Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

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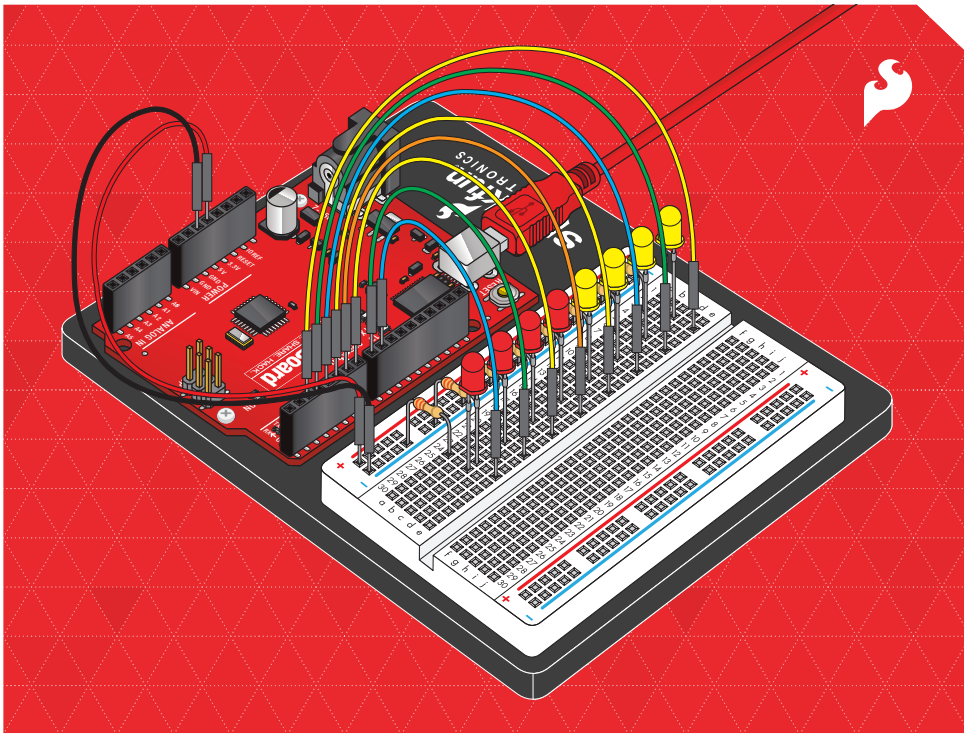
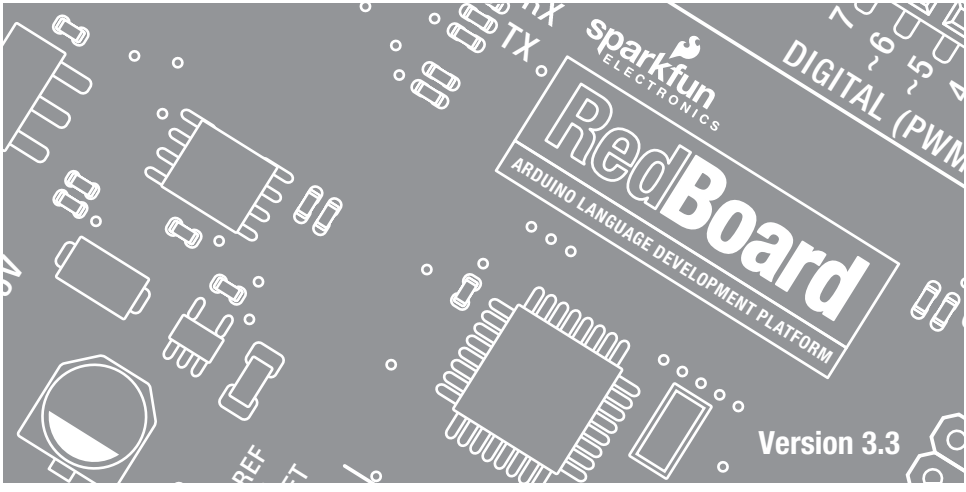
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



SIK GUIDE

Your guide to the SparkFun Inventor's Kit for the SparkFun RedBoard



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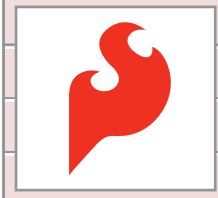
Welcome to the SparkFun Inventor's Guide

The SparkFun Inventor's Guide is your map for navigating the waters of beginning embedded electronics. This booklet contains all the information you will need to explore the 16 circuits of the SparkFun Inventor's Kit for SparkFun RedBoard. At the center of this manual is one core philosophy - that anyone can (and should) play around with electronics. When you're done with this guide, you'll have the know-how to start creating your own projects and experiments. Now enough talking - let's get inventing!

www.sparkfun.com/SIK



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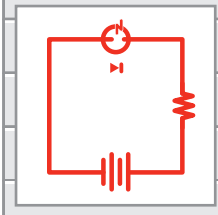

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What is the RedBoard platform?

The DIY Revolution

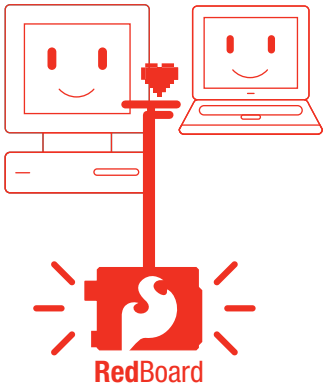
We live in a unique time where we have access to resources that allow us to create our own solutions and inventions. The DIY revolution is composed of hobbyists, tinkerers and inventors who would rather craft their own projects than let someone do it for them.

www.sparkfun.com

A Computer for the Physical World

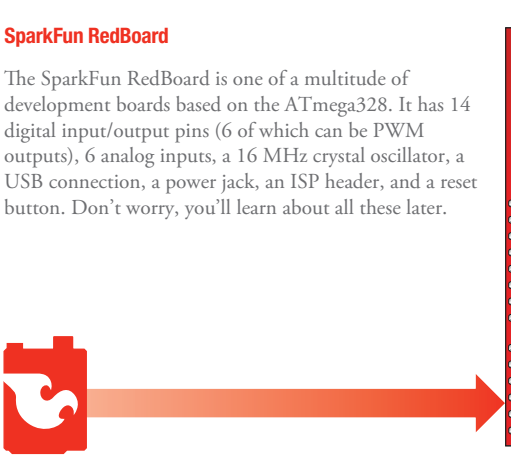
The RedBoard in your hand (or on your desk) is your development platform. At its roots, the RedBoard is essentially a small portable computer. It is capable of taking **inputs** (such as the push of a button or a reading from a light sensor) and interpreting that information to control various **outputs** (like a blinking LED light or an electric motor).

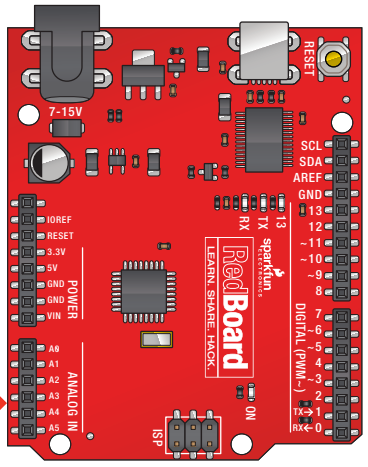
That's where the term "physical computing" is born - this board is capable of taking the world of electronics and relating it to the physical world in a real and tangible way. Trust us - this will all make more sense soon.

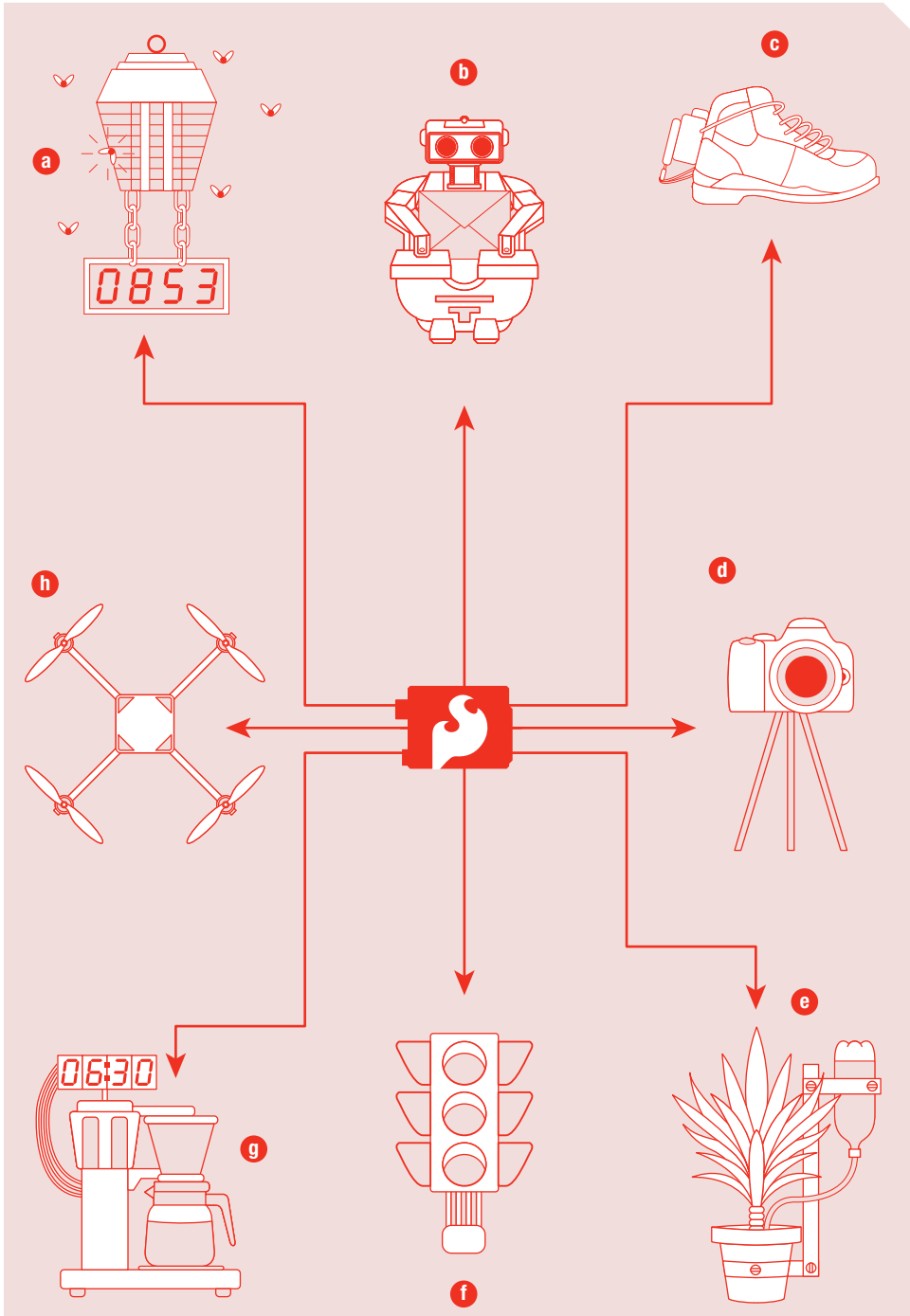


// SparkFun RedBoard

The SparkFun RedBoard is one of a multitude of development boards based on the ATmega328. It has 14 digital input/output pins (6 of which can be PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ISP header, and a reset button. Don't worry, you'll learn about all these later.







a Bug Zapper Counter
b Old Toy Email Notifer
c Power-Lacing High Tops
d Camera Time-lapse operation
e Auto-Plant Watering
f Re-Programmed Traffic Light
g Auto-Coffee Maker
h Quadcopter

Download the Arduino IDE (Integrated Development Environment)

Access the Internet

In order to get your RedBoard up and running, you'll need to download the newest version of the Arduino software first from www.arduino.cc (it's free!). This software, known as the Arduino IDE, will allow you to program the board to do exactly what you want. It's like a word processor for writing programs. With an internet-capable computer, open up your favorite browser and type in the following URL into the address bar:

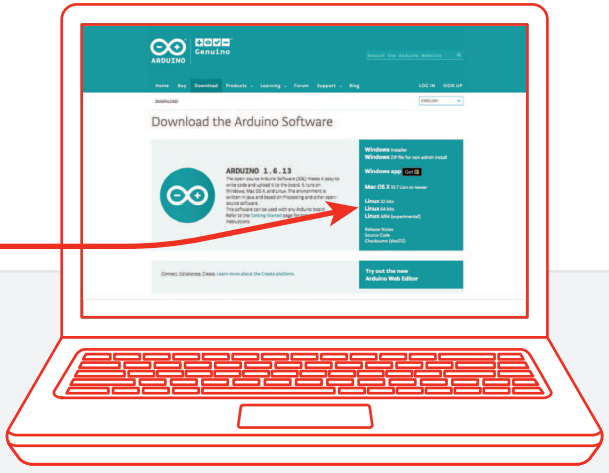
arduino.cc/en/main/software < case sensitive >

1

Download

Select the installer option appropriate for the operating system you are using.

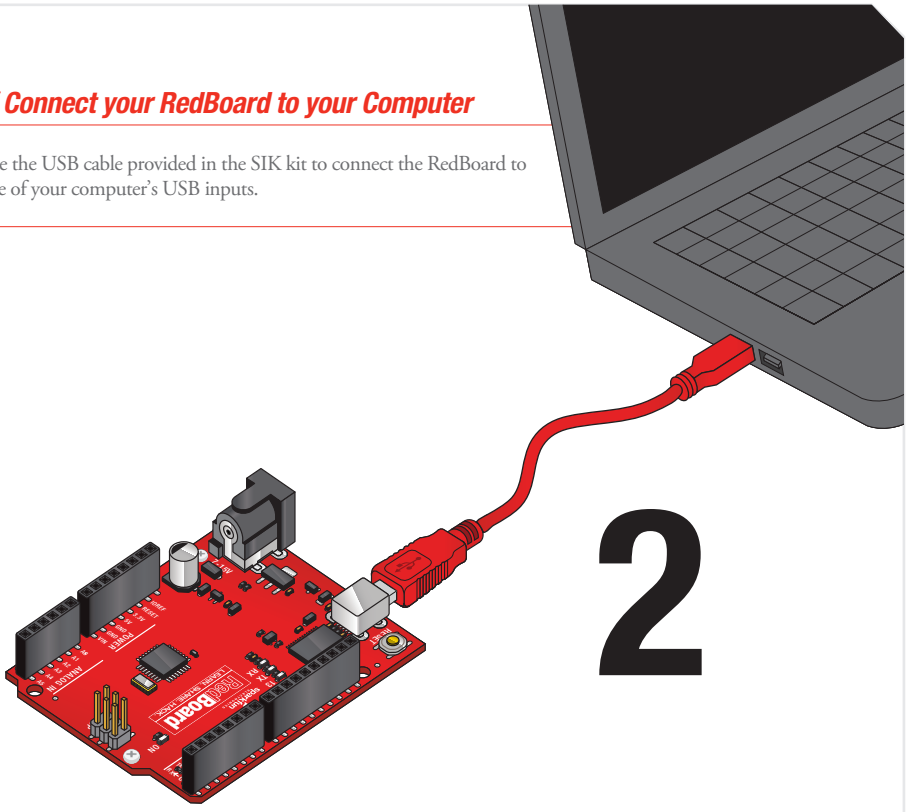
- **Windows**
- **Mac OS X**
- **Linux: 32 bit, 64 bit**
- **source**



Choose the appropriate Operating System installation package for your computer.

// Connect your RedBoard to your Computer

Use the USB cable provided in the SIK kit to connect the RedBoard to one of your computer's USB inputs.

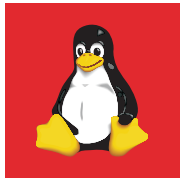


2

3

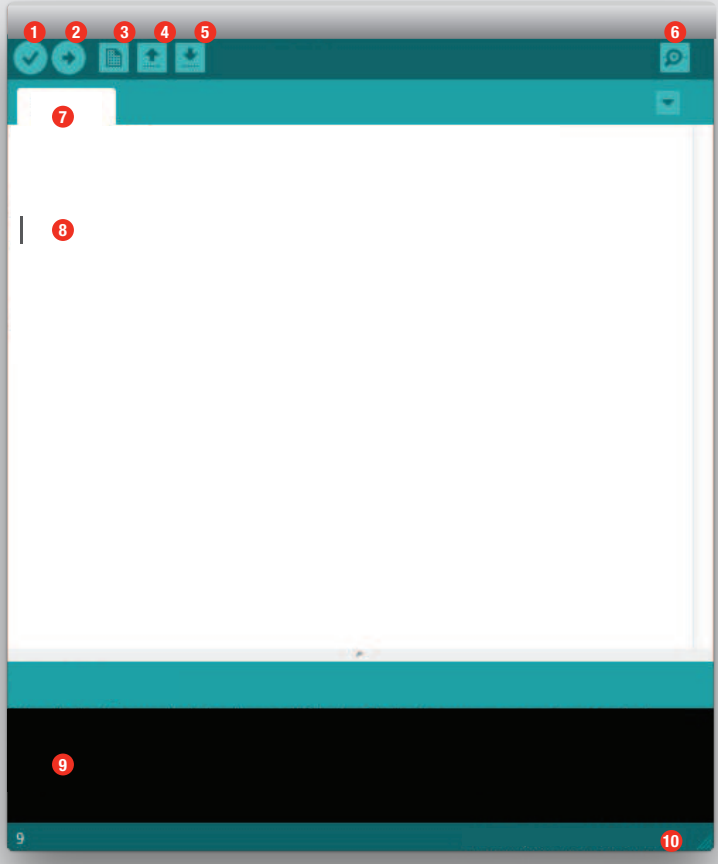
// Install Arduino Drivers

Depending on your computer's operating system, you will need to follow specific instructions. Please go to **www.sparkfun.com/FTDI** for specific instructions on how to install the FTDI drivers onto your RedBoard.



// Open the Arduino IDE:

Open the Arduino IDE software on your computer. Poke around and get to know the interface. We aren't going to code right away, this is just an introduction. This step is to set your IDE to identify your RedBoard.



GUI (Graphical User Interface)

1. **Verify:** Compiles and approves your code. It will catch errors in syntax (like missing semi-colons or parenthesis). // See Diagram Below
2. **Upload:** Sends your code to the RedBoard. When you click it, you should see the lights on your board blink rapidly. // See Diagram Below
3. **New:** This buttons opens up a new code window tab.
4. **Open:** This button will let you open up an existing sketch. // See Diagram Below
5. **Save:** This saves the currently active sketch.
6. **Serial Monitor:** This will open a window that displays any serial information your RedBoard is transmitting. It is very useful for debugging.
7. **Sketch Name:** This shows the name of the sketch you are currently working on.
8. **Code Area:** This is the area where you compose the code for your sketch.
9. **Message Area:** This is where the IDE tells you if there were any errors in your code.
10. **Connection Area:** This shows the board and serial port currently selected.

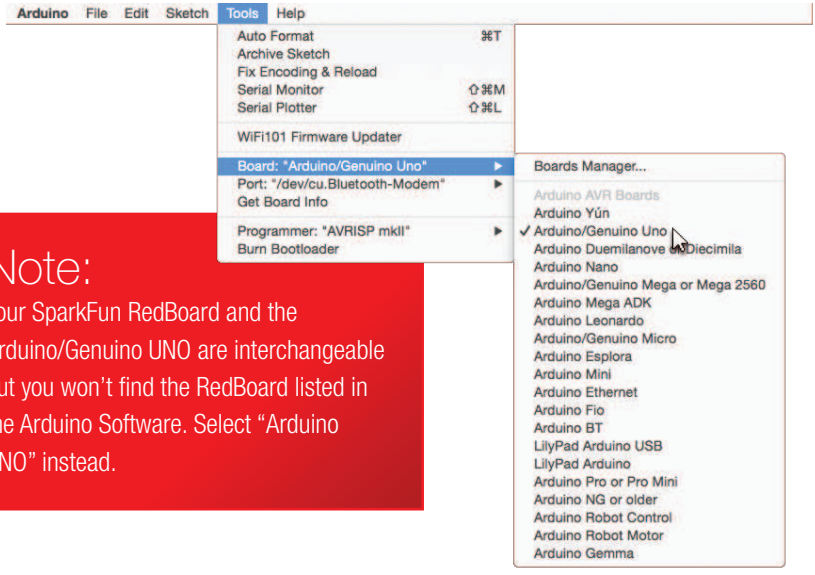
// The three most important commands for this guide are these:

Open

Verify

Upload

4 // Select your board: Arduino/Genuino Uno

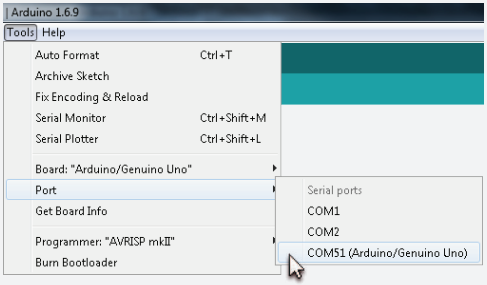


Note:

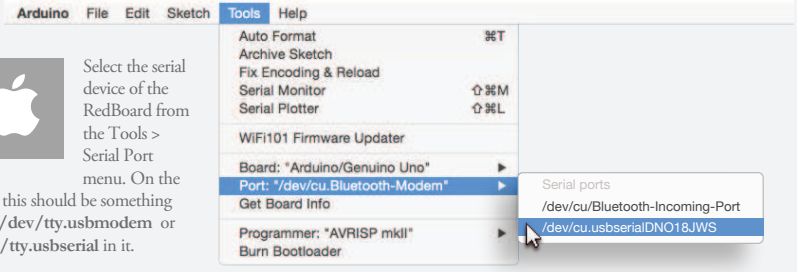
Your SparkFun RedBoard and the Arduino/Genuino UNO are interchangeable but you won't find the RedBoard listed in the Arduino Software. Select "Arduino UNO" instead.

// Select your Serial Device

Select the serial device of the RedBoard from the Tools | Serial Port menu. This is likely to be **com3 or higher** (COM1 and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your RedBoard and re-open the menu; the entry that disappears should be the RedBoard. Reconnect the board and select that serial port.



Select the serial device of the RedBoard from the Tools > Serial Port menu. On the Mac, this should be something with **/dev/tty.usbmodem** or **/dev/tty.usbserial** in it.



http://www.arduino.cc/playground/Learning/Linux

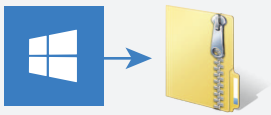
Download Arduino Code (For use with the circuits in this guide)

5

Type in the following URL to download the code:

sparkfun.com/sikcode

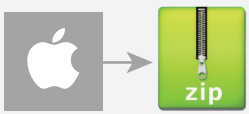
// Copy "SIK Guide Code" into "Examples" library in Arduino folder



Unzip the file "SIK Guide Code". It should be located in your browser's **"Downloads"** folder. Right click the zipped folder and choose **"unzip"**.

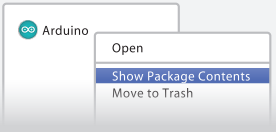
Start → Programs → arduino → examples

Copy the "SIK Guide Code" folder into Arduino's folder named "examples".



Unzip the file **"SIK Guide Code"**. It should be loacted in your browser's **"Downloads"** folder. Right click the zipped folder and choose **"unzip"**.

Find "Arduino" in your applications folder. Right click(ctrl + click) on "Arduino". Select "Show Package Contents".



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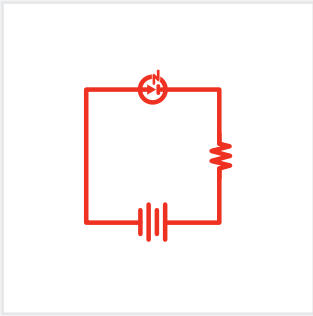
Resources
↓
Java
↓
examples

Copy the "SIK Guide Code" folder into Arduino's folder named "examples".

http://www.arduino.cc/playground/Learning/Linux

WHAT'S NEXT? Read on to learn more about getting started with circuits. Then you can start on your first circuit on page 17!

Getting Started with Circuits



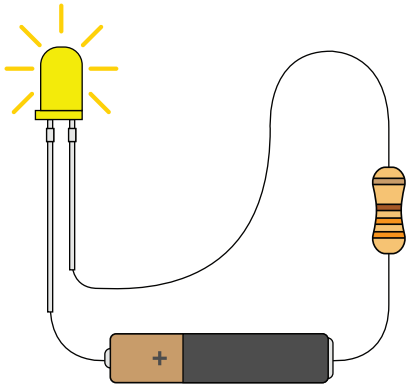
What is an Electrical Circuit?

A circuit is basically an electrical loop with a starting point and an ending point - with any number of components in between. Circuits can include resistors, diodes, inductors, sensors of all sizes and shapes, motors, and any other handful of hundreds of thousands of components.

Circuits are usually divided into three categories - analog circuits, digital circuits, or mixed-signal circuits. In this guide, you will explore all three sets of circuits.

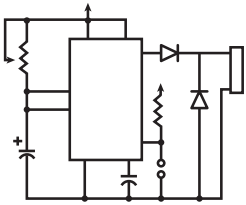
The World Runs on Circuits:

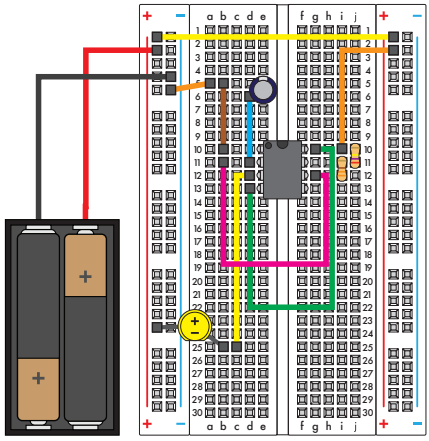
Everywhere you look, you'll find circuits. The cell phone in your pocket, the computer that controls your car's emissions system, your video game console - all these things are chock full of circuits. In this guide, you'll experiment with some simple circuits and learn the gist of the world of embedded electronics.

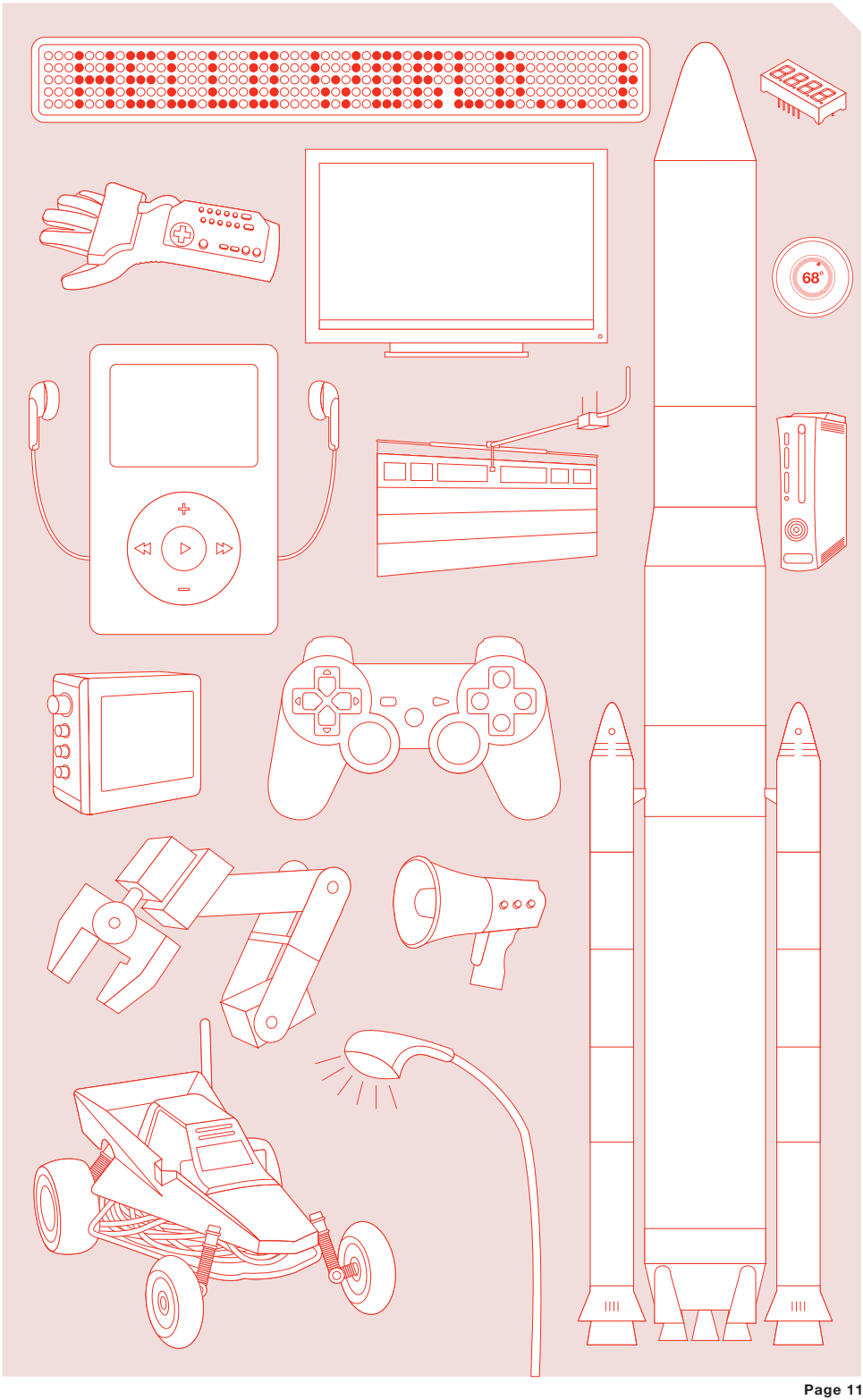


// Simple and Complex Circuits

In this guide, you will be primarily exploring simple circuits - but that doesn't mean you can't do amazing things with simple tools! When you've finished the SIK, your knowledge of circuits will enable you to explore amazing projects and unleash the power of your imagination.



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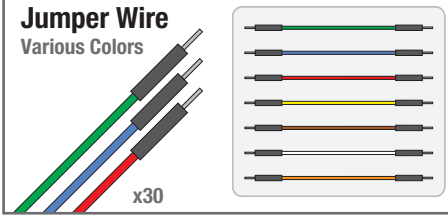
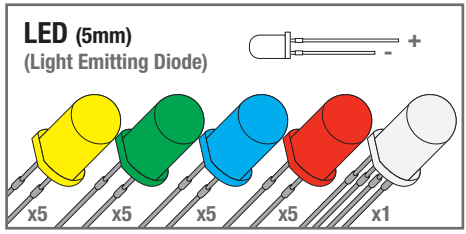
Inventory of Parts

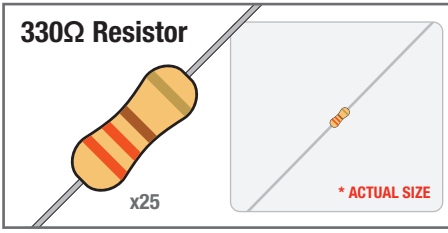
Jumper Wire
Various Colors



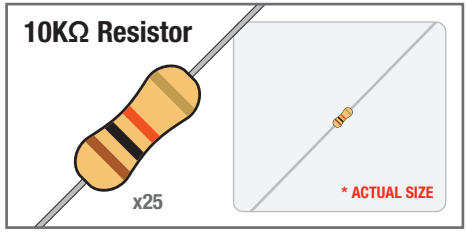
LED (5mm)
(Light Emitting Diode)



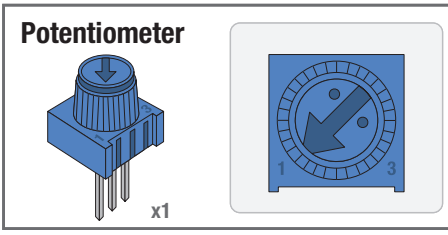
330Ω Resistor



10KΩ Resistor



Potentiometer



Diode
(1N4148)

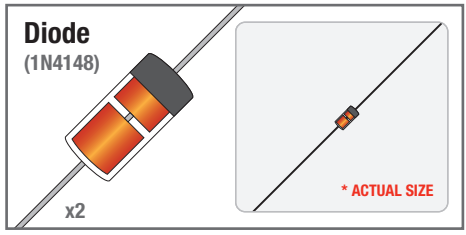
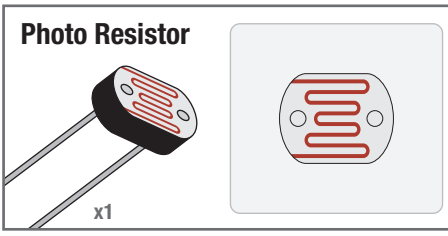
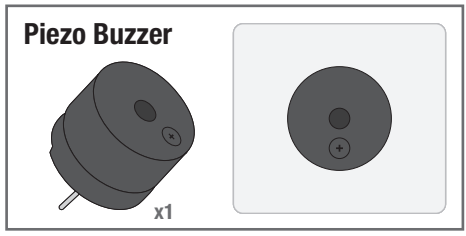


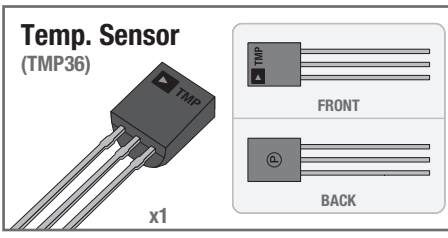
Photo Resistor



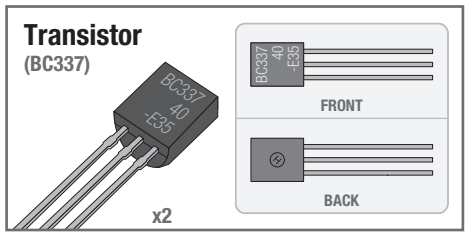
Piezo Buzzer



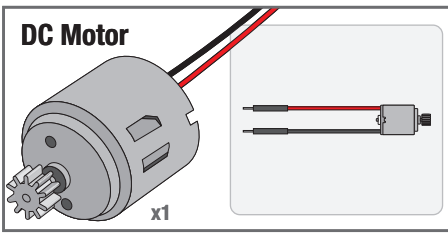
Temp. Sensor
(TMP36)



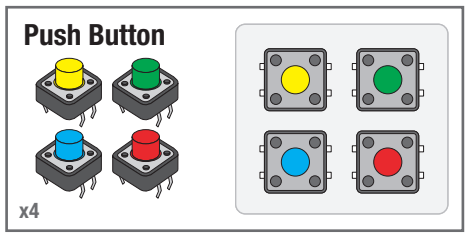
Transistor
(BC337)



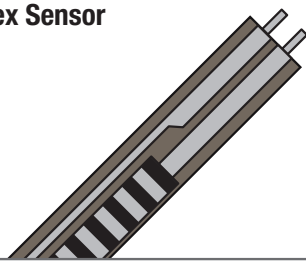
DC Motor



Push Button

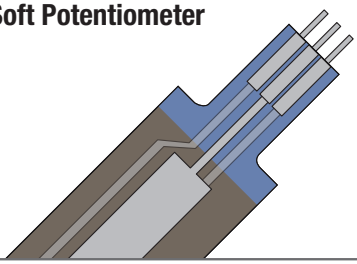


Flex Sensor



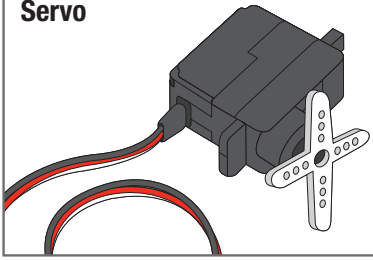
x1

Soft Potentiometer



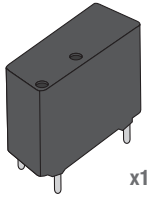
x1

Servo



x1

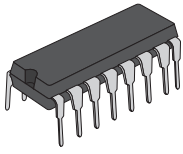
Relay



x1

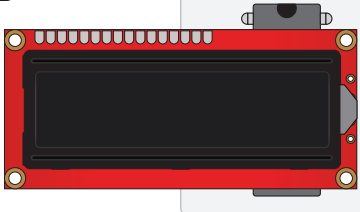
Integrated Circuit

(IC)

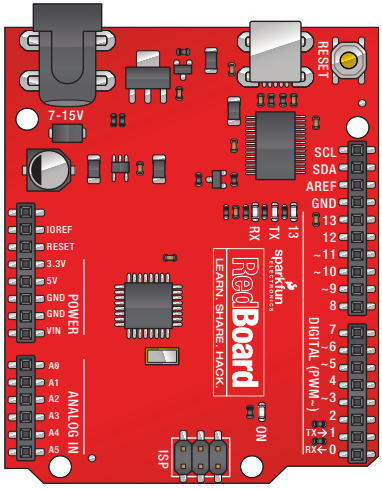


x1

LCD



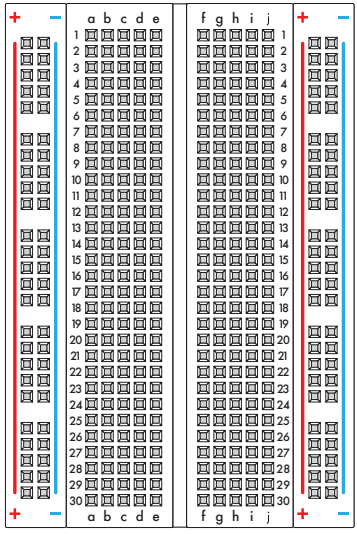
SparkFun RedBoard



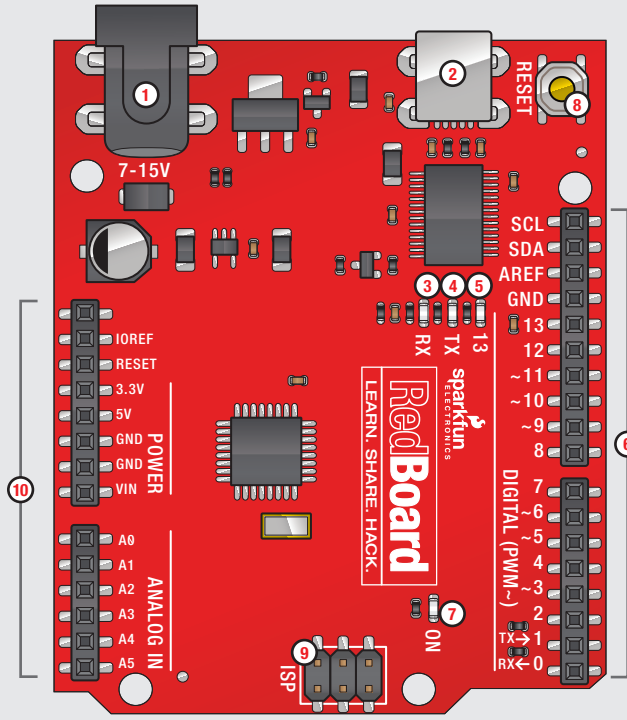
x1

Breadboard

Standard Solderless (Color may vary)



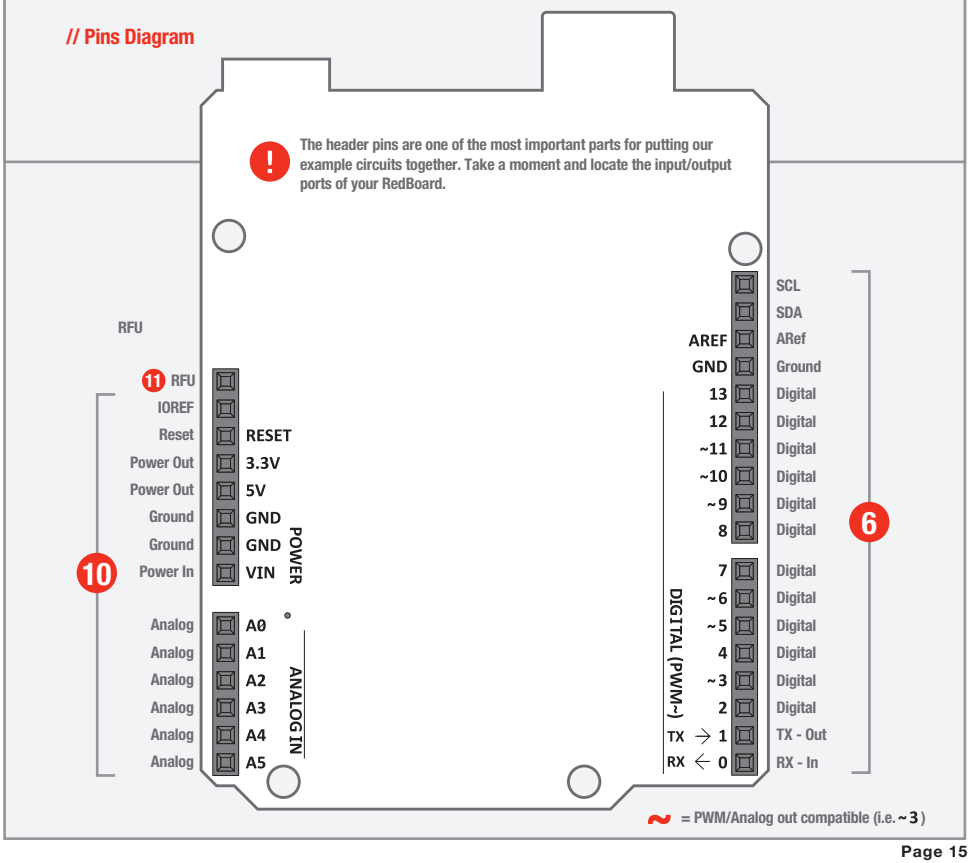
x1

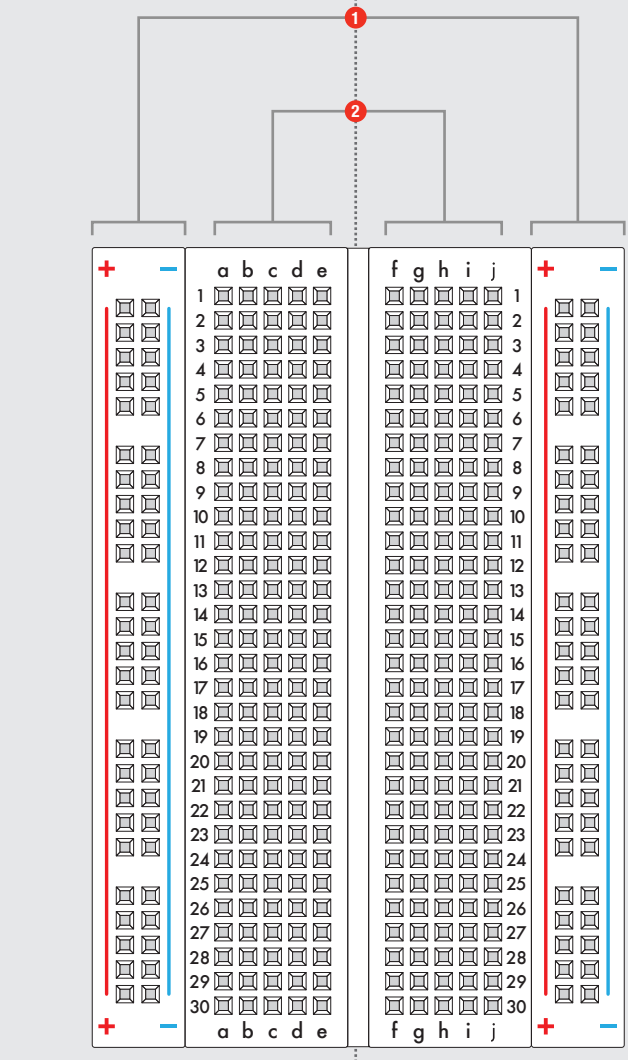

1
2
7-15V
RESET
8
SCL
SDA
AREF
GND
13
12
~11
~10
~9
8
3
4
5
RX
TX
13
IOREF
RESET
3.3V
5V
GND
GND
VIN
POWER
10
sparkfun
ELECTRONICS
RedBoard
LEARN. SHARE. HACK.
6
7
6
5
4
3
2
TX→1
RX←0
DIGITAL (PWM~)
ON
7
A0
A1
A2
A3
A4
A5
ANALOG IN
9
ISP

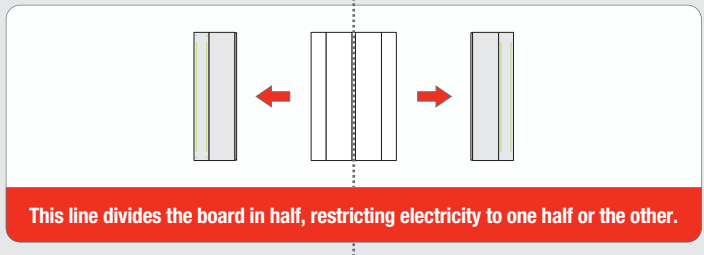
SparkFun RedBoard

1. **Power In** (Barrel Jack) - Can be used with either a 9V or 12V wall-wart or battery.
2. **Power In** (USB Port) - Provides power and communicates with your board when plugged into your computer via USB.
3. **LED** (RX: Receiving) - This shows when the FTDI chip is receiving data bits from the microcontroller. This happens when the microcontroller is sending data bits back to the computer.
4. **LED** (TX: Transmitting) - This shows when the FTDI chip is transmitting data bits to the microcontroller. This happens when the microcontroller is receiving this data from the computer.
5. **LED** (Pin 13: Troubleshooting) - This LED is incorporated into your sketch to show if your program is running properly.
6. **Pins** (ARef, Ground, Digital, Rx, Tx) - These various pins can be used for inputs, outputs, power, and ground. // See Diagram Below
7. **LED** (Indicates RedBoard is ON) - This is a simple power indicator LED.
8. **Reset Button** - This is a way to manually reset your RedBoard, which makes your code restart.
9. **ICSP Pins** (Uploading Code without Bootloader) - This is for "In-Circuit Serial Programming," used if you want to bypass the bootloader.
10. **Pins** (Analog In, Power In, Ground, Power Out, Reset) - These various pins can be used for inputs, outputs, power, and ground. // See Diagram
11. **RFU** - This pin is reserved for future use.

// Pins Diagram







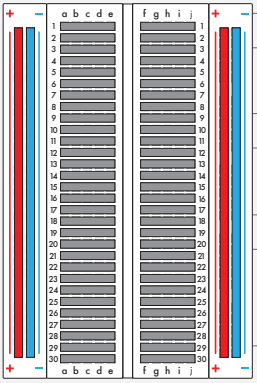
This line divides the board in half, restricting electricity to one half or the other.

Breadboard

1 Vertical Connection (+ Power and - Ground) - Power bus // See Diagram Below

2 Horizontal Connection (a-e & f-j) // See Diagram Below)

How's it all connected?



+ Power:

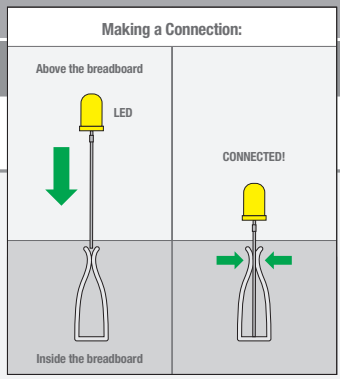
Each + sign runs power anywhere in the vertical column.

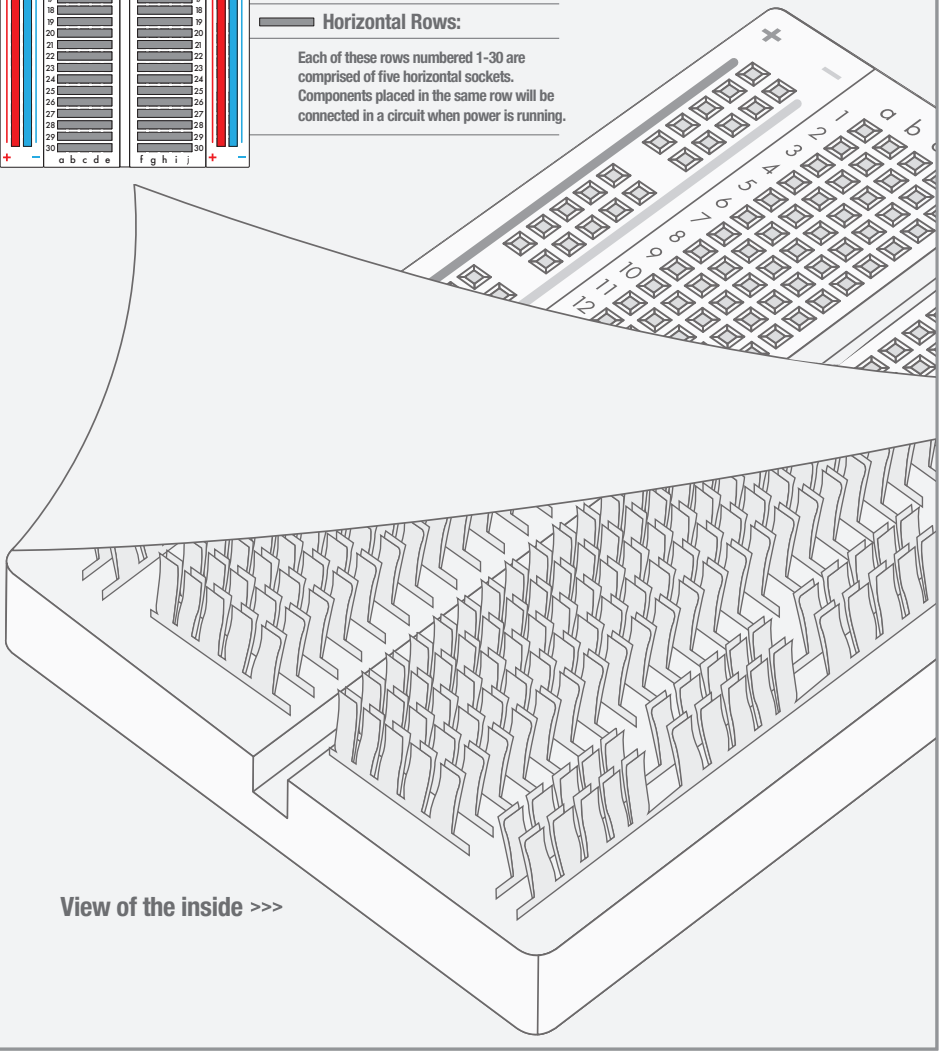
− Ground:

Each - sign runs to ground anywhere in the vertical column.

Horizontal Rows:

Each of these rows numbered 1-30 are comprised of five horizontal sockets. Components placed in the same row will be connected in a circuit when power is running.





View of the inside >>>

CIRCUIT #1 - *Your First Circuit*

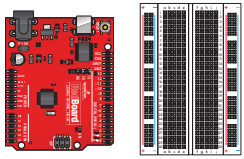
How It Works:

1 ASSEMBLE

2 WRITE

3 UPLOAD

+ Make sure the text on the RedBoard and breadboard are facing up so you can read them.



+ Connect the USB cable.

+ Screw the RedBoard down and into place.

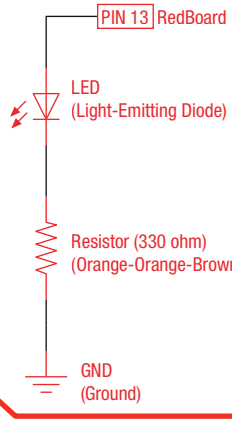
+ Peel sticker off back of breadboard and stick into place.

Your RedBoard runs on 5V. This is the power that will be supplied from your computer via USB and will be the driving force behind any components you use in your circuits. By plugging your RedBoard into your computer, you are supplying it with just the right voltage it needs to thrive! 5V can't hurt you, so don't be afraid to touch anything in your circuit. You can also power the RedBoard through the barrel jack. The on-board voltage regulator can handle anything from 7 to 15VDC.

1

Blinking an LED

LEDs (light-emitting diodes) are small, powerful lights that are used in many different applications. To start off the SIK, we will work on blinking an LED. That's right - it's as simple as turning a light on and off. It might not seem like much, but establishing this important baseline will give you a solid foundation as we work toward more complex experiments.

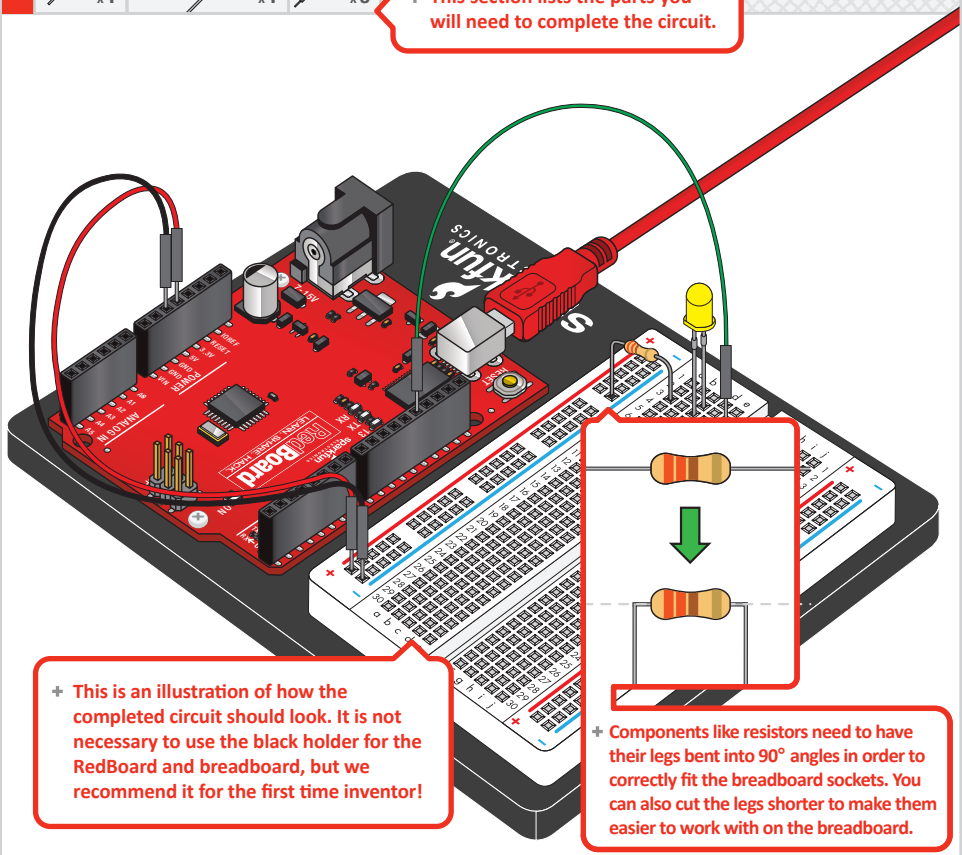


+ This is a schematic of your circuit.

+ Each circuit begins with a brief description of the what you are putting together and the expected result.

PARTS:

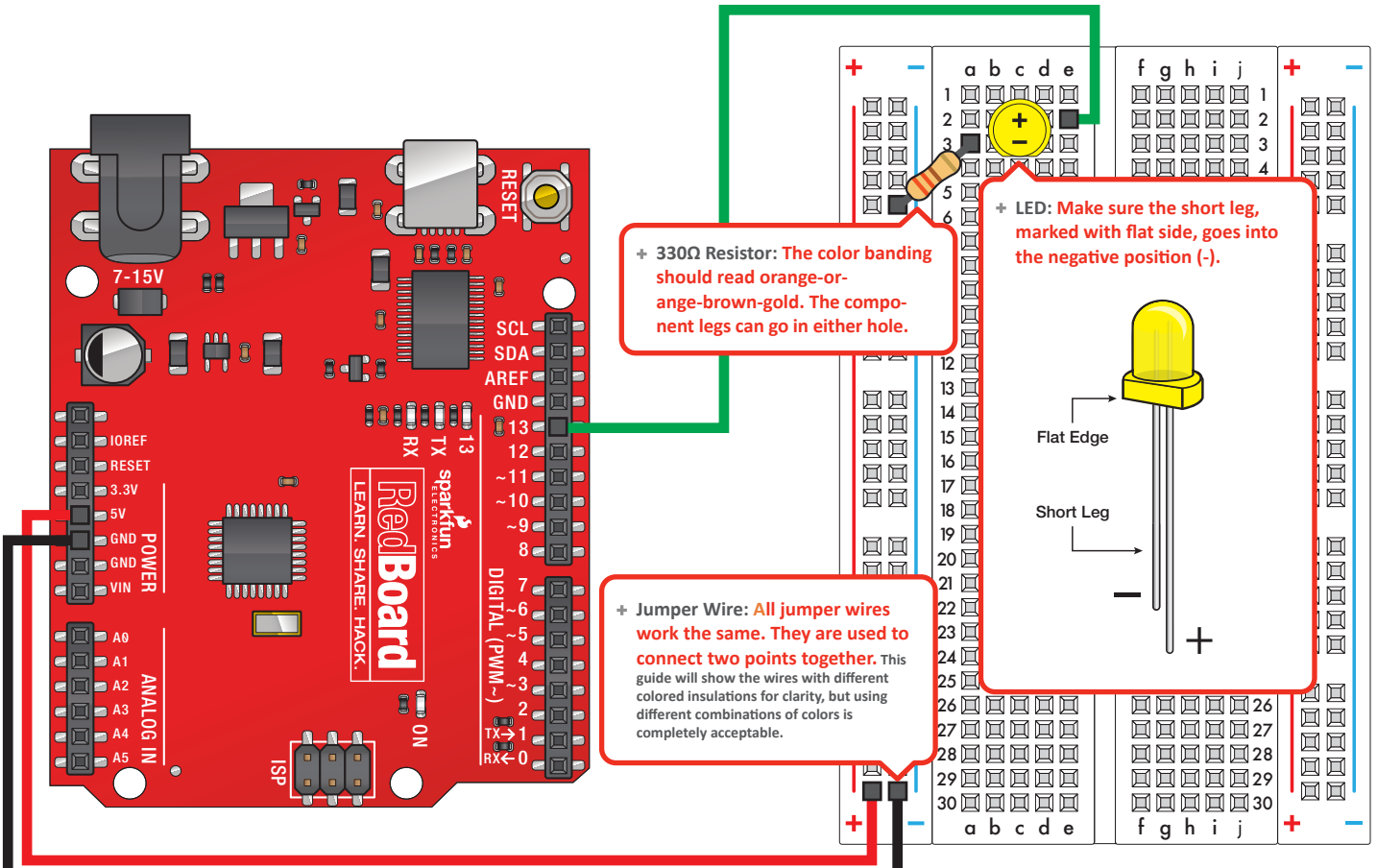
+ This section lists the parts you will need to complete the circuit.

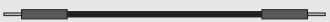
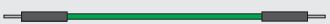


+ This is an illustration of how the completed circuit should look. It is not necessary to use the black holder for the RedBoard and breadboard, but we recommend it for the first time inventor!

+ Components like resistors need to have their legs bent into 90° angles in order to correctly fit the breadboard sockets. You can also cut the legs shorter to make them easier to work with on the breadboard.

Circuit 1: Blinking an LED



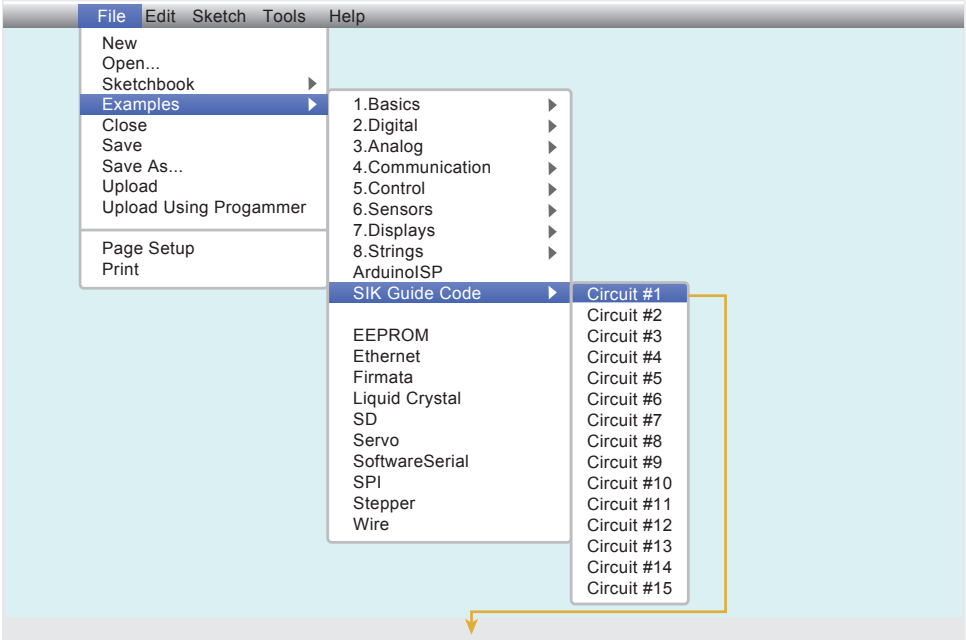
Component:	Image Reference:			
LED (5mm) ⚠			c2 (+) – c3 (-)	+ Components like LEDs are inserted into the breadboard sockets c2(long leg) c3(short leg). Steps highlighted with a yellow warning triangle represent a polarized component. Pay special attention to the component's markings indicating how to place it on the breadboard.
330Ω Resistor			a3 – -	+ Resistors are placed in breadboard sockets only. The "-" symbol represents any socket in its vertical column on the breadboard's power bus.
Jumper Wire		GND	-	+ "GND" on the RedBoard should be connected to the row marked "-" on the breadboard.
Jumper Wire		5V	+	+ "5V" on the RedBoard connects to the row marked "+" on the breadboard.
Jumper Wire		Pin 13	e2	+ "Pin 13" on the RedBoard connects to socket "e2" on the breadboard.

+ **RedBoard:** The red background represents a connection to one of the RedBoard header pins.

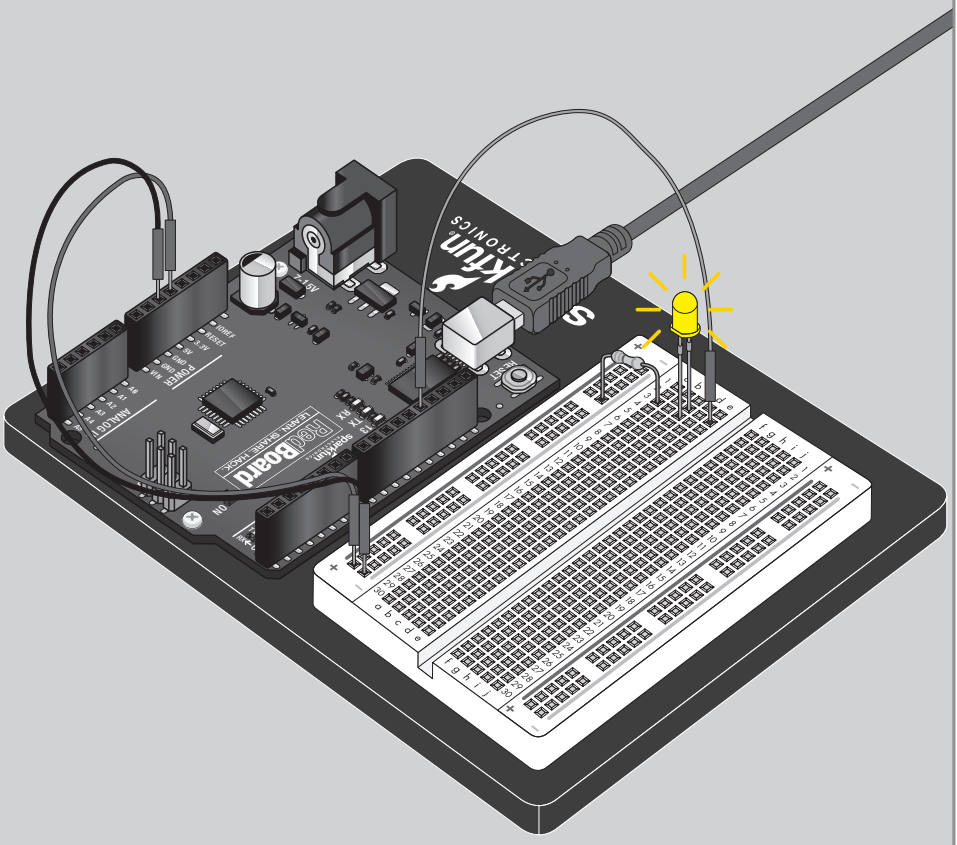
+ **Breadboard:** The white background represents a connection to a breadboard socket specified by a letter-number coordinate such as e2. These coordinates are merely suggestions that align with the graphic image.

Open Your First Sketch:

Open Up the Arduino IDE software on your computer. Coding in the Arduino language will control your circuit. Open the code for Circuit 1 by accessing the "SIK Guide Code" you downloaded and placed into your "Examples" folder earlier.



// Circuit #1

Verify	This compiles your code. The IDE changes it from text into instructions the computer can understand.
Upload	This sends the instructions via the USB cable to the computer chip on the RedBoard. The RedBoard will then begin running your code automatically.

// The result of a completed circuit with correct code after verified and uploaded.