RainDance Sprinkler Controller

This controller will replace the existing broken Intermatic electromechanical sprinkler clock system (240 VAC) using off the shelf electrical components.

A clear box with a clear cover

Description automatically generatedA close-up of a toggle switch

Description automatically generatedA black electronic device with green connectors

Description automatically generatedA blue and green electronic device

Description automatically generated

# Hardware Design

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| A diagram of a circuit board  Description automatically generated |

Power originate from the 240VAC house circuit. A switching power supply makes 5VDC available to the Arduino and relay.

### Relay

### The relay (YWBL-WH Relay Module One Way 30A Optocoupler Isolation Relay Module High Power Relay) exhibits the following behavior:

* When no 5VDC control signal is present,
  + COM and NC: closed
  + COM and NO: open
  + NC and NO: open
* When a 5VDC control signal is applied,
  + COM and NC: open
  + COM and NO: open
  + NC and NO: closed

So, the 240VAC should be wired to NC and NO.

### LEDs

Three LEDs will be used to denote the following conditions:

### Using LEDs on a Breadboard with 5VDC

#### Resistor Calculation

To prevent damage to the LEDs, a current-limiting resistor is required. The resistor value can be calculated using Ohm's Law:

R = (VSupply−VLED) / ILED

R = \frac{V\_{supply} - V\_{LED}}{I\_{LED}}R=ILED​Vsupply​−VLED​​

Where:

* VsupplyV\_{supply}Vsupply​ = Supply voltage (5V)
* VLEDV\_{LED}VLED​ = Forward voltage of the LED
* ILEDI\_{LED}ILED​ = Desired current through the LED (typically 20mA or 0.02A)

Example Calculation for a Red LED (forward voltage 2V): R=5V−2V0.02A=3V0.02A=150ΩR = \frac{5V - 2V}{0.02A} = \frac{3V}{0.02A} = 150 \OmegaR=0.02A5V−2V​=0.02A3V​=150Ω

### Recommended LED Types

1. **Kingbright WP7113GD (Green, 2.1V, 20mA)**
2. **Kingbright WP7113ID (Red, 1.85V, 20mA)**

# Software Design

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# Irrigation Pump

# The pump is a Pentair Flotec FP5172 1.5 HP Thermoplastic Sprinkler Pump

(<https://www.pentair.com/en-us/products/residential/water-supply-disposal/water-supply-pumps/pentair-flotec-fp5172-thermoplastic-sprinkler-pump-1-5-hp.html>).

Nameplate Values: 1½ HP; 230 VAC; 9.95A; 1 PH; 60 Hz; 3450RPM

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