diameter using heat shrink. If it is too big and you are using the secondary cable access opening, then place the cable through the left-most hole in the rubber cable channel where the diameter can be up to 0.25 in (6.4 mm).

If you are not using the secondary opening or the cable is still too big, then splice on another cable with a smaller diameter to fit through the hole. See the steps later in this section for working with the rubber cable channel.

Analog Sensor Port

Specifications

Input Channels: Two, single-ended

Field Wiring: Two- or three-wire via screw terminals on detachable connector, 16–24 AWG.

Replacement detachable connectors: Part of spares kit, Part No. A-FS-CVIA-7P-1

Input Range: User-configurable: 0–20 mA DC, 0–20 VDC (suitable for 2.5, 5, 10V sensors)

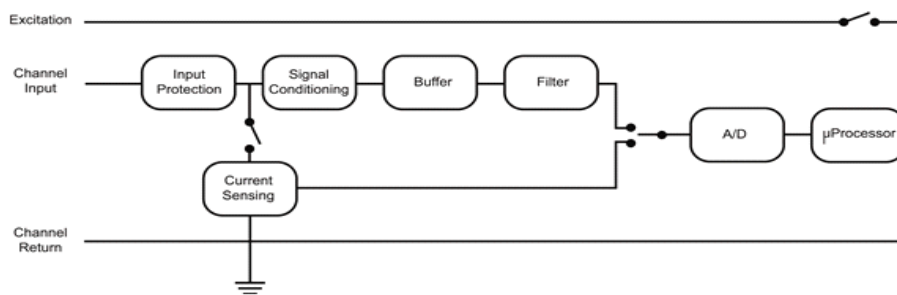Minimum/Maximum Input Voltage: 0 / 24 VDC

Minimum/Maximum Input Current: 0 / 24 mA DC

Minimum Current Source Impedance: > 20 KΩ

Accuracy: ± 0.25% of FSR from 50mV to FSV

ADC Resolution: 12 bits

Analog Sensor Port Functional Diagram


Analog Sensor Port Pinout

Pin # Left	Function	Pin # Right	Function
1	Shield	1	Shield
2	Channel 1 Signal	2	Channel 2 Signal
3	Channel 1 Return	3	Channel 2 Return
4	Excitation Voltage	4	Excitation Return

To take advantage of this adaptability, HOBOware Pro lets you configure these modules/ports at launch time, or create and save different configurations to be loaded into the modules/ports whenever needed.

Creating and saving a configuration

To configure an analog sensor port in the HOBO U30 Station or a FlexSmart module in the HOBO Energy Logger Pro, take the following steps:

1. Connect the device to the computer. (Refer to the manuals that came with your logger, module, and sensors for more specific instructions on how to set up the logger hardware.)

2. From the Device menu, choose **Configure Modules/Ports.** (If the logger is already logging, you will be warned that the logger will have to be stopped first.) This will display the Select Channel to Configure dialog.

3. If using the HOBO Energy Logger Pro, you can attach additional modules while viewing this dialog. Click **Refresh** to update the module list. Only configurable modules are listed in this dialog.
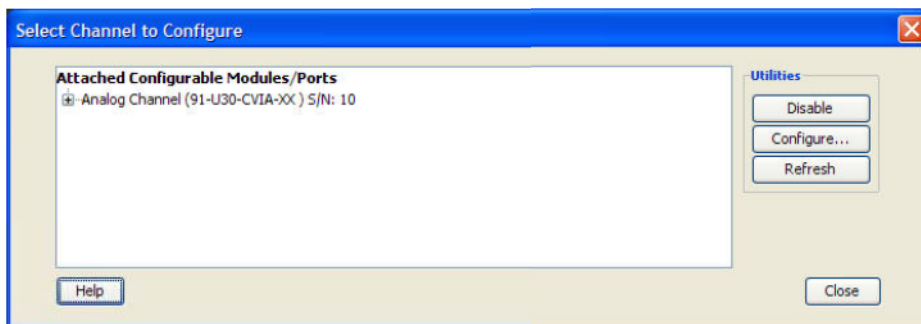

4. Double-click a module/port name to display a list of the available channels. Each channel in the module/port is defined by its channel number (the physical order in the module/port), the configured channel name, and any location (assigned at launch) defined for this channel in the logger.
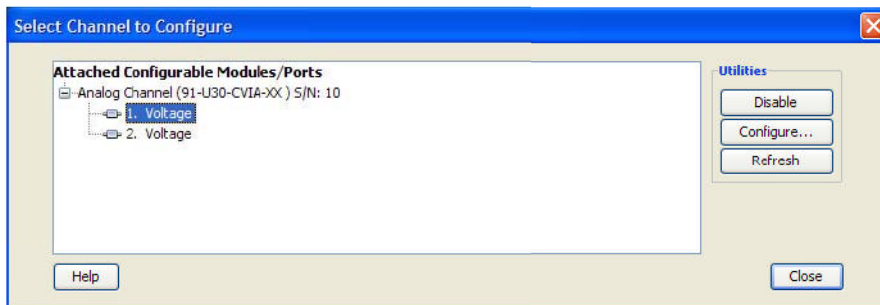
> **Tip:** You can disable one (but not both) of the sensors on a module/port so that it does not log, use battery power, or consume memory. Click the sensor channel name to select it, then click the **Disable** button. Click the button again (now displayed as **Enable**) to re-enable the sensor for logging.

5. Click a channel name to select it, then click **Configure** to display the configuration dialog for that channel.

> **Tip:** You can also access the configuration dialog from the Launch window. Double-click the module/port name to expand it, click the channel name to select it, and click the **Configure** button.
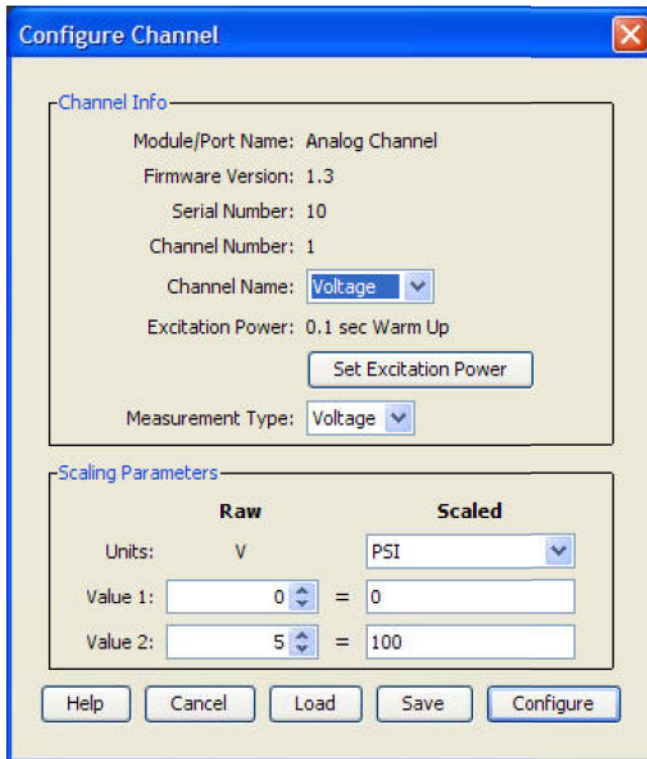
6. When the Configure Channel dialog appears, change any relevant configurable parameters:

   - Select (or define) **Channel Name**

   - Set **Excitation Power**, if applicable

   - Select (or define) **Measurement Type**, if applicable

   - Set up scaling parameters, including **Scaled Units**, if applicable

   For details on each of these parameters, refer to "Module configuration parameters" on page 88.

7. To save this configuration for future use with any module/port of the same type, click **Save**. Enter a name for the file and click **Save**. By default, the file is saved in the My Documents\HOBOware\Configs folder with an extension of .hcfg.
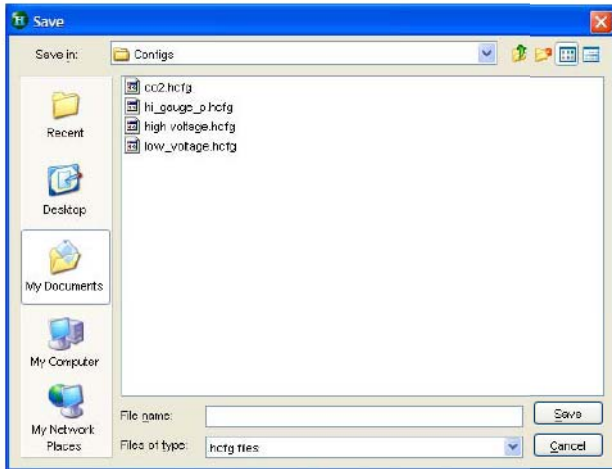
You do not have to save the configuration now if you are going to send it to the module/port right away, but you may find it convenient to save the configuration for future use, especially if you have defined custom sensor settings.

8. To send the currently displayed configuration to the module/port now (with or without saving it first), click **Configure**. The module will remain in this configuration until you send a different configuration to it.

Loading a saved configuration or resetting the default

Once you have created and saved a sensor configuration, you can load it into any module/port of the same type. For example, a configuration for a FlexSmart TRMS module can be loaded into any other FlexSmart TRMS module, but not into a FlexSmart Analog module.

1. Access the configuration dialog as you did in steps 1 through 5 in "Creating and saving a configuration" on page 84.
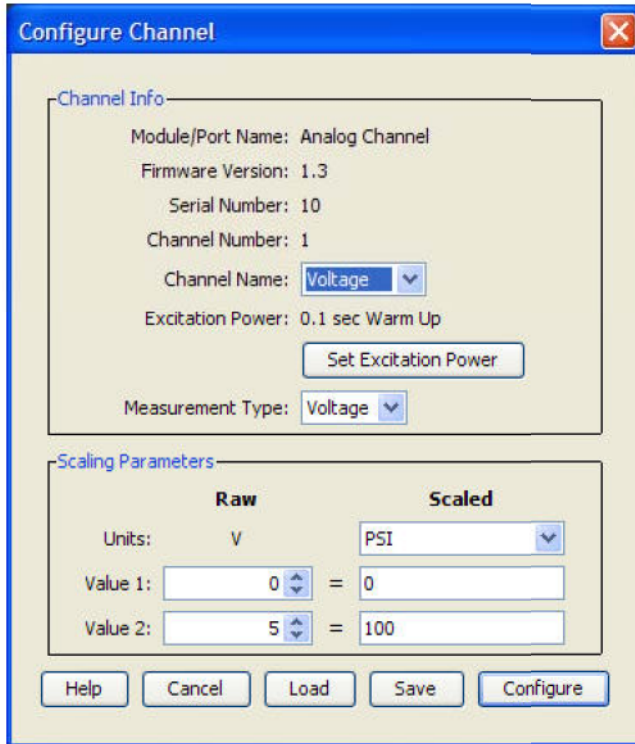
2. Click the **Load** button. The resulting dialog lists all defined configurations in the currently selected folder that are compatible with the module/port.
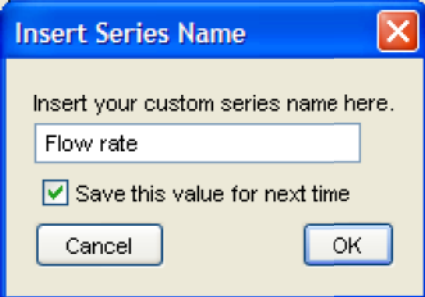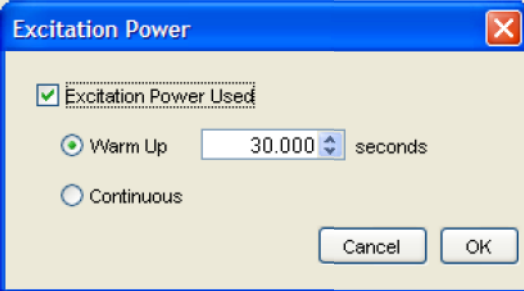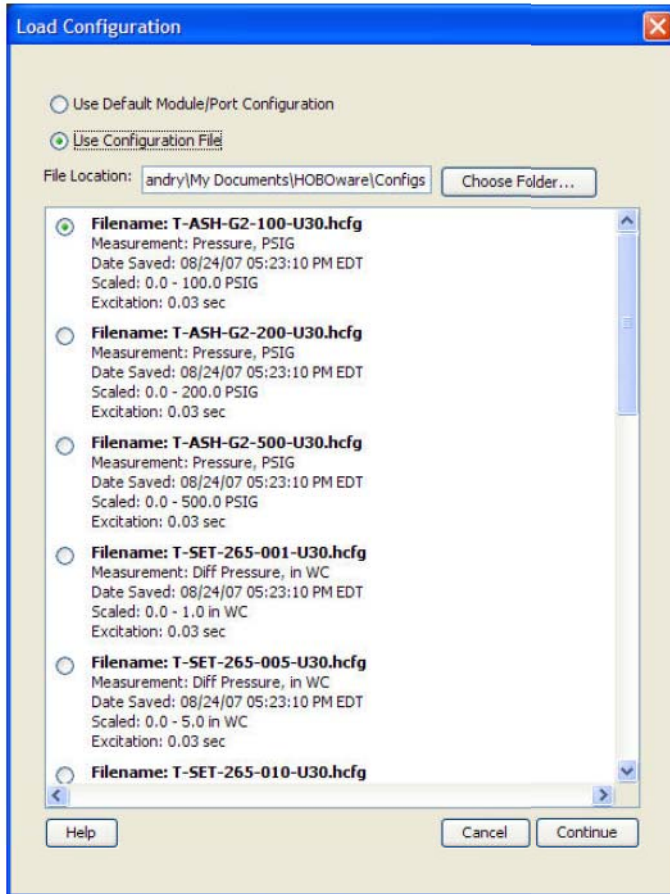
3. Choose a configuration:

- To use one of the defined configurations, click the button next to **Use Configuration File**, then click the button next to the name of the configuration file you want to use. Then click **Continue**.

- If you are experiencing problems with the module, you can reset the channel to its default configuration. Select **Use Default Module Configuration**, then click **Continue**.

4. To send the currently displayed configuration to the module/port, click **Configure**. The module/port will remain in this configuration until you send a different configuration to it.

Module configuration parameters

The following table explains the elements in the Configure Channel dialog.

Configuration parameter	Description
Module Name	FlexSmart module model and description or analog sensor port name.
Firmware Version	Version number of the firmware for the module/port.
Serial Number	Serial number of the module/port.

Configuration parameter	Description
Channel Number	Physical order of the channel in the module/port, starting at 1.
Channel Name	Description, up to 16 characters, of the physical property this sensor will measure. For example, if the external sensor attached to this channel was a flow meter, you could specify **Flow rate** as the measured property. Choose one of the predefined names from the pull-down, or choose **Custom** to display the following dialog, which allows you to define a new name. **Insert Series Name** Insert your custom series name here. Flow rate ☑ Save this value for next time Cancel OK If you check the **Save this value for next time** box, the name will be added to the **Channel Name** pull-down so that it can be selected in the future when using the same type of module/port. (Saved names are stored as preferences, and are removed when you restore preference defaults.) Click **OK** to return to the Configure Channel dialog.
Excitation Power	Some modules/ports can supply power to attached sensors using the logger's battery. If you are using a sensor with a module/port that supports excitation power and want to change the setting, click the **Excitation Power** button to display the following dialog. Check the **Excitation Power Used** box to enable excitation power. **Excitation Power** ☑ Excitation Power Used ⦿ Warm Up 30.000 ⇕ seconds ○ Continuous Cancel OK Providing excitation power drastically decreases the logger's battery life. (Consult the logger manual for more information.) In order to save battery power, you may specify the minimum time needed to power the sensor before taking a measurement. For example, if you specify a **Warm Up** of one second and set the logging interval in the logger to one minute, the logger will power the external sensor for one second, log data and then turn off the excitation power for the next 59 seconds. A warmup time can be up to 120 seconds. If the warmup required is longer than 120 seconds, or if you are not concerned with battery life, you may choose the **Continuous** option, which will power the sensor for the entire deployment. Then click **OK** to return to the Configure Channel

Configuration parameter	Description
	dialog.
	Tip: Always enable the internal battery channel for the HOBO Energy Logger Pro when logging with excitation power. (The internal battery channel in the HOBO U30 Station is automatically enabled.) If the battery becomes too low to provide excitation power, excitation power is turned off, but logging continues as long as the battery can power the logger. This will cause the further readings on that channel to become inaccurate. If you are logging the internal battery channel when this happens, an Excitation Off event will be shown in your datafile to mark the point at which excitation power was disabled.
Measurement Type	Native measurement recorded by the module/port, if applicable. Some modules/ports support multiple types of native measurements. For example, the FlexSmart Analog module can measure either current or voltage. If your module/port offers more than one type of input, select the correct one for your sensor.
Scaling Parameters - Scaled Units	Description, up to eight characters, of the units associated with the physical property to be measured. For example, if the sensor attached to this channel was a flow meter that measured flow rate, you could specify **cfs** as the scaled unit. Note that this choice does not allow for any conversion between other unit types (for example, converting from SI to US units). It is only a reference used to indicate how the module/port is configured and how the resulting data should be labeled. Choose one of the predefined units from the pull-down, or choose **Custom** to display the following dialog, which allows you to define a new unit. If you check the **Save this value for next time** box, the unit name will be added to the **Scaled Units** pull-down so that it can be selected in the future when using the same type of module/port. (Saved units are stored as preferences, and are removed when you restore preference defaults.) Click **OK** to return to the Configure Channel dialog.

Configuration parameter	Description
Scaling Parameters - Raw	**Raw Units** refers to the native measurement being reported by the external sensor (the **Measurement Type**). **Raw Value 1** and **Raw Value 2** should be input in these units. For example, if the external sensor has an output of 4 – 20 mA, the raw units would be in mA. **Raw Value 1:** The low raw value given by the external sensor. In the previous example, this would be 4 mA. **Raw Value 2:** The high raw value given by the external sensor. In the previous example, this would be 20 mA. **Raw Value 2** must always be greater than **Raw Value 1**.
Scaling Parameters - Scaled	**Scaled Value 1:** The value you will see on the graph when the sensor reports a raw value equal to **Raw Value 1**. This value should be entered in the same units that are specified in the **Scaled Units** box. **Scaled Value 2:** The value you will see on the graph when the sensor reports a raw value equal to **Raw Value 2**. This value should be entered in the same units that are specified in the **Scaled Units** box.

HOBO shuttles

HOBO shuttles provide a convenient way to read out and relaunch loggers in the field. The HOBO U-Shuttle features a text display and is compatible with all loggers supported by HOBOware Pro except the HOBO U30 Station; the HOBO Waterproof Shuttle communicates with HOBOware-compatible optic loggers.

> **Tip:** To use a U-Series logger (other than the HOBO U30 Station) with the shuttle, the logger must first be launched with HOBOware version 2.2 or higher at least once. Consult the shuttle user guide for details.

HOBOware Pro allows you to launch these shuttles, collect logger data in the field, and offload the datafiles from them. For detailed instructions on using the shuttles to read out loggers, check logger status, and relaunch loggers, refer to the user guide that came with your shuttle.

Checking shuttle status

The Shuttle Management dialog displays the status of the shuttle, including battery and clock information, and lists the datafiles that have been read out from loggers in the field. The example below shows a HOBO Waterproof Shuttle with several files available for offload. (The HOBO U-Shuttle Management dialog is similar in format.)