

## Infrared Remote Control Experiment

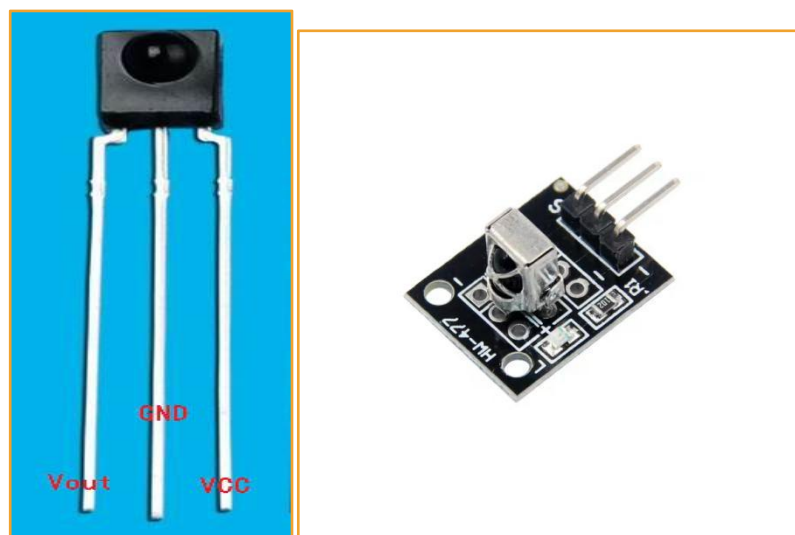
### Introduce to Infrared Remote Control

We have introduced infrared receiving tube in former passage, it is a kind of sensor which can identify the infrared. The integration of infrared sensor receives and modulates the 38kHz infrared. In order to avoid in the process of wireless transmission from other infrared signal interference, the infrared remote control usually modulate the signal on a specific carrier frequency, and then launch out by the infrared emission diode. While the infrared receiving device needs to filter out other clutter, receives the specific frequency signal and restores it into binary pulse code, namely, demodulation.

### Working Principle

The built-in receiving tube converts the light signal emitted by infrared transmitting tube to weak electrical signal, the signal is amplified through the internal IC, then restored to original code emitted by the infrared remote control through the automatic gain control, band-pass filtering, demodulation, waveform shaping, and input to the decoding circuit on electric appliance through the output pin of the receiving header

Infrared receiver header has three pins: connecting VOUT to analog interface, GND to the GND onboard and VCC to +5 v.



### Experiment Purpose

The aim is to ecode all the keys of the remote control by Ardunio and display them in a serial port. Due to the decoding process is based on the given protocol, and the code is massive, so we use open source libraries to decode and copy IRremote to arduino1.6.5-r5\libraries.

The link: <https://github.com/shirriff/Arduino-IRremote> to arduino1.6.5-r5\libraries

## Experiment Principle

The encoding of a remote control is required to be learned first if we want to decode it. The control code used in this product is: NEC protocol.

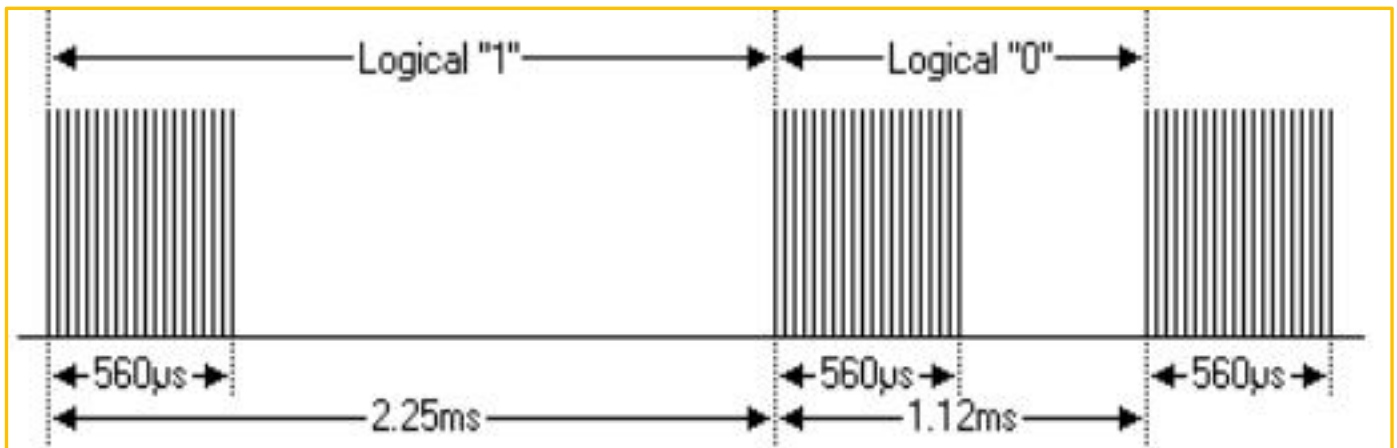
The following will introduce the NEC protocol:

## Introduction of NEC

### Characteristics

- 8 address bits, 8 command bits
- Address bits and command bits are transmitted twice in order to ensure reliability
- Pulse-position modulation
- Carrier frequency 38kHz
- Every bit lasts 1.125ms or 2.25ms

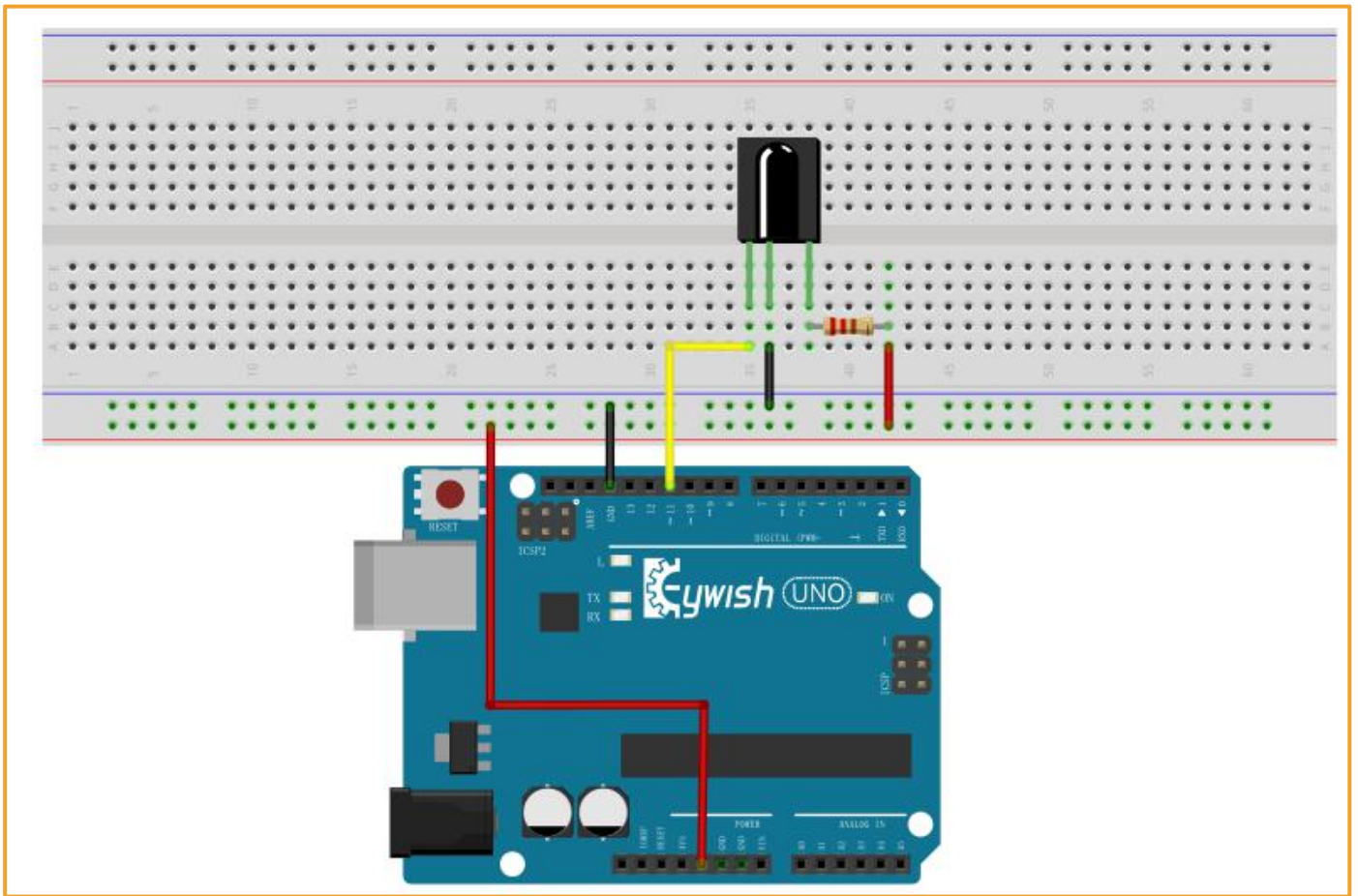
The definitions of logic 0 and 1 are as below





- ◆ Breadboard
- ◆ USB cable
- ◆ NEC infrared remote control \* 1
- ◆ The integrative infrared receiving header \*1
- ◆ 1k Resistor \*1
- ◆ Several jumper wires

## Wiring of Circuit



## Code

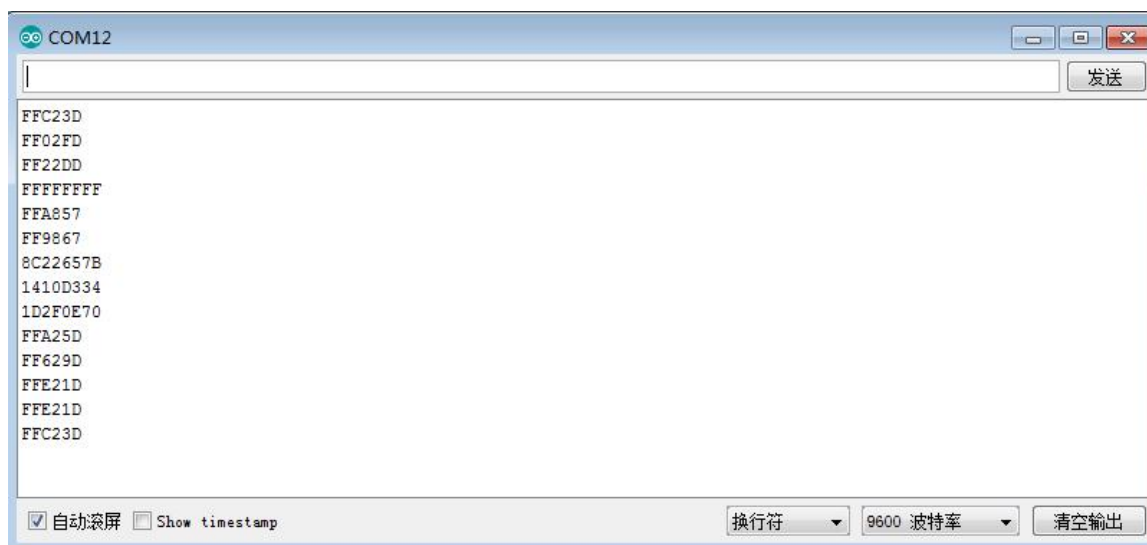
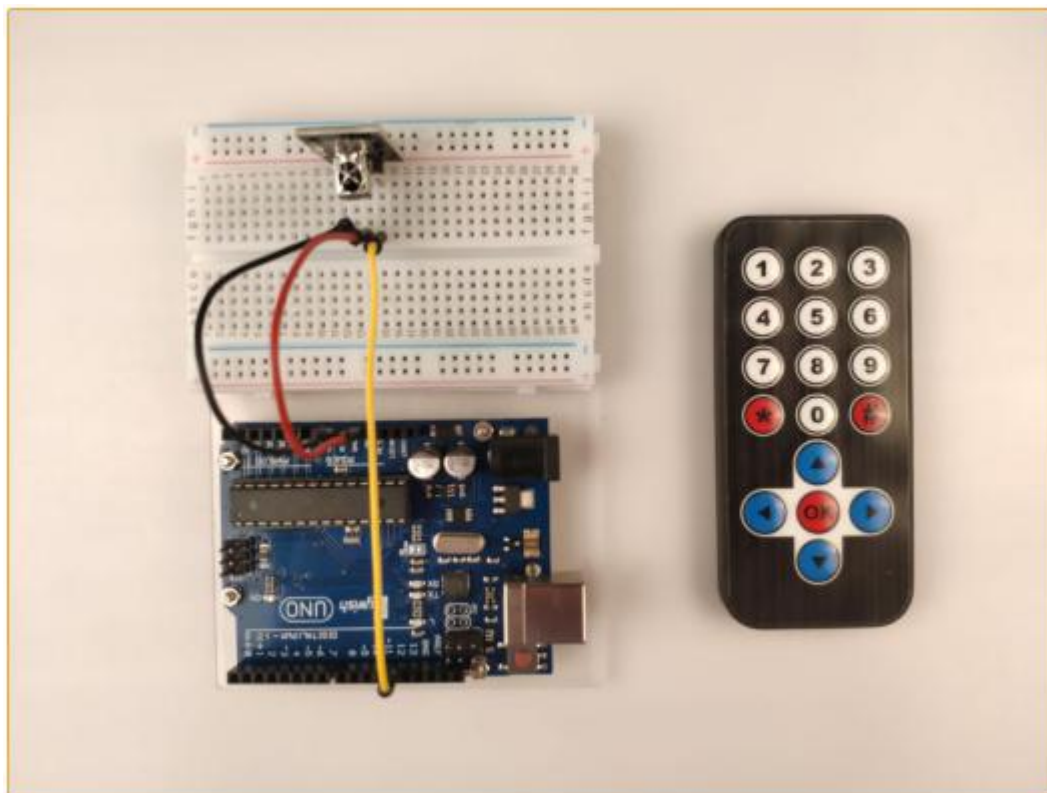
```
#include "IRremote.h"

int RECV_PIN = 12; //定义红外接收器的引脚为 12
IRrecv irrecv(RECV_PIN);
decode_results results;

void setup()
{
    Serial.begin(9600);
    irrecv.enableIRIn();    // 初始化红外接收器
}

void loop() {
    if (irrecv.decode(&results)) {
        Serial.println(results.value, HEX);
        irrecv.resume(); // 接收下一个值
    }
    delay(120);
}
```

## Experiment Result



## MBlock graphical programming program

The program prepared by mBlock is shown in the figure below:



You can also open the program file directly with mblock, which is a .Sb2 file. Here are the steps to open it:

