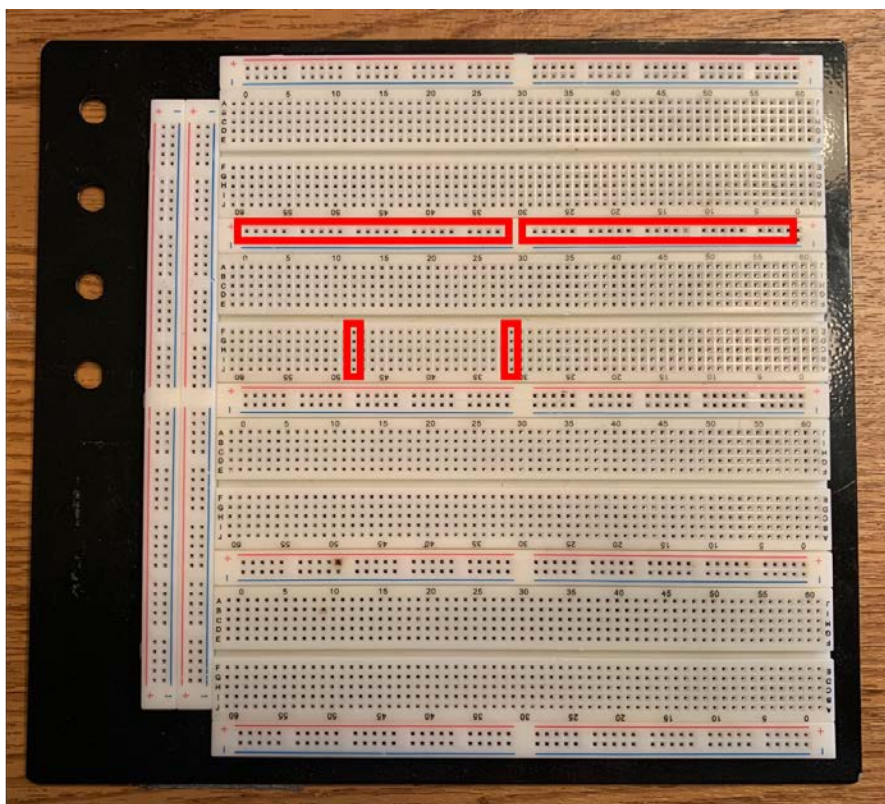### Using a breadboard

Let's prep your breadboard. Please fasten an Arduino to your breadboard. I recommend duct tape (the baby sitter's friend!); if you don't have any duct tape, improvise something from packing tape or Band-Aids.

Here's how the holes are interconnected, underneath the plastic surface. The five holes in a column are connected, as shown in a few spots in the picture below. The 25 holes in a horizontal row are also connected.


In the second photo I show a breadboard with an Arduino and connections between the Arduino's 5V and grounds to the breadboard. The doubled connection of the Arduino grounds is not electrically necessary, but it does provide redundancy in case one of the ground wires falls out. Take note of the red and black wires I am using to jumper the 5V and ground busses in a few spots on the breadboard.

Be sensible in your choices of wire colors: **always** use red for 5V and black for ground. You'll want to strip about 5 mm of insulation from each end of a wire when establishing your connections. And use lots of other colors to make tracing your wiring during debugging and troubleshooting easier.

The breadboard holes are meant to accommodate 22AWG unstranded wire; that's what I've included for you in your kit of parts. ("AWG" stands for "American Wire Gauge.")
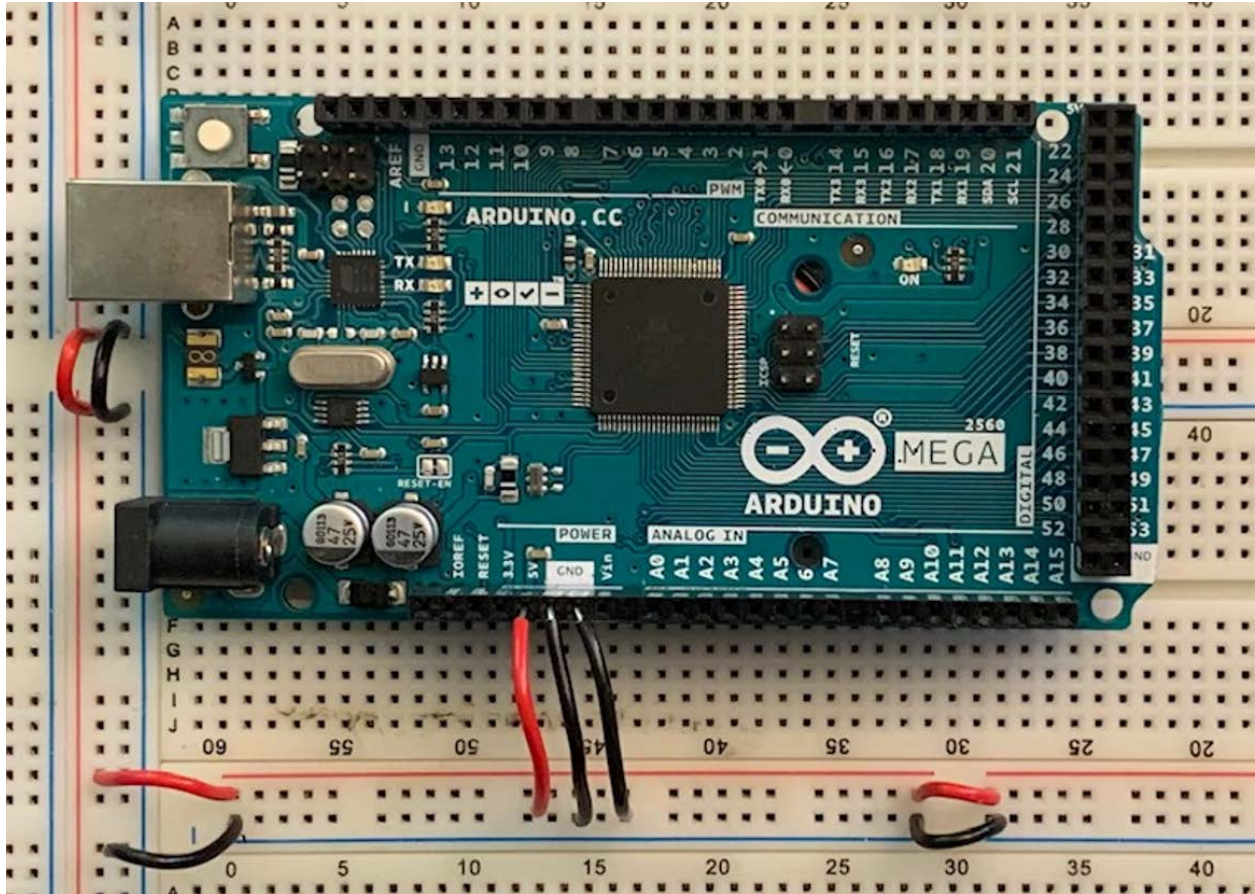
I show a slightly more complicated circuit in the next figure. From left to right, you'll see the Arduino, an electret microphone (its amplifier is on the bottom side of the small circuit board), and a real time clock.
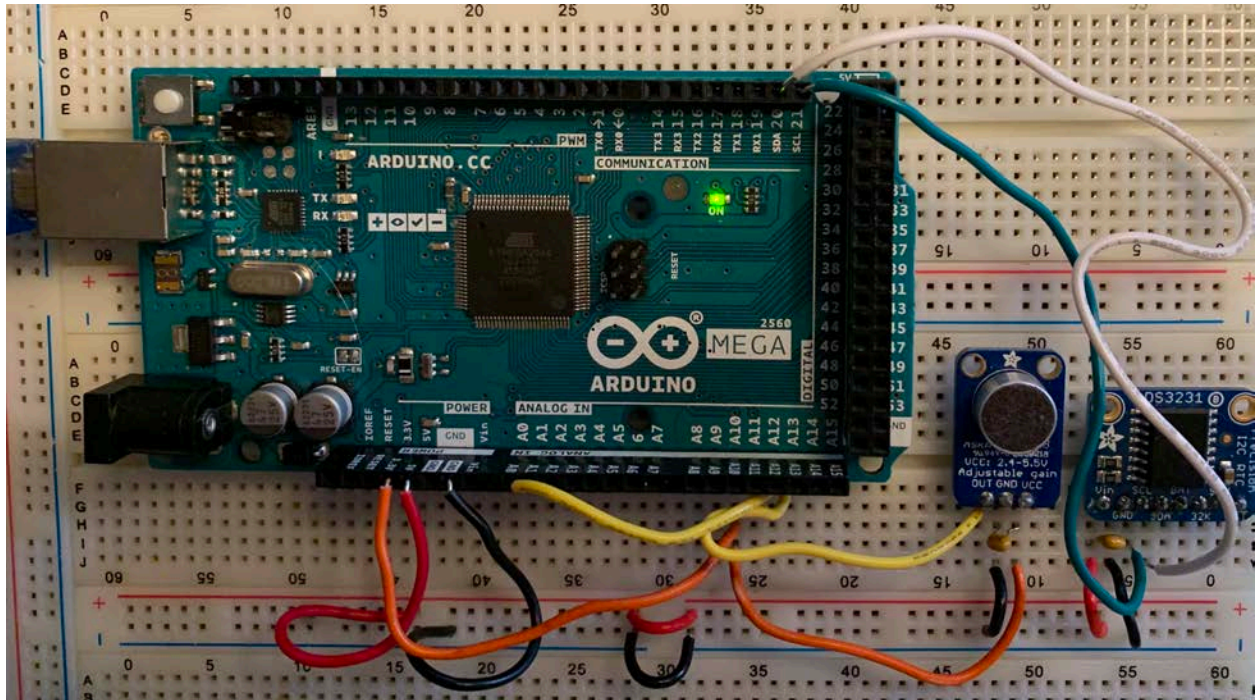
Here's a closeup of the connections to the real time clock. You can see how I make use of the interconnections between the five holes in a column to bring wires from the RTC "breakout board" to the Arduino.
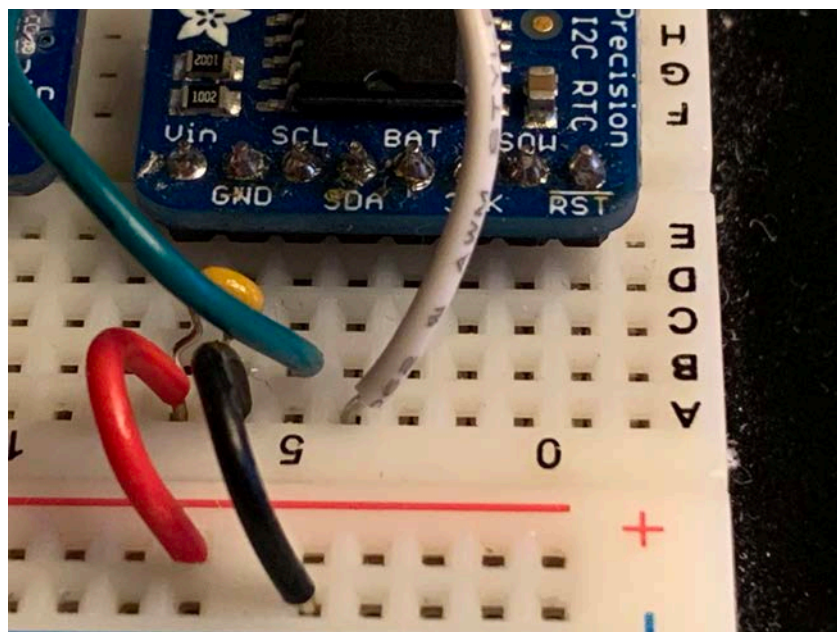
Here is the schematic for the breadboard circuit in the above photo. The large rectangle represents the Arduino, of course. Do take note of my convention for numbering pins on the

breakout boards: in the photo, I number the pins from left to right. In the schematic I number them from top to bottom. For the DS3231 real time clock, Vin is pin 1, GND is pin 2, etc.
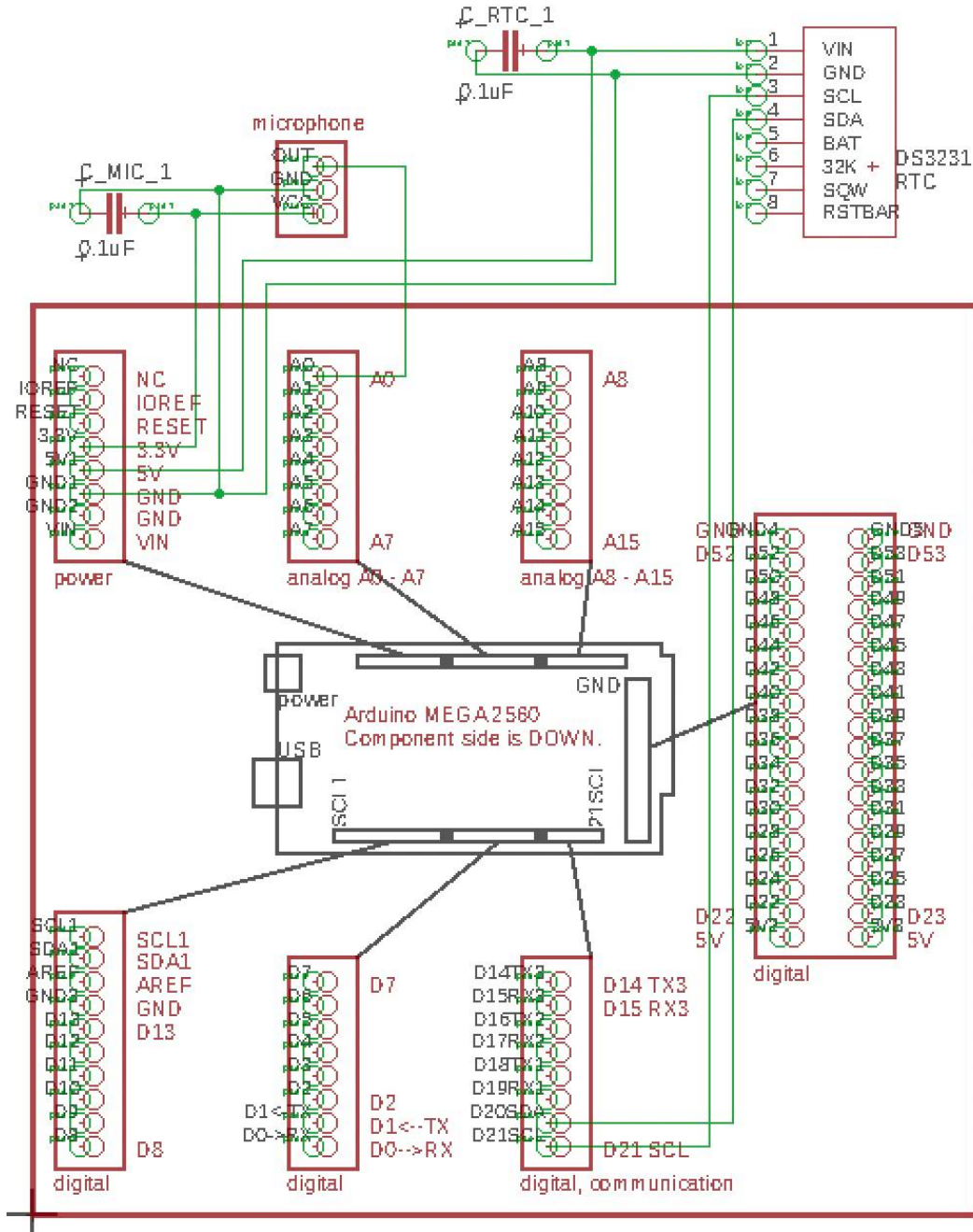
In the circuit, the 0.1μF capacitors serve to reduce possible noise injected into the 3.3V and 5V power supply lines. In general it's a good idea to include a capacitor near each device's power/ground inputs.