PicoCricket
Reference Guide

Version 1.2a
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Welcome! This Reference Guide provides an overview of the PicoCricket family of parts and the PicoBlocks software used to program the PicoCricket.

If you are just getting started with the PicoCricket and PicoBlocks, please go through the Setup Guide and Getting Started booklet first, to get an overall introduction. If you want more detailed information, then come back to this Reference Guide.

We are continually updating the Reference Guide. You can download the latest version from [www.picocricket.com/support](http://www.picocricket.com/support)

**PicoCricket Family**

The PicoCricket family includes the following parts:

- **PicoCricket**
- **Motor Board**
- **Sound Box**
- **Motor**
- **Display**
- **Colored Light**
- **Touch Sensor**
- **Sound Sensor**
- **Resistance Sensor**
- **Beamer**
- **Light Sensor**

**PicoCricket**

The PicoCricket is a tiny computer that can control things in the world. The PicoCricket has four ports where you can plug in other devices, such as sensors, motors, and lights. You can plug any of these devices into any of the ports.
The PicoCricket has three types of indicator lights:

- The **on-off indicator light** turns on (orange) when you turn on the PicoCricket. If the batteries are low, the light flashes rapidly when you turn on the PicoCricket.
- The **program-running indicator light** turns on (green) when the PicoCricket is running a program, and it changes color to amber when the PicoCricket is running two programs at the same time.
- The **IR-communication indicator lights** flash (yellow) when the PicoCricket is communicating through its infrared transmitter.

If you push the PicoCricket button while the PicoCricket is running a program, the program will stop. If you push the button when no program is running, the PicoCricket will re-run the last program that it ran.

Even when you turn the PicoCricket off, it remembers the last program that it ran. So if you run a program, turn it off the PicoCricket, turn it back on later, and push the button, the PicoCricket will run the program again.

**Beamer**

The Beamer transmits information (via infrared signals) from your computer to your PicoCricket. When you write a program using PicoBlocks software on your computer, you send the program to the PicoCricket via the Beamer.
The PicoCricket Kit includes a USB-serial cable for connecting the Beamer to a USB port on your computer. Alternatively, you can connect the Beamer to a serial port, using a standard serial cable (not included).

When you are sending information to the PicoCricket, make sure that the antennas on the Beamer are facing towards the antennas on the PicoCricket. While the Beamer and PicoCricket are communicating, the indicator lights in the antennas will flash yellow (on both the Beamer and the PicoCricket).

The Beamer has a range of about a 1 meter. Note that a Beamer can communicate with one PicoCricket at a time. If you have multiple PicoCrickets, make sure that only one of them is in range of the Beamer at any time.

**Actuators**

Actuators are devices that make things happen in the world. The PicoCricket Kit includes four types of actuators: colored lights, sound box, motor (with motor board), and numeric display.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Programming Blocks</th>
<th>Icon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>You can set the color of the light across the entire rainbow, from red to violet. You can also set the brightness of the light.</td>
<td>setlight color, setlight power, light off</td>
<td>![Light Icon]</td>
</tr>
<tr>
<td>Sound Box</td>
<td>The sound box is a small synthesizer that can play notes, melodies, sound effects, and rhythms. PicoBlocks software includes special editors for creating melodies and rhythms. You can set and change which instrument will play notes and melodies.</td>
<td>play sound, set inst, set volume, set note, set tempo</td>
<td>![Sound Icon]</td>
</tr>
<tr>
<td>Motor and Motor Board</td>
<td>The motor board connects to the PicoCricket, and the LEGO motor connects to the motor board. You can turn the motor on and off, and set its power and direction.</td>
<td>motor on, motor off, this way, that way, reverse, set power</td>
<td>![Motor Icon]</td>
</tr>
<tr>
<td>Display</td>
<td>The three-digit display can show any number between 0 and 999. It is especially useful for displaying sensor values.</td>
<td>display</td>
<td>![Display Icon]</td>
</tr>
</tbody>
</table>
Sensors

Sensors allow your PicoCricket to respond to sounds, lights, or other changes in its environment.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Programming Blocks</th>
<th>Icon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Sensor</td>
<td>Reports the brightness of light. For example, you can use the light sensor to detect when someone casts a shadow with their hand – or when the sun shines through the window.</td>
<td>dark?</td>
<td><img src="eye_icon.png" alt="Eye Icon" /></td>
</tr>
<tr>
<td>Sound Sensor</td>
<td>Reports the loudness (or volume) of sound. For example, you can use the sound sensor to detect when someone claps their hands – or when someone sings into the sensor.</td>
<td>loud?</td>
<td><img src="ear_icon.png" alt="Ear Icon" /></td>
</tr>
<tr>
<td>Touch Sensor</td>
<td>Reports if the button is pressed. For example, you can write a program that makes something happen (a motor spinning or a light changing color) when someone presses the touch sensor.</td>
<td>touch?</td>
<td><img src="hand_icon.png" alt="Hand Icon" /></td>
</tr>
<tr>
<td>Resistance Sensor</td>
<td>Reports the resistance in the circuit formed by the alligator-clip cables. If you put different materials (for example, play-dough or a banana) between the alligator clips, the resistance will change. You can also use the resistance sensor to detect when the alligator clips are touching each other (or connected through a conductive material, such as aluminum foil).</td>
<td>connected?</td>
<td><img src="resistor_icon.png" alt="Resistor Icon" /></td>
</tr>
</tbody>
</table>

Each of the programming blocks will be described further in the following pages. For examples of how to use the actuators and sensors, see “Magic Lantern” and other sample project placemats.

PicoCricket Care

1. Remember to turn off the PicoCricket when you aren’t using it.

2. If the orange on-off indicator light flashes, it means that your PicoCricket is running out of batteries. To change the batteries, follow the instructions in the Setup Guide.

3. Be gentle with the cable connectors. If you push the connectors up and down with too much force, the connectors will break.

4. Keep your PicoCricket devices away from water and other liquids.

5. If your PicoCricket is misbehaving, check the Troubleshooting section in our website: www.picocricket.com/troubleshooting
Overview

PicoBlocks is a programming language designed specifically for programming your PicoCricket. With PicoBlocks, you create programs by snapping graphical blocks together into stacks.

Tools

The tools are used for taking different actions on the blocks, such as copying blocks, deleting blocks, or sending blocks to the PicoCricket. When you click on a tool, the cursor turns into that tool.

Arrow

Use the Arrow to drag blocks from the Blocks Palette to the Workspace, or within the Workspace. To move an entire stack, drag from the top block. Dragging a block from the middle of a stack will also move any blocks attached beneath the one you are dragging.

You can get rid of blocks by dragging them off of the Workspace, in any direction. If you delete blocks by mistake, click Undo.
**Magic Wand**

Use the Magic Wand to run a program. When you click on a block or stack with the Magic Wand, it sends the program to the PicoCricket and tells the PicoCricket to run the program.

You can use the Magic Wand to click on blocks in the Blocks Palette, the same way you click on blocks in the Workspace. This feature is useful for testing out a block.

Another way to run a program is by double-clicking with the Arrow, instead of single-clicking with the Magic Wand.

**Scissors**

Use the Scissors to get rid of blocks. Clicking on a block in a stack will also cut all blocks attached below it.

If you delete blocks by mistake, click Undo 🔄.

You can also get rid of blocks by dragging them out of the Workspace.

**Stamper**

Use the Stamper to copy blocks and stacks. Click once to copy, then move to a new location and click a second time to paste. When you click on a block in a stack with the Stamper, it also copies all blocks attached below it.

You can switch to the Stamper temporarily using Ctrl + 📋, or ⌘ + 📋.
Help

Use the Help tool to get more information. If you click on a block with the Help tool, a window with more information will appear.

Second Wand

Use the Second Wand to tell the PicoCricket to run a second stack at the same time as it is running something else. To run two stacks, click on one with the Magic Wand, then the other with the Second Wand.

For example, you can use the Second Wand to start background music or display sensor values while another program is running.

Tags

Use the Tags tool when you want to tell two devices of the same type to do different things. For example, if you plug two colored lights into a PicoCricket, and then send a setlight-color command to the PicoCricket, the PicoCricket will change the color of both lights. If you want to turn each light to a different color, you need to use Tags.
Each of the four ports on the PicoCricket is labelled with a different number of dots. If you want to send a command to a particular port, then you need to “tag” the block with the appropriate number of dots. For example, if you plug colored lights into ports ● and ●●, then you can set the color of each light individually with the following blocks:

To tag a block, click on the appropriate dot in the Tags tool, then click on the block that you want to tag.

To remove a tag from a block, click in the center of the Tags tool and then click on the block.

Click on the Stop sign to stop all programs running on the PicoCricket. Make sure that the PicoCricket is “in sight” of the Beamer. Alternatively, you can stop programs on the PicoCricket by pressing the white button on the PicoCricket. Note that stopping programs on the PicoCricket does not turn off lights attached to the PicoCricket. If you want to turn off the lights, slide the on-off switch into the off position.
This list shows all of the basic blocks in PicoBlocks.

- `setlight color` sets the light’s color
- `setlight power` sets the light’s power
- `light off` turns the light off
- `display` displays a value on the display
- `chirp` makes the PicoCricket chirp
- `note` plays a note (pitch and duration)
- `play sound` plays a sound
- `set inst` sets an instrument for the next note or melody
- `set tempo` sets the tempo or volume for the next note, melody or rhythm
- `motor on` turns motor on or off
- `motor off` turns the motor off
- `motor onfor` turns the motor on for a certain period of time
- `reverse` reverses the motor’s direction
- `this way` sets the motor’s direction
- `set power` sets the motor’s power
- `touch?` reports true if the touch sensor is pressed
- `brightness` reports a value from the light sensor
- `dark?` reports true if the light sensor detects little light
- `loud?` reports true if the sound sensor detects a loud sound
- `loudness` reports a value from the sound sensor
- `resistance` reports true if the resistance sensor detects a resistance of 0
- `beamIR` beams a value to another PicoCricket
- `IR` reports a value beamed by infrared from another PicoCricket
- `newIR?` reports true if another PicoCricket has beamed a new value by infrared
- `timer` reports the PicoCricket’s timer value
- `clear` erases all the data
- `collect` stores a value in the PicoCricket’s memory
- `rewind` goes back to the beginning of the data
- `next data` reports the value of the next data stored in the PicoCricket’s memory
- `wait` waits a number of ticks (where 10 ticks = 1 second)
- `waituntil` waits until the condition is true
- `forever` repeats a block or stack forever
- `repeat` repeats a block or stack a certain number of times
**Blocks Summary - Continued**

- **if** runs a block or stack if the condition is true.

- **if** if condition is true, run one stack; if not, run the other stack.

- **stop all** stops everything.

- **stop stack** stops this stack.

- **creates space between blocks, so that they don’t overlap one another**

- **number** specifies a number (click to highlight, and then type in a number).

- **+ - x /** computes arithmetic operations.

- **random** picks a random value between the two numbers.

- **< > =** makes a comparison between two numbers and reports true or false.

- **and** reports true if both conditions are true.

- **or** reports true if either condition is true.

- **not** reports the opposite of a condition.

- **sits on top of stack, and allows you to type in name for the stack**

- **store in box1** set and report values for variables.

- **store in box2**
Light Blocks

**setlight color**

- **which color**
- turns the light blue
- waits for 4 ticks
- turns the light pink (color 5)

Sets the LED's color and turns it on. You can set the color by using the color slider, or choosing a number between 0 and 100. Colors are numbered as follows:

<table>
<thead>
<tr>
<th>Color</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pink</td>
<td>0</td>
</tr>
<tr>
<td>red</td>
<td>20</td>
</tr>
<tr>
<td>yellow</td>
<td>40</td>
</tr>
<tr>
<td>aqua</td>
<td>60</td>
</tr>
<tr>
<td>light blue</td>
<td>80</td>
</tr>
<tr>
<td>violet</td>
<td>100</td>
</tr>
<tr>
<td>magenta</td>
<td>10</td>
</tr>
<tr>
<td>orange</td>
<td>30</td>
</tr>
<tr>
<td>green</td>
<td>50</td>
</tr>
<tr>
<td>cyan</td>
<td>70</td>
</tr>
<tr>
<td>blue</td>
<td>90</td>
</tr>
</tbody>
</table>

Default value: **setlightcolor 0**

**setlight power**

- **how bright**
- sets light to half power and turns it on
- waits for 40 ticks
- sets light back to full power

*setlightpower* can take numbers between 0 (no light) and 100 (full power). You can set the power by using the slider or a number block.

Default value: **setlightpower 100**

**light off**

- turns the light green
- waits for 15 ticks
- turns the light off

**lightoff** turns the light off.
Displays a value on the display

**Sound Blocks**

The Sound palette starts with six basic blocks (shown below). You can create additional blocks with the Melody and Rhythm editors. See page 32 for information on creating melodies and rhythms.

*chirp* makes the PicoCricket chirp once

Making the PicoCricket *chirp* is a good way to test whether your computer is communicating properly with the PicoCricket.

*note* can play notes between 0 (lowest) and 100 (highest). You can play notes with the PicoCricket speaker or with the Sound Box (but it will sound much better with the Sound Box). For composing melodies, we suggest using the Melody Editor rather than putting individual note blocks together.

Default value: *note 50 2*

Select a sound with the slider or enter a number between 0 and 100. There are 24 sounds available (see table below).
# Sound

<table>
<thead>
<tr>
<th>#</th>
<th>Sound</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Piano</td>
</tr>
<tr>
<td>2</td>
<td>Flute</td>
</tr>
<tr>
<td>3</td>
<td>Pizzicato</td>
</tr>
<tr>
<td>4</td>
<td>Strings</td>
</tr>
<tr>
<td>5</td>
<td>Trombone</td>
</tr>
<tr>
<td>6</td>
<td>Vibes</td>
</tr>
<tr>
<td>7</td>
<td>Agogo</td>
</tr>
<tr>
<td>8</td>
<td>Cabasa</td>
</tr>
<tr>
<td>9</td>
<td>Claps</td>
</tr>
<tr>
<td>10</td>
<td>Cowbell</td>
</tr>
<tr>
<td>11</td>
<td>Maracas</td>
</tr>
<tr>
<td>12</td>
<td>Slap</td>
</tr>
<tr>
<td>13</td>
<td>Timbale</td>
</tr>
<tr>
<td>14</td>
<td>Wood Block</td>
</tr>
<tr>
<td>15</td>
<td>Guiro</td>
</tr>
<tr>
<td>16</td>
<td>Bloops</td>
</tr>
<tr>
<td>17</td>
<td>PicoCricket</td>
</tr>
<tr>
<td>18</td>
<td>Fairydust</td>
</tr>
<tr>
<td>19</td>
<td>HighQ</td>
</tr>
<tr>
<td>20</td>
<td>Dog</td>
</tr>
<tr>
<td>21</td>
<td>Rooster</td>
</tr>
<tr>
<td>22</td>
<td>Goose</td>
</tr>
<tr>
<td>23</td>
<td>Horse</td>
</tr>
<tr>
<td>24</td>
<td>Kitten</td>
</tr>
</tbody>
</table>

All these sounds require the Sound Box. Sound 0 is the PicoCricket chirp. For numbers greater than 24, `playsound` plays the next sound in the list: 25 plays sound 1, 26 plays sound 2, ... and so on.

Default value: `playsound 24` (kitten)

---

```plaintext
setinstrument
```

Sets the instrument to be used for subsequent notes or melodies. You can select the instrument with the slider or attach a number between 0 and 100. `setinstrument 0` sets the note or melody with the PicoCricket’s beeper.

The inputs for `setinstrument` are the same as for `playsound` (shown in table above). You can use any sound as an instrument, but they don’t all work well.

Default value: `setinstrument 1` (piano)

---

```plaintext
settempo
```

Sets tempo to 100 (fastest)

`settempo` takes values between 0 (slowest) and 100 (fastest). The fastest tempo (100) equals to 240 bpm (beats per minute), while the slowest (0) equals to 60 bpm.

Default value: `settempo 50` (120bpm)
setvolume takes values between 0 (no sound) and 100 (loudest). Setvolume only works with the Sound Box. Default value: setvolume 80

Action Blocks

motor on turns the motor on
motor off turns the motor off
motoroff makes the motor coast to a stop. If you want the motor to stop more abruptly or more gently, try using the brake and coast commands in the PicoBlocks Text Language.

motor on for 20 turns the motor on for 20 ticks (2 seconds)
10 ticks = 1 second

motor on for 20 turns on motor for 20 ticks (2 seconds)

reverse causes the motor to change the direction in which it is spinning. reverse does not turn the motor on, it only changes the direction.
**thisway** sets the motor in one direction, **thatway** sets it in the other direction. Which direction is which depends on how the motor is plugged in. **thisway** and **thatway** do not turn on the motor, they only set the direction.

**setpower** takes values between 0 (no power) and 100 (strongest power). **setpower** does not turn on the motor, it only sets the power. Default value: **setpower 100**

**Sensors Blocks**

**touch?** reports true when the touch sensor is being pressed. The example above will make the PicoCricket chirp continuously while you are pressing the button on the touch sensor. If you want to chirp only once each time you push the button, you should make a stack similar to the one shown below:
forever

waituntil touch?

chirp

waituntil not touch?

waits until the touch sensor is released

dark?

waituntil dark?

plays this sound (dog)

dark? reports true if the light sensor detects the brightness to be less than 15.

brightness

display brightness

reports numbers between 0 (no light) and 100 (lots of light)

loud?

waituntil loud?

sets light color

turns the light pink

loud? reports true if the sound sensor detects a sound with loudness greater than 60.

loudness

waituntil loudness > 30

sets light color

turns the light green

loudness reports numbers between 0 (no sound) and 100 (loud sound).
connected? reports true if the resistance sensor detects a resistance of less than 50.

resistance reports numbers between 0 (no resistance) and 100 (lots of resistance). If you are getting numbers in a very narrow range, it is useful to adjust the range and sensitivity of the resistance block. To do that, shift click on the block to add sliders. Then adjust the sliders like this:

- try this if you aren't getting low numbers
- try this if you aren't getting high numbers

Remember to use the magic wand after moving the sliders

Sliders are useful in situations where you want to use resistance values control something like the color of a light:

If the resistance is changing by only a small amount, you will only see a narrow range of colors. You can use sliders to extend the range of colors that you see as the resistance changes.

To see how this works, consider a specific example. Imagine that you connect a resistance sensor, a colored light and a display to your PicoCricket. Then connect the alligator clips of the resistance sensor to a lump of Play-Dough and start the program:
Suppose you find that as you squeeze the Play-Dough, the numbers on the display vary over the narrow range from 40 and 80. The color of the light will change from yellow to blue/green.

By moving sliders into the positions shown below – with the left slider at the 40 position and the right slider at the 80 position, you will expand the range of numbers on the display to stretch all the from 0 to 100, and the light color will vary from red through purple.

\[
\text{set light color} \quad 40 \quad 80 \\
\text{display} \\
\text{set light color} \quad 40 \quad 80
\]

\text{beamIR} beams a number to another PicoCricket via infrared (IR). To use this command, you need two PicoCrickets: one beaming the IR signal, the other receiving the IR signal. See example for \text{IR} block below. We recommend using numbers in the range 0 to 100. Numbers outside this range may produce unexpected results.

\[
\text{forever} \quad \text{beamIR} \quad \text{random} \quad 0 \quad 100 \\
\text{wait} \quad 10
\]

\text{beamIR} beams a number between 0 and 100.

\text{newIR?} reports true if a new infrared (IR) signal has been received. \text{IR} reports the value of the latest infrared signal received.

\[
\text{forever} \quad \text{wait until} \quad \text{newIR?} \quad \text{IR} \\
\text{note} \quad 10
\]

\text{forever} \quad \text{wait until} \quad \text{newIR?} \quad \text{IR} \\
\text{note} \quad 10

IR stands for Infra Red.

newIR? reports true if a new infrared (IR) signal has been received. IR reports the value of the latest infrared signal received.
100 ticks of the timer equals 1 second

**Data Blocks**
- **clear** erases all the data.
- **collect** stores the number reported by the light sensor in the PicoCricket’s memory.
- **repeat** allows you to store up to 200 data points.
- **wait** ensures a 1 tick (1/10 second) delay before collecting the next data point.

**collect** stores a data point (a number from 0 to 100) in the PicoCricket’s memory. A PicoCricket can collect up to 200 data points. Click on **graph** to see a graph of the collected data.

**rewind** prepares the PicoCricket to “play back” collected data, starting with the first data point.
**nextdata** reports the value of the next number stored in the PicoCricket’s memory. Upon reaching the end of the collected data, **nextdata** loops back to the beginning of the data.

When a rewind block is followed by a collect block, the PicoCricket starts collecting new data, permanently erasing any old data.

---

**Flow Blocks**

- **wait**
  - **setlight color** turns the light pink
  - **wait** waits for 20 ticks (2 seconds)
  - **light off** turns the light off

10 ticks equals 1 second
Default value: **wait 10**

---

- **waituntil**
  - **motor on** turns on motor
  - **waituntil touch?** waits until the touch sensor is pressed
  - **motor off** turns off motor

Waits until the condition is true.
To stop the forever, push the button on your PicoCricket or click on STOP.

If the condition reports true, then the PicoCricket will run the blocks below the word “then.”
If the condition reports true, then run the blocks under the word “then”; if not, run the blocks under “else.”

**stopall**

Stops all programs and motors (but leaves lights on). **stopall** is equivalent to pressing the button on the PicoCricket.

**stopstack**

**stopstack** stops only the current stack. You can use this block to stop one stack while continuing another stack.
For example:

**colors** will stop when the touch sensor is pressed, yet the other stack will continue. The light will be turned off and melody1 will be played.
Numbers Blocks

- **number**

- **set power**
  - sets motor power to 50 (half power)

- **motor onfor**
  - turns on motor for 20 ticks (2 seconds)

Click on **to type in a number.** **accepts negative numbers.**

Default Value: **10**

Numbers in PicoBlocks are limited to integers between -32768 and +32767.

- **+** adds two values

  *Turns on motor for 10 plus the value of the brightness sensor (for example, if the brightness sensor is 30, motor turns on for 40 ticks).*

- **-** subtracts two values

  *Turns on light with a power of 100 minus the value of the brightness sensor (for example, if the brightness sensor is 60, light power will be 40).*

- **\(\times\)** multiplies two values

  *Sets the light's color to a random number multiplied by 10 (for example, if the random number is 7, sets the color to 70 which is cyan).*

- **/** divides the first value by the second value

  *Turns on motor for the value of brightness sensor divided by 10 (for example, if the brightness sensor is 50, motor turns on for 5).*
reports a random number between this and that

turns on motor for a random number of ticks (in this case it could be 10, or 50, or anything in between...)

Default value: `random 0 100`

if this is greater than that...

number1 > number2 reports true if number1 is greater than number2.

if this is less than that...

number1 < number2 reports true if number1 is less than number2.

if this is equals that...

number1 = number2 reports true if the two numbers are equal.
and reports true if the result of the first condition (touch?) and the second condition (loud?) are both true.

or reports true if the result of the first condition (touch?) or the second condition (loud?) is true.

not reports true if the condition is false. not reports false if the condition is true.
My Blocks

You can use this block to give a name to a stack of blocks – and create a new block that does the same thing as the entire stack. Here's how:

1. Attach the block at the top of the stack you want to name.

2. Click and type a name.

3. A new block with that name appears in the My Blocks.

4. Use it in other stacks.

Use these blocks for setting and retrieving the values of variables.

Use to store a value, and use to retrieve it.

box1 stores a random number

turns a light that random color

waits for 5 ticks

turns a second light the same color
To change the name of a variable, drag it into the workspace, click on it, and type in the new name.

When box1 is renamed in the workspace, the blocks in the palette are automatically updated.
Melody and Rhythm Editors

PicoBlocks has two editors for creating music: a Melody Editor and a Rhythm Editor.

To create a new melody or rhythm (or to edit an existing one), first click on the Sound tab. At the bottom of Sound palette are two buttons, one for opening the Melody Editor, the other for opening the Rhythm Editor.

After you create a new melody or rhythm, it will appear as a new block in the Sound palette. You can drag these music blocks into the workspace, and connect them to stacks, just as you would with any other block in PicoBlocks.
Melody Editor

Click on to open the Melody Editor.

If this is your first melody, you will see a blank Melody Workspace for creating your melody. If you have previously created melodies, you will see one of your existing melodies in the Melody Workspace. You can edit this melody – or select one of your other existing melodies to edit (by clicking on a block in the palette on the left side) – or create a new melody (by clicking on the “Create” button at the top-left).

To add notes to your melody, either click on the keyboard, or click directly in the Melody Workspace.

When you are finished creating your melody, click to turn your melody into a block and exit the Melody Editor.
All of your melodies appear at the left of the Melody Editor. Click on the melody that you want to edit.

To change the name of a melody, click on the block and type a new name.

Use 🖌️ to make a copy of a melody. Use ❌ to delete melodies.

Drag on the background to select notes. Move the selected notes by dragging them to other location.

You can also copy 🖌️, cut ✂️ and play ⭐ the selection.

You can also play the selection by double clicking on it.
Rhythm editor

Click on \(\text{rhythms}\) to open the Rhythm Editor.

If this is your first rhythm, you will see a blank Rhythm Workspace for creating your rhythm. If you have previously created rhythms, you will see one of your existing rhythms in the Rhythm Workspace. You can edit this rhythm – or select one of your other existing rhythms to edit (by clicking on a block in the palette on the left side) – or create a new rhythm (by clicking on the “New Rhythm” button at the top-left).

When you are finished creating your rhythm, click \(\text{OK}\) to turn your rhythm into a block and exit the Rhythm Editor.
All of your rhythms appear at the left of the Rhythm Editor. Click on the rhythm that you want to edit.

To change the name of a rhythm, click on the block and type a new name.

Use 🔄 to make a copy of a rhythm. Use 🗑️ to delete rhythms.
The Graphing Tool lets you view a graph of data that you have collected on your PicoCricket.

To open the Graphing Tool, first click on the Data tab, then click on the **graph** button at the bottom of the Data palette.

To see a graph of the collected data, turn on your PicoCricket and aim it at the Beamer, then click on the **Upload and Graph** button at the bottom of the Graphing Tool.

You can collect and view up to 200 data points, where each data point is a number from 0 to 100.
The PicoBlocks Text Language

Overview

PicoBlocks lets you construct computer programs by snapping different blocks together, like pieces of a puzzle. This approach makes it easy to get started; different kinds of blocks have different shapes and can only snap together in certain ways. The shapes of the pieces provide a lot of guidance as to how to structure your programs, helping you build programs that work the way you want them to work. But if you try to write longer programs you may find that using the blocks can get cumbersome. For example, all of your stacks may no longer fit on the screen at the same time. Also, there are some advanced programming features that are not available using the blocks. As your programs become longer and more complex, you may want to consider using the Text Language that is available from within the PicoBlocks software. The PicoBlocks Text Language is similar to the computer language Logo. (For more information on Logo see www.logofoundation.org.) To begin writing programs in the Text Language, click on the text icon located in the lower left hand corner of the PicoBlocks Workspace. The Text Language Workspace, shown in the figure below, will appear.
Try typing the following commands in the Command Center. (Press the Enter key to run each line.)

chirp  The PicoCricket chirps!
chirp wait 2 chirp  The PicoCricket chirps twice.

Note that spaces are very important in the Text Language; they are used to determine where words start and end. For example, if you leave out the space between wait and 2 in the last example you will get an error message that says “I don’t know how to wait2”. This is because PicoBlocks does not understand the word wait2.

Each block in PicoBlocks has an associated word in the text language. The general rule for finding the name of the word in the text language that is associated with a particular block is a very simple one1:

*Just copy what’s written on the block, leaving out a space if there is one.*

For example, plug a light into your PicoCricket and type the following in the Command Center:

```
setlightcolor 20  The light turns red
```

Note that there are no spaces in the word setlightcolor.

Now try typing the following line in the Command Center:

```
repeat 5 [chirp wait 2]
```

In the Text Language square brackets are used to enclose the list of words that are to be repeated. You can get guidance about how the text word corresponding to a particular block is meant to be used by clicking on that block, which you can find on the left hand side of the Text Language Workspace. For example if you click on the “repeat” block the following text will appear in the Command Center:

```
repeat 10 [ WHATEVER ]
```

In this message “WHATEVER” is meant as a place holder for the list of commands that you want repeated.

**Other Examples**

Plug in a touch sensor and a sound box and type:

```
waituntil [touch?] playsound 24
```

You should hear a “meow” when you press the touch sensor on the touch sensor.

If you type: forever [waituntil [touch?] playsound 24] you should now hear the “meow” each time you press the touch sensor. In these last two examples you will need to make sure you type the square brackets in the proper places.

Plug in a display and type: display 7 * 9 + 6

The Text language uses parentheses to determine the order of in which things are done. Compare the above result to what you get if you type:

```
display 7 * (9 + 6)
```

---

1 Exceptions to this rule occur for the cases of the if and ifelse words; since the text word does not include “then”. For a complete list of the blocks and corresponding text words, see the Summary of Text Language Words chart at the end of this section.
**Procedures**

You can “teach” your PicoCricket to understand new words by defining procedures in the Procedures Area of the Text Language Workspace. Procedures are defined using the following general form:

```
to procedure-name
    procedure-body
end
```

The procedure definition starts with the keyword `to`, followed by the name of the procedure. Next comes the body of the procedure, which is a list of words that describe what the procedure is to do. The keyword `end` is used to complete the procedure definition.

For example, in the Procedure Area type:
```
to chirp-twice
    chirp wait 5 chirp
end
```

You’ve now taught your PicoCricket a new word; if you type the word `chirp-twice` in the Command Center, the PicoCricket will chirp twice.

**Procedures with Inputs and Outputs**

You can create procedures that take inputs or produce an output. For example, you can create a procedure named `chirps` that takes an input that is used as the counter in a repeat loop. Note that the name of the input must begin with a colon.
```
to chirps :num
    repeat :num [chirp wait 5]
end
```

Typing
```
chirps 10
```

in the Command Center will cause the PicoCricket to chirp 10 times.

You can create a procedure that takes two inputs that will determine both the number of chirps and the duration of the pause between chirps:
```
to chirps2 :num :pause
    repeat :num [chirp wait :pause]
end
```

Typing
```
chirps2 10 3
```

in the Command Center will cause the PicoCricket to chirp 10 times, with a pause of 3 tenths of a second between chirps.

Procedures may return values using the output command. For example, you can define a procedure called `half` by:
```
to half
    output brightness / 2
end
```
Then, with a display and a light sensor plugged in, try typing in the Command Center:

    display half

Or, you can define a procedure called dark? that returns a true or false result:

    to dark?
    output (brightness < 20)
    end

Now if you try typing in the Command Center:

    forever [if dark? [chirp]]

your PicoCricket should chirp when it is dark enough.

### Make Your Own Blocks

You can use the Text Language to make different kinds of blocks, which you can then use to build programs in the PicoBlocks Workspace. This feature allows you to continue doing much of your programming using the Blocks Language, with the Text Language being used as a supplement when its advanced features are needed.

New blocks are defined by typing in the Procedures Area. The block definitions begin with the keyword **block**. For example:

```plaintext
block chirp1
  chirp wait 3 chirp
end
```

Makes a block that chirps twice.

Blocks that you have defined will automatically be created and placed in the “My Blocks” area. You can create blocks with up to three inputs. For example, to create a block with one input:

```plaintext
block chirp2 :num
  repeat :num [chirp wait 3]
end
```

Makes a block that chirps a number of times.

To create a block with two inputs:

```plaintext
block chirp3 :num :pause
  repeat :num [chirp wait :pause]
end
```

Makes a block that chirps a number of times, with the ability to vary the length of the pause between chirps.

When you define a block that outputs a number, PicoBlocks will automatically create a number-shaped reporter block:

```plaintext
block bright2
  output 2 * brightness
end
```

Reports a number twice as big as the brightness measured by the light sensor.
Use the keyword `bblock` when you want to make a block that outputs the result of a true/false condition:

```
bblock quiet?
output loudness < 5
end
```

### Using Tags in the Text Language

PicoBlocks “tags” are used when you are plugging in more than one of the same kind of part, two lights or two motors for example, and you want these parts to act differently. (See the previous section on Tags on pages 10 and 11.) In programs written in the Text Language, a word without a tag will address all parts of the same type. For example, if two lights are plugged into your PicoCricket, the command

```
setlightcolor 90
```

will turn both lights blue.

If you want to refer only to the light plugged into the • port, add a period to the end of the word, without a space:

```
setlightcolor. 90
```

Similarly, to refer only to the light plugged into the •• port, add two periods to the end of the word, without spaces:

```
setlightcolor.. 90
```

To refer only to the light plugged into the •• port, add a period and a colon to the end of the word, without spaces:

```
setlightcolor.: 90
```

To refer only to the light plugged into the •• port just add two colons to the end of the word, without spaces:

```
setlightcolor:: 90
```

This method of tagging text words will work with other words\(^2\). For example

```
display.: 57
```

will display the number 57 on a display plugged into the •• port and

```
forever [if touch?: [chirp]]
```

will cause the PicoCricket to chirp if a touch sensor that is plugged into the •• port is pressed.

### Global Variables

In the “My Blocks” tab you will find blocks for storing numbers in two different “global variables” called box1 and box2. In the Text Language you can use the keyword `global:` to create up to five additional global variables. For example, by including the line:

```
global: times, pause
```

\(^2\) **Note:** Tags will not work with words related to the sound box.
in the Procedures Area you will create two new global variables called `times` and `pause`. Now, try typing the following in the command center:

```plaintext
storeintimes 5 storeinpause 3
repeat times [chirp wait pause]
```

The PicoCricket should chirp 5 times, with pauses of 3 tenths of a second between chirps.

If you click on the My Blocks tab you will also find that new blocks corresponding to the new variables `times` and `pause` have been created.

**Local Variables**

The word `make` allows you to change the value of an input to a procedure. For example, if you define a procedure called `rainbow` by:

```plaintext
to rainbow :a
repeat 30 [setlightcolor :a make "a :a + 1 wait 2]
end
```

then, with a light plugged into your PicoCricket, typing

```plaintext
rainbow 20
```

in the Command Center will cause colors 20 through 49 to flash.

Variables of this kind are called “local variables” because they are only available for use by the procedure in which they are defined. Because PicoBlocks has a very limited number of global variables (7), local variables can be helpful because they do not use any of the global variable slots.

**Data Memory**

A PicoCricket has 200 bytes of memory used for storing collected data. These memory locations can be accessed sequentially using the `collect` and `nextdata` blocks, as explained on page 22.

Alternatively, data memory locations can be randomly accessed using `readdata` and `writedata` as follows:

- `readdata address` - reports the value of the one-byte number that has been stored at a particular `address` in data memory.
- `writedata address number` - stores a one-byte number at a particular `address` in data memory.

For example, typing:

```plaintext
writedata 147 75
```

stores the number 75 at address 147 in data memory. To verify this, plug a display into your PicoCricket, and type:

```plaintext
display readdata 147
```

The number 75 should appear on the display.
**PicoBlocks - Reference**

The “second wand” is not available in the Text Language.

### Summary of Text Language Words

The following table shows the text word that corresponds to each PicoBlocks block and gives an example of how the word can be used.

<table>
<thead>
<tr>
<th>Block</th>
<th>Light</th>
<th>Example Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td><code>setlightcolor number</code></td>
<td>Setlightcolor takes an input from 0 to 100.</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td></td>
<td>setlightcolor 70</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td></td>
<td>The light changes to cyan and turns on.</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td><code>setlightpower number</code></td>
<td>Setlightpower takes an input from 0 to 100.</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td></td>
<td>setlightpower 50</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td></td>
<td>The light turns on at half power.</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td><code>lightoff</code></td>
<td>lightoff</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td></td>
<td>The light turns off.</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td><code>display number</code></td>
<td>Displays a value on the digit display:</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td></td>
<td>display 709</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td></td>
<td>The display shows the number 709.</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td><code>setrgb number number number</code></td>
<td>Sets the color of the light.</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td></td>
<td>Setrgb takes 3 inputs (red, green, and blue), each with a range from 0 to 100. The three inputs mix to give one particular light color.</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td></td>
<td>setrgb 0 100 100</td>
</tr>
<tr>
<td><img src="light.png" alt="Light Block" /></td>
<td></td>
<td>The light turns cyan.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Block</th>
<th>Sound</th>
<th>Example Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="chirp.png" alt="Chirp Block" /></td>
<td><code>chirp</code></td>
<td>chirp wait 3 chirp</td>
</tr>
<tr>
<td><img src="chirp.png" alt="Chirp Block" /></td>
<td></td>
<td>The PicoCricket chirps twice.</td>
</tr>
<tr>
<td><img src="note.png" alt="Note Block" /></td>
<td><code>note number number</code></td>
<td>Note takes two inputs. The first input (a number between 0 and 100) determines the pitch of the note and the second input determines the duration of the note (in tenths of a second).</td>
</tr>
<tr>
<td><img src="note.png" alt="Note Block" /></td>
<td></td>
<td>note 36 5</td>
</tr>
<tr>
<td><img src="note.png" alt="Note Block" /></td>
<td></td>
<td>The sound box plays a note for half a second.</td>
</tr>
<tr>
<td><img src="play_sound.png" alt="Play Sound Block" /></td>
<td><code>playsound number</code></td>
<td>Plays a sound on the sound board. Playsound takes any number between 0 and 100. There are 24 built-in sounds. Playsound repeats the list in sequence for numbers greater than 24.</td>
</tr>
<tr>
<td><img src="play_sound.png" alt="Play Sound Block" /></td>
<td></td>
<td>playsound 24</td>
</tr>
<tr>
<td><img src="play_sound.png" alt="Play Sound Block" /></td>
<td></td>
<td>The sound box meows.</td>
</tr>
</tbody>
</table>
### Sound

<table>
<thead>
<tr>
<th>Block</th>
<th>Word</th>
<th>Example Usage</th>
</tr>
</thead>
</table>
| set inst    | setinstrument number | Sets the instrument for the next note, or melody to be played on the sound board. Setinstrument takes any number between 0 and 100:  
  setinstrument 4 note 36 5  
The sound box plays violin note. |
| set tempo   | settempo number | Sets the tempo at which the next rhythm or melody will be played on the sound board. Settempo takes any number between 0 - lowest pace - and 100 - fastest pace.  
  settempo 50 melody1  
The sound box plays a melody at the standard tempo. |
|             | setvolume number | Sets the volume at which the next note, sound, rhythm or melody will be played on the sound board. Setvolume takes any number between 0 - lowest volume - and 100 - highest volume:  
  setvolume 30 playsound 24  
  setvolume 100 playsound 24  
The sound box meows softly, then loudly. |

In addition to the blocks above can add your own blocks to the Sound tab by creating melodies and/or rhythms in their respective editors. The melody or rhythm name becomes a text word that you can use.

### Action

<table>
<thead>
<tr>
<th>Block</th>
<th>Word</th>
<th>Example Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>motor on</td>
<td>motoron</td>
<td>Turns a motor on or off.</td>
</tr>
<tr>
<td>motor off</td>
<td>motoroff</td>
<td></td>
</tr>
</tbody>
</table>
|             | motoronfor number | Turns the motor on for a set period of time (in tenths of a second).  
  motoronfor 10  
The motor spins for 1 second. |
| reverse     | reverse       | Change the direction in which the motor spins.  
  repeat 6 [motoronfor 3 reverse]  
The motor wiggles back and forth. |
| this way    | thisway       | Set the motor to spin in a specific direction.  
  thisway motoronfor 10  
The motor spins one way for 1 second, then the other way for 1 second. |
| that way    | thatway       |                                                                                                                                              |
| set power   | setpower number | Setpower takes an input from 0 to 100.  
  setpower 100 motoronfor 10  
The motor spins quickly.  
  setpower 30 motoronfor 10  
The motor spins slowly. |
# Action

<table>
<thead>
<tr>
<th>Block</th>
<th>Word</th>
<th>Example Usage</th>
</tr>
</thead>
</table>
| text only | brake | Causes the motor to stop immediately. This is slightly different from `motoroff`, which does a short brake followed by a coast. 
`motoron wait 10 brake`  
The motor spins for 1 second, then immediately comes to rest. |
| text only | coast | Turns off the power to the motor but does not brake it, so that the motor slowly comes to rest. 
`motoron wait 10 coast`  
The motor spins for 1 second, then slowly comes to rest. |

# Sensors

<table>
<thead>
<tr>
<th>Block</th>
<th>Word</th>
<th>Example Usage</th>
</tr>
</thead>
</table>
| touch? | touch? | Reports true if the touch sensor is pressed. 
`waituntil [touch?] chirp` 
The PicoCricket waits until the touch sensor is pressed before chirping. |
| dark? | dark? | Reports true if the value measured by the light sensor is less than 15. 
`waituntil [dark?] chirp` 
The PicoCricket will chirp after the light sensor detects little light. |
| brightness | brightness | Reports the value measured by the light sensor as a number from 0 to 100. 
`forever [display brightness wait 1]` 
The display shows, and continually updates, the light level measured by the light sensor. |
| loud? | loud? | Reports true (the number 1) if the value measured by the sound sensor is greater than 60. 
`waituntil [loud?] chirp` 
The PicoCricket will chirp after the sound sensor detects a loud sound. |
| loudness | loudness | Reports the value measured by the sound sensor as a number from 0 to 100. 
`forever [display loudness]` 
The display shows, and continually updates, the sound level measured by the sound sensor. |
| connected? | connected? | Reports true if the value measured by the resistance sensor is less than 50. 
`waituntil [connected?] chirp` 
The PicoCricket waits until the alligator clips on the resistance sensor connect before chirping. |
### Sensors

<table>
<thead>
<tr>
<th>Block</th>
<th>Word</th>
<th>Example Usage</th>
</tr>
</thead>
</table>
| ![resistance](resistance.png) | resistance | Reports a number from 0 to 100.  
forever [display resistance wait 1]  
The display shows, and continually updates, the electrical resistance measured by the resistance sensor. |
| ![text only](text-only.png) | rawresistance | Reports the value measure by the resistance sensor as a number between 0 and 1023; rawresistance provides finer resolution than resistance.  
forever [display rawresistance wait 1]  
The display shows, and continually updates, the electrical resistance measured by the resistance sensor on a scale of 0 to 1023. (Numbers of 1000 or greater appear as dashes.) |
| ![text only](text-only.png) | rawrange | Rawrange is used to adjust the sensitivity of the resistance sensor. It takes as an input either the number 0, 1, or 2. An input of 0 results in the highest sensitivity and should be used when measuring resistances of 1000 ohms or less. An input of 1 is medium sensitivity and is the default setting. It works best for resistances of about 10,000 ohms. 2 is the lowest sensitivity and should be used to measure resistances of 100,000 ohms or more.  
rawrange 0  
display rawresistance |
| ![beamIR](beamIR.png) | beamIR number | Beams a number from the PicoCricket’s infrared transmitter.  
beamIR 4 |
| ![newIR?](newIR?).png | newIR? | Reports true (the number 1) if the PicoCricket’s infrared receiver has received a new value.  
waituntil [newIR?] chirp  
The PicoCricket chirps when a new number is beamed to it. |
| ![IR](IR.png) | IR | Reports the value of the most recent number beamed to the PicoCricket.  
to test  
waituntil [newIR?]  
if IR = 20 [chirp]  
end  
The PicoCricket chirps if the number beamed to it is equal to 20. |
| ![reset timer](reset-timer.png) | reset timer | Resets to zero the value of the PicoCricket’s internal timer. See next example. |
| ![timer](timer.png) | timer | Reports the PicoCricket’s timer value. Timer measures time in hundredths of a second.  
to test  
reset  
chirp  
waituntil [touch?]  
display timer  
end  
The display shows the amount of time that has elapsed between when the PicoCricket chirps and when the touch sensor is pressed. |
## Data

<table>
<thead>
<tr>
<th>Block</th>
<th>Word</th>
<th>Example Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>![clear]</td>
<td>clear</td>
<td>Permanently erases all collected data. Use clear before starting to collect new data. See next example.</td>
</tr>
<tr>
<td>![collect]</td>
<td>collect number</td>
<td>Stores a data point (a number from 0 to 100) in the PicoCricket's memory. clear repeat 200[collect loudness]</td>
</tr>
<tr>
<td>![rewind]</td>
<td>rewind</td>
<td>Prepares the PicoCricket to “play back” collected data, starting with the first data point. rewind repeat 200[display nextdata wait 5]</td>
</tr>
<tr>
<td>![nextdata]</td>
<td>nextdata</td>
<td>Reports the value of the next number stored in the PicoCricket's memory. rewind repeat 200[display nextdata wait 5]</td>
</tr>
<tr>
<td>text only</td>
<td>datalength</td>
<td>Reports the total number of data points that have been collected. display datalength</td>
</tr>
<tr>
<td>text only</td>
<td>writedata address number</td>
<td>Stores a one-byte number at a particular address in the data memory. writedata 47 75</td>
</tr>
<tr>
<td>text only</td>
<td>readdata address</td>
<td>Reports the value of the one-byte number stored at a particular address in the data memory. display readdata 47</td>
</tr>
</tbody>
</table>

## Flow

<table>
<thead>
<tr>
<th>Block</th>
<th>Word</th>
<th>Example Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>![wait]</td>
<td>wait number</td>
<td>Waits a certain amount of time (in tenths of a second). chirp wait 10 chirp The PicoCricket pauses for a second between the two chirps.</td>
</tr>
<tr>
<td>text only</td>
<td>mwait number</td>
<td>Waits a certain amount of time (in milliseconds). setlightcolor 20 mwait 10 lightoff The light flashes very briefly.</td>
</tr>
<tr>
<td>text only</td>
<td>no-op</td>
<td>Does nothing for about 40 microseconds. repeat 10 [no-op] The PicoCricket waits for 400 microseconds.</td>
</tr>
<tr>
<td>![waituntil]</td>
<td>waituntil [condition]</td>
<td>Waits until the condition is true. waituntil [touch?] chirp The PicoCricket waits until you press the touch sensor before chirping.</td>
</tr>
<tr>
<td>Block</td>
<td>Word</td>
<td>Flow</td>
</tr>
<tr>
<td>---------</td>
<td>------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>forever</td>
<td>forever [list]</td>
<td>Repeats a list of instructions forever.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>repeat</td>
<td>repeat number</td>
<td>Repeats a list of instructions a set number of times.</td>
</tr>
<tr>
<td></td>
<td>[list]</td>
<td></td>
</tr>
<tr>
<td>if</td>
<td>if condition</td>
<td>Runs a list of instructions if a certain condition is met.</td>
</tr>
<tr>
<td></td>
<td>[list]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>if</td>
<td>ifelse condition</td>
<td>Runs the first list of instructions if a certain condition is met and the second list if it is not.</td>
</tr>
<tr>
<td></td>
<td>[list1]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[list2]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>stopall</td>
<td></td>
<td>Stops everything: programs, motors, etc. Stopall is equivalent to pressing the button on the PicoCricket.</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>stopstack</td>
<td>stopstack</td>
<td>Terminates execution of a procedure, returning control to the calling procedure.</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is no need for spacers in the text language.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is no need for spacers in the text language.</td>
</tr>
<tr>
<td>Block</td>
<td>Word</td>
<td>Example Usage</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>--------------</td>
</tr>
<tr>
<td><img src="image" alt="number" /></td>
<td>number</td>
<td>Reports a number. Numbers in PicoBlocks are limited to integers between -32768 and +32767. display 7 The display shows the number 7.</td>
</tr>
<tr>
<td><img src="image" alt="number + number" /></td>
<td>number + number</td>
<td>Reports the sum of two numbers. display 7 + 4 The display shows the number 11.</td>
</tr>
<tr>
<td><img src="image" alt="number - number" /></td>
<td>number - number</td>
<td>Reports the difference of two numbers. display 7 - 4 The display shows the number 3</td>
</tr>
<tr>
<td><img src="image" alt="number * number" /></td>
<td>number * number</td>
<td>Reports the product of two numbers. display 7 * 4 The display shows the number 28.</td>
</tr>
<tr>
<td><img src="image" alt="number / number" /></td>
<td>number / number</td>
<td>Reports the quotient of two numbers, rounded down to the nearest integer. display 7 / 4 The display shows the number 1.</td>
</tr>
<tr>
<td>text only</td>
<td>%</td>
<td>Reports the remainder when two numbers are divided. display 7 % 4 The display shows the number 3.</td>
</tr>
<tr>
<td><img src="image" alt="random number" /></td>
<td>random number</td>
<td>Report a random number, the two inputs determining the lower and upper limits. display random 0 10 The display shows a random number from 0 to 10.</td>
</tr>
<tr>
<td><img src="image" alt="number &gt; number" /></td>
<td>number &gt; number</td>
<td>Reports true (the number 1) if the value of the first input is greater than the value of the second input. to test forever [if brightness &gt; 30 [chirp]] end The PicoCricket chirps if the light sensor measures a value greater than 30.</td>
</tr>
<tr>
<td><img src="image" alt="number &lt; number" /></td>
<td>number &lt; number</td>
<td>Reports true (the number 1) if the value of the first input is less than the value of the second input. to test forever [if brightness &lt; 30 [chirp]] end The PicoCricket chirps if the light sensor measures a value less than 30.</td>
</tr>
<tr>
<td><img src="image" alt="number = number" /></td>
<td>number = number</td>
<td>Reports true (the number 1) if the value of the first input is equal the value of the second input. forever [if brightness = 30 [chirp]] The PicoCricket chirps if the light sensor measures a value exactly equal to 30.</td>
</tr>
</tbody>
</table>
### Numbers

<table>
<thead>
<tr>
<th>Block</th>
<th>Word</th>
<th>Example Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>condition and condition</strong></td>
<td>Reports true (the number 1) if the first and second conditions are both true. To test forever [if (brightness &lt; 30) and touch? [chirp]] end The PicoCricket chirps if the light sensor measures a value less than 30 and the touch sensor is also pressed.</td>
</tr>
<tr>
<td></td>
<td><strong>condition or condition</strong></td>
<td>Reports true (the number 1) if the first or the second conditions are both true. To test forever [if (brightness &lt; 30) or touch? [chirp]] end The PicoCricket chirps if the light sensor measures a value less than 30 or the touch sensor is pressed.</td>
</tr>
<tr>
<td></td>
<td><strong>not condition</strong></td>
<td>Reports true (the number 1) if the result of the condition is false (number 0). To test forever [if not touch? [chirp]] end The PicoCricket chirps if the touch sensor is not pressed.</td>
</tr>
</tbody>
</table>

### My Blocks

<table>
<thead>
<tr>
<th>Block</th>
<th>Word</th>
<th>Example Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>block name</strong>&lt;br&gt;&lt;br&gt;<strong>block-definition</strong>&lt;br&gt;&lt;br&gt;<strong>end</strong></td>
<td>You can use the text language to make your own blocks. (See section Make Your Own Blocks above.)</td>
</tr>
<tr>
<td></td>
<td><strong>store in box1 number</strong></td>
<td>Stores a number in the global variable called box1. storeinbox1 57 display box1 The display shows the number 57.</td>
</tr>
<tr>
<td></td>
<td><strong>box1</strong></td>
<td>Reports the number stored in the global variable called box1. storeinbox1 57</td>
</tr>
<tr>
<td></td>
<td><strong>text only</strong>&lt;br&gt;&lt;br&gt;<strong>global:</strong></td>
<td>You can use the text language to create new global variables. (See section Global Variables above.)</td>
</tr>
<tr>
<td></td>
<td><strong>text only</strong>&lt;br&gt;&lt;br&gt;<strong>make “name value</strong></td>
<td>Make allows you to change the value of a local variable. (See section Local Variables above.)</td>
</tr>
</tbody>
</table>
# Common Error Messages

<table>
<thead>
<tr>
<th>Error Message</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| The Beamer cannot see the PicoCricket | The Beamer is sending, but no PicoCricket is responding.  
**Solution:** Make sure the PicoCricket is turned on, and that the PicoCricket and the Beamer are facing each other. For more information, see [www.picocricket.com/troubleshooting](http://www.picocricket.com/troubleshooting) |
| Can't find the Beamer | PicoBlocks wasn't able to open the communication port.  
**Solution:** Make sure the Beamer is properly connected to your computer. If you are using Windows, make sure only one copy of PicoBlocks is running. For more information, see [www.picocricket.com/support](http://www.picocricket.com/support) |
| Can't save an empty score | You tried to export a melody or rhythm that is empty.  
**Solution:** Make sure the block contains notes, then click Export again. |
| Can't use ____ as a name | PicoBlocks does not allow that word as a name. Numbers, names starting with % or [, and existing words are considered invalid.  
**Solution:** Type another name. |
| Communication problem | There was a communication problem while PicoBlocks was downloading data to your PicoCricket.  
**Solution:** Make sure that the Beamer and the PicoCricket are facing each other, then try again. If the PicoCricket's yellow antenna lights keep flashing even when you are not downloading, the PicoCricket is probably receiving infrared interference from a monitor or other device. Shield the PicoCricket from the monitor. For more information, see [www.picocricket.com/troubleshooting](http://www.picocricket.com/troubleshooting) |
| Missing input to _______ | One (or more) of the blocks requires input.  
**Solution:** Check that every block has something attached on its right side when required. (You can tell by the shape of a block whether it takes an input.)  
For example, display needs a number (or other value) attached as an input:  
![display block](image)  
**Repeat** requires a number value at the top right. It also requires plus one or more blocks under its “arm” to repeat:  
![repeat block](image)  
**Tip:** To check if a block needs inputs, click on the block with the Help tool 🎨 |
<table>
<thead>
<tr>
<th>Error Message</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I don't know how to _____</td>
<td>PicoBlocks tried to run a name that doesn’t exist.</td>
</tr>
<tr>
<td></td>
<td>Solution: If you name a stack, then PicoBlocks creates a block with that name. To run the block, you need to keep the named stack in the Workspace, so PicoBlocks knows what to do.</td>
</tr>
<tr>
<td>The name _____ already exists</td>
<td>There is already an existing block with the same name.</td>
</tr>
<tr>
<td></td>
<td>Solution: Type another name.</td>
</tr>
<tr>
<td>Number block doesn’t like _____</td>
<td>You typed an invalid character in the stack.</td>
</tr>
<tr>
<td></td>
<td>Solution: Type only numbers.</td>
</tr>
<tr>
<td>Project contains too many blocks</td>
<td>Your project contains too many blocks.</td>
</tr>
<tr>
<td></td>
<td>Solution: Delete all stacks, melodies and rhythms that are not being used.</td>
</tr>
<tr>
<td>Too many blocks in the stack</td>
<td>The stack contains too many blocks (and uses up too much memory).</td>
</tr>
<tr>
<td></td>
<td>Solution: Use a repeat to do more with fewer blocks. Or, place a block on the top of the stack, and click on it to type in a name.</td>
</tr>
<tr>
<td>Too many music blocks: Limit of 24</td>
<td>You have made more than the maximum number of music blocks. The maximum number of melodies and rhythms is 24 blocks.</td>
</tr>
<tr>
<td></td>
<td>Solution: Delete some of the melody or rhythm blocks so that the project has no more than 24 total.</td>
</tr>
<tr>
<td>Too many notes for one music block</td>
<td>The current melody or rhythm is too long.</td>
</tr>
<tr>
<td></td>
<td>Solution: Divide the melody or rhythm into two blocks.</td>
</tr>
<tr>
<td></td>
<td>To do this, first copy the current music block. In this block, delete the second half of the notes. In the other block, delete the first half of the notes. Now you can use these two blocks together to play the entire sequence.</td>
</tr>
<tr>
<td>waituntil needs input</td>
<td>The waituntil block needs an input block that fits.</td>
</tr>
<tr>
<td></td>
<td>Solution: Attach a block that fits onto the right side of the waituntil block.</td>
</tr>
<tr>
<td></td>
<td>Examples:</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="waituntil block examples" /></td>
</tr>
<tr>
<td>Error Message</td>
<td>Explanation</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>You can’t copy an empty music block</td>
<td>You tried to copy a melody or rhythm that is empty.</td>
</tr>
<tr>
<td></td>
<td>Solution: Add notes, then copy the block.</td>
</tr>
<tr>
<td>You can’t name a stack _____</td>
<td>The name typed on the block contains invalid characters. It cannot contain the following characters: % “ + - * / ] [ or a space. Numbers can only be used in combination with letters.</td>
</tr>
<tr>
<td></td>
<td>Solution: Type letters on the block.</td>
</tr>
<tr>
<td>You don’t say what to do with ______</td>
<td>PicoBlocks tried to run a block that returns a value, but there was no block attached to receive that value.</td>
</tr>
<tr>
<td></td>
<td>Solution: Attach a block that will fit that shape (and receive the value). For example: touch? waituntil</td>
</tr>
</tbody>
</table>

**Text-Only Error Messages**

The following error messages only appear when using the PicoBlocks Text Language.

<table>
<thead>
<tr>
<th>Error Message</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>_____: a block can’t have more than 3 inputs</td>
<td>You can’t make a block with more than 3 inputs.</td>
</tr>
<tr>
<td></td>
<td>Solution: Store the other values as global variables, and use the names of these variables in your program. For more information, see Global Variables in the PicoBlocks Text Language section of this reference guide.</td>
</tr>
<tr>
<td>_____ has no value</td>
<td>PicoBlocks could not find a value for the specified name.</td>
</tr>
<tr>
<td></td>
<td>Solution: In the Text Area, check that you have correctly typed the name of the input. Inputs should have a colon preceding them, but global variables should not.</td>
</tr>
<tr>
<td>_____: output block can only have 1 input</td>
<td>A block that outputs can only have 1 input.</td>
</tr>
<tr>
<td></td>
<td>Solution: Store the other values as global variables, and use the names of these variables in your program. For more information, see Global Variables in the PicoBlocks Text Language section of this reference guide.</td>
</tr>
<tr>
<td>() error misplaced )</td>
<td>A parenthesis is missing or misplaced.</td>
</tr>
<tr>
<td></td>
<td>Solution: Check that there are an equal number of open and closed parenthesis ( ), and that they are correctly placed.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Explanation</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Can’t name a global ______ | You need to type in a different name for the global variable.  
**Solution:** Use only letters and numbers as names for global variables. See **Global Variables** in the PicoBlocks Text Language section of this reference guide for more information. |
| Can’t use _____ as name of an input | PicoBlocks doesn’t like numbers as the name of an input.  
**Solution:** You need to type in a different name for the input. Avoid using numbers as input. Also, make sure to put a colon before the name of the input.  
For example:  
block mydance :turns  
repeat :turns [motoron for 10 reverse]  
end |
| Missing [Missing ] | There is a missing bracket: ] or [.  
**Solution:** Make sure there are an equal number of open and closed brackets. |
| Missing name after **to**  
Missing name after **block**  
Missing name after **bbox** | **Solution:** The words **to**, **block**, and **bbox** need to be followed by a valid name. For example:  
block mylights  
setlightcolor 60  
wait 10  
lightoff  
end |
| No output from _____ | The word or block indicated does not provide output.  
**Solution:** Make sure every block has something attached on its right side when required. See the PicoBlocks Text Language section for more on how to use **output**. |
| Too many globals | There are too many global variables in the project. The maximum number of variables is 7 (including box1 and box2).  
**Solution:** Delete some of the global variables so that the project has no more than 7 total. |
| **waituntil** needs a list as input. | **waituntil** needs a list as input.  
**Solution:** Add a list in brackets after waituntil  
For example:  
waituntil [touch?]  
chirp |
<table>
<thead>
<tr>
<th>Error Message</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>make needs a local variable</td>
<td>Make needs to be followed by the name for a local variable.</td>
</tr>
<tr>
<td></td>
<td><strong>Solution:</strong> Check that the word after <em>make</em> has a quotation mark before it, and is a local variable.</td>
</tr>
<tr>
<td></td>
<td><strong>For example:</strong></td>
</tr>
<tr>
<td></td>
<td>block fastlight :n</td>
</tr>
<tr>
<td></td>
<td>setlightcolor :n</td>
</tr>
<tr>
<td></td>
<td>make “n :n / 10</td>
</tr>
<tr>
<td></td>
<td>wait :n</td>
</tr>
<tr>
<td></td>
<td>lightoff</td>
</tr>
<tr>
<td></td>
<td>end</td>
</tr>
</tbody>
</table>