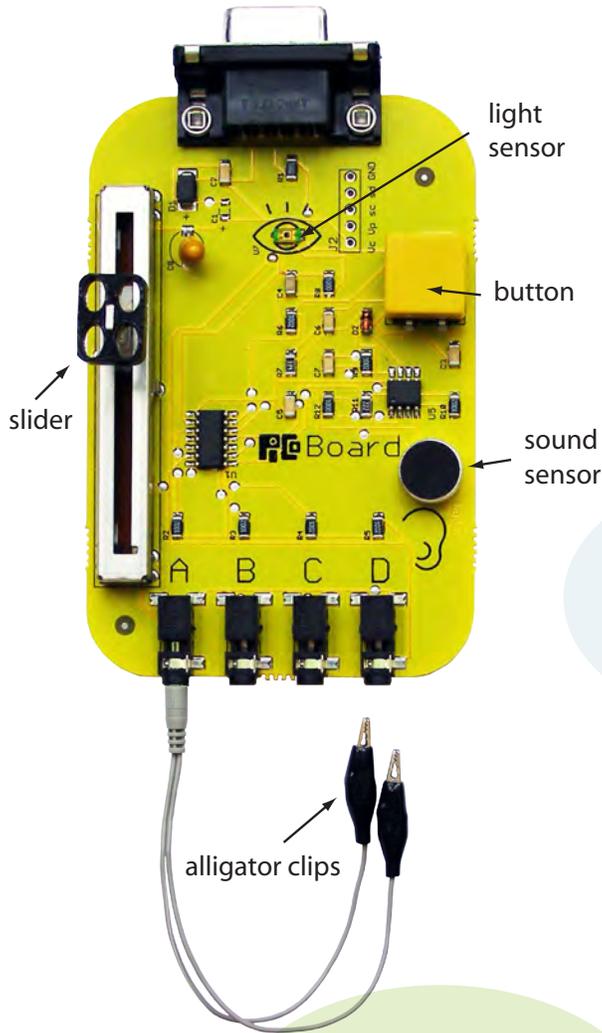


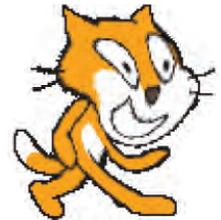
Getting Started with PicoBoards

Connect real-world sensors to your Scratch projects

The **PicoBoard** enables your Scratch (scratch.mit.edu) projects to sense – and respond to – things going on in the world outside your computer.



For example, using the **sound sensor**, you can make a sprite change how it looks whenever there is a loud sound.



Or, using the readings from the PicoBoard's **light sensor**, you can program a Scratch sprite to hop up and down whenever the sensor detects a passing shadow.

You can use the **slider** and **button** to control a character in a video game.

The PicoBoard also comes with four sets of **alligator clips** that measure the electrical resistance in a circuit.

With the alligator clips you can build all kinds of custom sensors.



For example, attach the clips to a pair of home-made metal bracelets and you can detect when your wrists touch.

The next few pages show you how to use the PicoBoard. For information about how to get a PicoBoard, see:

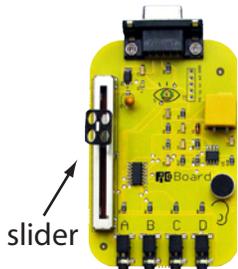
www.playfulinvention.com/picoboard.html

Getting Started with PicoBoards

www.playfulinvention.com/picoboard.html

1. Start Moving

Try using sensor readings to control the movement of a sprite.



sensor value blocks give readings ranging from 0 to 100.

Checking this box makes a sensor watcher appear on the stage, which lets you see the what value the **slider sensor** is reading.

Move the slider on the PicoBoard up and down and watch the readings change.

SCRATCH

New Open Save Save As Share! Undo Language Extras Want Help?

Motion Control Looks Sensing Sound Numbers Pen Variables

mouse x mouse y mouse down? key space pressed? touching ? touching color ? color is over ? distance to reset timer timer loudness loud? slider sensor value sensor button pressed ?

Sprite1 Export Sprite x: -103 y: 5 direction: 90

Scripts Costumes Sounds

slider sensor value 67.4 sensor watcher

when green flag clicked forever set y to slider sensor value

when green flag clicked forever set y to slider sensor value

With this script, you can control the cat's vertical position with the slider. Click on the green flag button to start the script.



Try using the slider to make the cat move up and down.

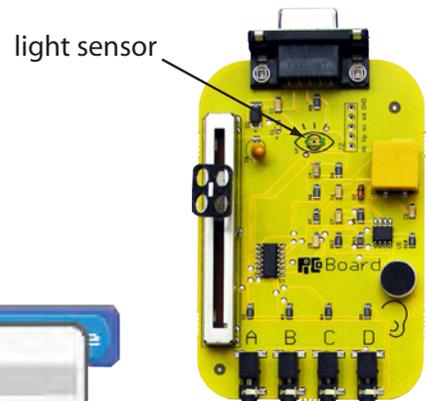
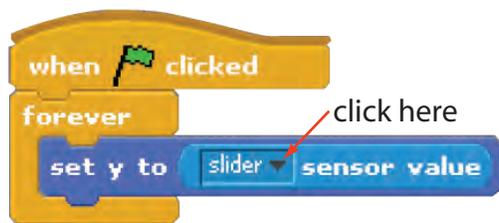
Not working?
See the Troubleshooting section at the end of this document.

Getting Started with PicoBoards

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2. Seeing Shadows

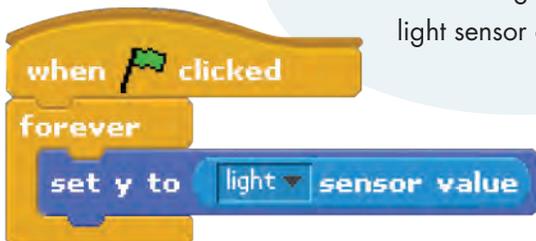
To change from the slider to another kind of sensor, click on the triangle on the sensor value block and select a sensor from the menu.



Select "light" and check the box to make a new sensor watcher appear on the stage. The readings on this watcher indicate the brightness of the light reaching the **light sensor** on the PicoBoard.

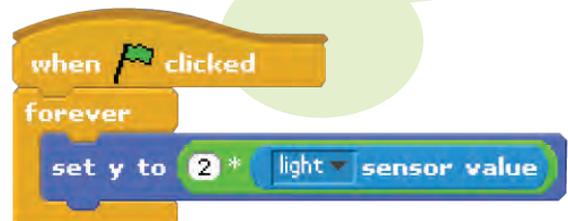
Try moving your hand to cast a shadow on the light sensor and see how the readings change.

Start this script and watch the the cat move up and down as the amount of light reaching the light sensor changes.



Want to make the cat move more?

You can use this script to make the cat twice as sensitive to changes in brightness.



Getting Started with PicoBoards

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3. Hearing Voices

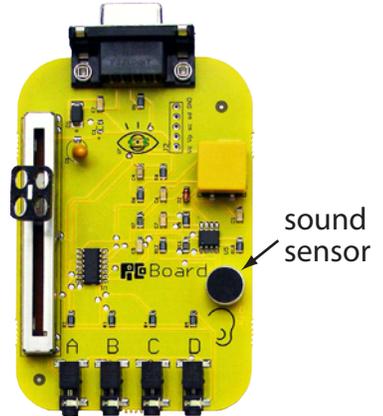
Use a PicoBoard's sound sensor to measure how loud a sound is.

Watch your sprite hop up and down as you speak into the **sound sensor**.

```
when clicked
  forever
    set y to sensor sound value
```



A **sound sensor** value block reports numbers from 0 to 100. The louder the sound, the bigger the number.

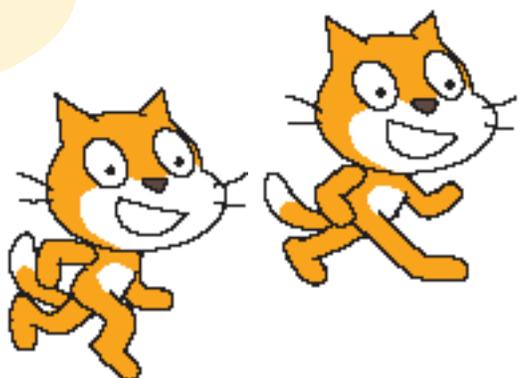


The sound sensor value block is similar to Scratch's loudness block; both blocks measure how loud sounds are.

The difference is that the loudness block uses your computer's microphone – if it has one – to make measurements, while the sound sensor value block uses the sound sensor on the PicoBoard.

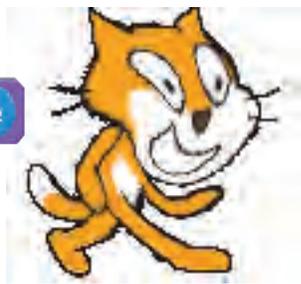
With this script, your sprite will change its costume each time you clap.

```
when clicked
  forever if < sound sensor value > 20
    next costume
    wait 0.2 secs
```



You can use sensor values to control graphic effects. Watch the cat whirl when you blow into the sound sensor.

```
when clicked
  forever
    set whirl effect to sound sensor value
```

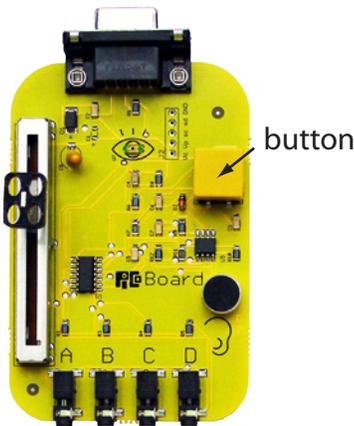


Getting Started with PicoBoards

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4. True or False?

A **sensor** ___? block reports either "true" or "false".

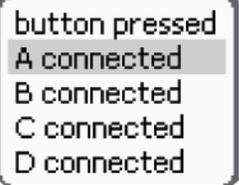


A **button pressed?** block reports "true" when the button on the PicoBoard is pressed, "false" when it is not.

With this script, the sprite will spin as long as the button is pressed.

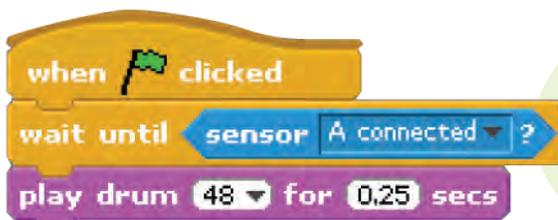


You can plug an alligator clip into one of four jacks (labelled A, B, C, and D).



The PicoBoard comes with four pairs of **alligator clips**. There is a **connected?** block for each pair of clips. This block reports "true" if there is a good electrical connection between the metal ends of the clips.

An **A connected?** block reports "true" if the ends of the alligator clips plugged into jack A are connected.



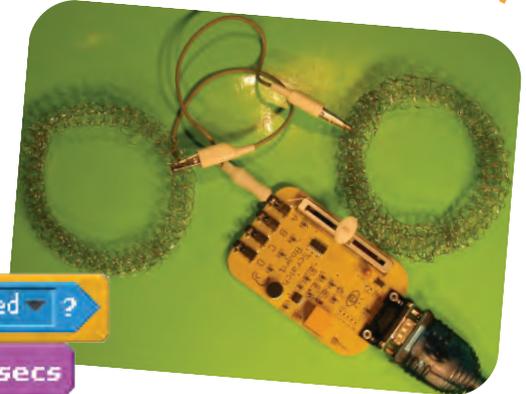
After clicking on the green flag, you won't hear the drum sound until the metal tips of the alligator clips touch each other.

Getting Started with PicoBoards

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5. Make Your Own Sensors

The PicoBoard's alligator clips can be used to build all kinds of custom sensors.



```
forever if sensor A connected ?
  play drum 48 for 0.15 secs
```

Rhythmic Wrists –

For example, if you attach the clips to a pair of home-made metal bracelets, you can detect when your wrists touch.



A resistance sensor value

block reports a number from 0 to 100, depending on how much electrical resistance there is between the metal ends of the alligator clips.

```
 resistance-A sensor value
```

```
resistance-A sensor value 28.2
```



```
forever
  play note sensor A resistance value for 0.2 secs
```

Musical Pom-Poms –

Try attaching the clips to a moist cotton pom-pom or piece of tissue paper. Watch how the resistance changes as you squeeze the pom-pom.

This script plays notes that change pitch depending on the resistance between the clips. Listen to the notes change as you squeeze the pom-pom.

Getting Started with PicoBoards

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6. Watching all the Sensors at Once

Want to watch all the PicoBoard sensors at once? Right-click (ctrl-click on a Macintosh) on any sensor block, then select the **show ScratchBoard watcher** option. A display showing all the sensor readings will appear on the stage. You can then drag the ScratchBoard watcher anywhere you want.



On	
Slider	28
Light	36
Sound	0
Button	false
A	100
B	100
C	100
D	100

If the ScratchBoard watcher does not turn on, try putting a check in the box next to one of the sensor blocks.

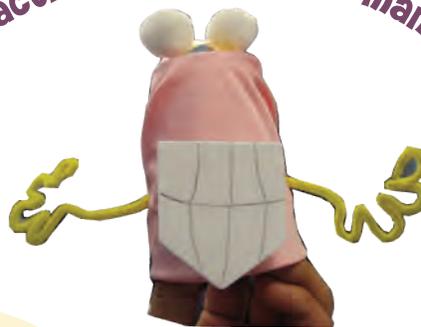
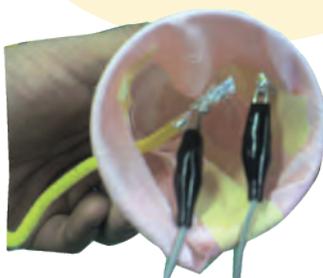
7. What else can you do with the PicoBoard?

Lots of things! For example:

Interactive Puppet Performances

Make a puppet, using craft materials, recycled materials, and other stuff.

Attach aluminum foil and position the alligator clips so that you can sense when your puppet's arms are moving.



Use Scratch to make a puppet show with characters that interact with your hand held puppet.

Getting Started with PicoBoards

www.playfulinvention.com/picoboard.html

8. Troubleshooting

To use the PicoBoard, you should be using Scratch version 1.1 or later. You can download the latest version of Scratch at:

<http://scratch.mit.edu/download>

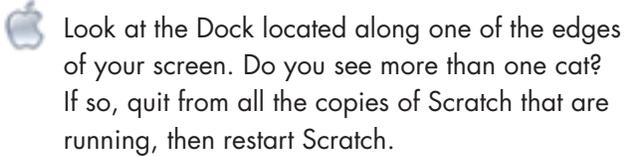
If your PicoBoard doesn't seem to be working, open the ScratchBoard watcher, as described on the previous page, and look for one of the following symptoms.

Symptom:

The ScratchBoard watcher says "Off" at the top, and the readings you see are all zero.



Things to try:

- Make sure the USB-to-serial cable and the PicoBoard are connected to the computer.
- Check for port conflicts. (Quit PicoBlocks. Turn off PalmPilot Hotsync. Disable Bluetooth software.)
- Make sure only one copy of Scratch is running.
- Have the drivers for the Prolific USB-serial cable been installed? You can download the drivers from www.playfulinvention.com/picoboard-drivers.html
-  Look at the Task Bar at bottom of your Windows screen. Make sure there is only one Scratch window open. If there is more than one, close (X) all the Scratch windows, then restart Scratch.
- Unplug and replug the USB-serial cable. Note that you can also use a serial-to-serial cable – the PicoBoard is not dependent upon the cable that ships with it.
- 
- To check if USB-serial cable is properly installed, go to Control Panel > System. Find Device Manager, and look at "Ports (COM & LPT)." You should see the Prolific USB-serial cable listed there.
- 
- Restart Scratch.
- Restart your computer, then restart Scratch.

 Applies to Windows users only

 Applies to Mac users only

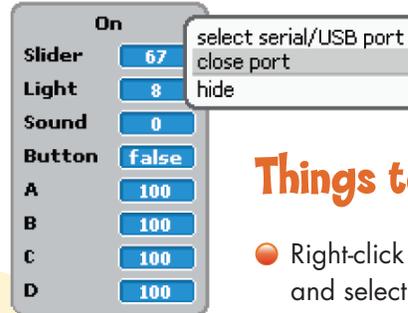
Getting Started with PicoBoards

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8. Troubleshooting *continued...*

Symptom:

The ScratchBoard watcher readings are “frozen”; they don’t change even when you make noise, move the slider, etc.



Things to try:

- Right-click (ctrl-click on a Mac) and select “close port” from the pull-down menu.
- Unplug and replug the USB-serial cable.
- Restart Scratch.
- Restart your computer, then restart Scratch.



Symptom:

The entire Scratch screen goes white and does not respond to any mouse or keyboard commands.

This is a known problem that occurs when a Windows machine goes into “standby mode” while Scratch is communicating with a PicoBoard. When you try to wake up the machine, Scratch will be in this “frozen” state.

Things to try:

- Simultaneously hold down <ctrl>, -<alt>, and <delete> keys to open the Windows Task Manager. Then select “End Task” to close Scratch. (Unfortunately, you will lose any unsaved work in Scratch.) Then restart Scratch.
- To avoid this problem, go to the Windows Control Panel and select “Power Options”. Change the settings to prevent Windows from entering standby mode.

Still Stuck?

If none of the above solutions work, contact us at picoboard@playfulinvention.com

or post a question to the ‘Sensor Boards’ forum

scratch.mit.edu/forums