

## 12-Bit 4-20 mA Input Adapter (Part # S-CIA-CM14)

The 12-Bit 4-20 mA Input Adapter is used for sensors with 4-20 mA current loop outputs and is designed to work with the HOBO<sup>®</sup> Weather Station and Micro Station data loggers. The input adapter features both a battery-saving switched input and a non-switched input. It also provides a trigger source voltage for controlling power to external sensors. The input adapter has a plug-in modular connector that allows it to be added easily to the HOBO Weather Station or HOBO Micro Station.



Part # S-CIA-CM14

Specification	12-Bit 4-20 mA Input Adapter
Measurement Range*	4-20 mA
Accuracy	$\pm 0.1$ mA ( $\pm 0.5\%$ full scale) over full temperature range of $-40^{\circ}\text{C}$ to $75^{\circ}\text{C}$ ( $-40^{\circ}\text{F}$ to $167^{\circ}\text{F}$ )
Resolution	$\pm 4.93$ $\mu\text{A}$
Input Impedance	124 $\Omega$
Switched Input	Maximum switch voltage above ground (Pin 2 to Pin 1): 20 V Maximum switch current: 50 mA On time: 316.6 ms $\pm$ 3%
Sensor Trigger: Source	Voltage: 2.5 V $\pm$ 2.4%; maximum source current: 1 mA On time: 316.6 ms $\pm$ 3%
Operating Temperature Range	$-40^{\circ}$ to $75^{\circ}\text{C}$ ( $-40^{\circ}$ to $167^{\circ}\text{F}$ )
Housing	Plastic case; must be placed inside logger enclosure to protect from direct exposure to the weather
User Connection	Six-position screw terminal strip (16 – 30AWG); shielded cable recommended with outside diameter of 3.2 mm to 3.8 mm (0.125 in. to 0.150 in.)
Dimensions	4.5 x 4.8 x 1.6 cm (1.8 x 1.9 x 0.6 in.)
Weight	25 g (0.88 oz)
Number of Data Channels <sup>†</sup>	1
Measurement Averaging Option	Yes
Digital Filtering	Automatic digital filtering with 32 readings/sample in 16.6 ms
Bits per Sample	12
Length of Network Cable <sup>†</sup>	14 cm (5.5 in.)
Part Number	S-CIA-CM14

\* The input adapter can provide readings as low as 0 mA. This can be helpful when diagnosing sensor issues such as open inputs.

<sup>†</sup> The HOBO Weather Station and HOBO Micro Station have 10 and 4 data ports, respectively. A single HOBO Weather Station or HOBO Micro Station can theoretically accommodate up to 15 data channels and up to 100 m (328 ft) of network cable (the digital communications portion of the input adapter and smart sensor cables), although available space in the enclosure may limit the number of sensors you can attach.

## 12-Bit 4-20 mA Input Adapter

### Inside this package

- 12-Bit 4-20 mA Input Adapter
- Hook-and-loop tape
- Three cable ties

### Mounting

For the HOBO Weather Station, use the self-adhesive hook-and-loop tape included in the package to mount the input adapter on top of the battery cover inside the logger enclosure. To mount more than one adapter, use the back of the logger enclosure door.

For the HOBO Micro Station, you can place the input adapter inside the logger enclosure and allow it to float freely. It is not necessary to use the hook-and-loop tape.

You can connect up to 10 adapters inside the HOBO Weather Station enclosure, or up to two adapters inside the HOBO Micro Station, based on available space.

### Mounting Considerations

- If sensor cables are left on the ground, use a conduit to protect against animals, lawn mowers, exposure to chemicals, etc.
- Refer to the *HOBO Weather Station User's Guide* or the *HOBO Micro Station User's Guide* for information about setting up complete stations.

### Attaching Sensor Cables

For the HOBO Weather Station, bring the cable through the opening at the bottom of the logger enclosure. Leave some slack in the cable inside the logger housing so that you can open and close the logger's door and change the batteries without straining the cable connection. Be sure to provide "drip loops" underneath the logger to prevent water from trickling up the cable and into the logger. Pack the opening with duct seal.

For the HOBO Micro Station, bring the cable through the logger's sensor port. (See the *HOBO Micro Station User's Guide* for details on removing the dome nut and stuffing gland from the sensor port.) Ensure that the cables to the sensor are the appropriate size for the stuffing gland (0.125"-0.15"). Be sure to provide "drip loops" underneath the logger to prevent water from trickling up the cable and into the logger.

Use the included cable tie to provide strain relief to the cable (or individual wires), as shown below.

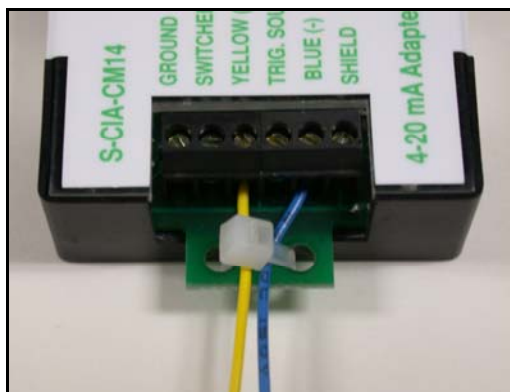


Figure 1: Cable strain relief

### Sensor Input Connections

The 12-Bit 4-20 mA Input Adapter utilizes a 6-position screw-terminal block for sensor connections with wire sizes ranging from 16 to 30AWG. Pin numbers, names and descriptions are as follows.

Pin #	Pin Name	Description
1	GROUND	Ground. Used as a common connection.
2	SWITCHED YELL (+)	Yellow switched. Makes connection to Pin 3 (+ Yellow) once per sample. This helps to conserve external sensor battery life. Maximum 20 V, 50 mA. See "Operation" below for timing diagrams.
3	YELLOW (+)	Positive current input for sampling.
4	TRIG. SOURCE	Triggered source. Provides voltage from the logger's battery to power, or trigger, the external circuitry. Maximum 2.5 V, 1 mA. See "Operation" below for timing diagrams.
5	BLUE (-)	Negative current input for sampling.
6	SHIELD	Connects cable shield for noise suppression and circuit protection.

### Typical Setup

A typical remote data logging setup consists of a 12-Bit 4-20 mA Input Adapter, a two-wire 4-20 mA transducer (i.e. flow, pressure, pH, etc.), and an external battery to provide transducer power.

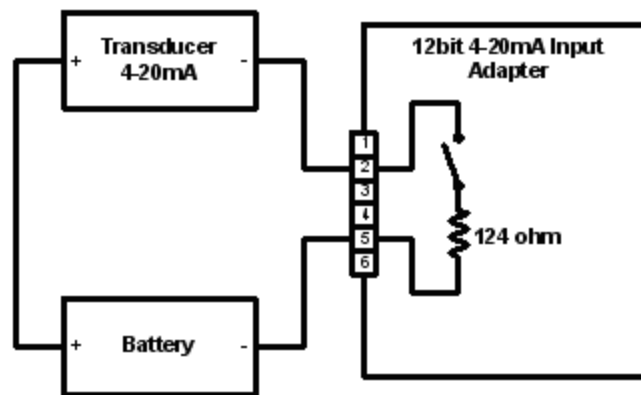


Figure 2: Switched connection

If battery conservation is not an issue, or if longer transducer warmup time is required, the following non-switched connection can be made.

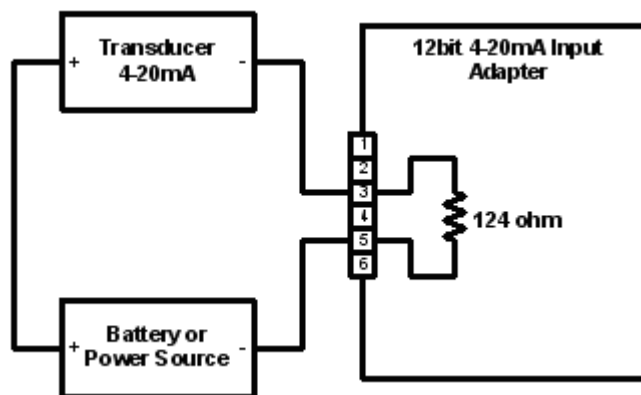


Figure 3: Non-switched connection

## 12-Bit 4-20 mA Input Adapter

### Connecting the Adapters to the Logger

To use the 12-Bit 4-20 mA Input Adapter, stop the logger and insert the adapter's modular jack into an available sensor connection port on the logger. If no port is available, use a 1-to-2 sensor connection adapter (Onset part # S-ADAPT), which allows you to plug two sensors into one port (HOBO Weather Station only).

The logger automatically detects the new input adapter the next time you launch it. Launch the logger and verify that the input adapter is functioning correctly. Measurements are recorded in milliamps (mA). See the *HOBO Weather Station User's Guide* or the *HOBO Micro Station User's Guide* for details.

### Operation

The 12-Bit 4-20 mA Input Adapter uses digital filtering and optional measurement averaging to reduce the effect of noise and improve accuracy.

Regardless of whether measurement averaging is used or not, each sample is comprised of a 300 ms ( $\pm 3\%$ ) warmup period and a 16.6 ms ( $\pm 3\%$ ) sample period. During the sample period, digital filtering is accomplished by taking 32 readings. These readings are then averaged to produce a single measurement, as shown in the following diagram:

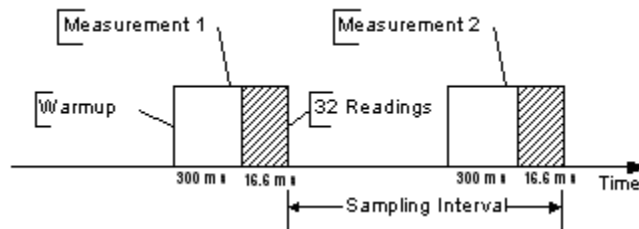


Figure 4: Measurement averaging (not to scale)

Optional measurement averaging can be selected at launch. Use measurement averaging if measurements may fluctuate significantly within the logging interval. Measurement averaging helps to prevent the sampling error known as aliasing.

To use measurement averaging, set the Sampling Interval to a rate that is faster than the logging interval. When measurement averaging is selected in this way, the adapter takes several measurements during the logging interval and averages them to produce a single logged data point. For example, if the logging interval is 10 minutes and the sampling interval is 1 minute, each recorded data point is the average of 10 measurements.

Note that fast sampling intervals (less than one minute) significantly reduce battery life.

For more information about sampling intervals, refer to the *HOBO Weather Station User's Guide* or the *HOBO Micro Station User's Guide*.

### Using the Switched Input

The 12-Bit 4-20 mA Input Adapter can be used with continuously powered 4-20 mA transducers as well as remote applications with external battery-powered 4-20 mA transducers. (See Figures 2 and 3.)

To take advantage of the switched input, the 4-20 mA transducer must meet the following criteria:

- The sensor must be able to be powered from the 4-20 mA loop.
- The sensor must have a warmup time of less than 300 ms.

Using the switched input can significantly reduce external battery consumption because the transducer is powered only during warmup and sampling, as shown in the following diagram, instead of being powered continuously.

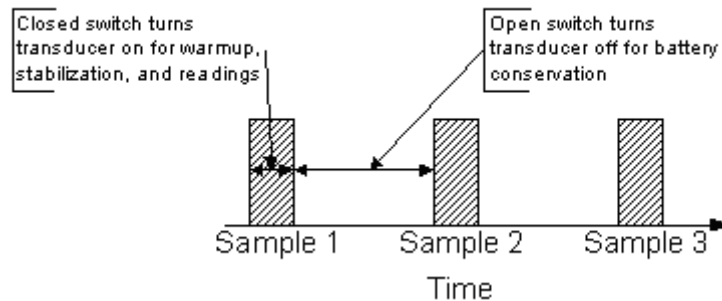


Figure 5: Logging with switched input

#### Note

- Using an external battery to drive the 4-20 mA transducer does not increase the battery life of the logger (HOBO Weather Station or HOBO Micro Station).

Compared with continuously powering the 4-20 mA transducer, the average current drain is significantly reduced. For an example of the power savings with and without using the switched input:

- If the logger's sampling interval is 60 seconds and the worst case current drain for the transducer is 20 mA, then the average current drain will be:

$$\frac{\text{transducer current} \times \text{sample duration}}{\text{20 mA} \times 0.327 \text{ s}} \div \text{sampling interval} \div 60 \text{ s} = 0.109 \text{ mA}$$

- If we assume that the transducer battery used has a useful capacity of 2000 mAh, the battery life is:

$$\frac{\text{battery capacity}}{2000 \text{ mAh}} \div \frac{\text{average current}}{0.109 \text{ mA}} \div 24 \text{ hr/day} = 764 \text{ days}$$

- Without switched input, the battery life would be:

$$\frac{2000 \text{ mAh}}{20 \text{ mA}} \div 24 \text{ hr/day} = 4.1 \text{ days}$$

Therefore, using the switched input allows the device to run approximately 186 times longer!

## **Maintenance**

With normal usage, if the adapter is installed correctly, the adapter's circuitry is protected against excessive moisture and does not require any maintenance or cleaning. However, in an unusually wet environment, excessive moisture can collect in the logger enclosure and adversely affect measurement accuracy and communications in the adapter module.

The circuit board is conformal coated to provide limited protection against moisture, but if you observe heavy condensation, consider the following options:

- Verify that the logger is installed properly and sealed according to the instructions given in the *HOBO Weather Station User's Guide* or the *HOBO Micro Station User's Guide*.
- Consider moving the logger to a location that is better protected from moisture, is better ventilated, or receives some sunlight to help keep the logger dry.
- Apply WD-40, LPS 1, or 711 to the six-position terminal block and the modular connectors to displace moisture and help prevent corrosion. (Other spray lubricants may be appropriate; check product labeling to ensure that it is safe to use on plastics and electronics.)

## **Verifying Accuracy**

You should check the accuracy of the 12-Bit 4-20 mA Input Adapter annually. Verify the accuracy of the input adapter against a known standard, such as a calibrated current source. If it is not providing accurate data, it may have been damaged. If you are unsure of the input adapter accuracy, you can send it back to Onset for re-certification. Contact Onset or your place of purchase for a Return Merchandise Authorization (RMA) number and associated costs prior to sending it.

## **Warranty**

This product is warranted to be free from defects in material and workmanship for a period of one year from the date of original purchase. During the warranty period, Onset will, at its option, either repair or replace products that prove to be defective. This warranty is void if the Onset products have been damaged by customer error or negligence, or if there has been an unauthorized modification.

## **Tune-up Service**

Onset will examine and re-test this input adapter. A tune up fee may be charged.