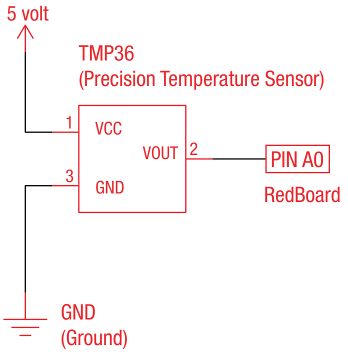
CIRCUIT #7

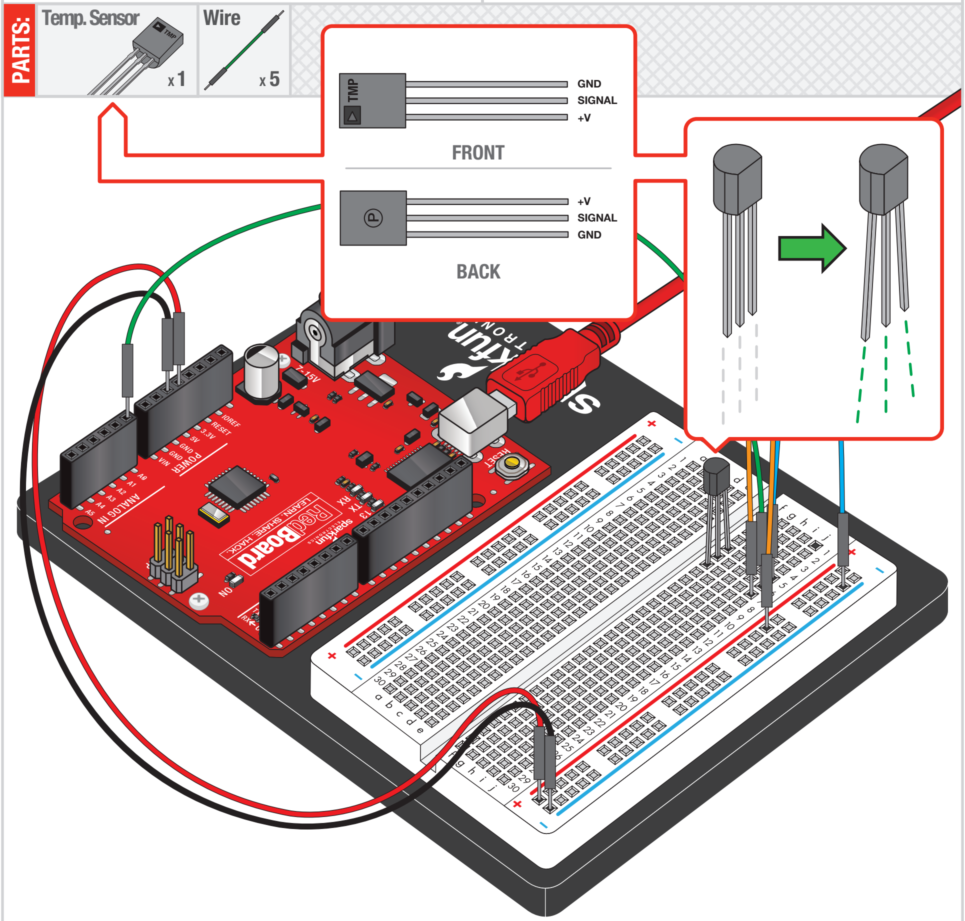
7

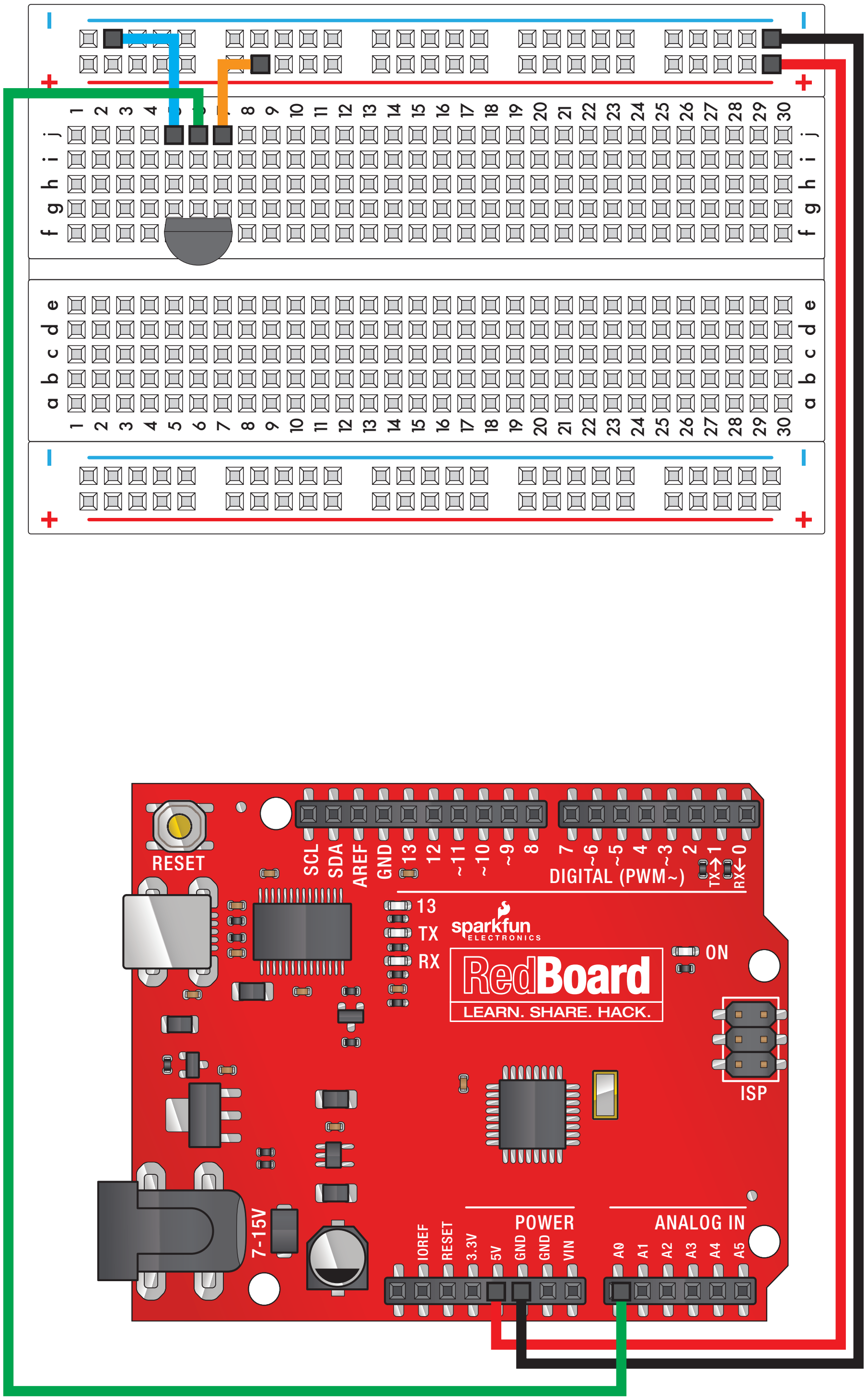


Temperature Sensor

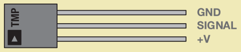
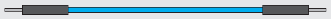
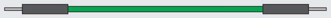
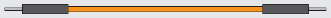
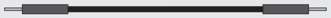
A temperature sensor is exactly what it sounds like – a sensor used to measure ambient temperature. This particular sensor has three pins – a positive, a ground, and a signal. This is a linear temperature sensor. A change in temperature of one degree centigrade is equal to a change of 10 millivolts at the sensor output. The TMP36 sensor has a nominal 750 mV at 25°C (about room temperature). In this circuit, you'll learn how to integrate the temperature sensor with your RedBoard, and use the Arduino IDE's serial monitor to display the temperature.

! When you're building the circuit be careful not to mix up the transistor and the temperature sensor, they're almost identical. Look for "TMP" on the body of the temperature sensor.



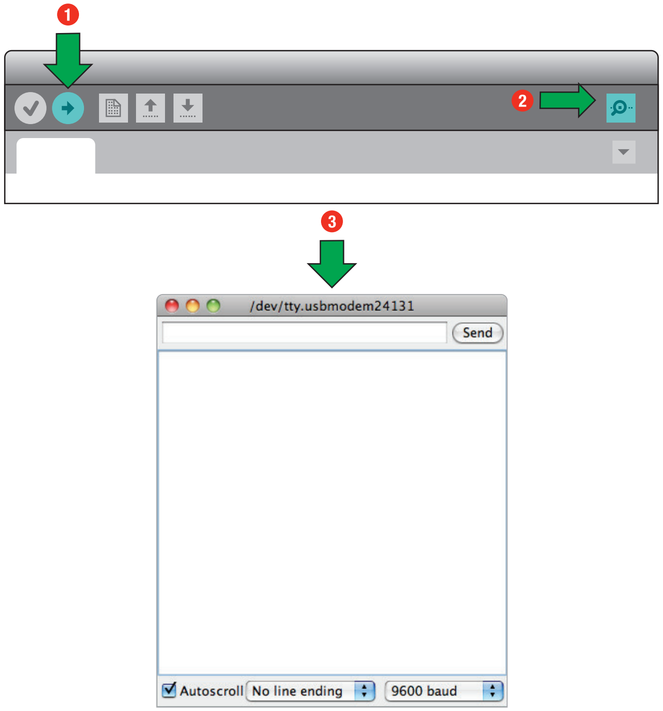


a b c d e f g h i j
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
RESET
SCL
SDA
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TX→1
RX←0
DIGITAL (PWM~)
13
TX
RX
sparkfun ELECTRONICS
RedBoard
LEARN. SHARE. HACK.
ON
ISP
7-15V
IOREF
RESET
3.3V
5V
GND
GND
VIN
POWER
A0
A1
A2
A3
A4
A5
ANALOG IN

Component:	Image Reference:	▣	□
Temperature Sensor ⚠		▨	f5 - f6 - f7 - V_{OUT} +
Jumper Wire		▨	j5 - -
Jumper Wire		A0	j6
Jumper Wire		▨	j7 - +
Jumper Wire		5V	+
Jumper Wire		GND	-

Opening your serial monitor:

This circuit uses the Arduino IDE's **serial monitor**. To open this, first upload the program then click the button which looks like a magnifying glass in a square. In order for the serial monitor to operate correctly it must be set to the same baud rate (speed in bits per second) as the code you're running. This code runs at 9600 baud; if the baud rate setting is not 9600, change it to 9600.



/dev/tty.usbmodem24131

☑ Autoscroll   No line ending   9600 baud

7

Arduino Code:

Open Arduino IDE // File > Examples > SIK Guide > Circuit # 7

Code to Note:

```
Serial.begin(9600);
```

Before using the serial monitor, you must call Serial.begin() to initialize it. 9600 is the "baud rate", or communications speed. When two devices are communicating with each other, both must be set to the same speed.

```
Serial.print(degreesC);
```

The Serial.print() command is very smart. It can print out almost anything you can throw at it, including variables of all types, quoted text (AKA "strings"), etc.

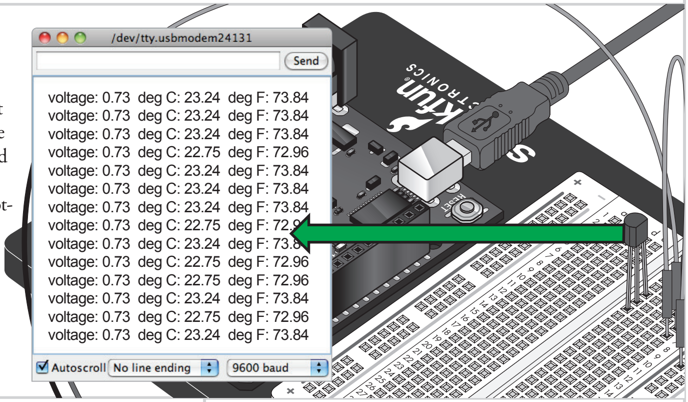
See **http://arduino.cc/en/serial/print** for more info.

```
Serial.println(degreesF);
```

Serial.print() will print everything on the same line. Serial.println() will move to the next line. By using both of these commands together, you can create easy-to-read printouts of text and data.

What You Should See:

You should be able to read the temperature your temperature sensor is detecting on the serial monitor in the Arduino IDE. If it isn't working, make sure you have assembled the circuit correctly and verified and uploaded the code to your board or see the troubleshooting tips below.



```
voltage: 0.73  deg C: 23.24  deg F: 73.84
voltage: 0.73  deg C: 23.24  deg F: 73.84
voltage: 0.73  deg C: 23.24  deg F: 73.84
voltage: 0.73  deg C: 22.75  deg F: 72.96
voltage: 0.73  deg C: 23.24  deg F: 73.84
voltage: 0.73  deg C: 23.24  deg F: 73.84
voltage: 0.73  deg C: 23.24  deg F: 73.84
voltage: 0.73  deg C: 22.75  deg F: 72.9
voltage: 0.73  deg C: 23.24  deg F: 73.8
voltage: 0.73  deg C: 22.75  deg F: 72.96
voltage: 0.73  deg C: 22.75  deg F: 72.96
voltage: 0.73  deg C: 23.24  deg F: 73.84
voltage: 0.73  deg C: 22.75  deg F: 72.96
voltage: 0.73  deg C: 23.24  deg F: 73.84
```

☑ Autoscroll | No line ending | 9600 baud

Troubleshooting:

Nothing Seems to Happen
This program has no outward indication it is working. To see the results you must open the Arduino IDE's serial monitor (instructions on previous page).

Gibberish is Displayed
This happens because the serial monitor is receiving data at a different speed than expected. To fix this, click the pull-down box that reads "*** baud" and change it to "9600 baud".

Temperature Value is Unchanging
Try pinching the sensor with your fingers to heat it up or pressing a bag of ice against it to cool it down.

Real World Application:

Building climate control systems use a temperature sensor to monitor and maintain their settings.