

## OVERVIEW

The Alcohol Dispenser DIY Kit (ADDK) is a non-contact alcohol dispenser consisting of a circuit board with an attached submersible pump and hose. User places their hand under the sensor at a certain distance to trigger the dispensing action. The kit is designed to be assembled by the user. At a minimum, the user shall provide a power supply using the microUSB connector onboard the PCB and a container for the alcohol.

The ADDK has two operating modes selected with an on board microjumper. The kit may work in stand alone "INT" mode where control of the dispenser is done by the internal circuit on the PCB. In external or "EXT" mode, the user may opt to connect the board to an external microcontroller such as an Arduino or any other control circuit e.g. logic gates. An IO pin header is available to allow the external microcontroller to control the pump and read the sensor using either analog or digital signals.



Figure 1 Alcohol Dispenser DIY Kit

## FEATURES

- Two selectable modes: Stand alone and external microcontroller mode
- Compatible with any 5V micro USB power source/charger rated 1A or more
- Individual potentiometers for infrared threshold, sensor sensitivity and dispensing duration

- Multicolor indicator LED
- Compact form factor

## SWITCHING BETWEEN MODES

Switching between internal stand alone mode (INT) and external microcontroller(EXT) mode is done by inserting the microjumper on the header labeled MCU to either the INT or EXT side.

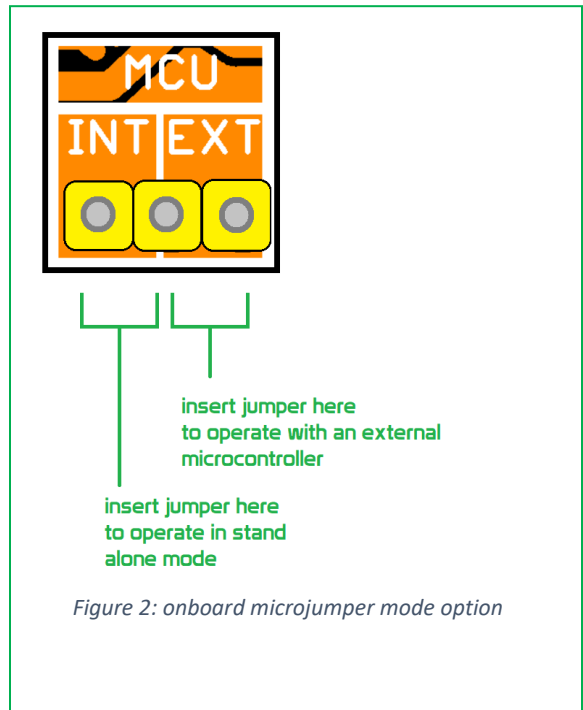


Figure 2: onboard microjumper mode option

## INT MODE OPERATION

- Stand alone. No added electronics other than power supply required to operate the device
- Install pump into a container and fill with alcohol. The motor should be fully submerged
- Install PCB with sensor facing down. Ideally, place the setup on a surface with a dark color so that the sensor is facing a dark surface. This increases sensor range.
- Fasten the hose adjacent to the PCB

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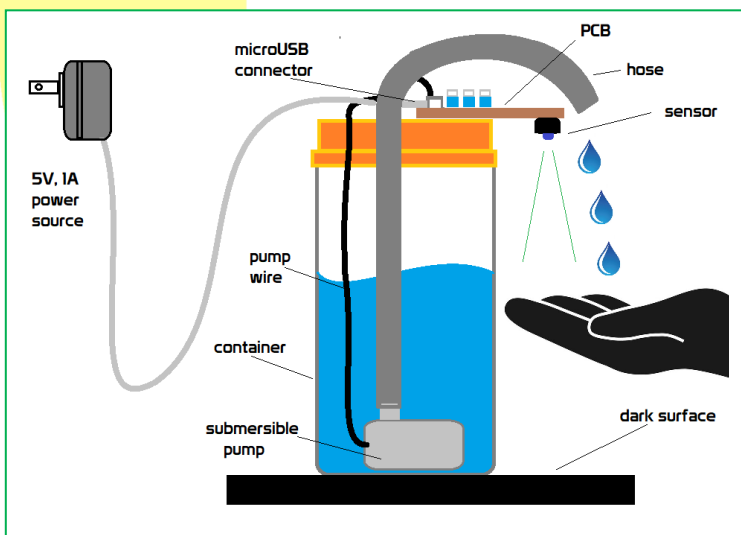
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- Apply power
- Present the palm of the hand around 1-4 inches from the sensor (defined by the THR potentiometer and, table surface color and environmental factors such as sunlight)
- The pump should start dispensing
- Adjust the potentiometers if necessary. Refer to the Tuning Potentiometers section

### EXT MODE

- This mode requires a microcontroller or other control circuit
- The PCB provides the sensor outputs with both a 5V Digital Output and Analog Output (0-4.3V). The digital sensor threshold is adjusted using the THR potentiometer
- The PCB has a digital input pin to control the pump on and off.
- The external microcontroller/circuit should be programmed or designed to read the sensor and turn the pump on and off according to desired behavior

### PHYSICAL SETUP



### POWER SUPPLY

The board requires a 5V power source with a microUSB connector. Minimum current rating is 1A.

### PIN FUNCTIONS

In external /EXT mode the module is interfaced to the external microcontroller via a 9 pin 2.54mm pitched header with the following functions. These pins are not used in stand alone/INT mode.

Pin Label	Function/Operation/Remarks
V	Vcc. 5V input if using this pin as power input. 5V output if power source is connected via microUSB. Use only one power connector, this pin or the microUSB connector, at a time. Power source must be rated at least 1A.
G	Ground. Power and signal ground pin.
A0	Sensor analog <b>output pin</b>
D0	Sensor digital <b>output pin</b> . HIGH when hand/reflective object is detected and LOW when nothing is detected.
PMP	Digital <b>input pin</b> for pump control. Pull HIGH to turn on PUMP and LOW to turn off pump.
T	Infrared Threshold setting. Analog <b>output pin</b> of the THR potentiometer.
D	Dispensing Duration setting. Analog <b>output pin</b> of the DUR potentiometer.
S	Sensor Sensitivity setting. Analog <b>output pin</b> of the SEN potentiometer.
W	Do not connect

### TUNING POTENTIOMETER

**SEN** – Infrared Sensitivity. This adjusts the time required for the hand to be under the sensor before the pump is turned on. Reduce this time for a quicker hand detection. Increase this time to reduce false triggers. The adjustment range is from around 0.1 to 2 seconds.

**DUR** –Pump Duration. This sets how long the pump should turn on after a successful hand detection. This time is adjustable up to 3 seconds.

**THR** – Sensor Threshold. This sets the level of reflected infrared light that defines a hand detection event. This directly affects the distance of the hand from the sensor before confirming detection. Decrease this to avoid false triggers from environmental factors such as strong sunlight. Increase this to improve sensor distance range.

### ENVIRONMENTAL CONSIDERATIONS

Avoid operating the device in environments where there are strong infrared sources. Direct sunlight should be avoided as this will interfere with the sensor. Protect the setup from direct sunlight where necessary.

### LED INDICATOR

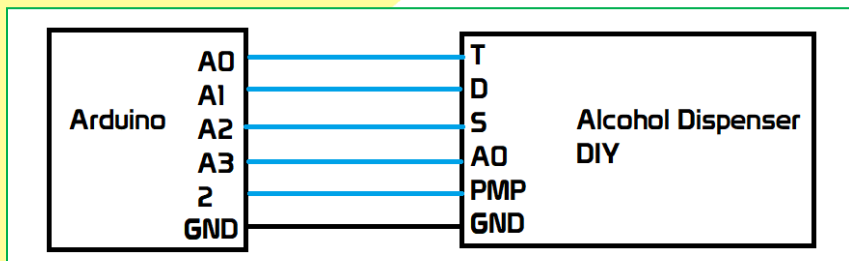
Color	Indication
Orange	No activity. Blinks twice.
Blue	Fast blinking. Successful hand detection indication. Related to SEN potentiometer
Green	Fast blinking. Pumping ongoing. Related to DUR potentiometer
Red	Fast blinking. Dispensing of alcohol is over. Remove hand and retrigger again to repeat dispensing

## APPLICATION NOTES FOR EXT MODE

### External Mode using the Analog Output pin

The following example uses pin AO with the external microcontroller's (Arduino Uno/Nano/Mega) ADC input. Pins T, D and S are used to configure the parameters required by the sensor. PMP is the pin used to directly control the pump.

### Connections



Analog output of Alcohol dispenser T, D, S and AO are connected to analog pins A0, A1, A2 and A3 of Arduino. The digital input of the Alcohol dispenser is connected to output digital pin 2 of Arduino.

### Arduino Code

```
/*
PINOUT
ARDUINO      ALCOHOL DISPENSER DIY
A0.....T
A1.....D
A2.....S
A3.....AO
2.....PMP
GND.....G
```

Note: move microjumper to EXT to enable External mode

```
*/

const byte PIN_POT_T = A0;
const byte PIN_POT_D = A1;
const byte PIN_POT_S = A2;
const byte PIN_POT_A0 = A3;

const byte PIN_PUMP = 2;

unsigned int ir_threshold;
unsigned int pump_duration;
```

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```

unsigned int ir_sensitivity;
unsigned int ir_analog;

void setup() {
  pinMode(PIN_PUMP, OUTPUT);
}

void loop() {
  // read analog inputs
  unsigned int potVal;
  potVal = analogRead(PIN_POT_D); // read potentiometer DUR
  // convert analog value to time duration used for turning ON pump
  // this is how long the pump is turned ON when hand is present
  if (potVal < 100) pump_duration = 100;
  else if (potVal < 300) pump_duration = 300;
  else if (potVal < 500) pump_duration = 500;
  else if (potVal < 700) pump_duration = 1000;
  else if (potVal < 900) pump_duration = 1500;
  else pump_duration = 2000;

  potVal = analogRead(PIN_POT_S); // read potentiometer SEN
  // convert analog value to time duration used to verify if hand is present
  // this is how long the hand must be detected by the IR sensor before pumping alcohol
  if (potVal < 100) ir_sensitivity = 50;
  else if (potVal < 300) ir_sensitivity = 100;
  else if (potVal < 500) ir_sensitivity = 300;
  else if (potVal < 700) ir_sensitivity = 500;
  else if (potVal < 900) ir_sensitivity = 700;
  else ir_sensitivity = 1000;

  ir_threshold = analogRead(PIN_POT_T); // read potentiometer THR, boundary where the
  pump is ON or OFF
  ir_analog = analogRead(PIN_POT_A0); // read IR sensor

  if (ir_analog < ir_threshold) // compare IR sensor and threshold
  {
    delay(ir_sensitivity); // delay to confirm if hand is present
    ir_analog = analogRead(PIN_POT_A0); // read latest value for IR sensor
    if (ir_analog < ir_threshold) // compare IR sensor and threshold to confirm if hand
    is actually present
    {
      digitalWrite(PIN_PUMP, HIGH);
      delay(pump_duration);
      digitalWrite(PIN_PUMP, LOW);

      while (ir_analog < ir_threshold)
      {
        // to prevent continuous pumping of alcohol
        // stay in while loop while hand is still present in IR range
        ir_analog = analogRead(PIN_POT_A0);
        delay(10);
      }
    }
  }
}

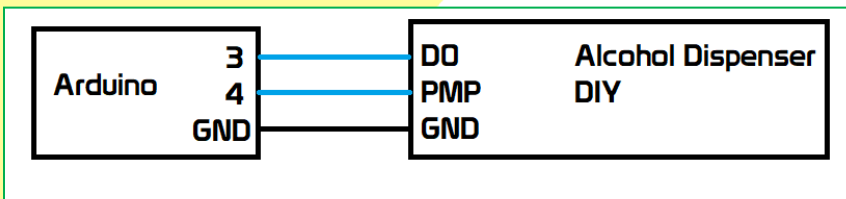
```

```
}  
}
```

### External Mode using digital output

This example is similar to the previous except that sensor detection is done using the digital output pin DO.

### Circuit



### Arduino Code

```

/*
  PINOUT
  ARDUINO      ALCOHOL DISPENSER DIY
  3.....DO
  4.....PMP
  GND.....G

  Note: move microjumper to EXT to enable External mode in Alcohol dispenser DIY
*/

const byte PIN_DO = 2;
const byte PIN_PUMP = 3;

void setup() {
  pinMode(PIN_DO, INPUT);
  pinMode(PIN_PUMP, OUTPUT);
}

void loop() {
  if (digitalRead(PIN_DO) == HIGH)
  {
    digitalWrite(PIN_PUMP, HIGH);
  }
  else
  {
    digitalWrite(PIN_PUMP, LOW);
  }
  delay(10);
}
  
```

## DOCUMENT REVISION HISTORY

Revision:

v1.0.0 / 09 November 2020 / E.A.Binay-an/CDMalecdan

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