Circuit 4A: LCD "Hello, World!"

Printing "Hello, world!" is usually the first thing that programming tutorials will have you do in a new language. This guide starts by blinking an LED, but now we're going to print out real text using a Liquid Crystal Display (LCD).
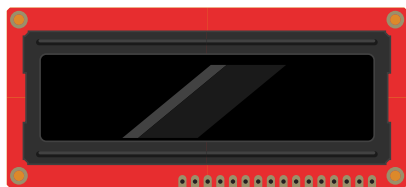
NEW COMPONENTS

CHARACTER LIQUID CRYSTAL DISPLAY (LCD): Designed to show a grid of letters, numbers and other special characters, LCDs are great for printing data and showing values. When current is applied to this special kind of crystal, it turns opaque. This is used in a lot of calculators, watches and simple displays. Adding an LCD to your project will make it super portable and allow you to integrate up to 32 characters (16x2) of information.

NEW CONCEPTS

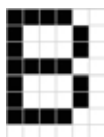**CONTRAST:** Pin 3 on the LCD controls the contrast and brightness of the LCD. Using a simple voltage divider with a potentiometer, the contrast can be adjusted. As you rotate the knob on the potentiometer, you should notice that the screen will get brighter or darker and that the characters become more visible or less visible. The contrast of LCDs is highly dependent on factors such as temperature and the voltage used to power them. Thus, external contrast knobs are needed for displays that cannot automatically account for temperature and voltage changes.

PIXELS: If you look closely at the characters on the LCD, you will notice that they are actually made up of lots of little squares. These little squares are called **pixels**. The size of displays is often represented in pixels. Pixels make up character space, which is the number of pixels in which a character can exist.

Here is a capital letter B as created in pixels. The character space in this example is 6 pixels x 8 pixels.