

Lizzie Apel & Emma Shaw  
Dr. Ackerman  
PHY 240 FA 19  
Arduino Write Up  
12/4/2019

# **ARDUINO ORACLE MANUAL**

## USER MANUAL FOR ARDUINO ORACLE

### OVERVIEW

The Arduino Oracle is designed for the user who struggles with making decisions or choosing between several options. The device is multifunctional: it provides both a “*dice rolling simulator*,” situated on the left side of the device’s circuit board, closest to the Arduino, and a “*magic 8 ball simulator*,” situated on the right side of the device’s circuit board, farthest from the Arduino.

The dice simulator features six bright blue LEDs that will light up in the familiar numerical patterns seen on a six sided die. The magic 8 ball simulator features a display screen that will read out one of multiple preset phrases. Each side of the device is equipped with a respective black button that, when pressed, triggers the corresponding simulator to output a result.

The combined functionality of these two simulators provides the user with a powerful decision making tool to use, should they feel the need to consult the forces that be!

### INSTRUCTIONS FOR INITIAL SETUP

As this device is powered by an Arduino, *it must be initially set up using the Arduino IDE software*. Instructions for first-time setup are included below.

- I. Ensure you have the [Arduino IDE software](#) installed on your computer.
- II. Plug the device in by using the provided Arduino USB cable. Plug one end into the large silver metal port on the Arduino board and plug the other end into your computer’s USB port.
- III. Open the provided Arduino Oracle code (oracle.ino) in the Arduino IDE software.
- IV. Ensure you have the correct board selected in settings by clicking Tools > Board > Arduino Genuino Uno and Tools > Port > Arduino Genuino Uno.
- V. Upload the code to the Oracle by clicking the right arrow icon in the upper left of the IDE software.
- VI. Once the code is uploaded to the device, the Oracle is set up for future use. Please do not edit the provided file (oracle.ino), as it is important to preserve the original code for troubleshooting purposes, in the event your device should malfunction.
- VII. Unplug the Oracle from your computer and plug it into the wall using the provided power cable.
- VIII. You can then push either button to use the device. Please ensure that the device stays plugged into the wall with the provided power cable while in use.

## INSTRUCTIONS FOR USE

### I. DICE SIMULATOR

Use the six sided die simulator to decide between multiple choices or options by assigning numbers to each option, such that each option is *equally represented* amongst the six possible outcomes. After assigning outcomes to each option, press the dice simulator button to view your result. Examples are given below.

- “We will have pizza if the Oracle rolls a one or a two, pasta if the Oracle rolls a three or a four, and sushi if the Oracle rolls a five or a six.”
- “I will attend Harvard if the Oracle rolls a one, Yale if the Oracle rolls a two, Brown if the Oracle rolls a three, Columbia if the Oracle rolls a four, Princeton if the Oracle rolls a five, or Agnes Scott College if the Oracle rolls a six.”

The dice simulator can also be used as a substitute for a physical six sided die, in the event that you are playing board games with your family and you have lost the die that came with the set- it happens to the best of us. The Arduino Oracle runs on random number generator code, which you can explain to your family members when they accuse you of cheating at Yahtzee.

### II. MAGIC 8 BALL SIMULATOR

The magic 8 ball simulator will output one of six preset phrases (*two positive, two negative, and two neutral*) on its Parallax LCD screen in response to the corresponding button being pressed. You will also hear an electronic “beep”- this sound is normal and to be expected, as it is produced by the Parallax’s integrated Piezo buzzer. To use the magic 8 ball simulator, simply ask it a yes or no question and then press the button. Your result will be displayed on the screen after a brief processing delay. Examples are given below.

- “Will I pass this class, Oracle?” “Outlook good!”
- “Will I get enough sleep this finals season, Oracle?” “Very doubtful.”

## **TROUBLESHOOTING**

It is important to note that both sides of the device require a small processing window between the user pressing the button and the device displaying the result- as a result, **we recommend waiting two or three seconds between consecutive pushes of either button** so as to not overwhelm the device. If the buttons are pushed too rapidly, it may cause a temporary lag in the device's output displays.

- If this occurs, simply wait a few seconds and then try again.

The issue described above was the only error *seen with any regularity* during final product testing. However, we are aware of one more issue that can potentially occur:

- Irregular and unpredictable errors in phrase display on the Parallax LCD screen.

We observed occasional shifting and backlight errors in phrase display on the LCD screen while testing longer, two-line phrases for the magic 8 ball simulator to output. We believe this is potentially due to an internal issue with the Parallax's circuitry or memory.

**At the time of launch, we seem to have successfully repaired this issue** by using shorter phrases as well as including a small processing delay and several "clearing" statements in the Arduino code the device runs off of. However, since this observed error was highly unpredictable in lab testing and may be due to an internal problem with the Parallax, *there is a possibility* that this problem could resurface.

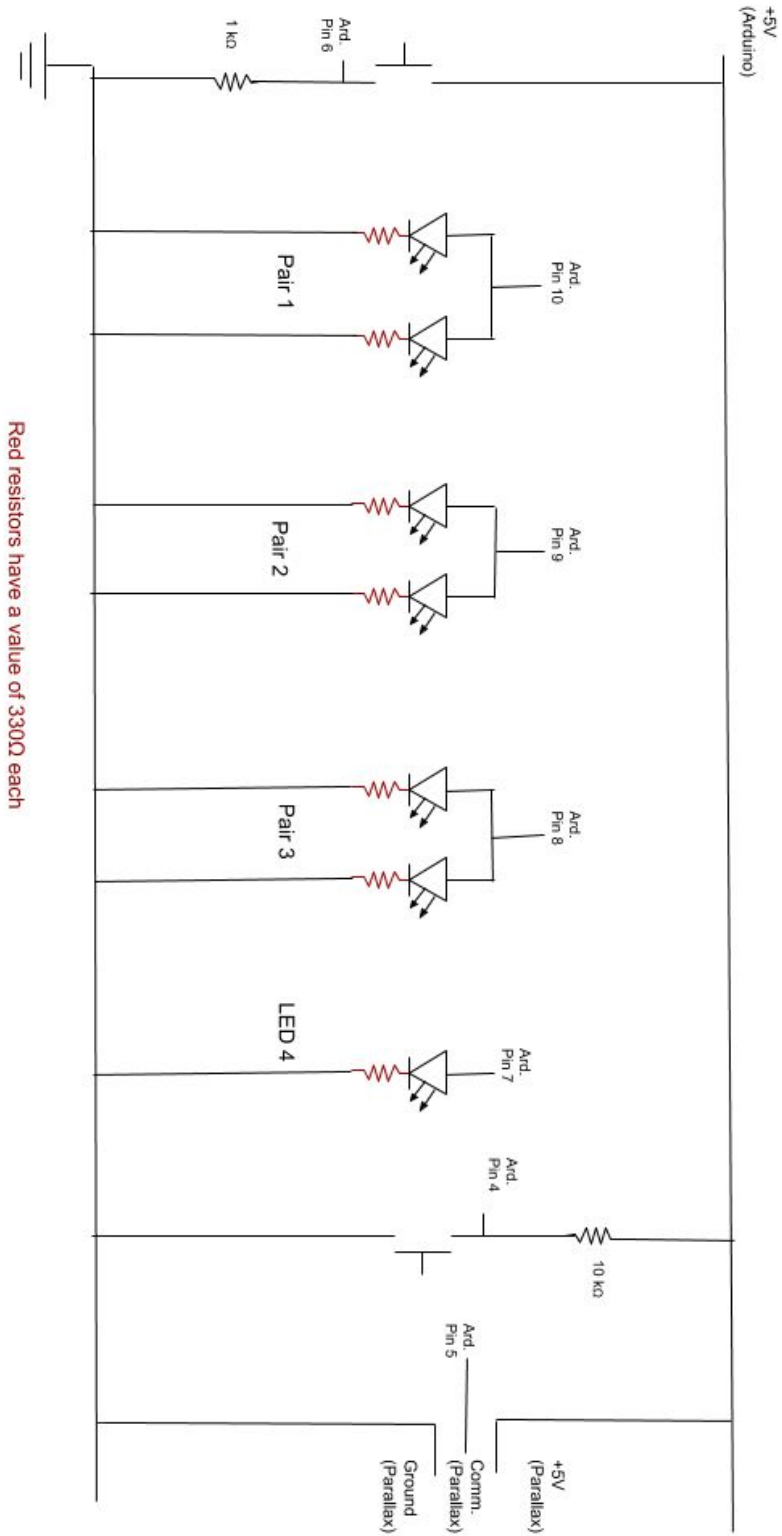
- Should your Arduino Oracle start to have this problem (dropped letters, missing spaces, scrambled words, backlight glitches, odd formatting), we recommend **unplugging the Arduino cable and plugging it back in again**. Reupload the code within the Arduino IDE software and attempt to activate the magic 8 ball simulator again using the button. If the problem is not resolved by unplugging the Oracle and plugging it back in, we recommend **replacing the Parallax screen with a new one**.

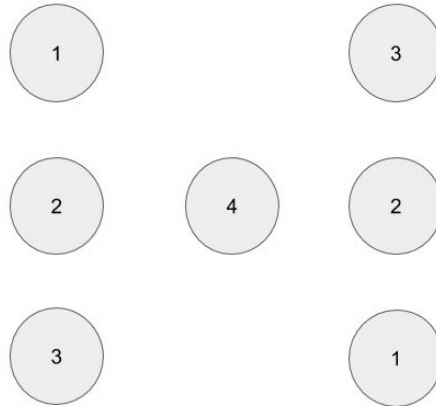
Details on the specific LCD screen used in this device (*including model number and a link to purchase, for your ordering convenience*) can be found in the "COMPONENTS" section of the Technical Manual (pg 10). The Parallax screen requires only three connections (*ground, +5V, and a I/O communication pin*) so installation according to the circuit diagram found in the Technical Manual should be a straightforward and simple process.

If you have any questions or need assistance, please contact Customer Service.

# TECHNICAL MANUAL FOR ARDUINO ORACLE

## CIRCUIT DIAGRAM

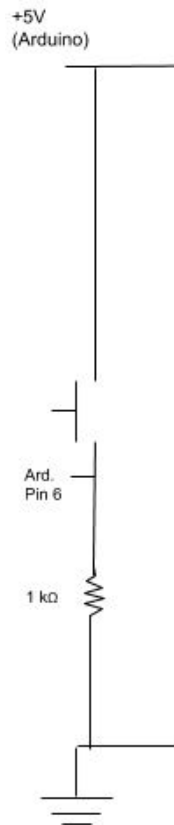


LED PAIRING MAP TO ACCOMPANY CIRCUIT DIAGRAM

## CIRCUIT FUNCTION

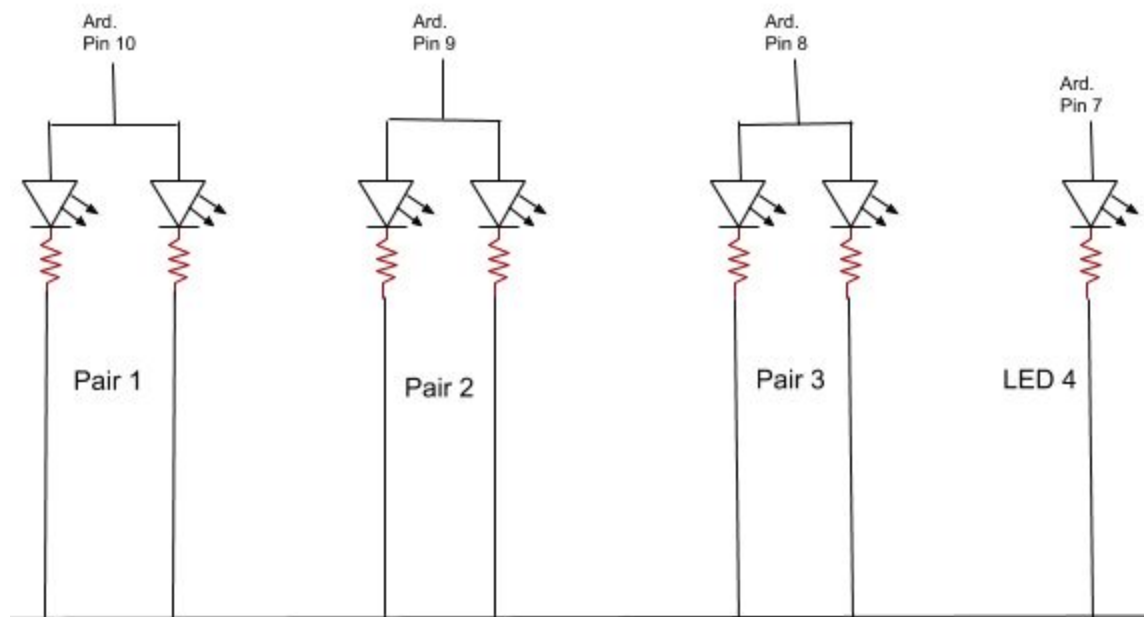
---

The portion of the circuit diagram shown below depicts the wiring of the momentary push button switch that operates the dice rolling simulator. Pin 6, the Arduino pin used to sense whether or not the dice rolling simulator button has been pressed, is tied to ground. When the dice simulator button is pressed, Pin 6 goes high (+5V). This tells the Arduino Oracle to run the code that “rolls” the dice.



---

The portion of the circuit diagram shown below depicts the wiring of the LEDs that make up the dice display configuration of the dice rolling simulator. The bottom rail represents connections to the Arduino's ground pin. Each of the seven clear lens blue LEDs is paired with a  $330\Omega$  resistor and then connected to ground. The LEDs are connected to the various Arduino pins in pairs according to the LED pairing map provided previously in the "CIRCUIT DIAGRAM" section of this Technical Manual (pg 5). When the Arduino Oracle "rolls" the dice, it sends signals through the appropriate pins in order to light up the correct pairs of LEDs to form the proper pattern that matches the numerical outcome.



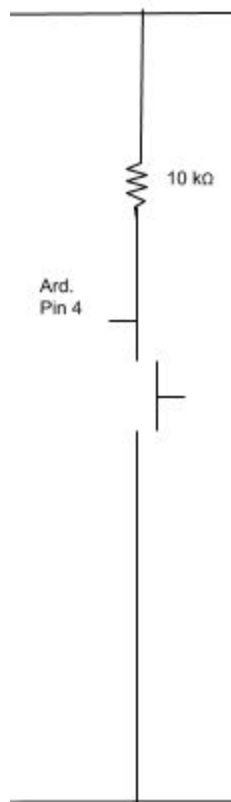
Red resistors have a value of  $330\Omega$  each

---



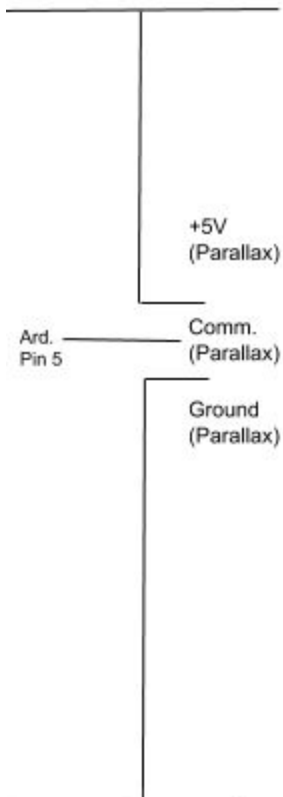
---

The portion of the circuit diagram shown below depicts the wiring of the momentary push button switch that operates the magic 8 ball simulator. The top rail represents connections to the Arduino's +5V pin, while the bottom rail represents connections to the Arduino's ground pin. Pin 4, the Arduino pin used to sense whether or not the magic 8 ball simulator button has been pressed, is tied to +5V. When the magic 8 ball simulator button is pressed, Pin 4 goes low (ground). This tells the Arduino Oracle to run the code that "shakes" the magic 8 ball- ie, generates a random number 1-6 and then selects the preset phrase associated with that number in the code.



---

The portion of the circuit diagram shown below depicts the wiring of the Parallax LCD screen that makes up the display configuration of the magic 8 ball simulator. The top rail represents connections to the Arduino's +5V pin, while the bottom rail represents connections to the Arduino's ground pin. The Parallax LCD screen is powered by +5V and grounded. The Arduino uses Pin 5 to communicate with the Parallax LCD screen. As such, the Parallax LCD screen's I/O pin is connected to Pin 5 on the Arduino. When the Arduino Oracle "shakes" the magic 8 ball, it sends a signal through Pin 5 to the Parallax LCD screen's I/O pin, telling it which of the six preset messages to display.



## COMPONENTS

The Arduino Oracle uses the following components. Online purchasing links and links to spec sheets are provided where appropriate.

| Component Type            | Quantity Used | Model Number                    | Links                                                          |
|---------------------------|---------------|---------------------------------|----------------------------------------------------------------|
| Momentary Push Button     | 2             | FSM4JH                          | <a href="#">Spec Sheet</a><br><a href="#">Link to Purchase</a> |
| Resistor, 330Ω            | 7             | Not Applicable                  | Not Applicable. Substitute any suitable 330Ω resistor.         |
| Resistor, 1kΩ             | 1             | Not Applicable                  | Not Applicable. Substitute any suitable 1kΩ resistor.          |
| Resistor, 10kΩ            | 1             | Not Applicable                  | Not Applicable. Substitute any suitable 10kΩ resistor.         |
| LED, Clear Lens Blue      | 7             | Cree Inc.<br>C503B-BCN-CV0Z0461 | <a href="#">Spec Sheet</a><br><a href="#">Link to Purchase</a> |
| Parallax 2x16 Backlit LCD | 1             | 27977                           | <a href="#">Spec Sheet</a><br><a href="#">Link to Purchase</a> |
| Arduino UNO               | 1             | Rev3 SMD                        | <a href="#">Link to Purchase and View Specs</a>                |
| Arduino Cable             | 1             | USB 2.0 Cable Type<br>A/B       | <a href="#">Link to Purchase</a>                               |

## LIBRARIES

The Arduino Oracle requires the following library in order for the code to run:

- SoftwareSerial.h

This library is required for communication with the Parallax screen.

This library is included in the Arduino IDE software and does not require an independent download. As the inclusion reference to this library is already built into the Arduino Oracle's code file, **no user action related to this library is required.**