

Firmata

Firmata is a protocol that allows a computer to control and communicate with an Arduino microcontroller via a serial connection. By uploading the Firmata firmware to the microcontroller, you can use external software (e.g., Isadora, TouchDesigner, Max/MSP and Processing) to control hardware without needing to write and upload specific Arduino sketches for each task. It simplifies prototyping and supports various programming languages but may not be ideal for time-sensitive applications and is heavy on resources.

More information on the firmata protocol can be found here: <https://github.com/firmata/protocol>

See also https://jmarsico.github.io/rsma2019/tutorials/td_arduino/

- [Firmata and TouchDesigner](#)
- [Firmata and Isadora](#)

Firmata and TouchDesigner

https://www.youtube.com/embed/FPRRRelhE_I

Firmata and Isadora

<https://troikatronix.com/add-ons/arduino-firmata/>



Isadora Firmata


How to setup a sensor using TroikaTronix Isadora and the Isadora Arduino Firmata module

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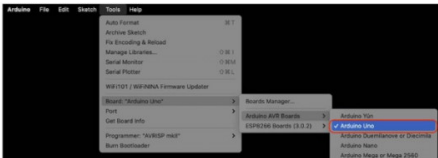
 TroikaTronix Isadora https://troikatronix.com/	 Arduino IDE https://www.arduino.cc/en/software	 Arduino Development Board https://www.arduino.cc/en/Main/Products	 Sensor https://store.arduino.cc/collections/sensors
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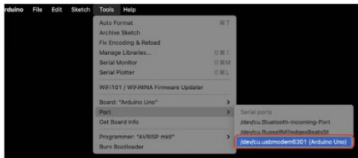
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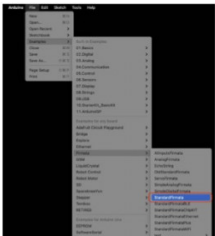
Connect your Arduino board to the host computer.



Select the appropriate development board in the Arduino IDE: Tools > Board >

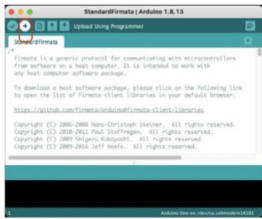


Enable the appropriate port for board in the Arduino IDE: Tools > Port >



Select the Standard Firmata Example in the Arduino IDE: File > Examples > Firmata > Standard Firmata.

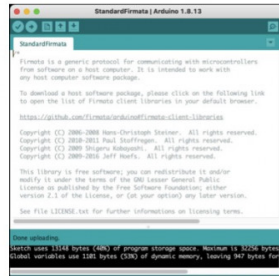
NOTE: If the Firmata library does not appear follow the Arduino IDE help instructions for loading the library.



Upload the StandardFirmata code to the board using the Arduino IDE Programmer



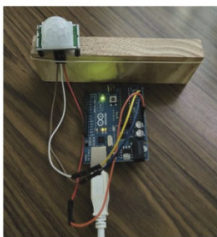
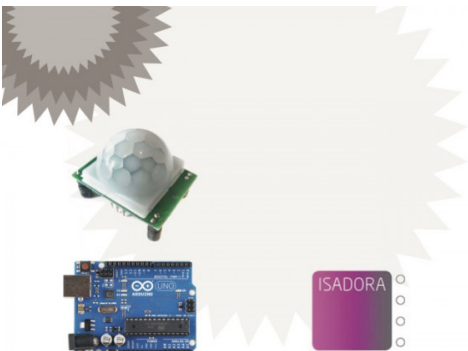
The Arduino Programmer will take a short time to upload the code to the Arduino board.



The Arduino Programmer informs you that it is "Done Uploading" the code to the Arduino board.



If all has worked as expected go ahead and quit the Arduino IDE so that the USB port becomes available to Isadora.



Setup your sensor and Arduino board with reference to the appropriate Data Sheet associated with the sensor you are using. Many sensors require three or more wires to be connected to the Arduino board. Usually the minimum is a voltage wire that can be 3.3v or 5v, Ground wire and Data wire. The voltage and ground pins on the Arduino are generally clearly marked.
Use jumper wires to connect the voltage and ground pins appropriately. Have additional jumper wires ready for the other pins that will be specified by the Isadora Arduino Firmata actor.

Launch Isadora and access the Communications > Serial Port Setup...

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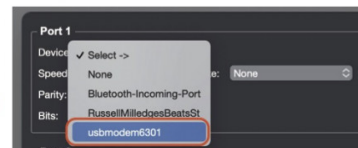
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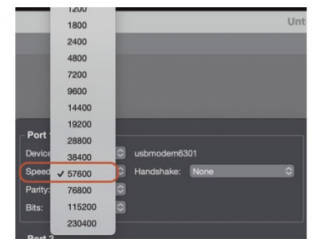
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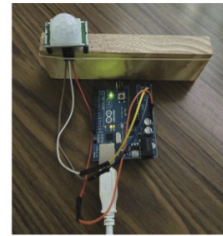
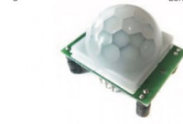
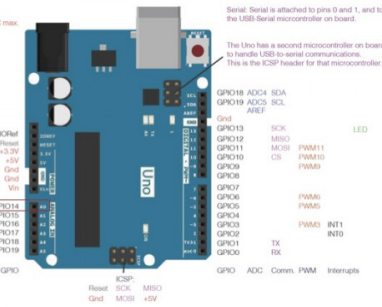
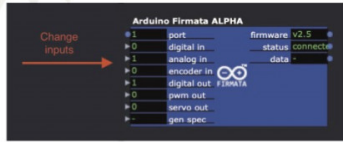
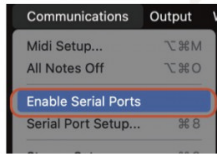
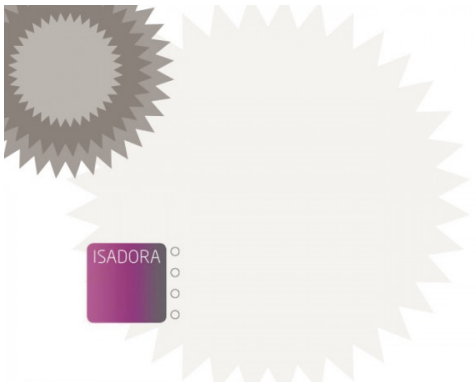
Launch Isadora and access the Communications > Serial Port Setup...



With the Arduino board connected to the computer select the Arduino board device. This is usually named as a "usbmodemXXXX" or similar. Communications > Serial Port Setup... > Device >



Set the correct baud rate for the Firmata serial port connection Communications > Serial Port Setup... > Speed > 57600



Remember to Enable Serial Ports. Communications > Enable Serial Ports >

Place an Arduino Firmata module into the Scene Editor of your Isadora patch. Wait for the status output to change to 'connected' indicating that the Arduino Firmata module is ready to be configured.

To understand the Arduino Firmata actor in Isadora, think of the actor inputs in relation to the in and out pins of the physical Arduino board. For example, sensor data goes from the sensor device to an input pin on the Arduino. Therefore, an 'analog in' is a common selection for sensor data in the Isadora actor (as indicated in the screen grab above). If your sensor requires a trigger or some other signal from the Arduino going to the sensor, this would be selected as an output on the Isadora actor.

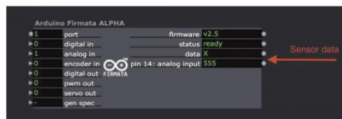
Change the input settings to match the type of inputs/outputs associated with your sensor. For example, with just one sensor connected it is possible that only one analogue input is required. Other sensors will require a number of outputs from the Arduino as well as an input (as indicated in the screen grab above). Using multiple sensors and combinations of devices is possible by specifying the total number and kind of in and out pins required on the Arduino board.

After the input and output ports have been specified, trigger the 'gen spec' (generate specification) input.

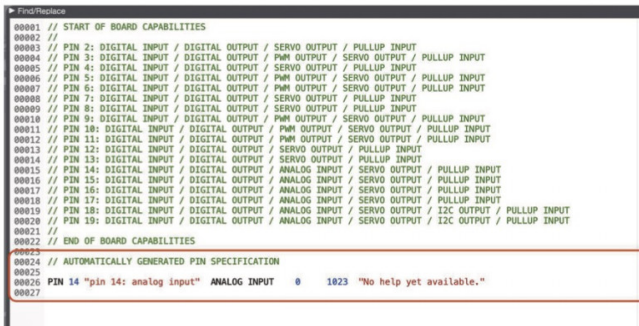
The module automatically generates appropriate pin routing for the specified settings. In this case, GPIO pin 14 for the Arduino board input and GPIO pin 2 for the Arduino board output. You can then access a Pin Out table associated with the Arduino Board you are using to locate the physical pin on the board.

Why are the inputs and outputs reversed on the Isadora Arduino Firmata actor? The Isadora Arduino Firmata actor is specified in relation to the inputs and outputs of the physical Arduino board. Therefore, 'pin 14: analog input' appears as an output on the Isadora actor, and 'pin 2: digital output' appears as an input on the Isadora actor as these represent and transfer data directly to and from the pins (also called 'headers') of the Arduino board connected to your computer and the Isadora Scene Editor patch. For example, data from a sensor is input on the physical Arduino board, this sensor data is then transferred to the Isadora Arduino Firmata actor to appear as an output available to route within the Scene Editor patch network. This indicates that the Isadora Firmata specification attempts to reflect the pins on your physical Arduino board.

Go to the sensor and Arduino board and, with a jumper wire, set the Data and other pins of the sensor to the Arduino board pins specified by the Arduino Firmata module in Isadora.



The sensor data is now routed to the Arduino Firmata module inside the Scene Editor of Isadora and can be linked into the patch.



You can access the Arduino Firmata module specification inside Isadora by double-clicking on the module. A code interface appears and can be modified manually.

<https://community.troikatronix.com/assets/uploads/files/1659913766503-isadora-firmata-sensor-setup.pdf>