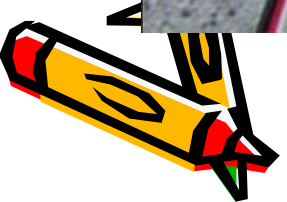
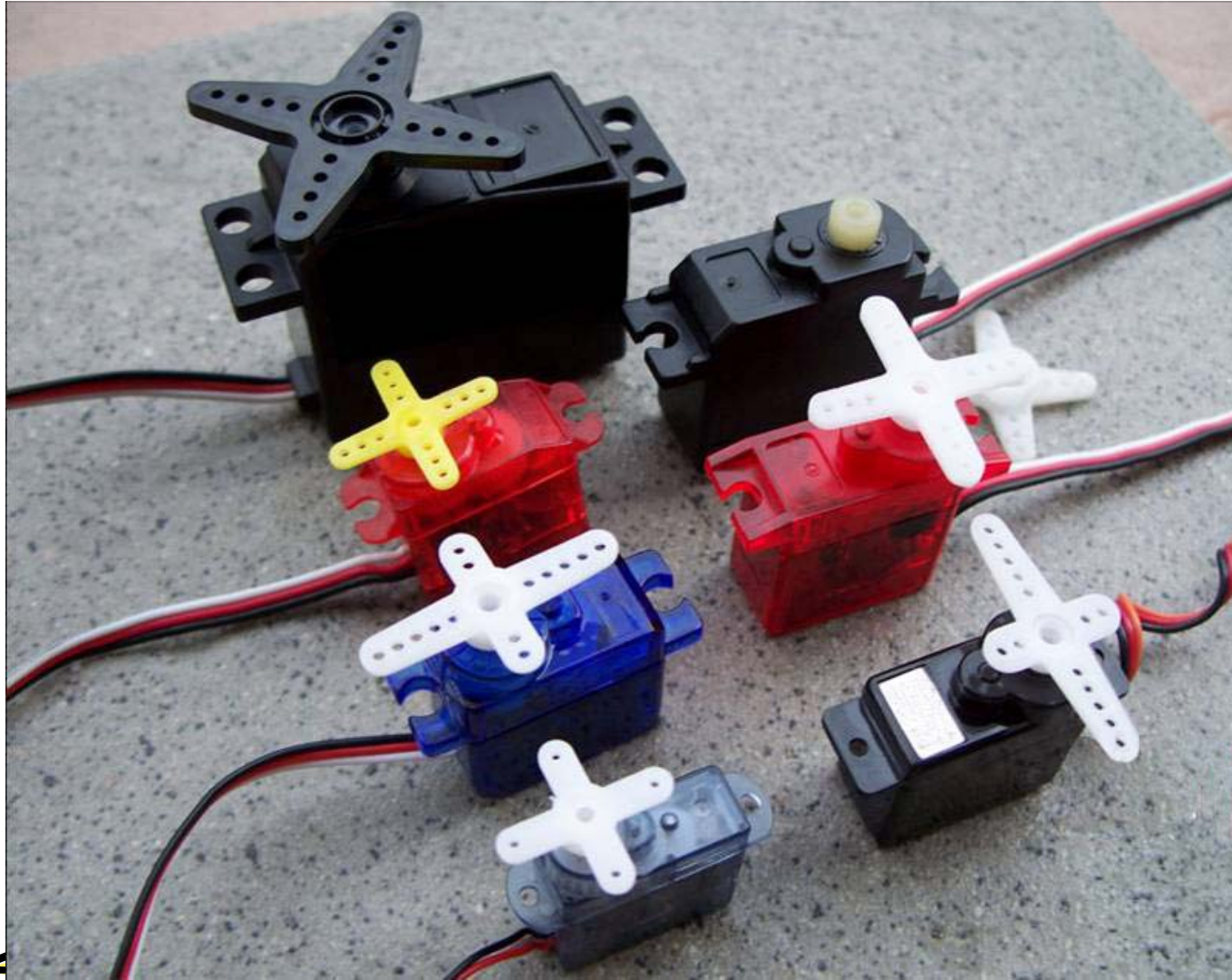




Paper robot

Electronics connections





Servo



(GND)
【black】

Power positive
(VCC) 【red】

PWM signal
(SGN)
【white】

Standar
2.54mm
connector

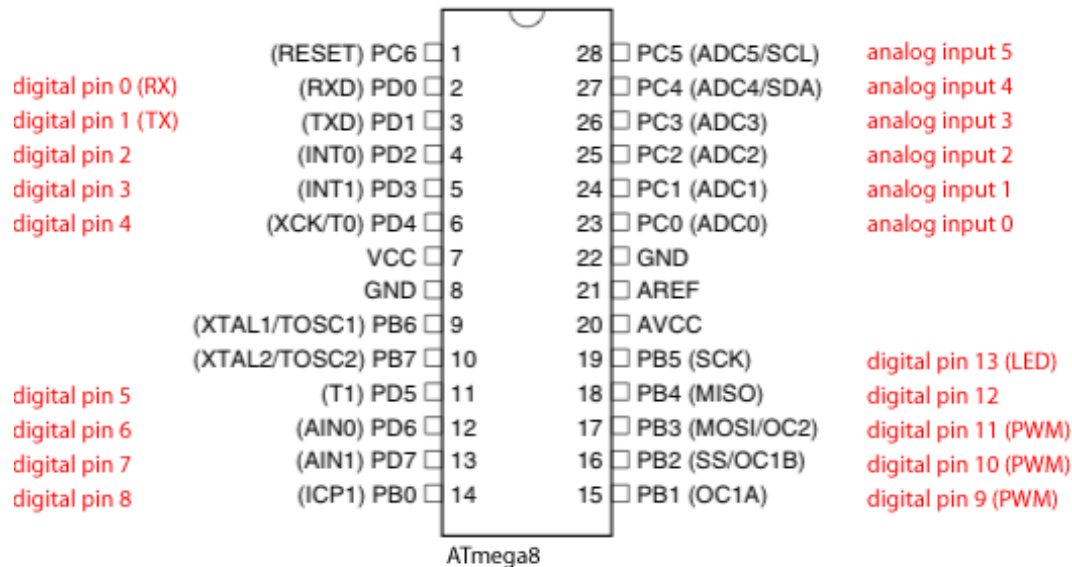


ATMEGA8L-8PU

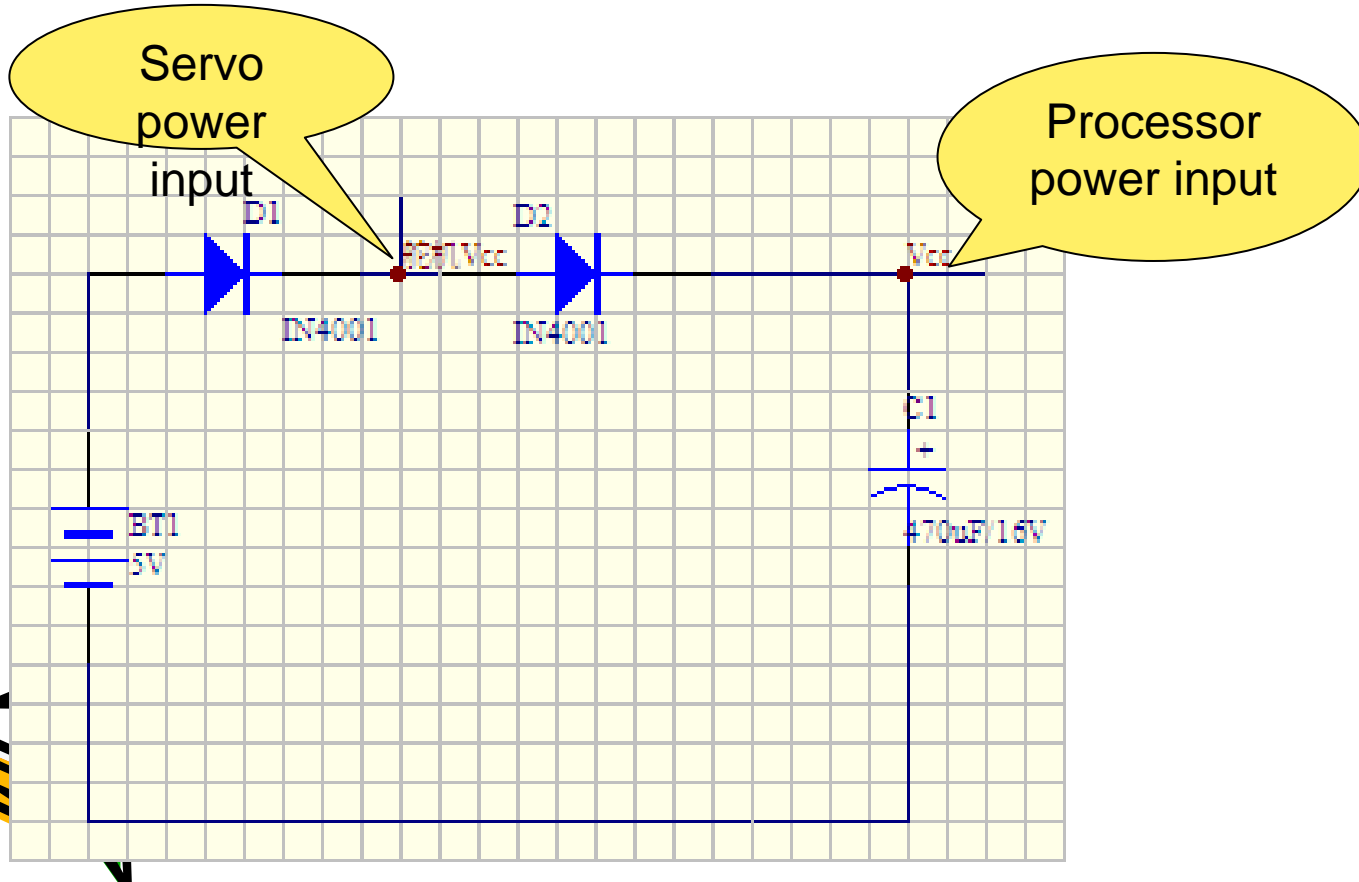
- operation voltage : 2.7 - 5.5V
(ATmega8L)

Arduino Pin Mapping

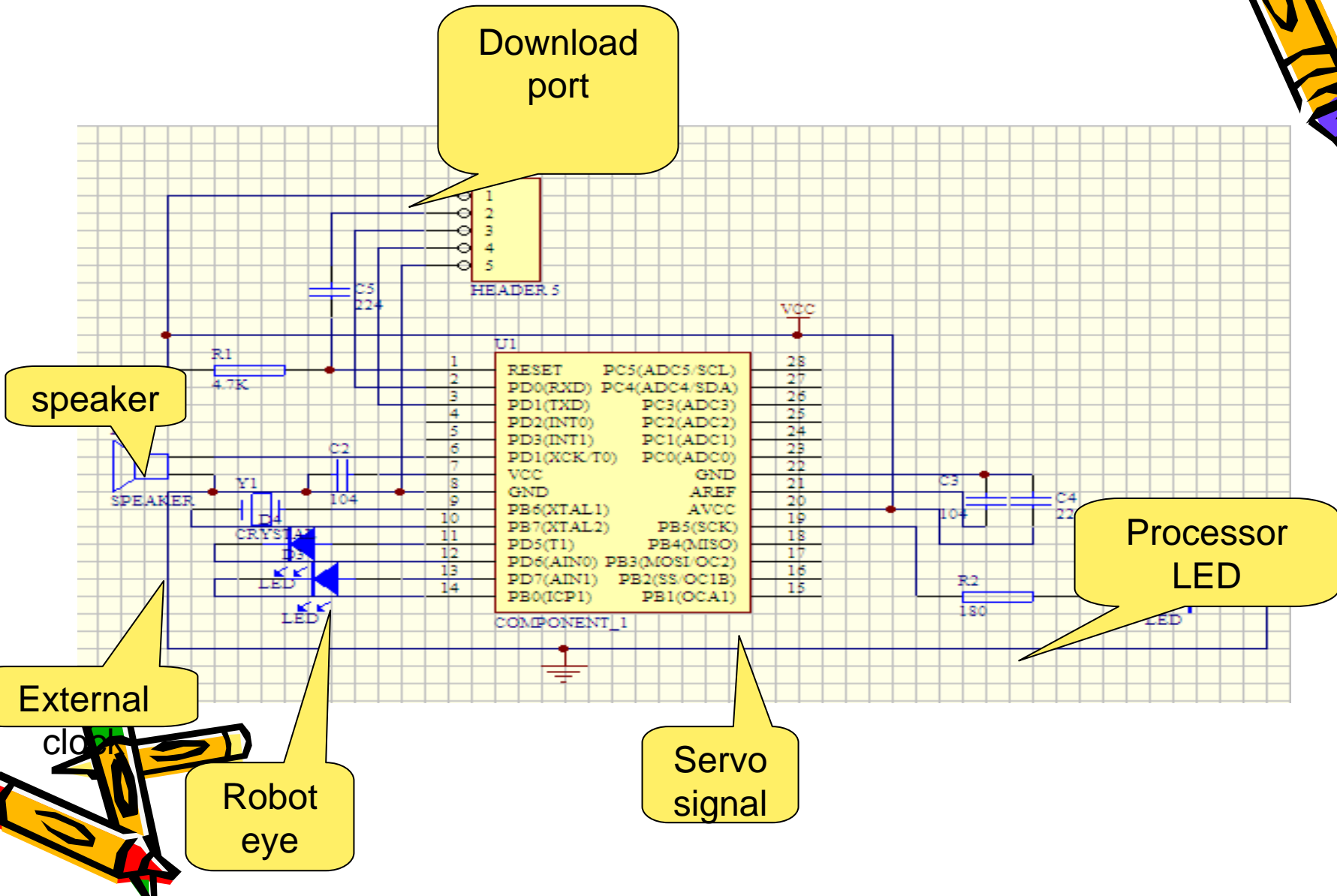
www.arduino.cc



Simple circuit

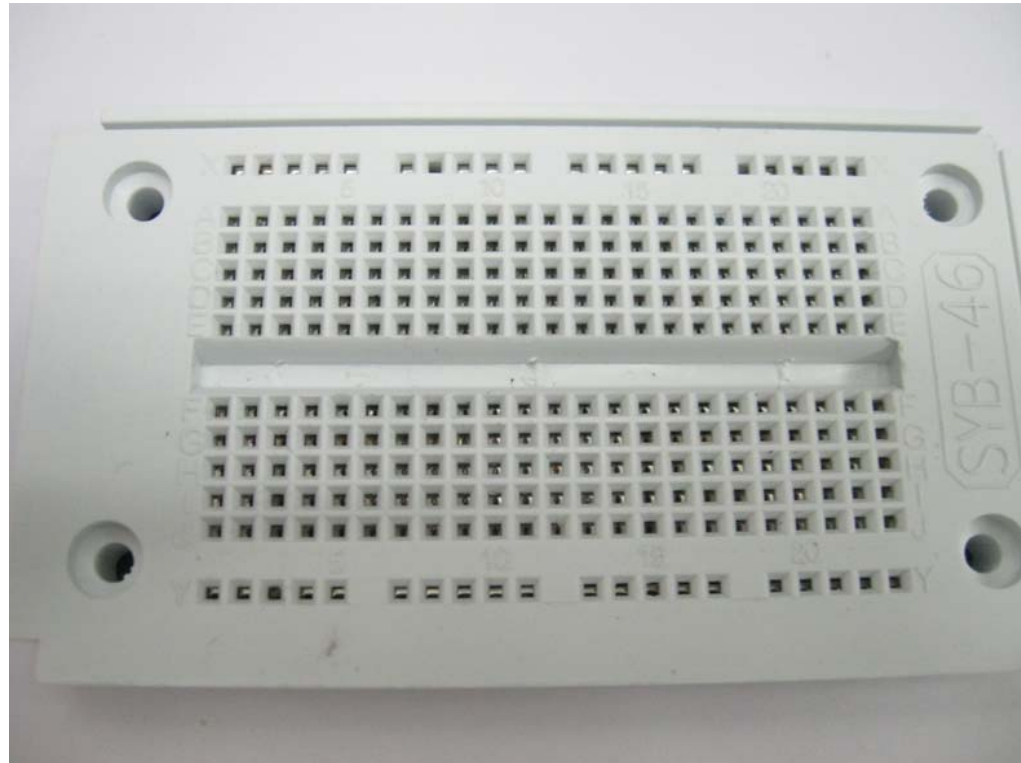


Simple system

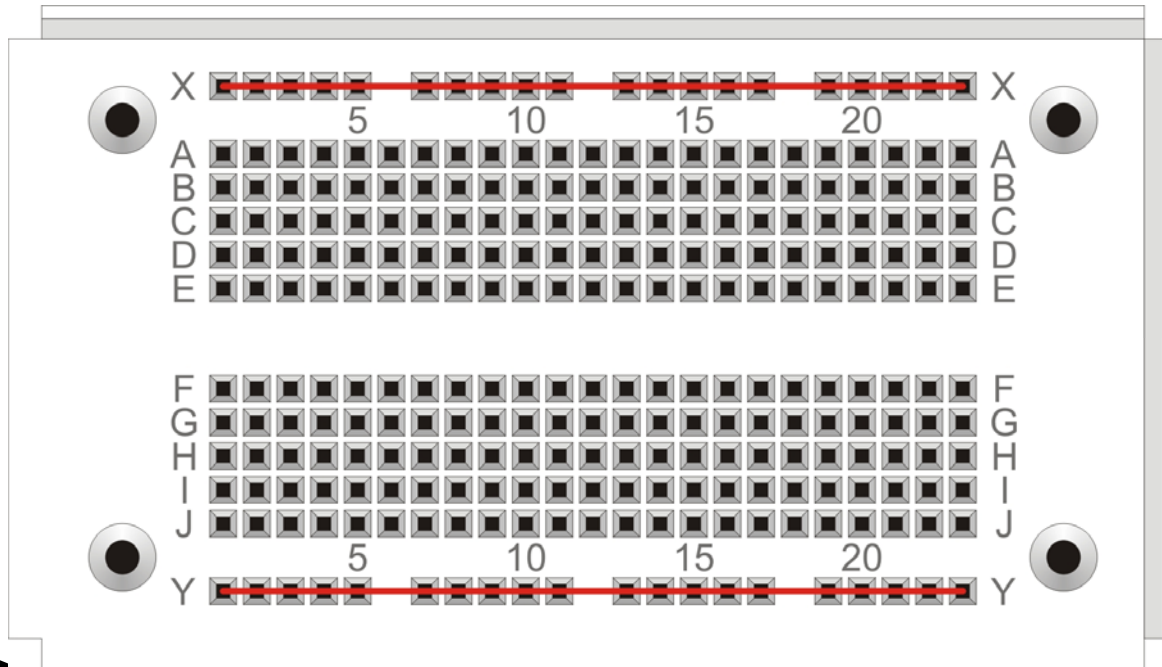


breadboard

- Breadboard for the base electronics connections.

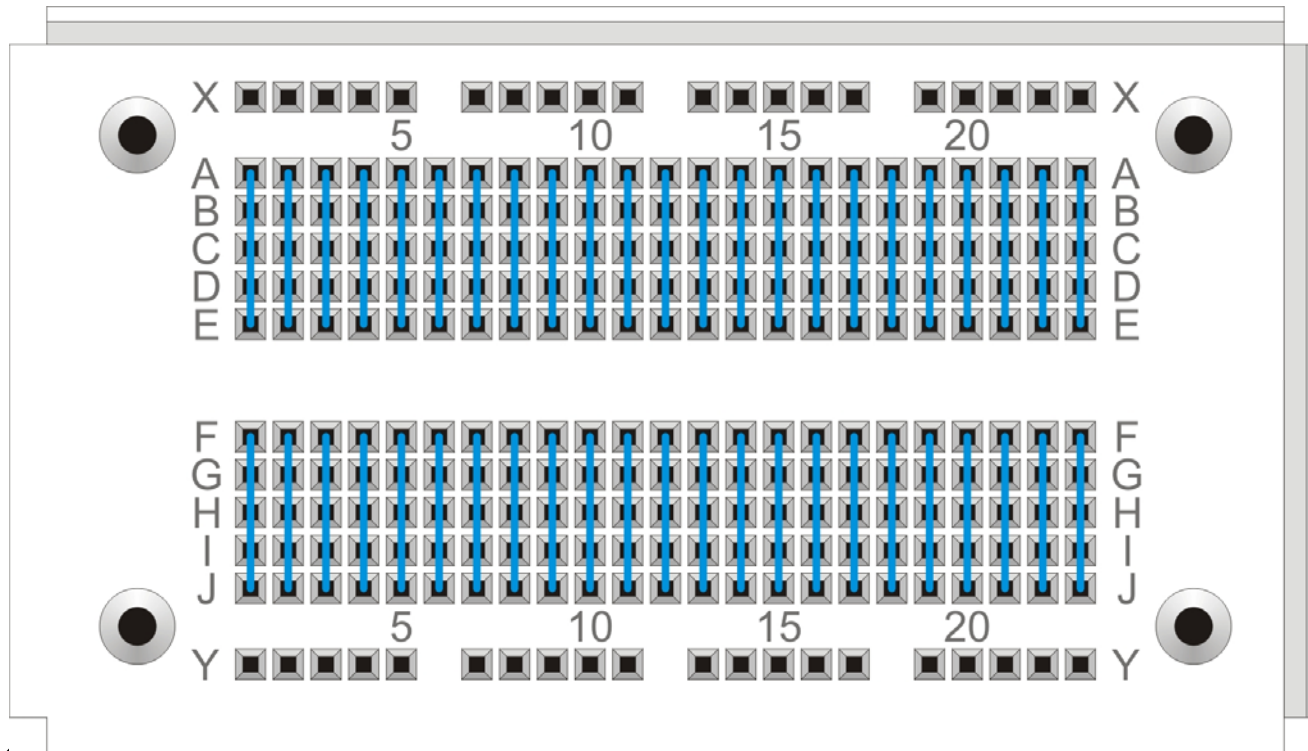


every holes in X is connected
every holes in Y is connected

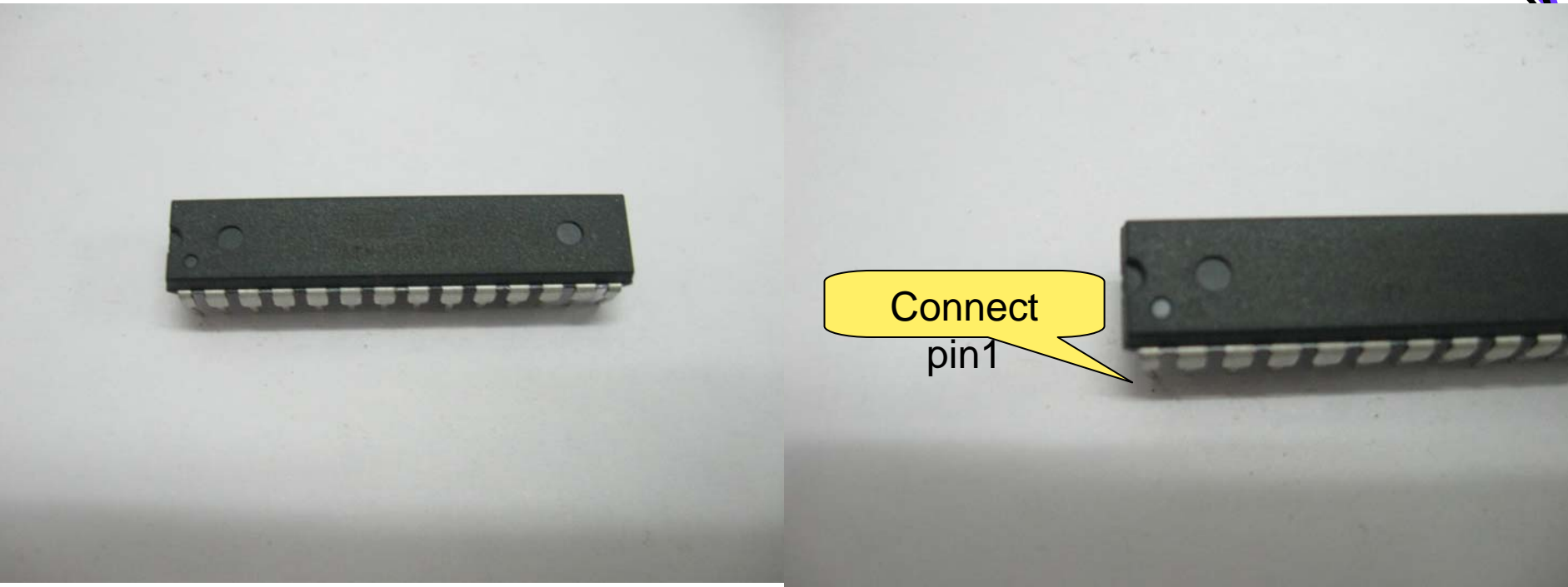
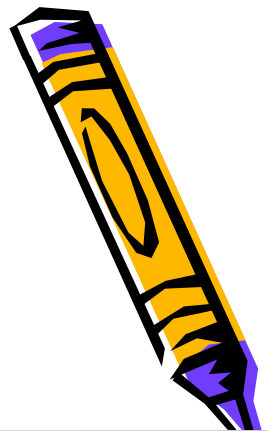


A-E every 5 holes are connected

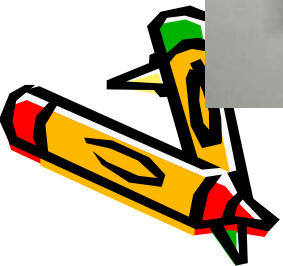
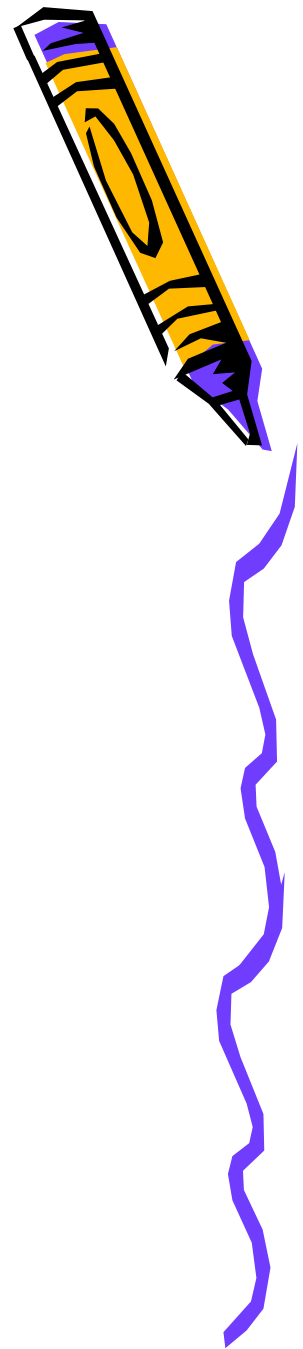
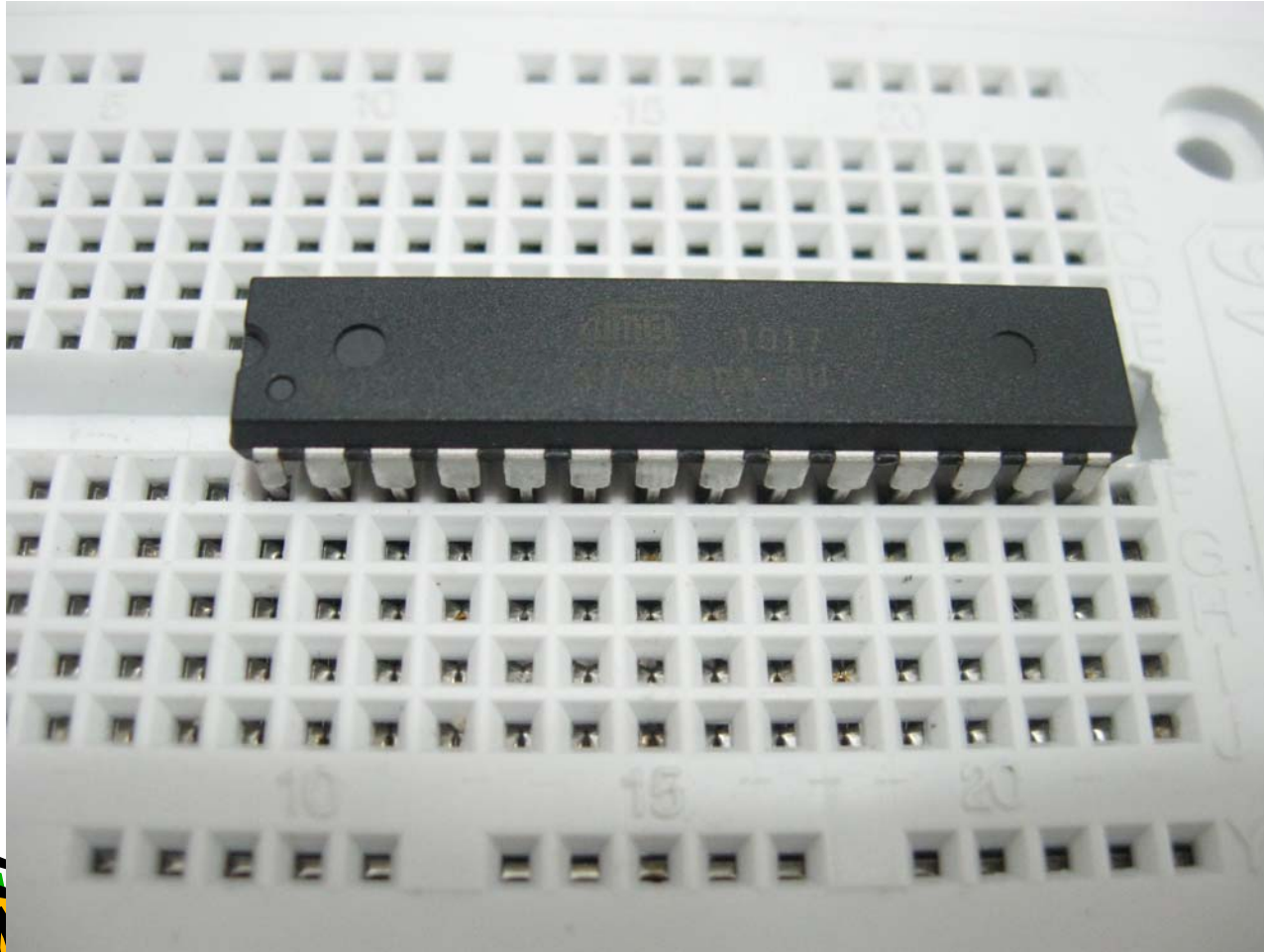
F-J every 5 holes are connected



With a small circle on the left side of processor,
please connect to PIN 1



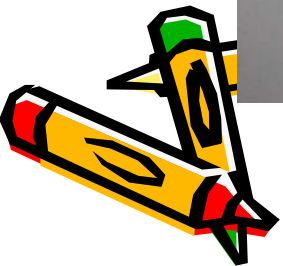
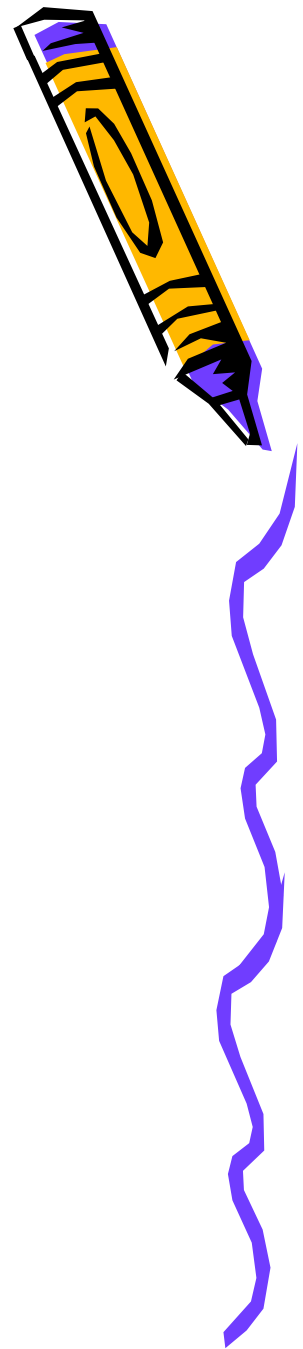
PIN 1 insert (9, F), then press down slowly. Please notice do not bend down the pins.



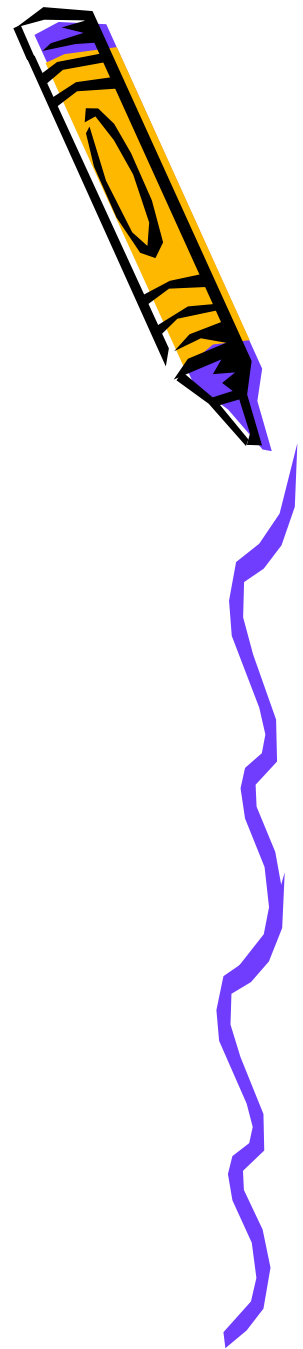
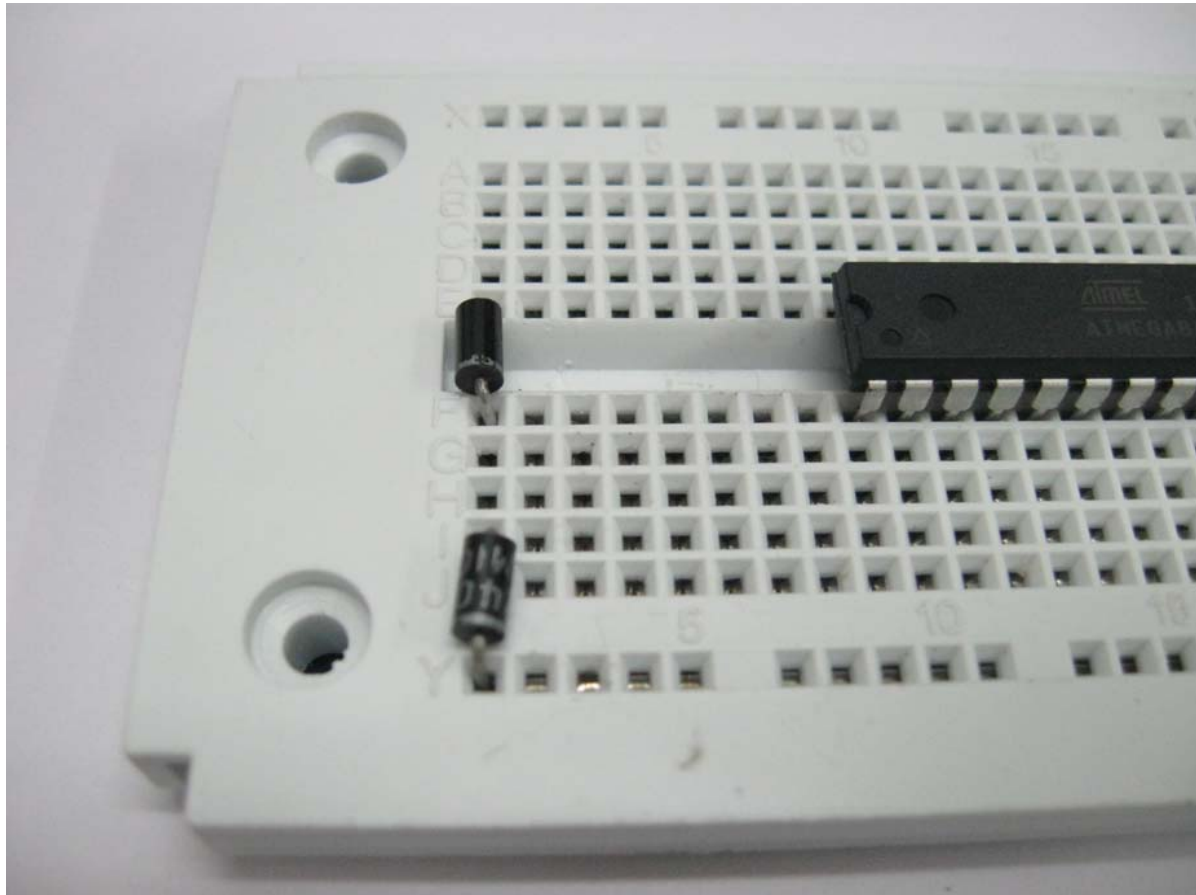
Cut the diode in a good length

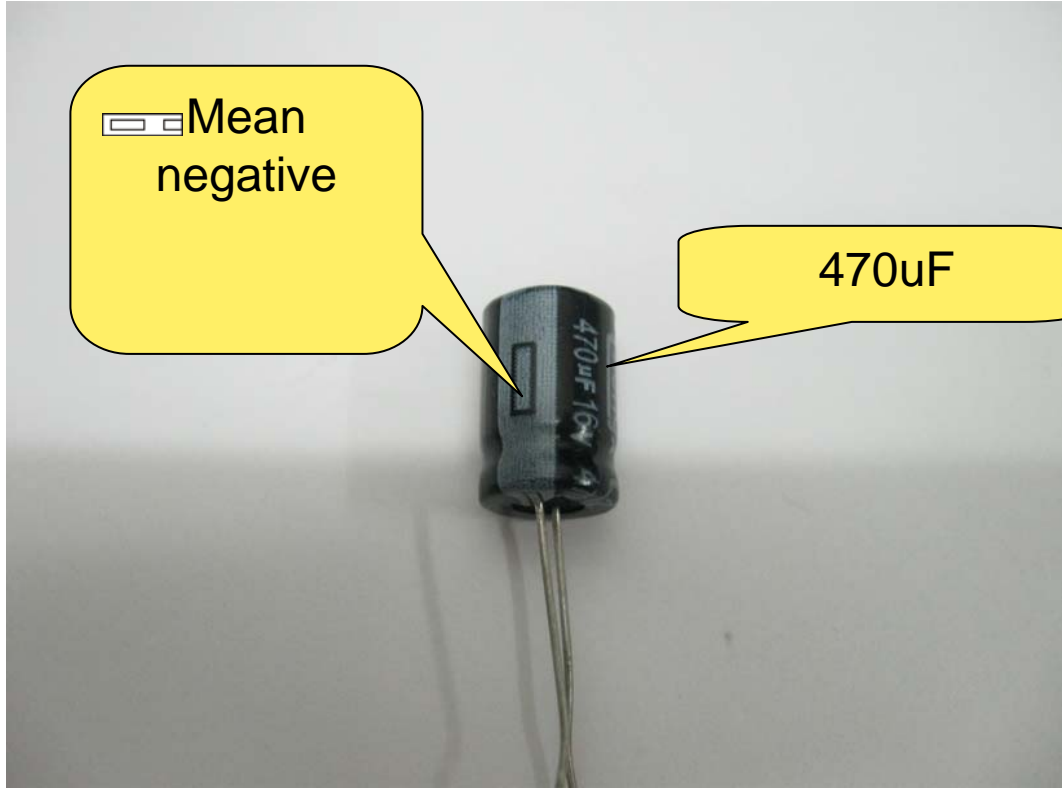


Diode positive pin insert (1, E), negative insert (1, F).



Another diode negative and positive in (1, J) 、
(1, Y)



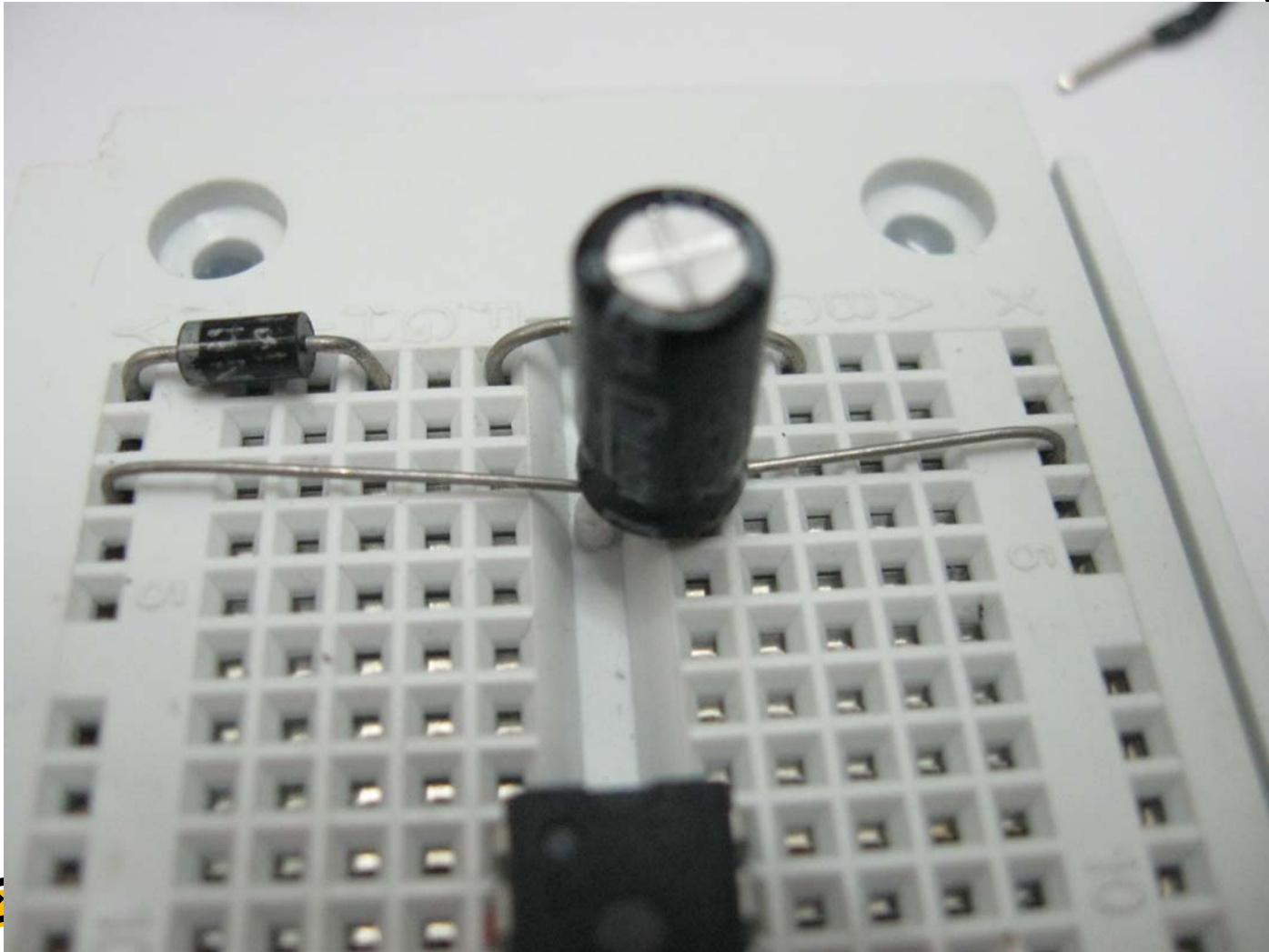


Mean negative

470uF

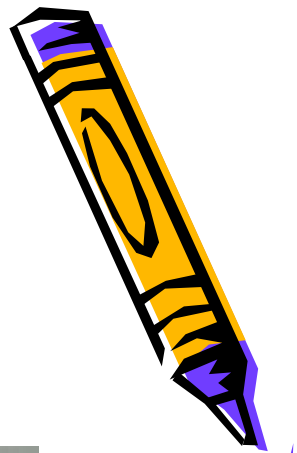


electrolytic capacitor positive insert (3, Y) 、 negative in (3, X)



VCC and GND

104 capacitor



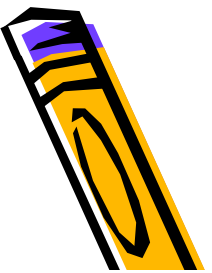
Processor 7、8 pin is Vcc and GND,
Insert a 104 capacitor between two pins.



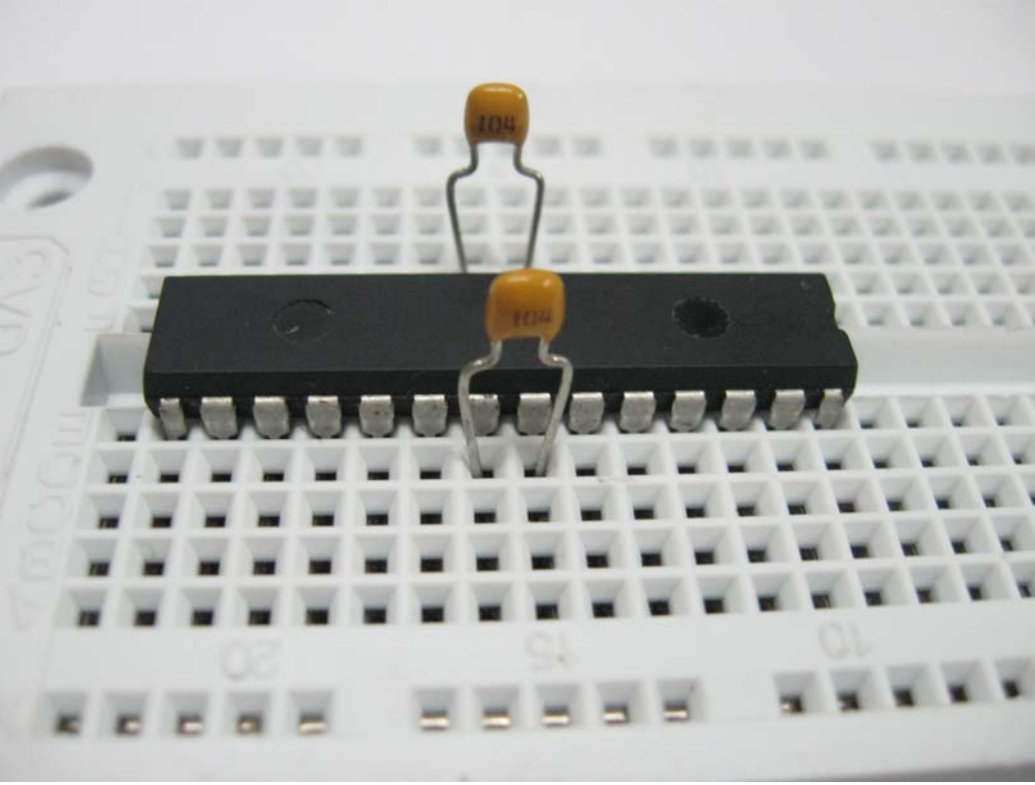
(RESET) PC6	1	28	PC5 (ADC5/SCL)
(RXD) PD0	2	27	PC4 (ADC4/SDA)
(TXD) PD1	3	26	PC3 (ADC3)
(INT0) PD2	4	25	PC2 (ADC2)
(INT1) PD3	5	24	PC1 (ADC1)
(XCK/T0) PD4	6	23	PC0 (ADC0)
VCC	7	22	GND
GND	8	21	AREF
(XTAL1/TOSC1) PB6	9	20	AVCC
(XTAL2/TOSC2) PB7	10	19	PB5 (SCK)
(T1) PD5	11	18	PB4 (MISO)
(AIN0) PD6	12	17	PB3 (MOSI/OC2)
(AIN1) PD7	13	16	PB2 (SS/OC1B)
(ICP1) PB0	14	15	PB1 (OC1A)

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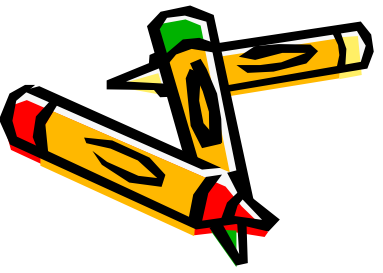


Insert a 104 capacitor between 21 and 22

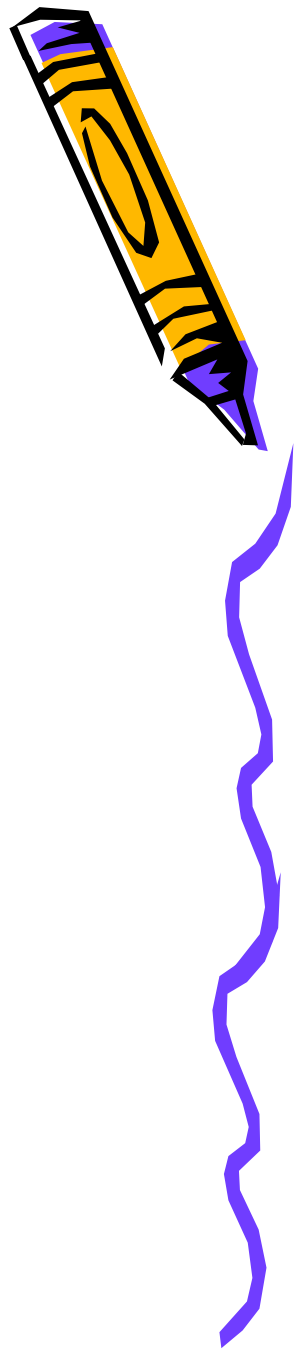


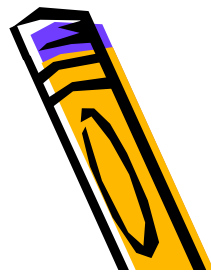
ATmega8

(RESET) PC6	1	28	PC5 (ADC5/SCL)
(RXD) PD0	2	27	PC4 (ADC4/SDA)
(TXD) PD1	3	26	PC3 (ADC3)
(INT0) PD2	4	25	PC2 (ADC2)
(INT1) PD3	5	24	PC1 (ADC1)
(XCK/T0) PD4	6	23	PC0 (ADC0)
VCC	7	22	GND
GND	8	21	AREF
(XTAL1/TOSC1) PB6	9	20	AVCC
(XTAL2/TOSC2) PB7	10	19	PB5 (SCK)
(T1) PD5	11	18	PB4 (MISO)
(AIN0) PD6	12	17	PB3 (MOSI/OC2)
(AIN1) PD7	13	16	PB2 (SS/OC1B)
(ICP1) PB0	14	15	PB1 (OC1A)

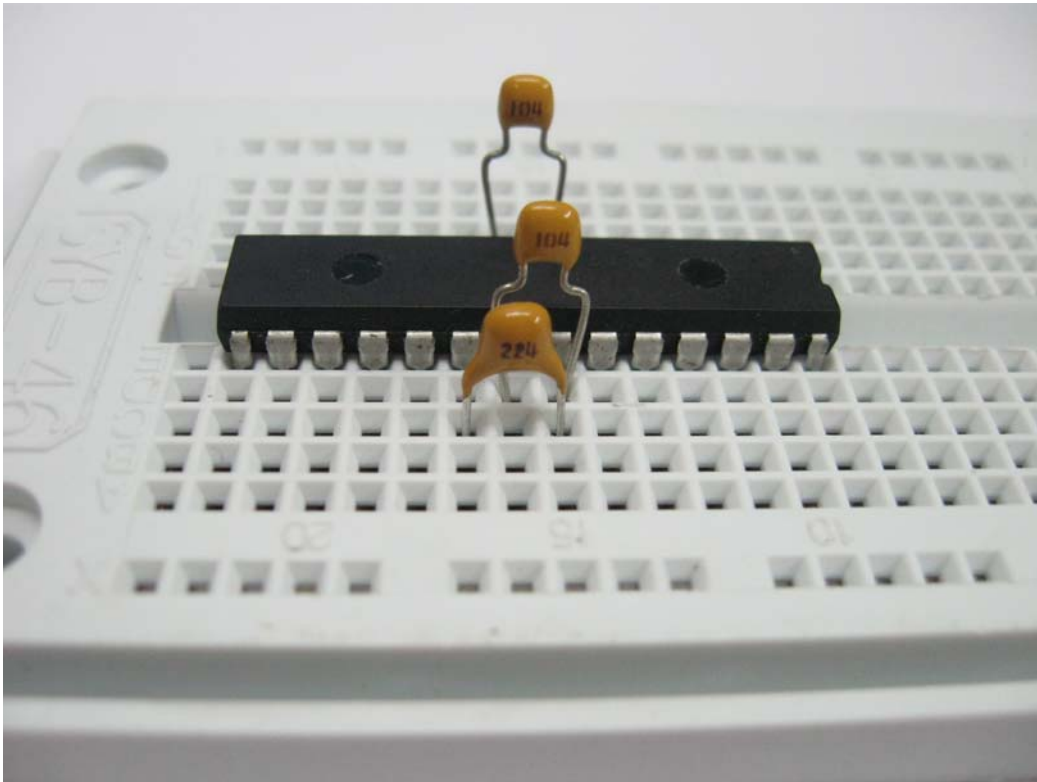


224 capacitor





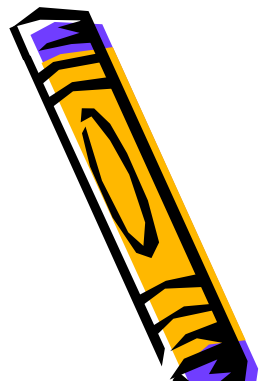
Insert a 224 capacitor between 20 and 22 pins.



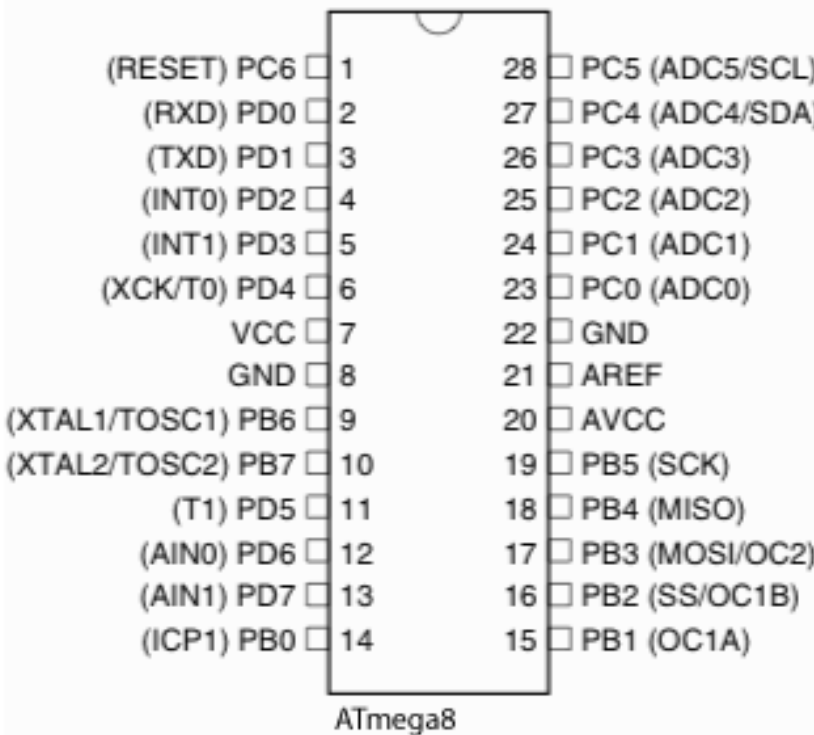
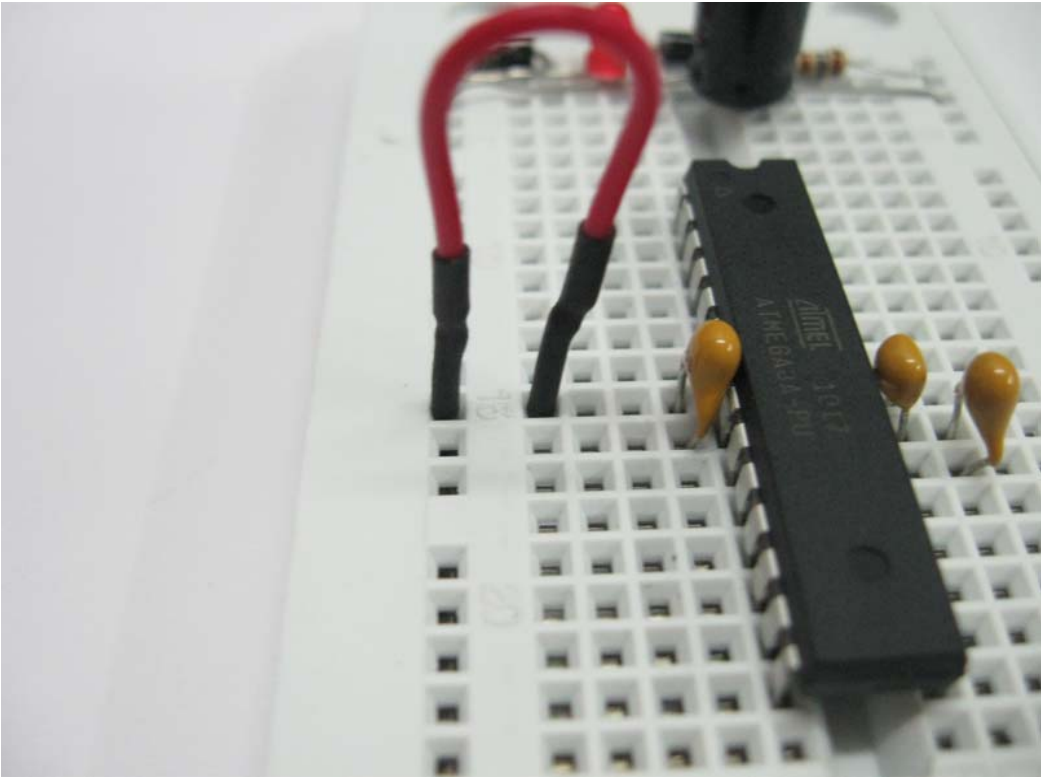
Atmega8

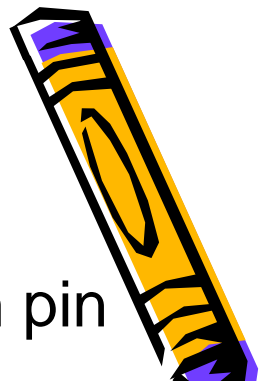
(RESET) PC6	1	28	PC5 (ADC5/SCL)
(RXD) PD0	2	27	PC4 (ADC4/SDA)
(TXD) PD1	3	26	PC3 (ADC3)
(INT0) PD2	4	25	PC2 (ADC2)
(INT1) PD3	5	24	PC1 (ADC1)
(XCK/T0) PD4	6	23	PC0 (ADC0)
VCC	7	22	GND
GND	8	21	AREF
(XTAL1/TOSC1) PB6	9	20	AVCC
(XTAL2/TOSC2) PB7	10	19	PB5 (SCK)
(T1) PD5	11	18	PB4 (MISO)
(AIN0) PD6	12	17	PB3 (MOSI/OC2)
(AIN1) PD7	13	16	PB2 (SS/OC1B)
(ICP1) PB0	14	15	PB1 (OC1A)



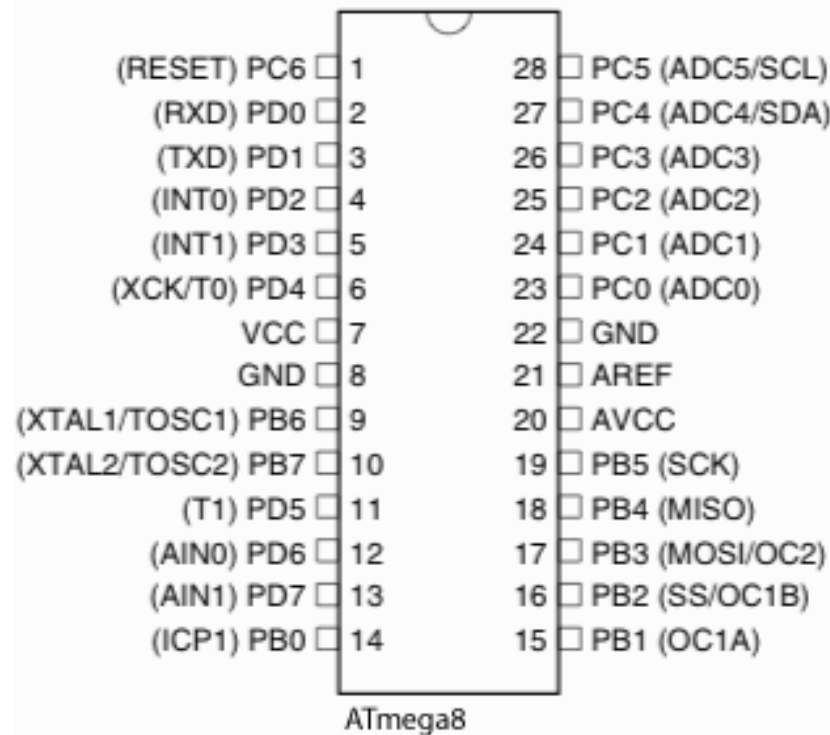
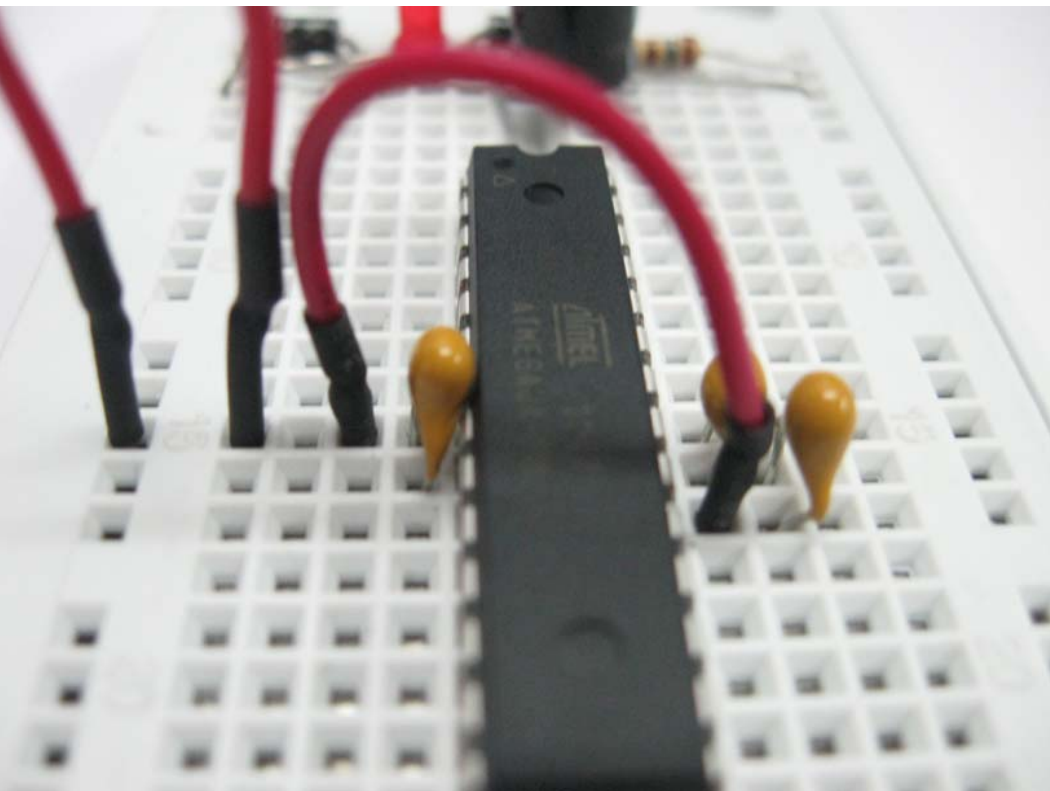


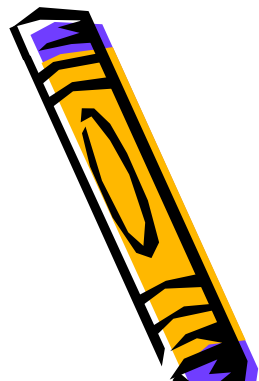
A red jumper cable connect Y and the 7th pins



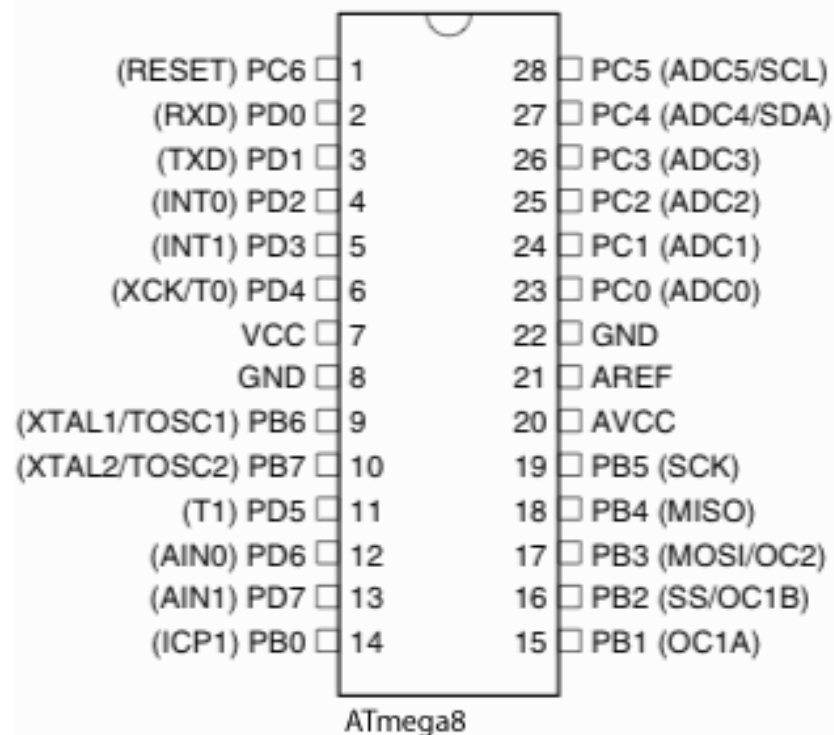
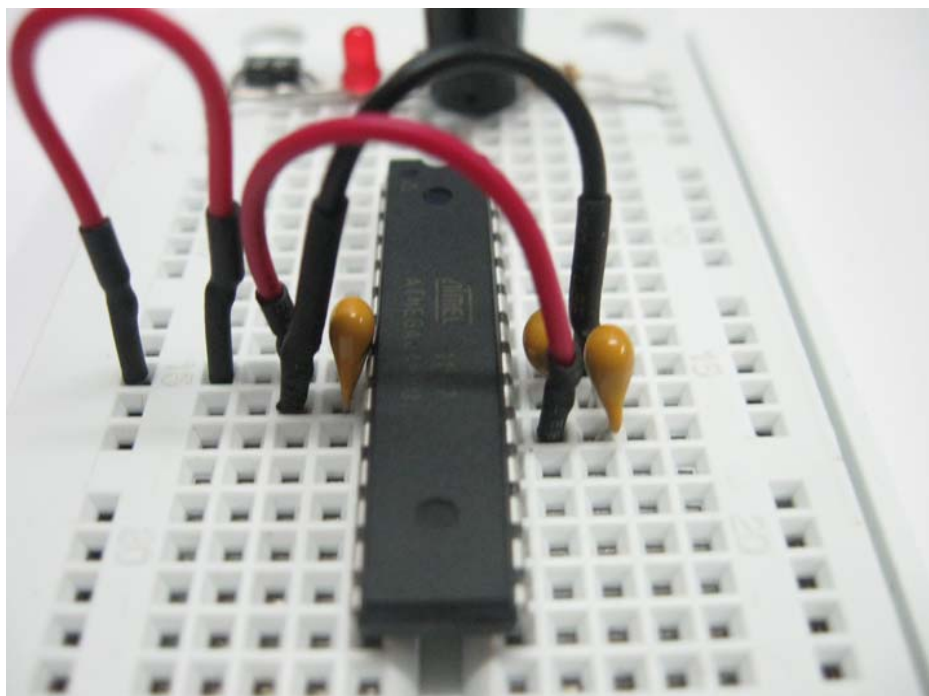


The second red jumper cable connect 7th pin and 20th pin

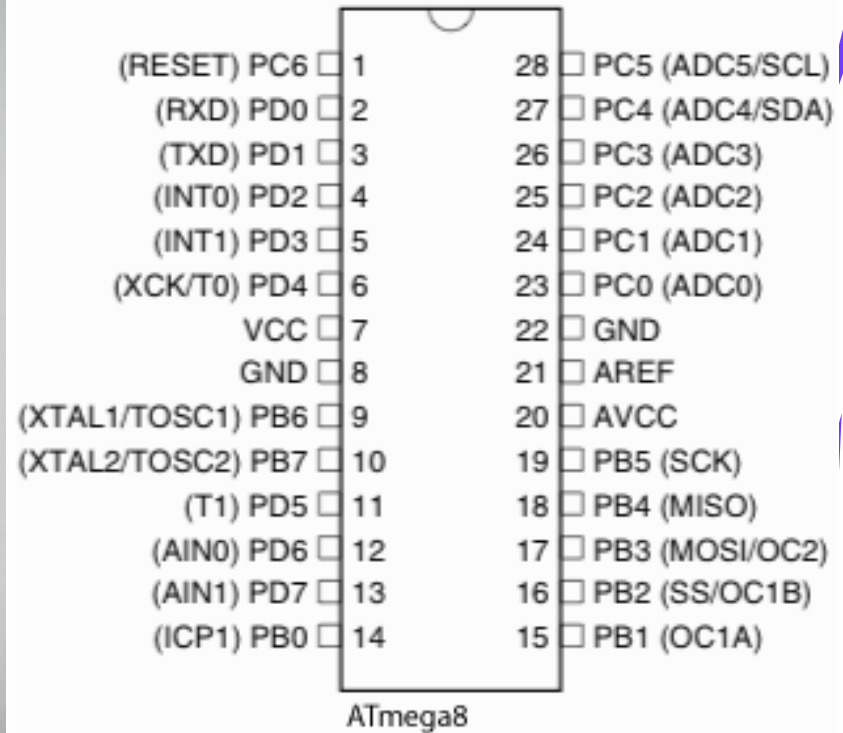
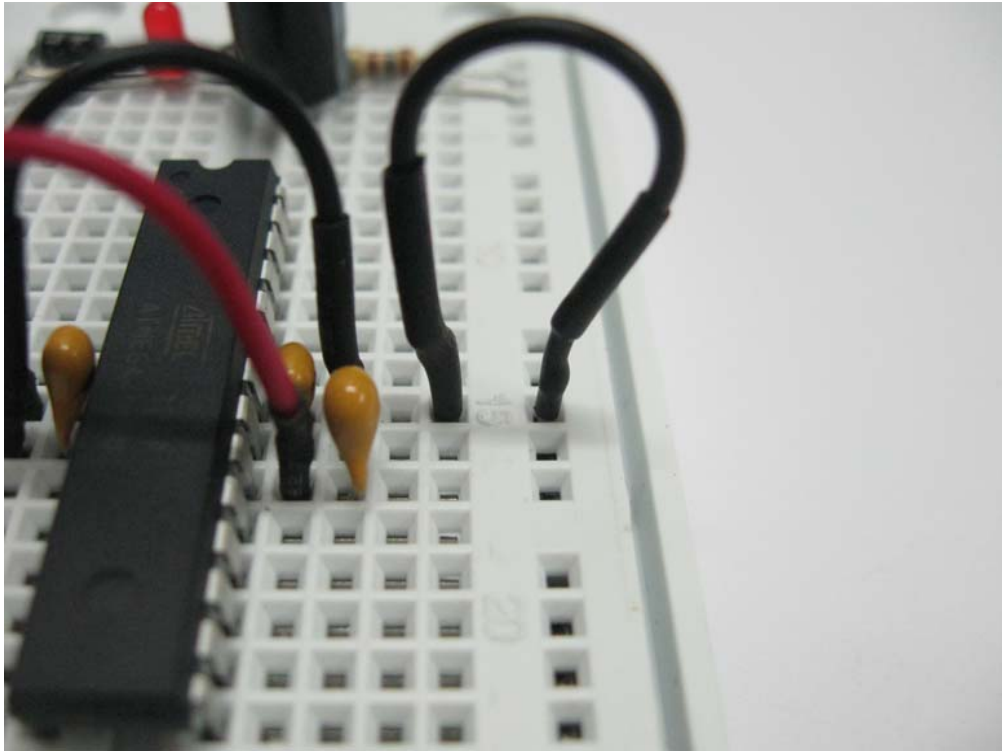




A black jumper cable connect 8th pin and 22nd pin



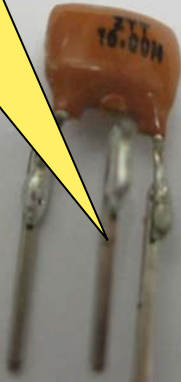
A black jumper cable connect 22nd pin and X



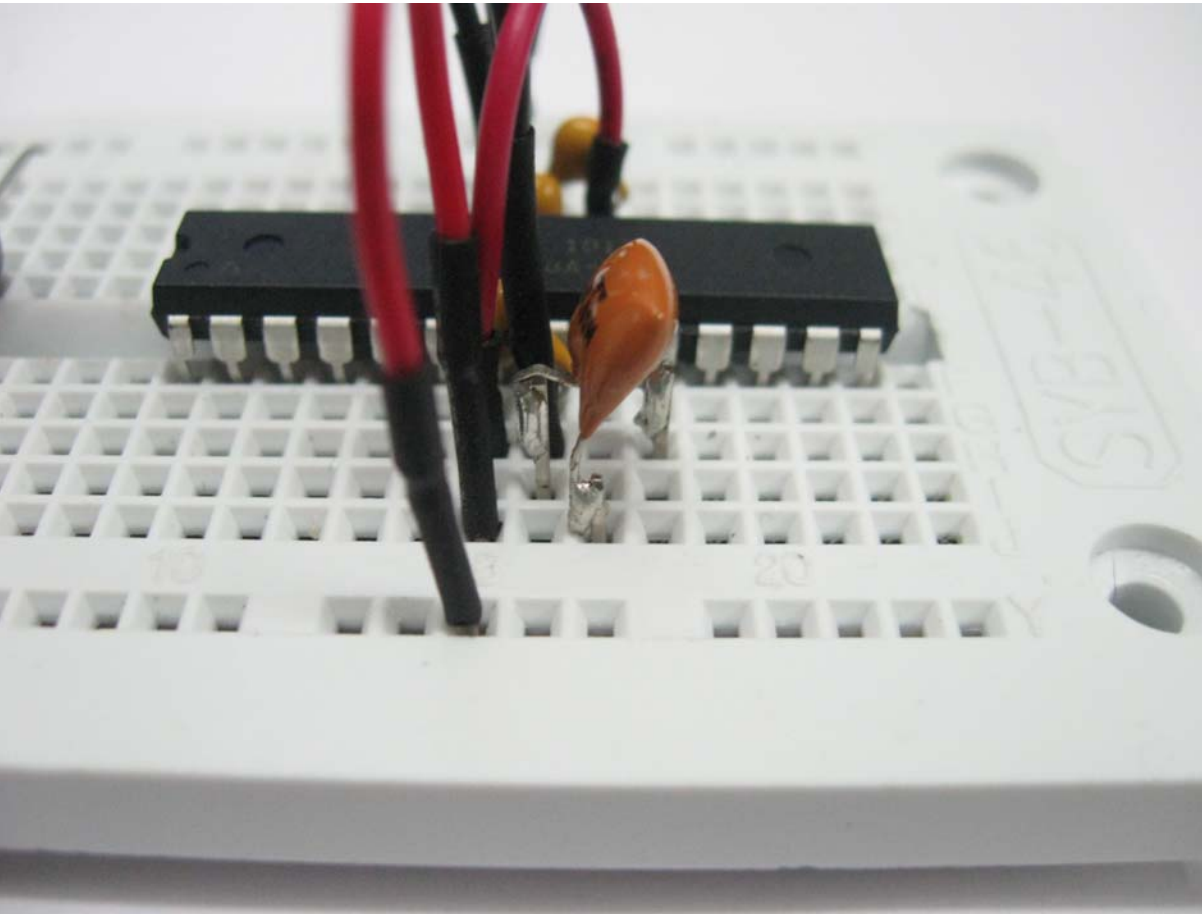
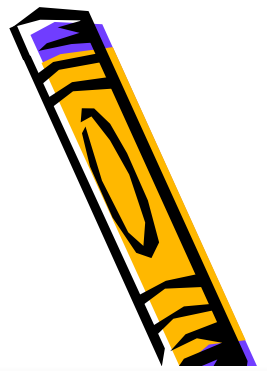
It is a crystal. Middle pin connects to GND



Middle pin
connects GND



Middle pin connects to 8th pin of processor, the other 2 pins connects to 9th, 10th pin.



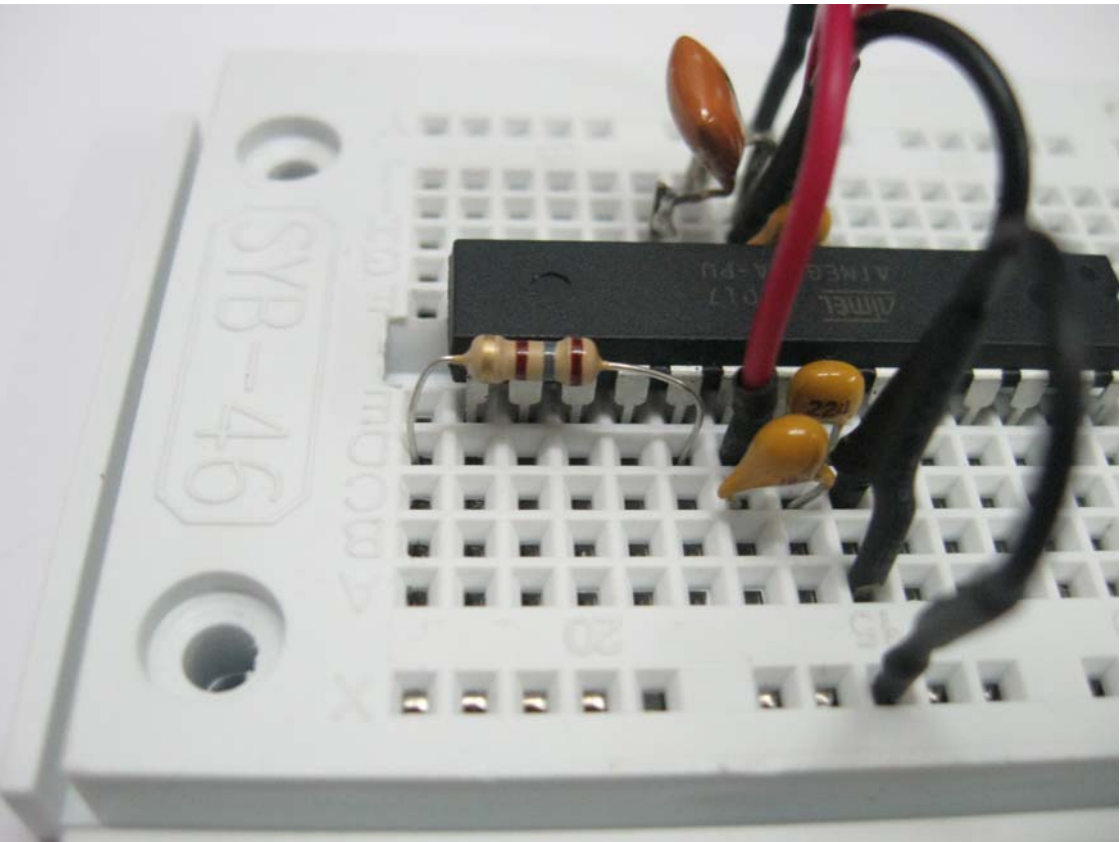
(RESET) PC6	1	28	PC5 (ADC5/SCL)
(RXD) PD0	2	27	PC4 (ADC4/SDA)
(TXD) PD1	3	26	PC3 (ADC3)
(INT0) PD2	4	25	PC2 (ADC2)
(INT1) PD3	5	24	PC1 (ADC1)
(XCK/T0) PD4	6	23	PC0 (ADC0)
VCC	7	22	GND
GND	8	21	AREF
(XTAL1/TOSC1) PB6	9	20	AVCC
(XTAL2/TOSC2) PB7	10	19	PB5 (SCK)
(T1) PD5	11	18	PB4 (MISO)
(AIN0) PD6	12	17	PB3 (MOSI/OC2)
(AIN1) PD7	13	16	PB2 (SS/OC1B)
(ICP1) PB0	14	15	PB1 (OC1A)

ATmega8





Resistor (brown grey brown golden) connect to 19th pin and (D, 23)

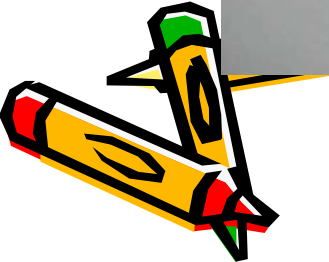
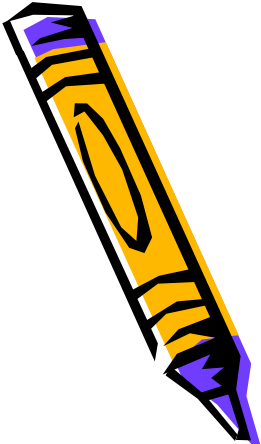
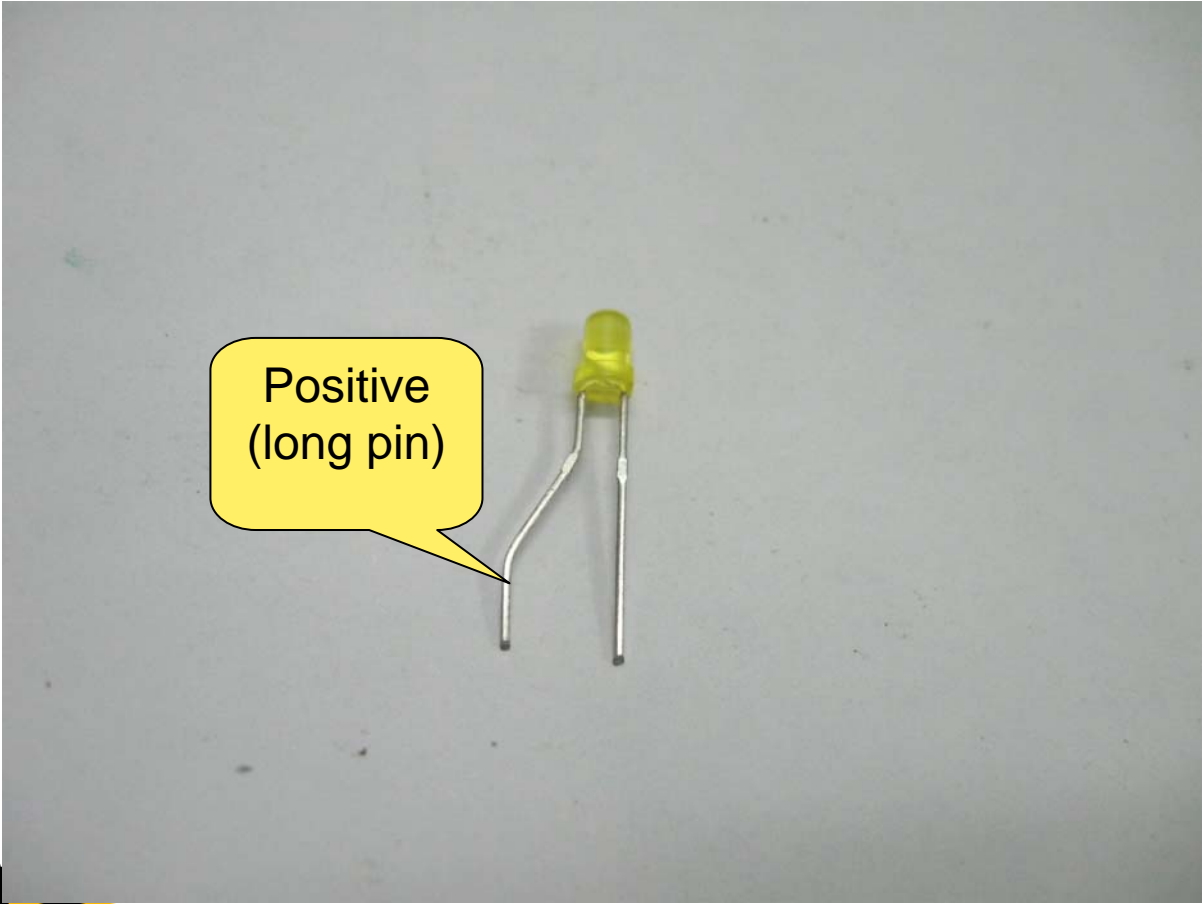


ATmega8

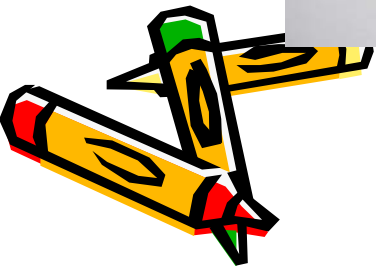
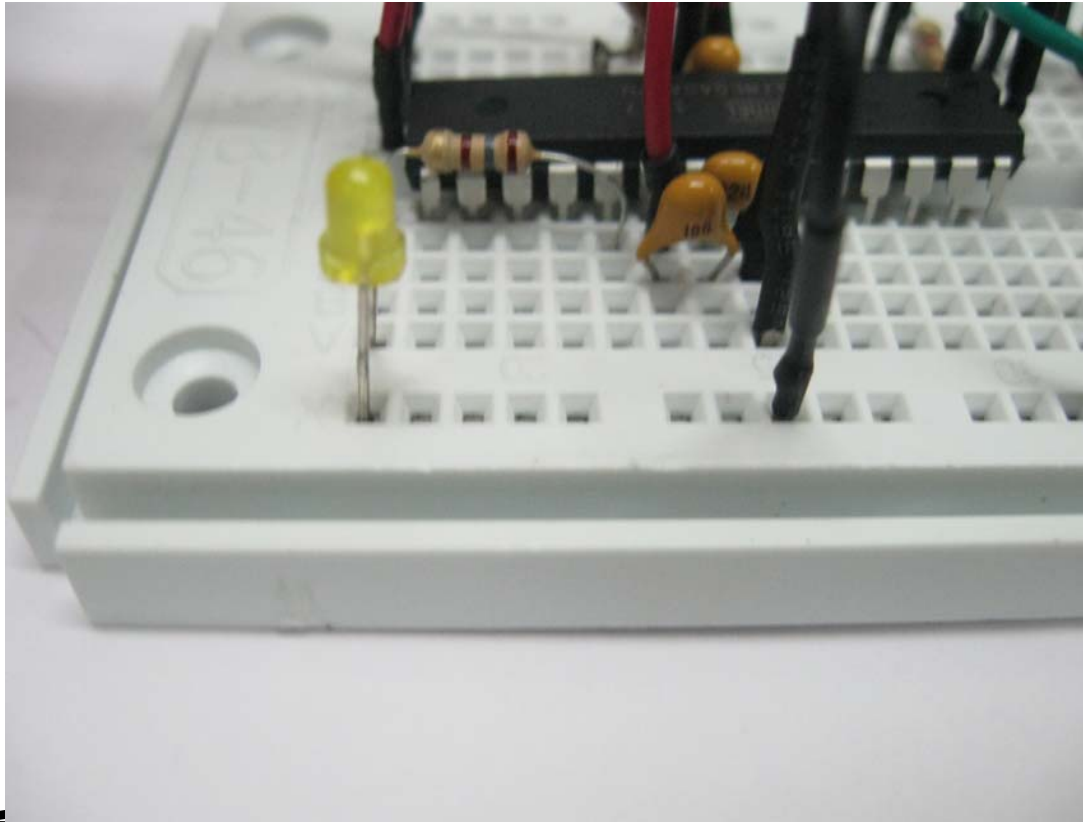
(RESET) PC6	1	28	PC5 (ADC5/SCL)
(RXD) PD0	2	27	PC4 (ADC4/SDA)
(TXD) PD1	3	26	PC3 (ADC3)
(INT0) PD2	4	25	PC2 (ADC2)
(INT1) PD3	5	24	PC1 (ADC1)
(XCK/T0) PD4	6	23	PC0 (ADC0)
VCC	7	22	GND
GND	8	21	AREF
(XTAL1/TOSC1) PB6	9	20	AVCC
(XTAL2/TOSC2) PB7	10	19	PB5 (SCK)
(T1) PD5	11	18	PB4 (MISO)
(AIN0) PD6	12	17	PB3 (MOSI/OC2)
(AIN1) PD7	13	16	PB2 (SS/OC1B)
(ICP1) PB0	14	15	PB1 (OC1A)



Bend the positive pin as picture show



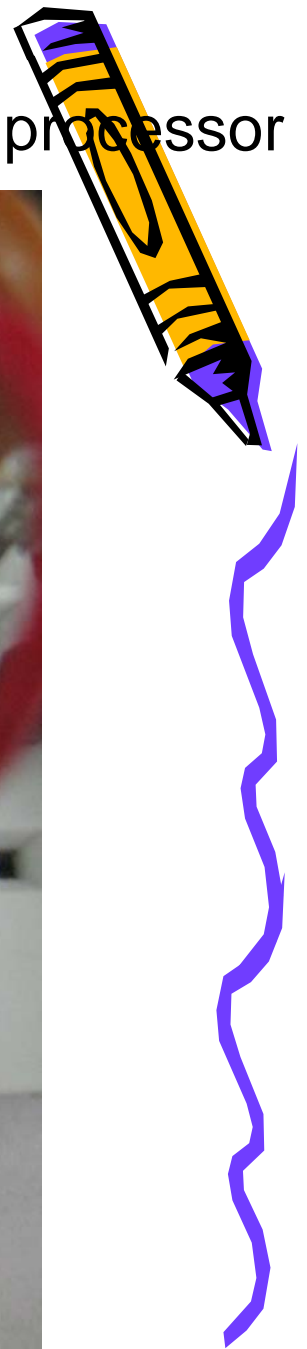
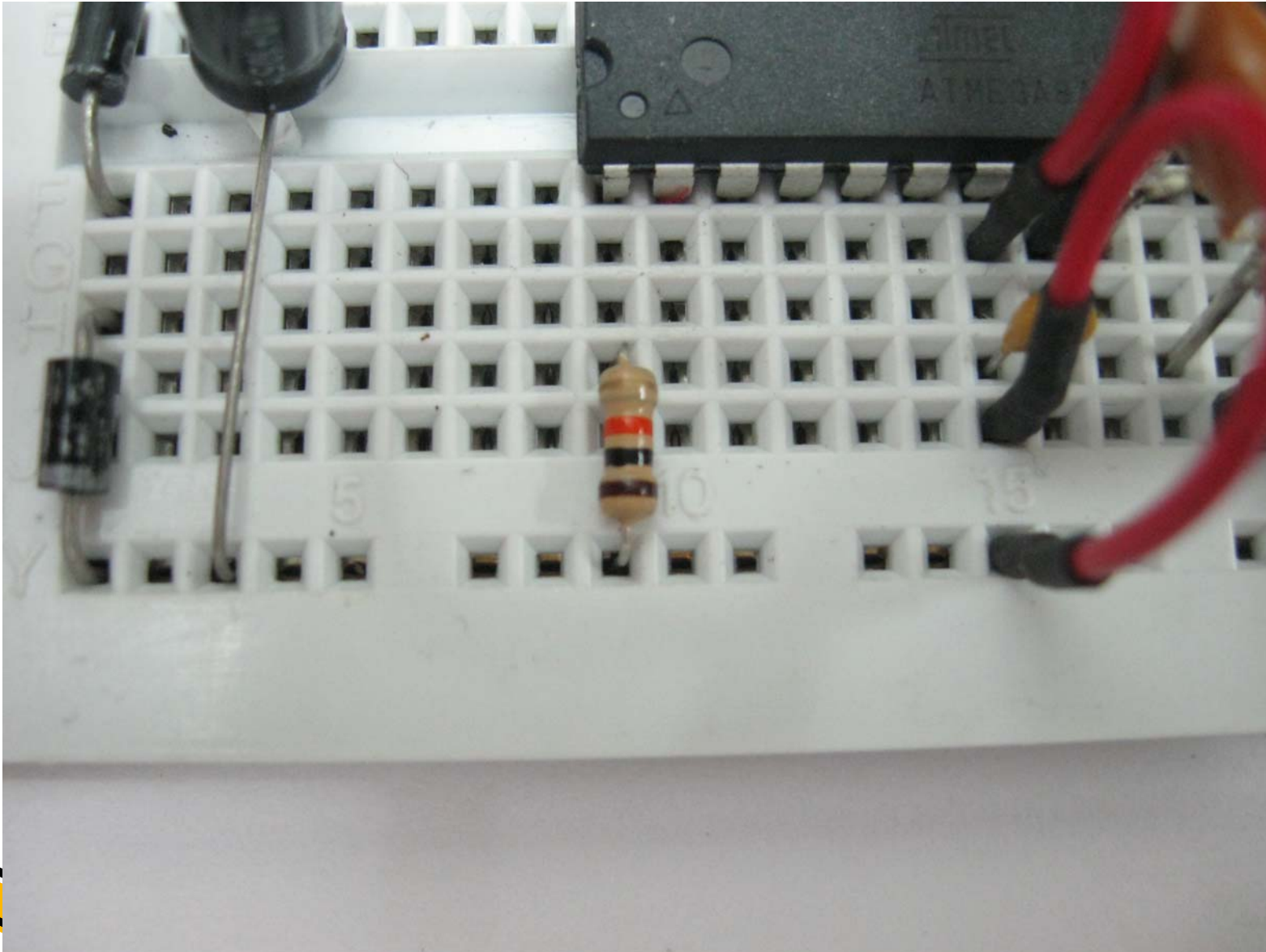
LED: positive pin connects (23, A), negative pin connects X;



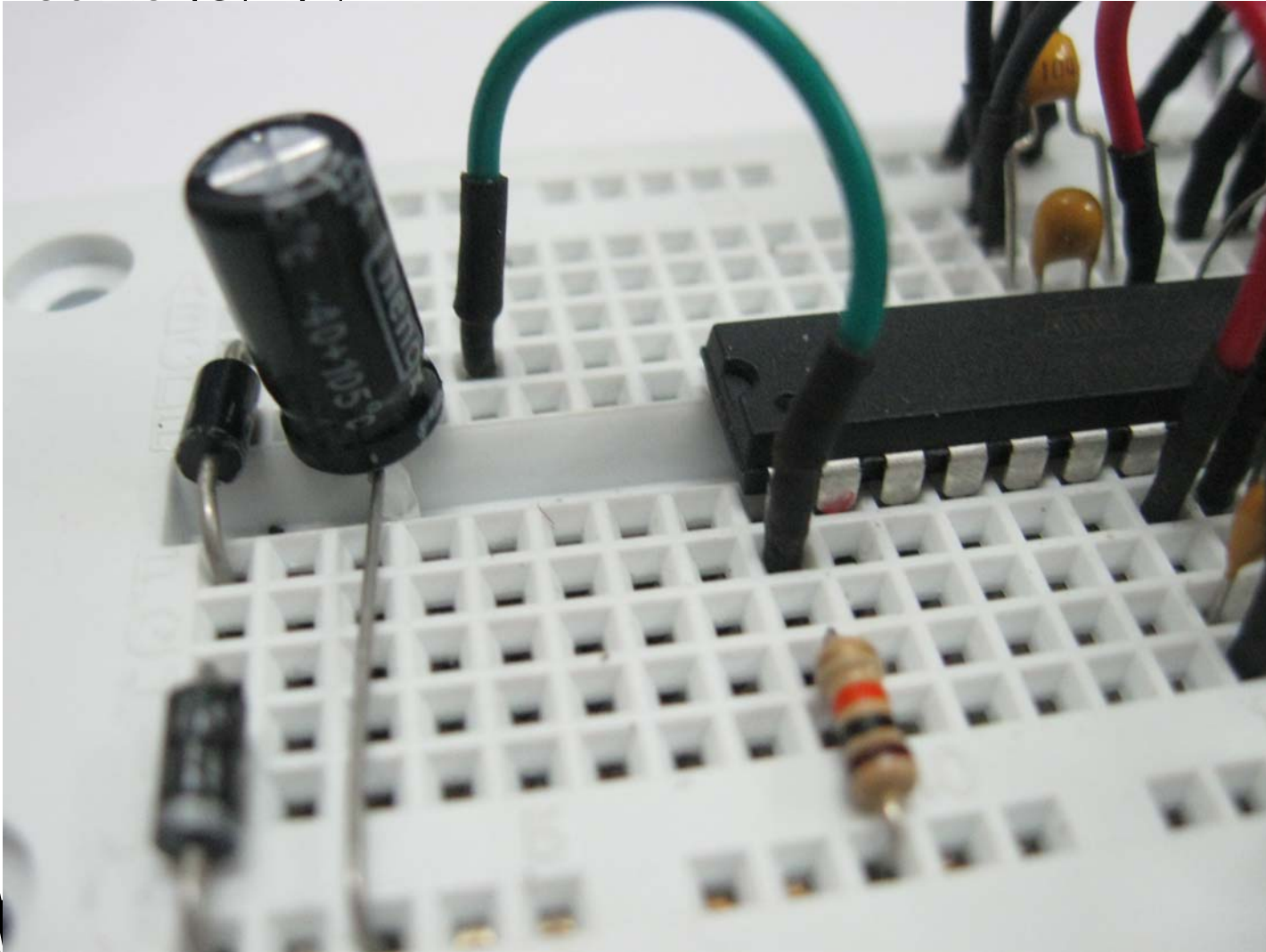
Resistor (brown black orange golden)



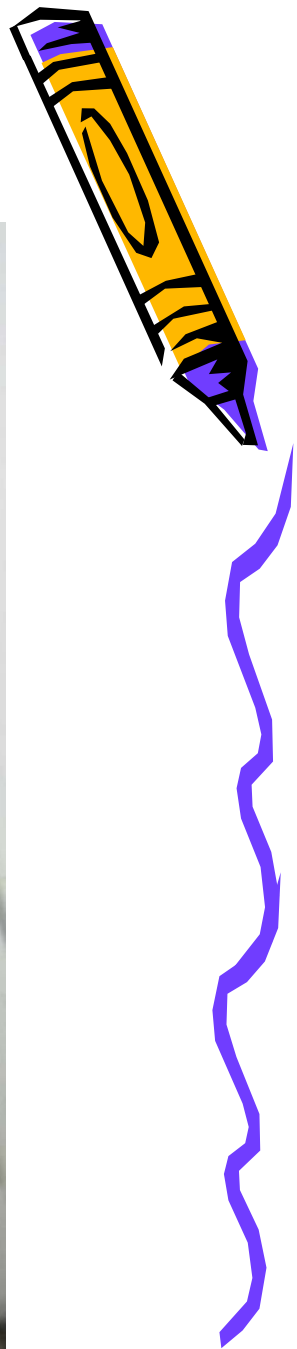
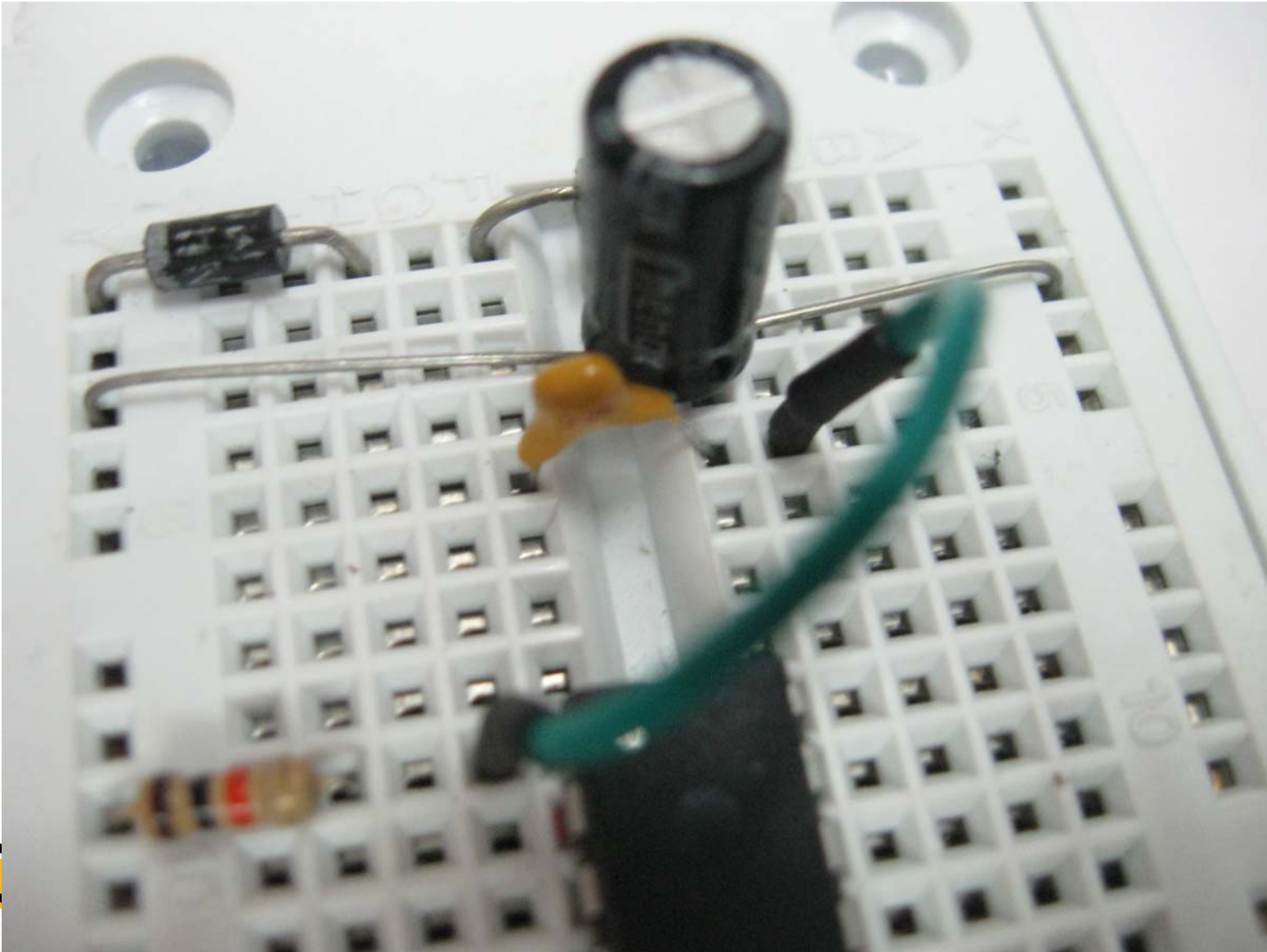
One pin connects Y, the other pin connect to 1th pin of processor



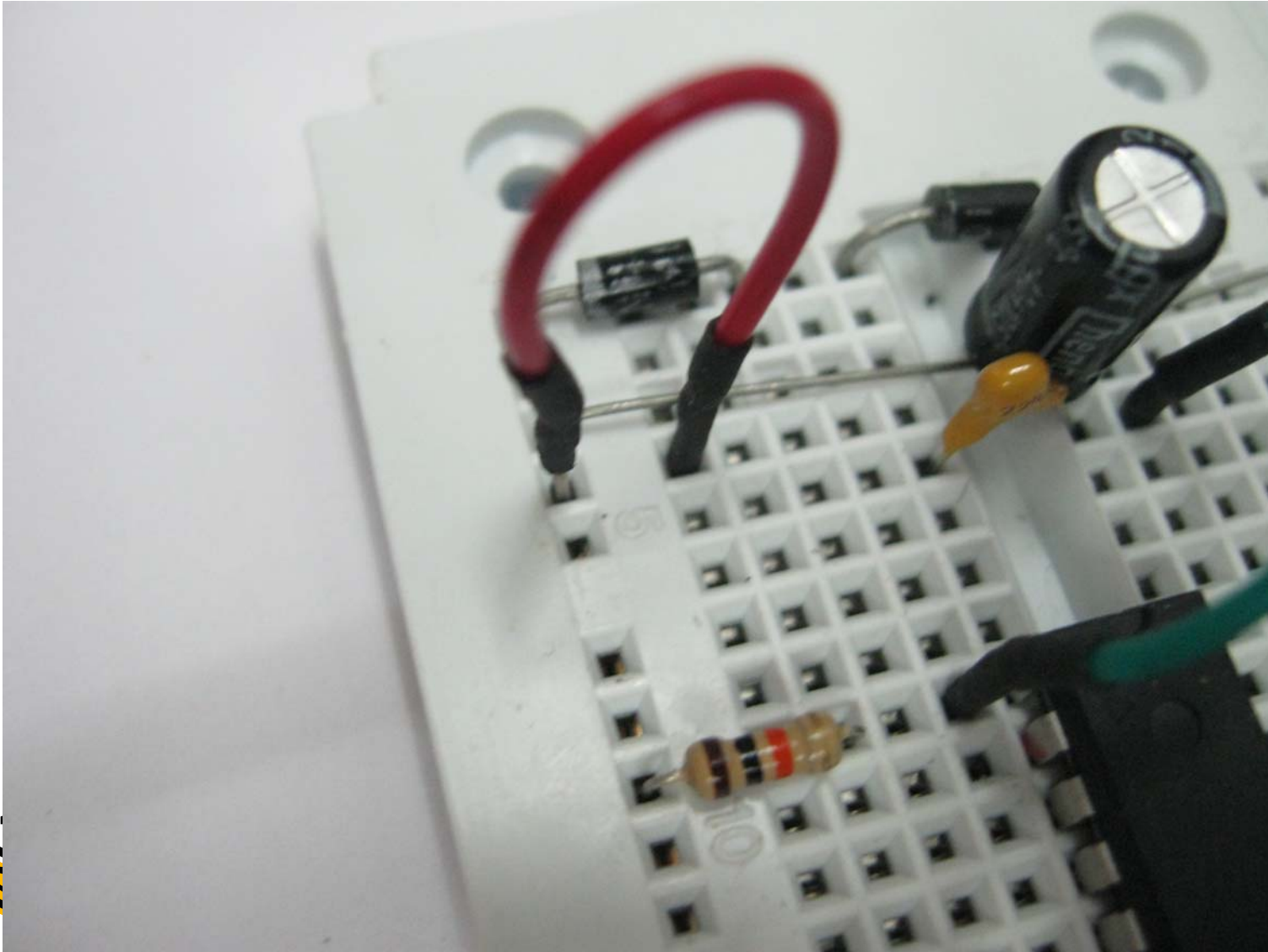
Green jumper cable, one pin connects to pin 1, the other pin connect to (5.D) :



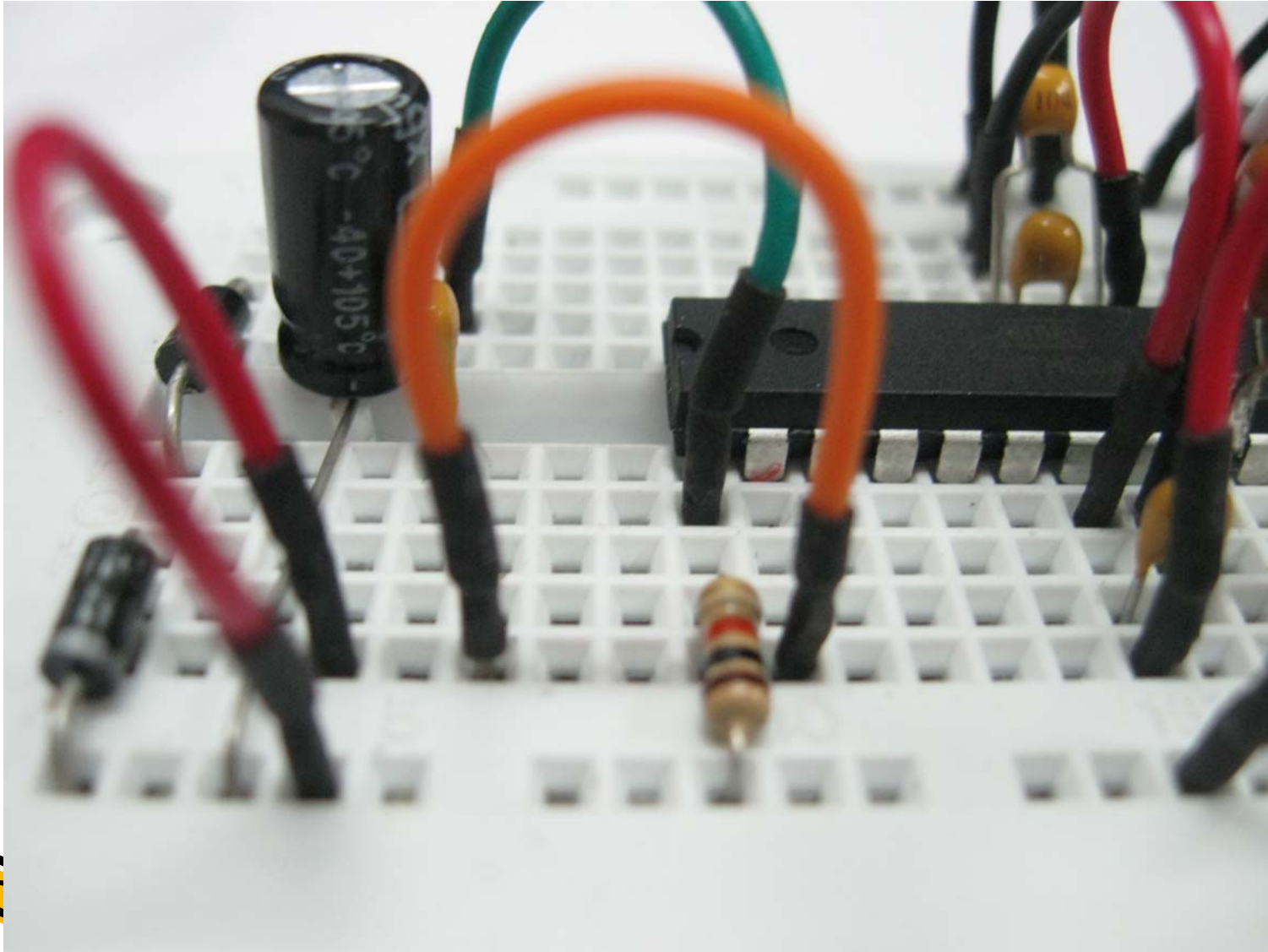
224 capacitor connects (5,E) and (5,F) ;



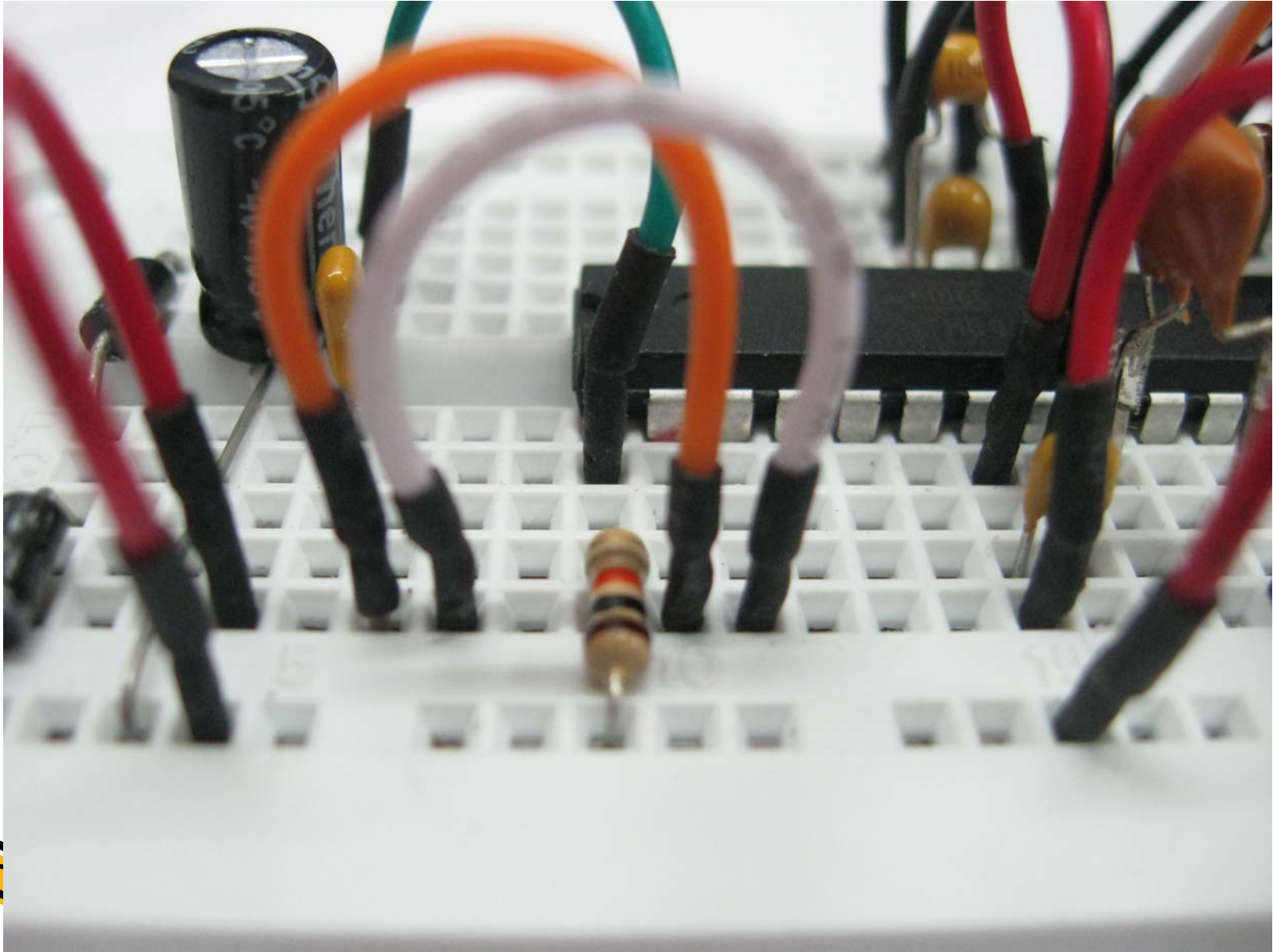
Red jumper cable, one pin connect to Y, the other pin connect to (4, J);



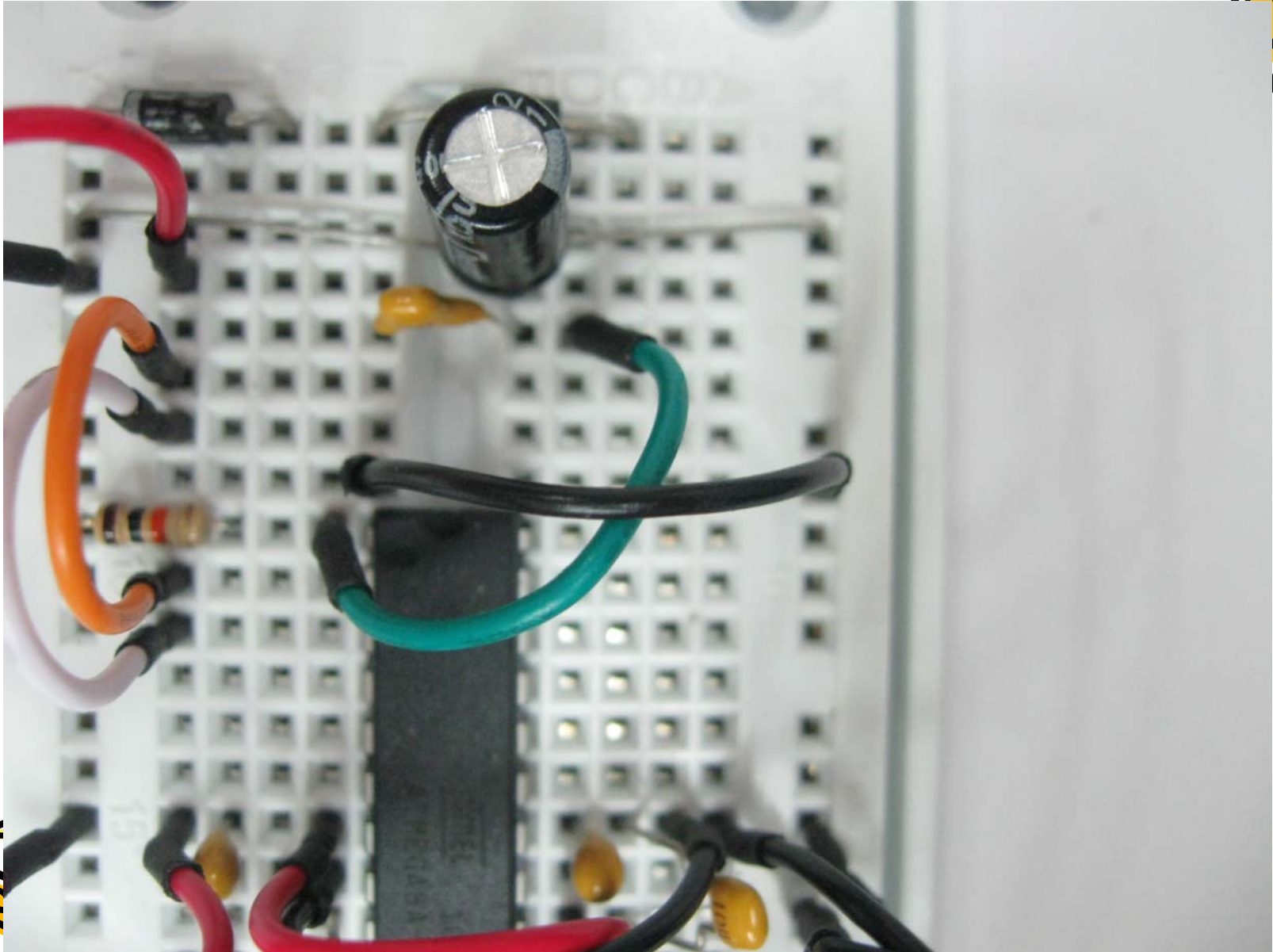
A orange jumper cable connects (6,F) and 2nd pin



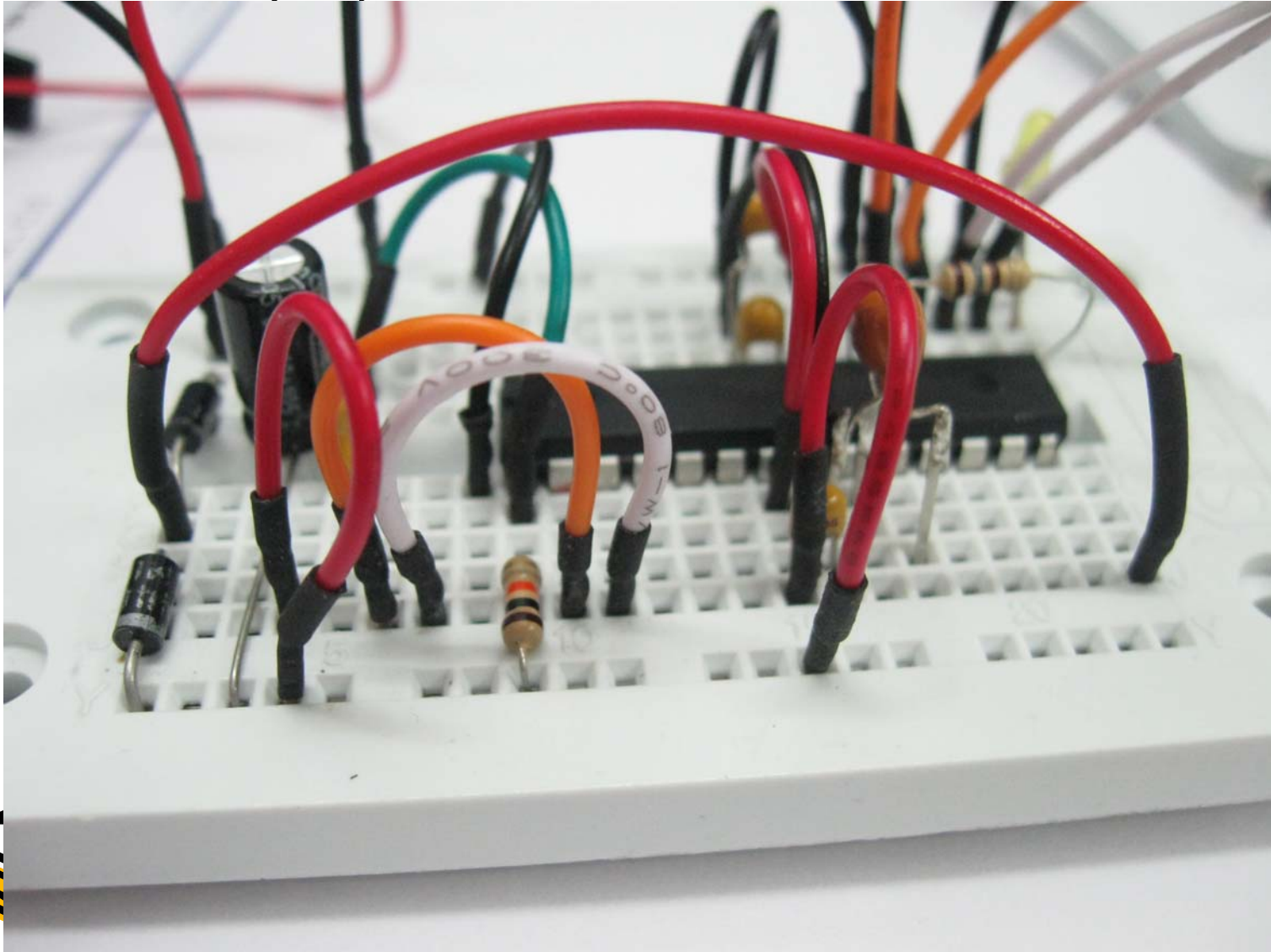
A white jumper cable connects (7, F) and 3rd pin



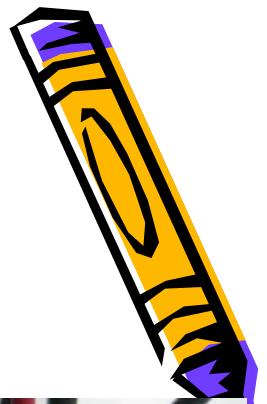
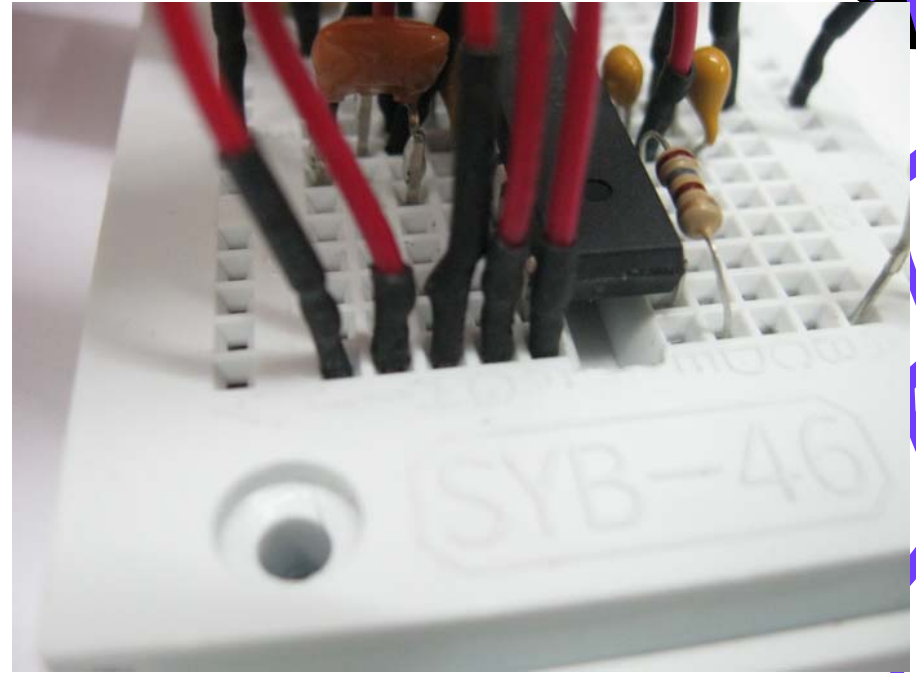
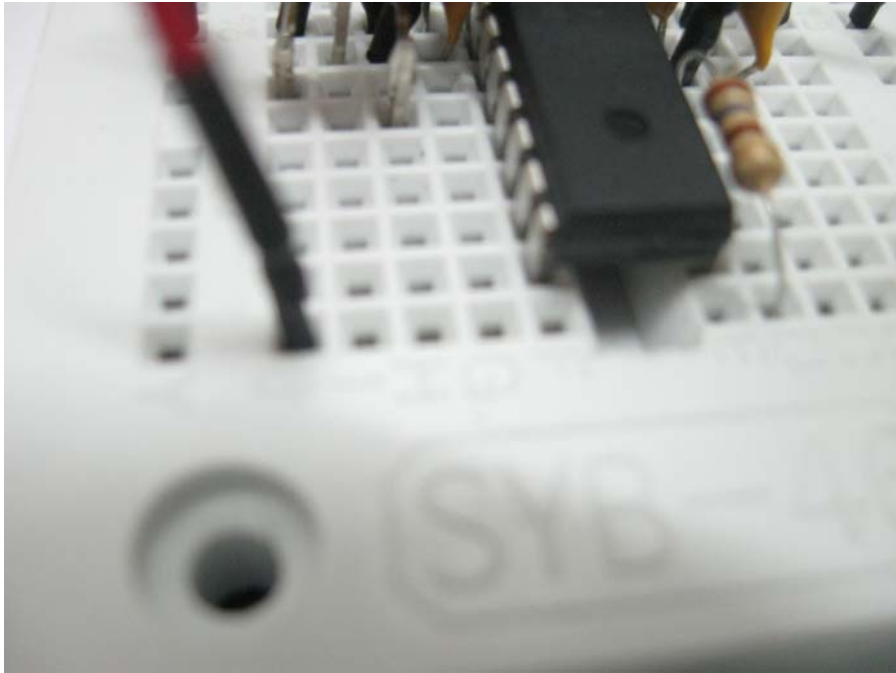
A black jumper cable connects (8, F) and X;



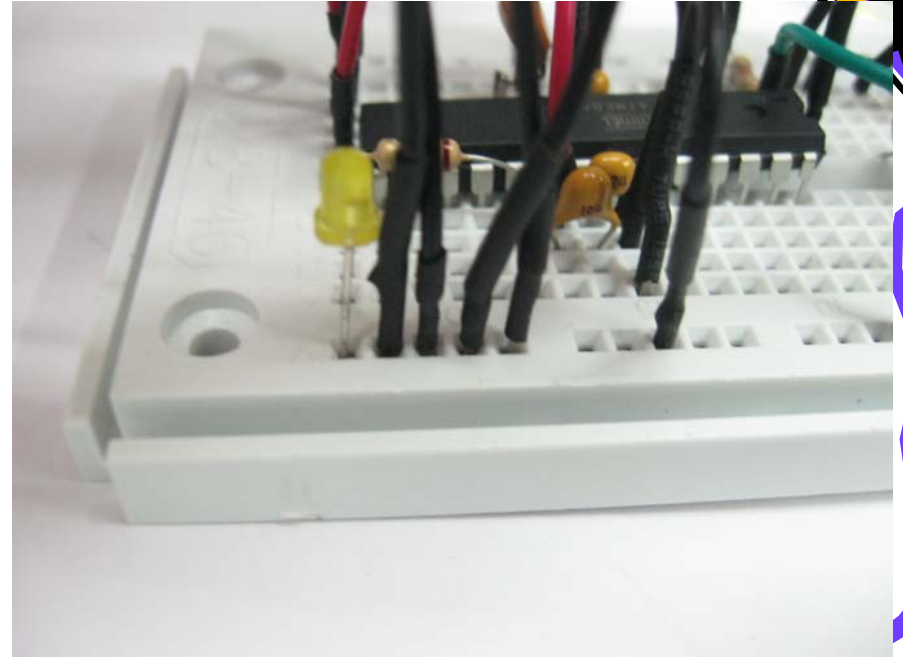
Use a red jumper cable to connect (1, G) (23, J)

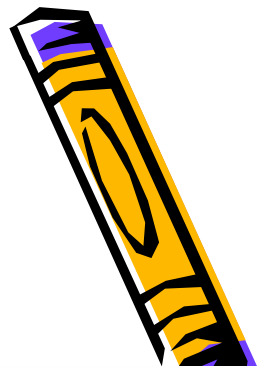


Insert 4pcs red jumper cable in (23, F), (23, G) ,
(23, H) , (23,I) as the servo power cables.

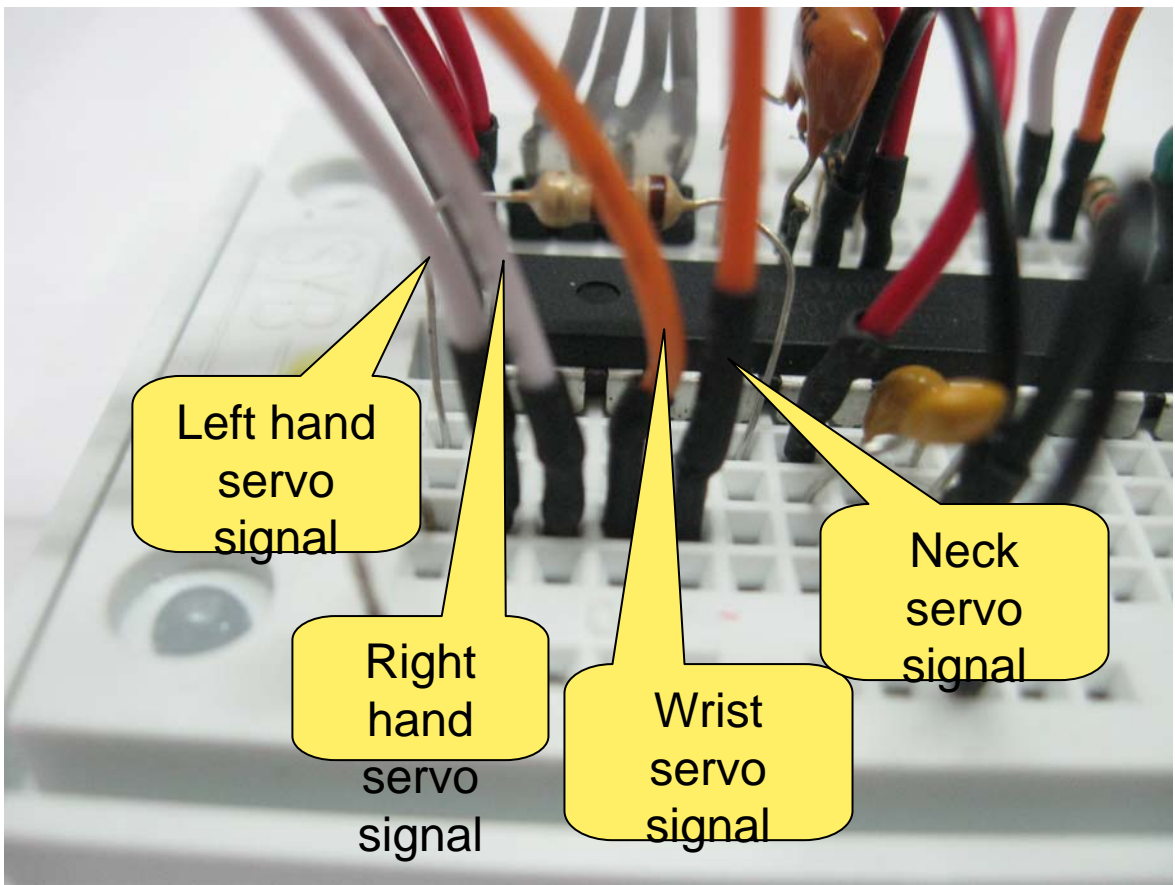


Insert 4pcs black jumper cable in X, as servo GND cables.





Pin15、 16、 17、 18 of the processor, insert 4pcs jumper cable as servo signal cables.

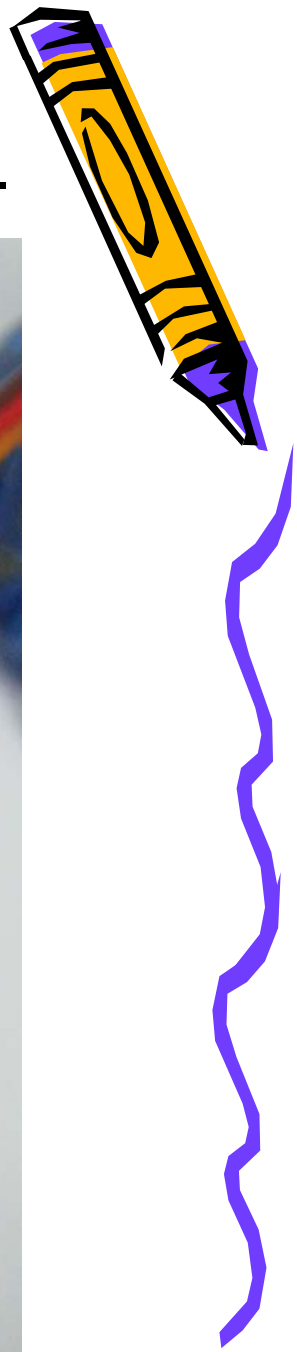
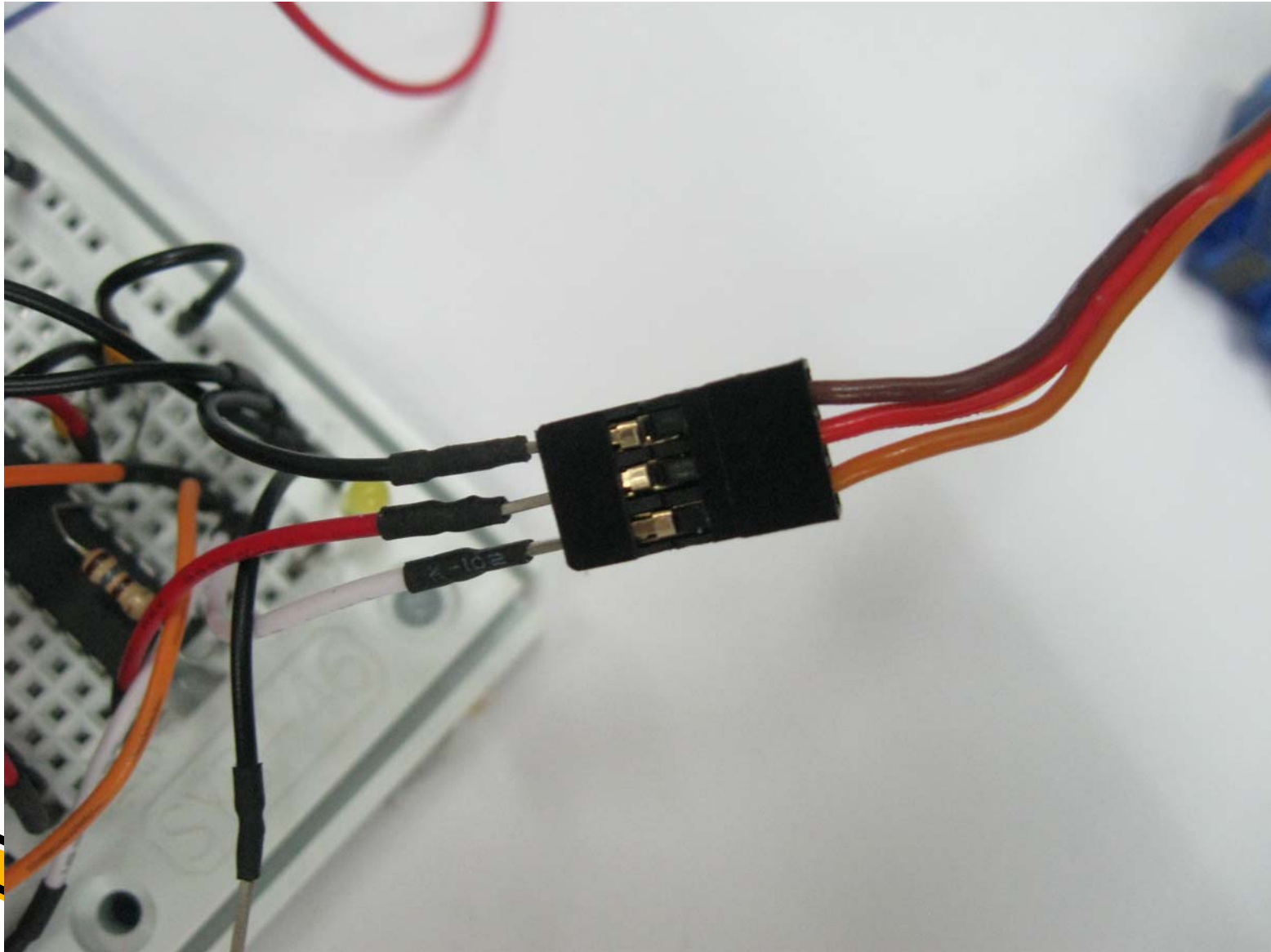


(RESET) PC6	<input type="checkbox"/>	1	<input type="checkbox"/>	28	PC5 (ADC5/SCL)
(RXD) PD0	<input type="checkbox"/>	2	<input type="checkbox"/>	27	PC4 (ADC4/SDA)
(TXD) PD1	<input type="checkbox"/>	3	<input type="checkbox"/>	26	PC3 (ADC3)
(INT0) PD2	<input type="checkbox"/>	4	<input type="checkbox"/>	25	PC2 (ADC2)
(INT1) PD3	<input type="checkbox"/>	5	<input type="checkbox"/>	24	PC1 (ADC1)
(XCK/T0) PD4	<input type="checkbox"/>	6	<input type="checkbox"/>	23	PC0 (ADC0)
VCC	<input type="checkbox"/>	7	<input type="checkbox"/>	22	GND
GND	<input type="checkbox"/>	8	<input type="checkbox"/>	21	AREF
(XTAL1/TOSC1) PB6	<input type="checkbox"/>	9	<input type="checkbox"/>	20	AVCC
(XTAL2/TOSC2) PB7	<input type="checkbox"/>	10	<input type="checkbox"/>	19	PB5 (SCK)
(T1) PD5	<input type="checkbox"/>	11	<input type="checkbox"/>	18	PB4 (MISO)
(AIN0) PD6	<input type="checkbox"/>	12	<input type="checkbox"/>	17	PB3 (MOSI/OC2)
(AIN1) PD7	<input type="checkbox"/>	13	<input type="checkbox"/>	16	PB2 (SS/OC1B)
(ICP1) PB0	<input type="checkbox"/>	14	<input type="checkbox"/>	15	PB1 (OC1A)

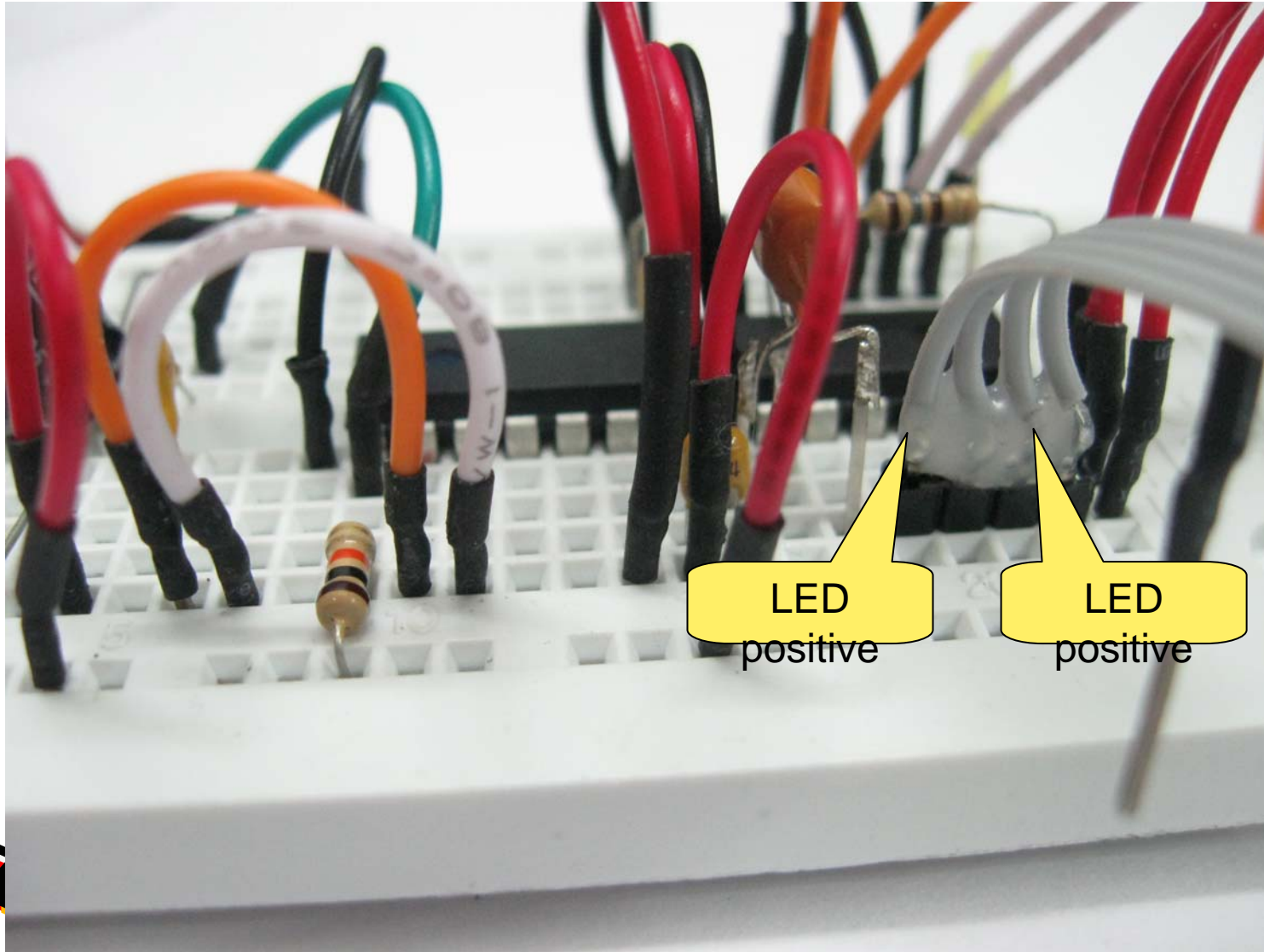
Atmega8



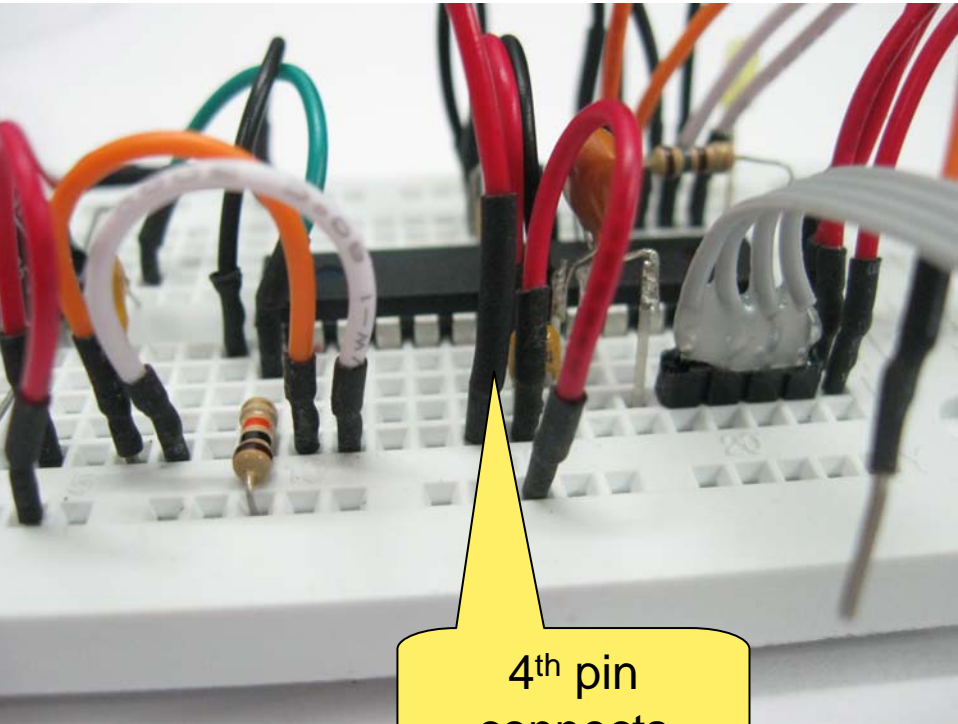
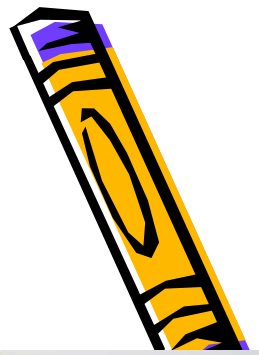
Servo white pin is signal, red is VCC, black is GND.



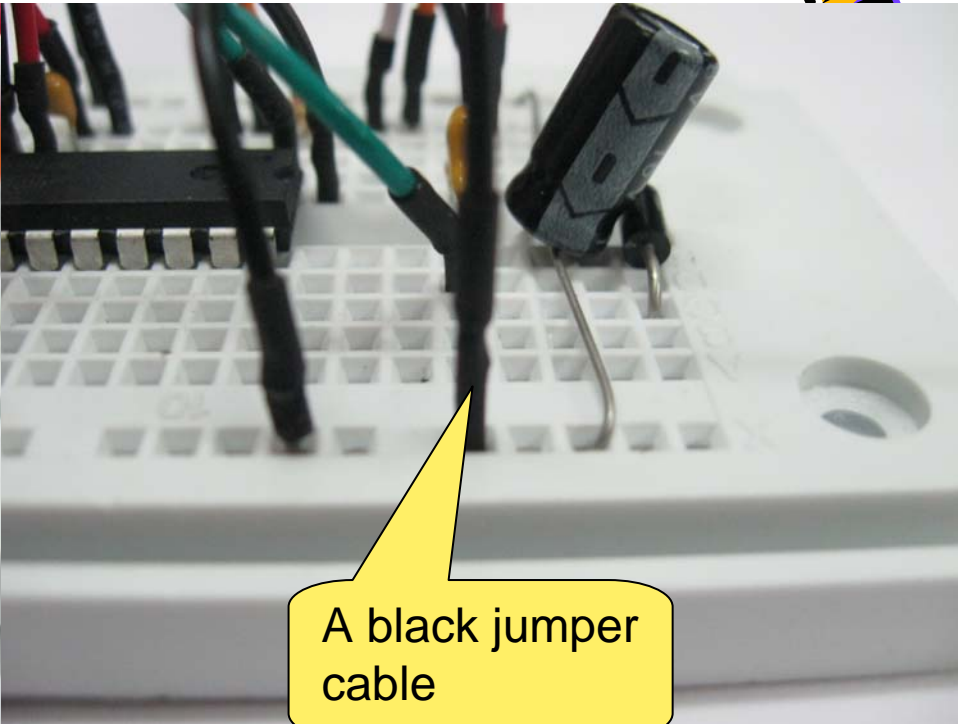
The 4 pins in 23、 24、 25、 26 connects to EYE LED pins.



4th pin connects speaker, use a red jumper to connect
Connect one black jumper cable in X, and connect to
the other pin of speaker.



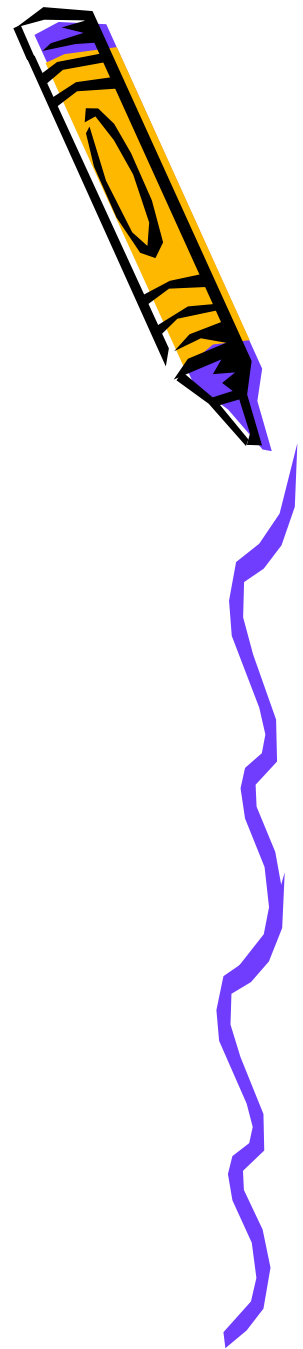
4th pin
connects
speaker



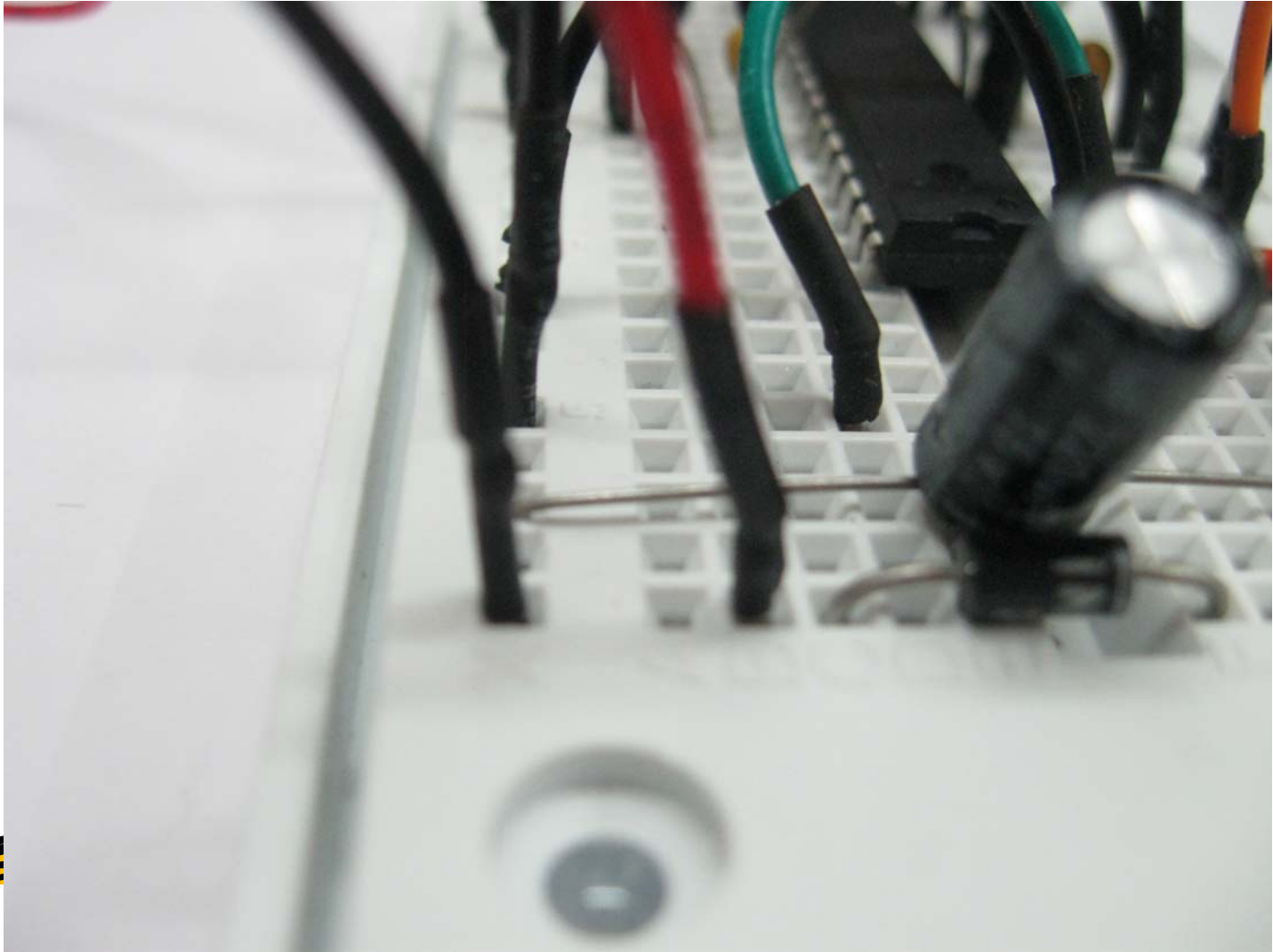
A black jumper
cable
connects to
the other pin
of speaker.



The red cable is positive



Battery box: Red cable connects in (1, B) , black cable connects to X



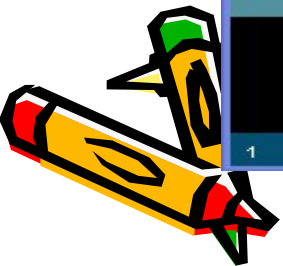
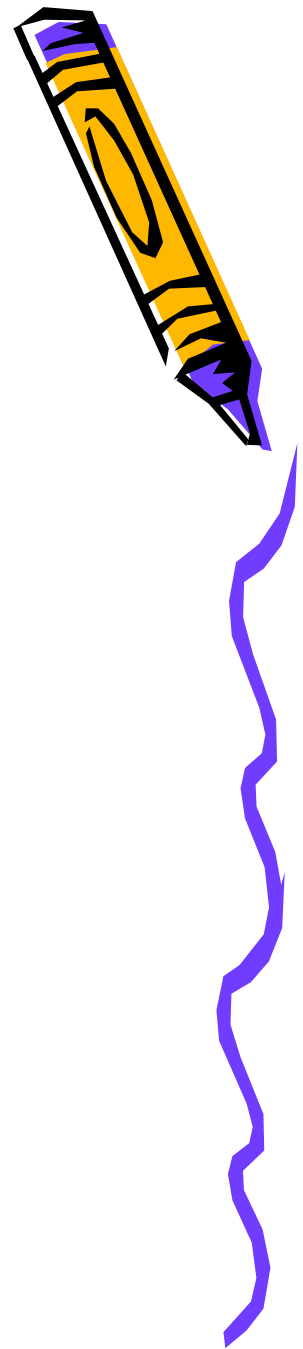
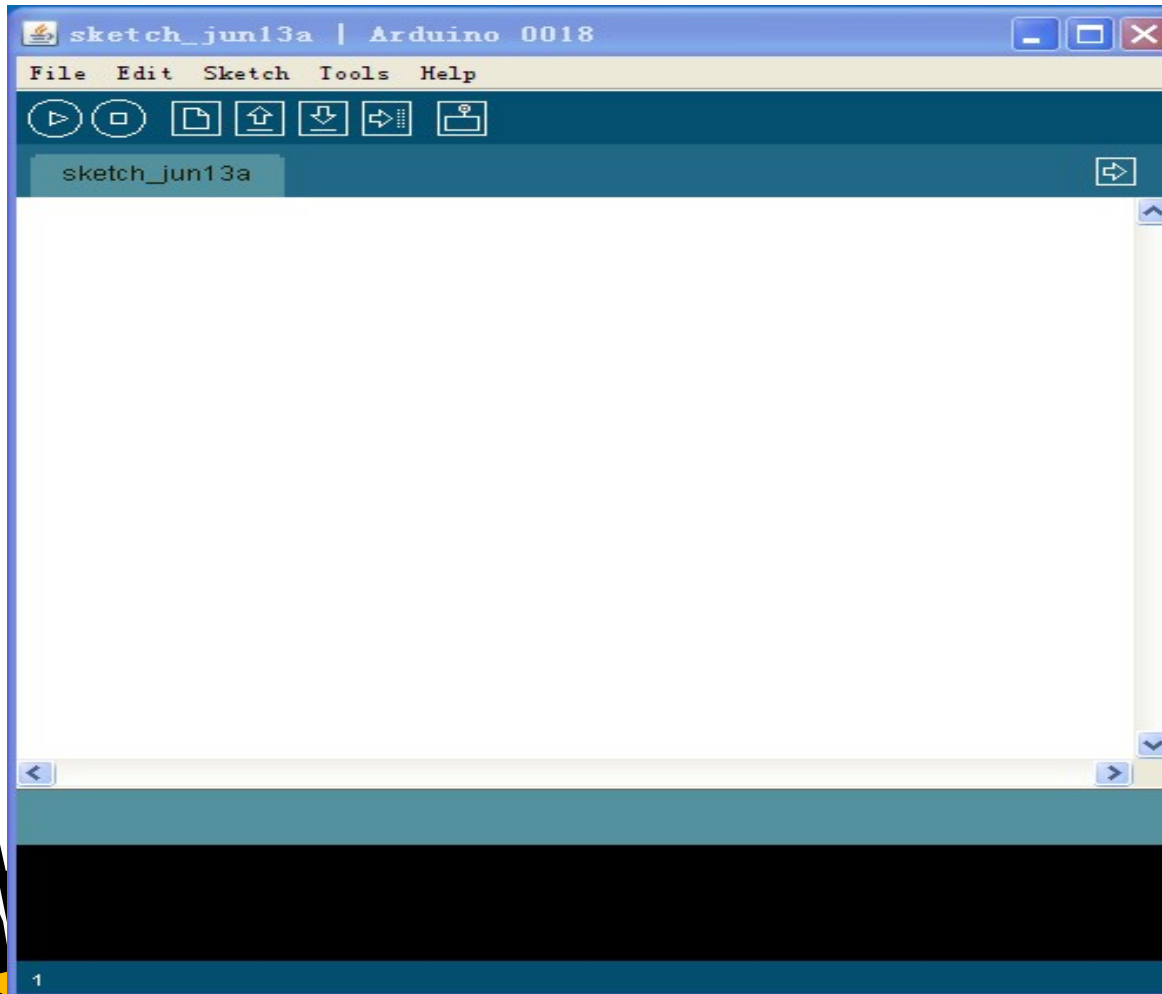
arduino

- Click www.arduino.cc to download arduino software.
- Arduino is a free software with free source code schematic diagram.



Open arduino

This is arduino.



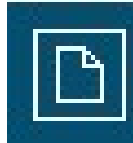
Functions of each buttons



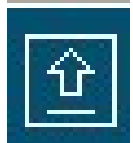
compile



stop



new



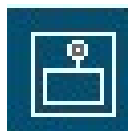
open



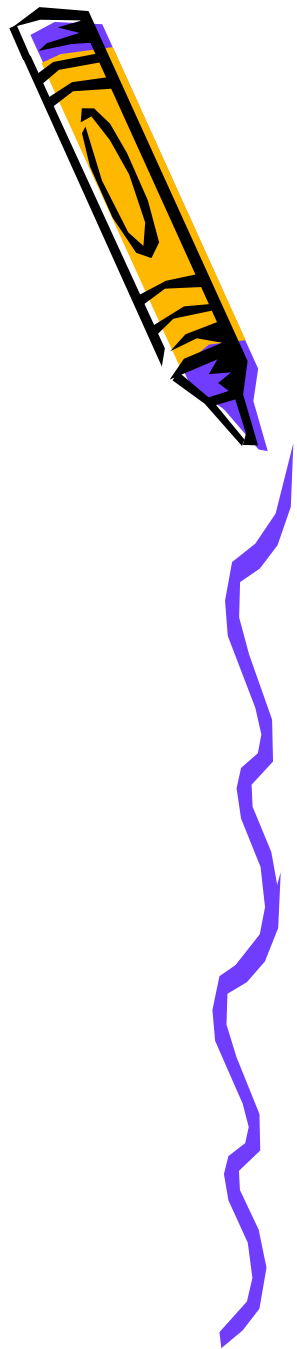
save



upload

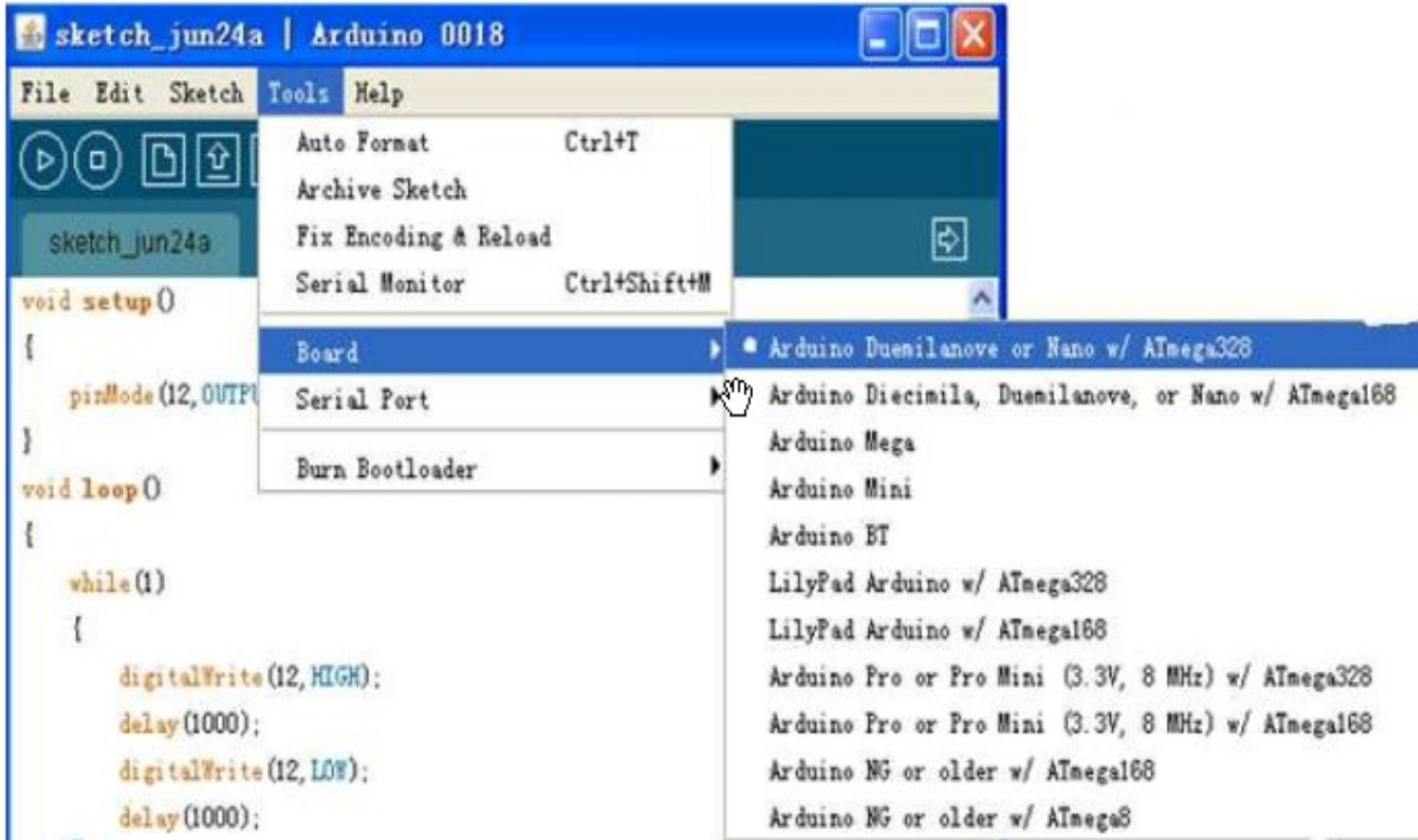


Serial monitor

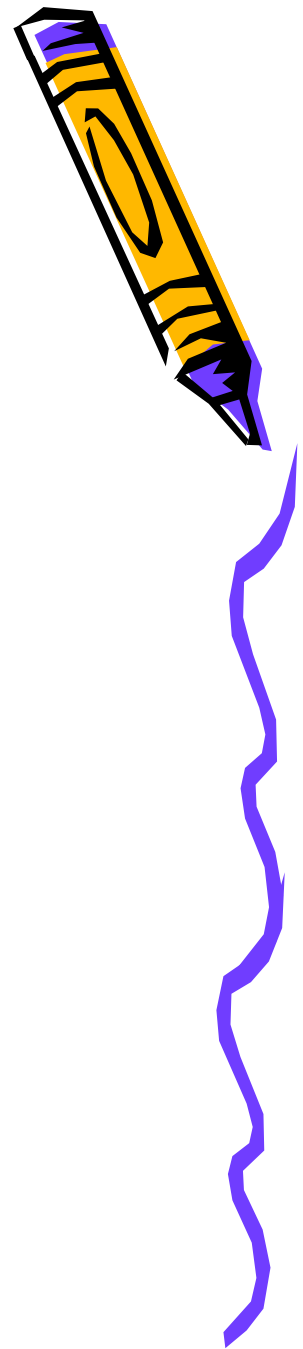


• Select Tools->Board

We use ATmega8



Then let's go to next step to program.

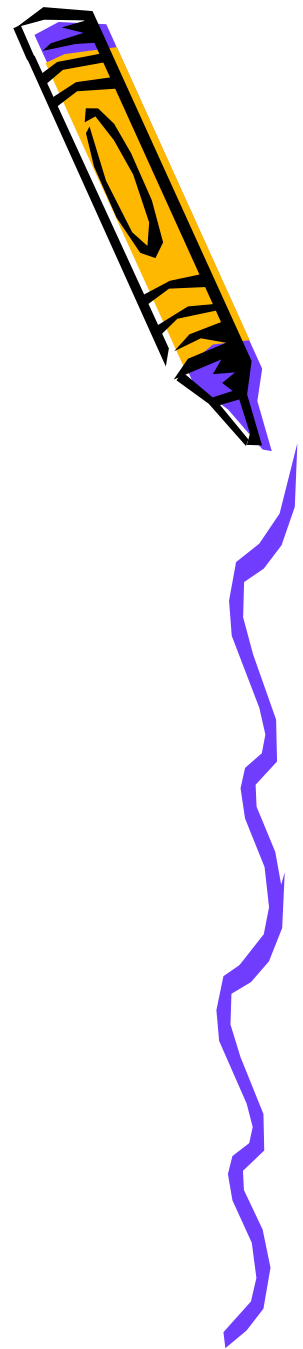


- Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments.
- Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller on the board is programmed using the [Arduino programming language](#) (based on [Wiring](#)) and the Arduino development environment (based on [Processing](#)). Arduino projects can be stand-alone or they can communicate with software running on a computer (e.g. Flash, Processing, MaxMSP).

First let's light up the EYE.

```
#include<Servo.h>

Void setup()
{
    pinMode(5,OUTPUT);
    pinMode(6,OUTPUT);
    pinMode(7,OUTPUT);
    pinMode(8,OUTPUT);
}
```

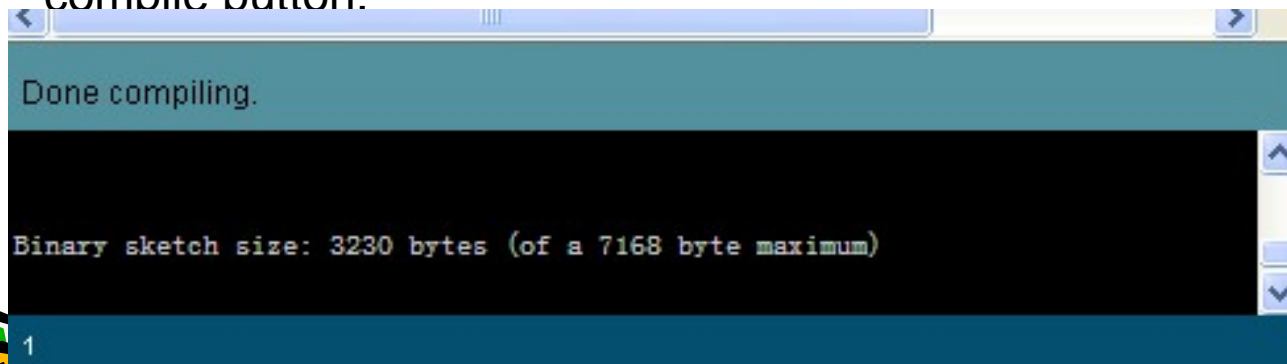




```
digitalWrite(5,1); //  
digitalWrite(6,0); //  
digitalWrite(7,1);  
digitalWrite(8,0);  
}
```

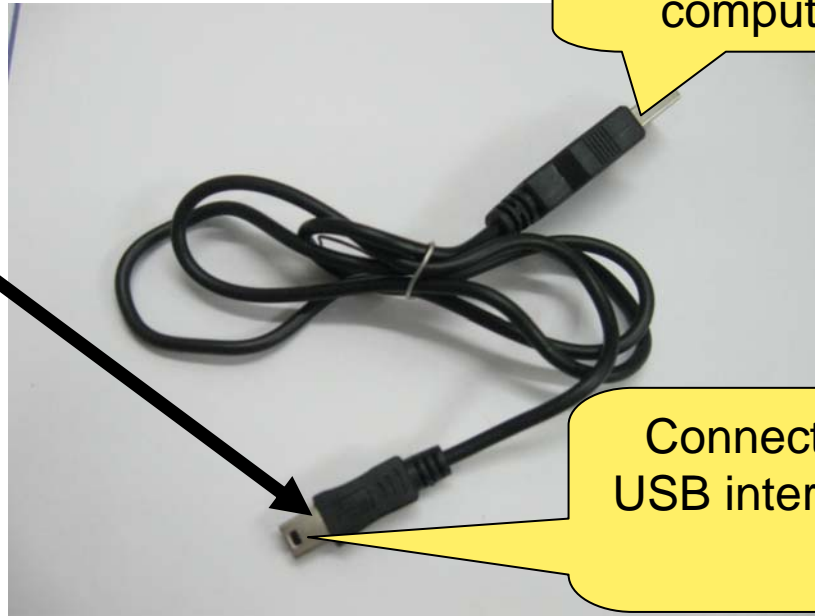
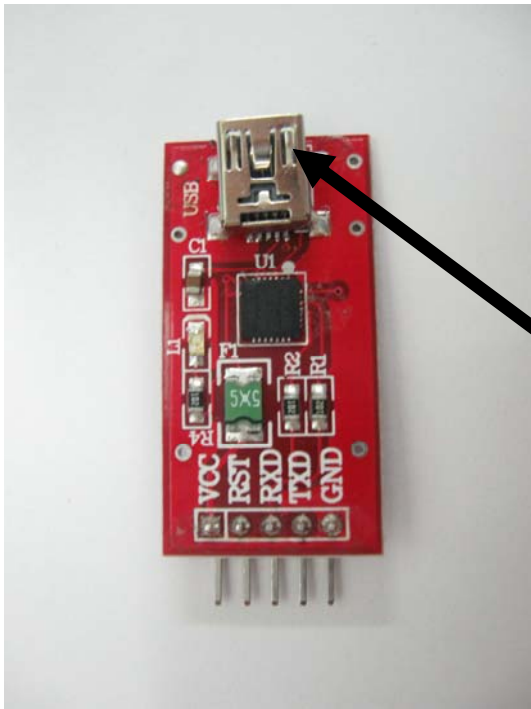
```
void loop()  
{  
}
```

After compiling, then press
compile button.



When you see Done compiling, it means the program is good, it finish compiling.



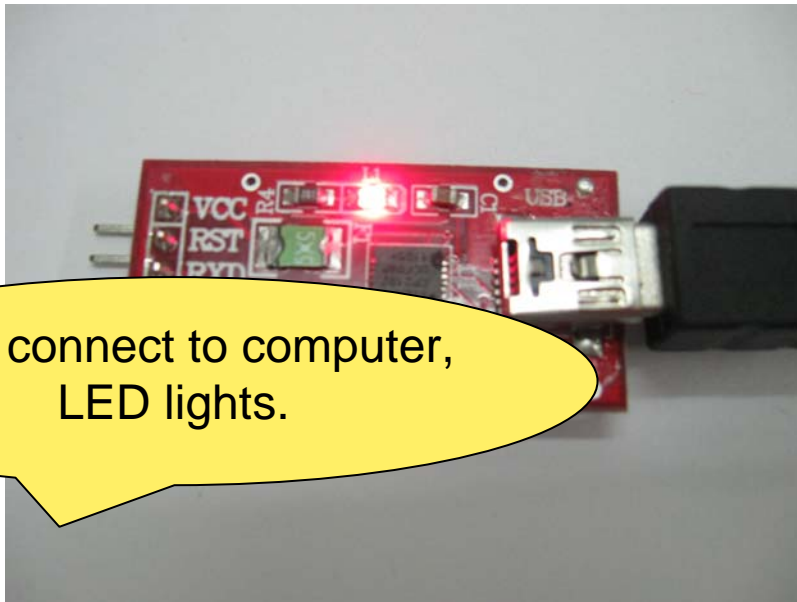


Connect to computer

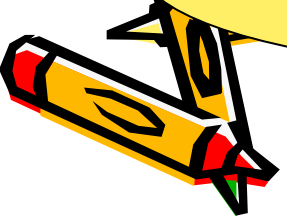
Connect to USB interface

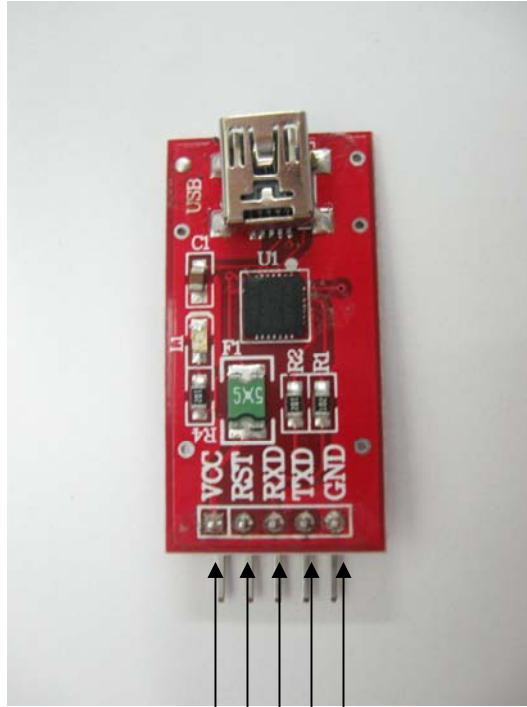
USB cable

Programming board

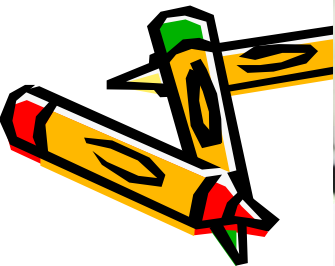
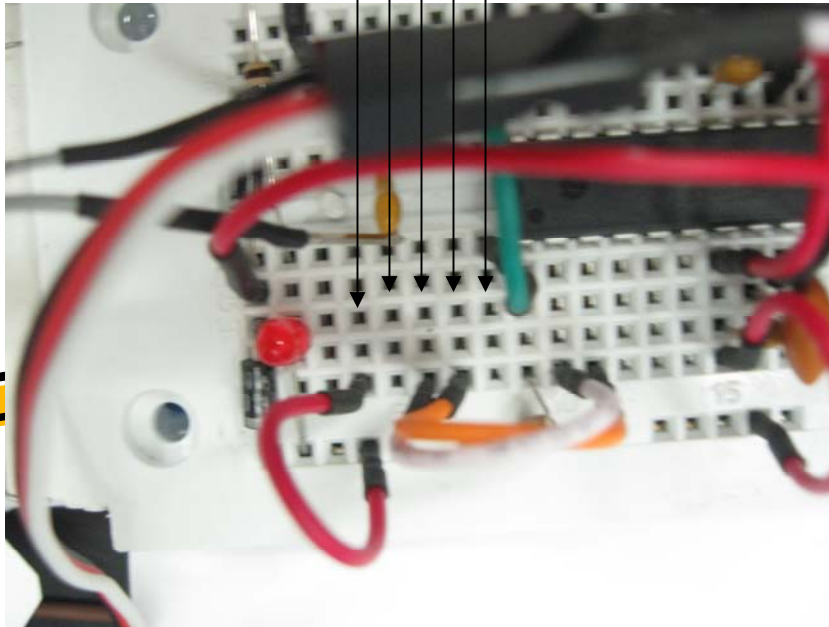


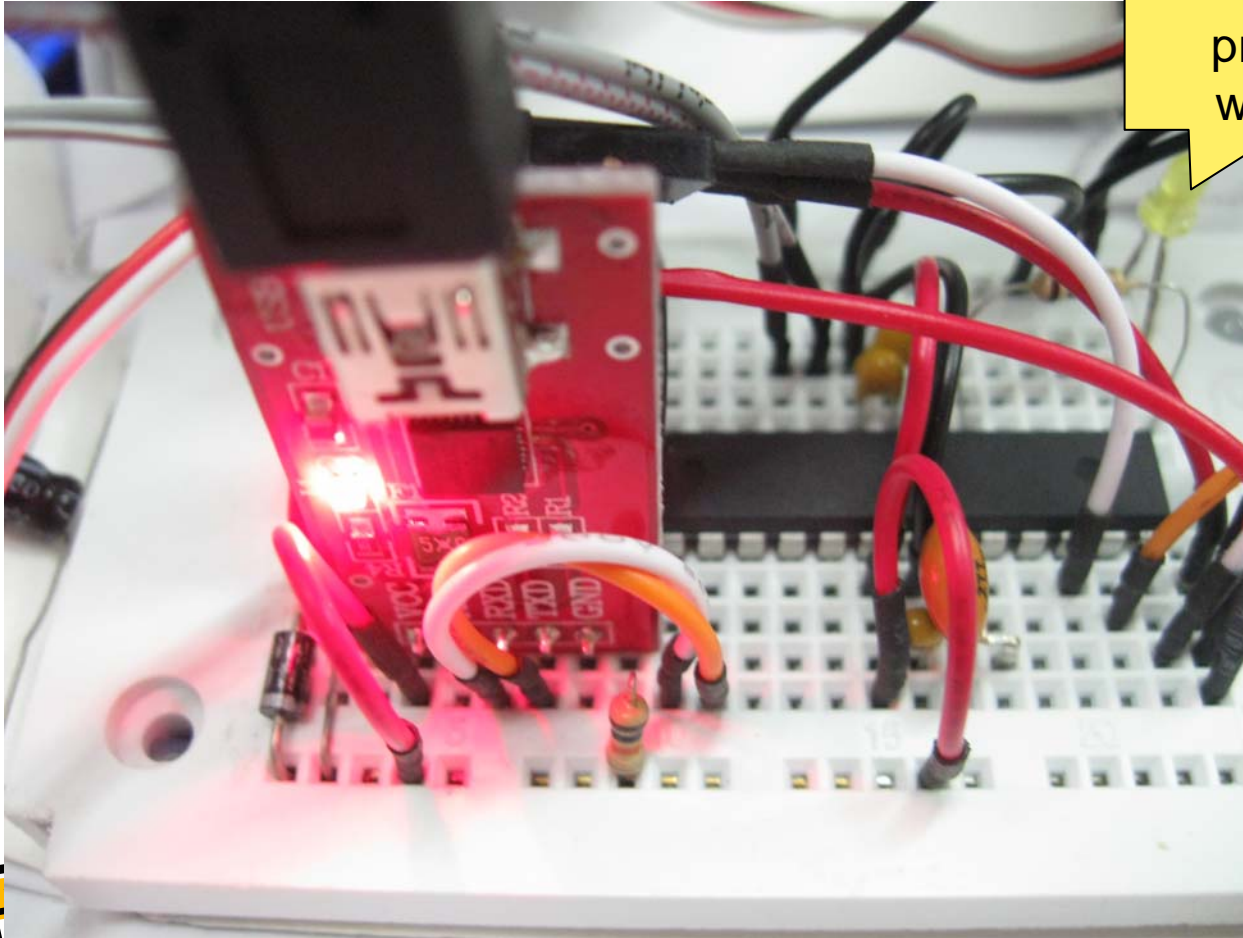
After connect to computer, LED lights.



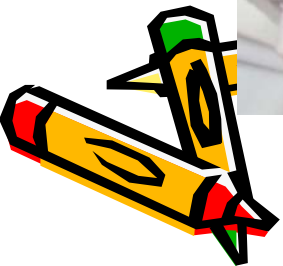


Insert program board in the breadboard, start from VCC, 4、5、6、7、8 in I.

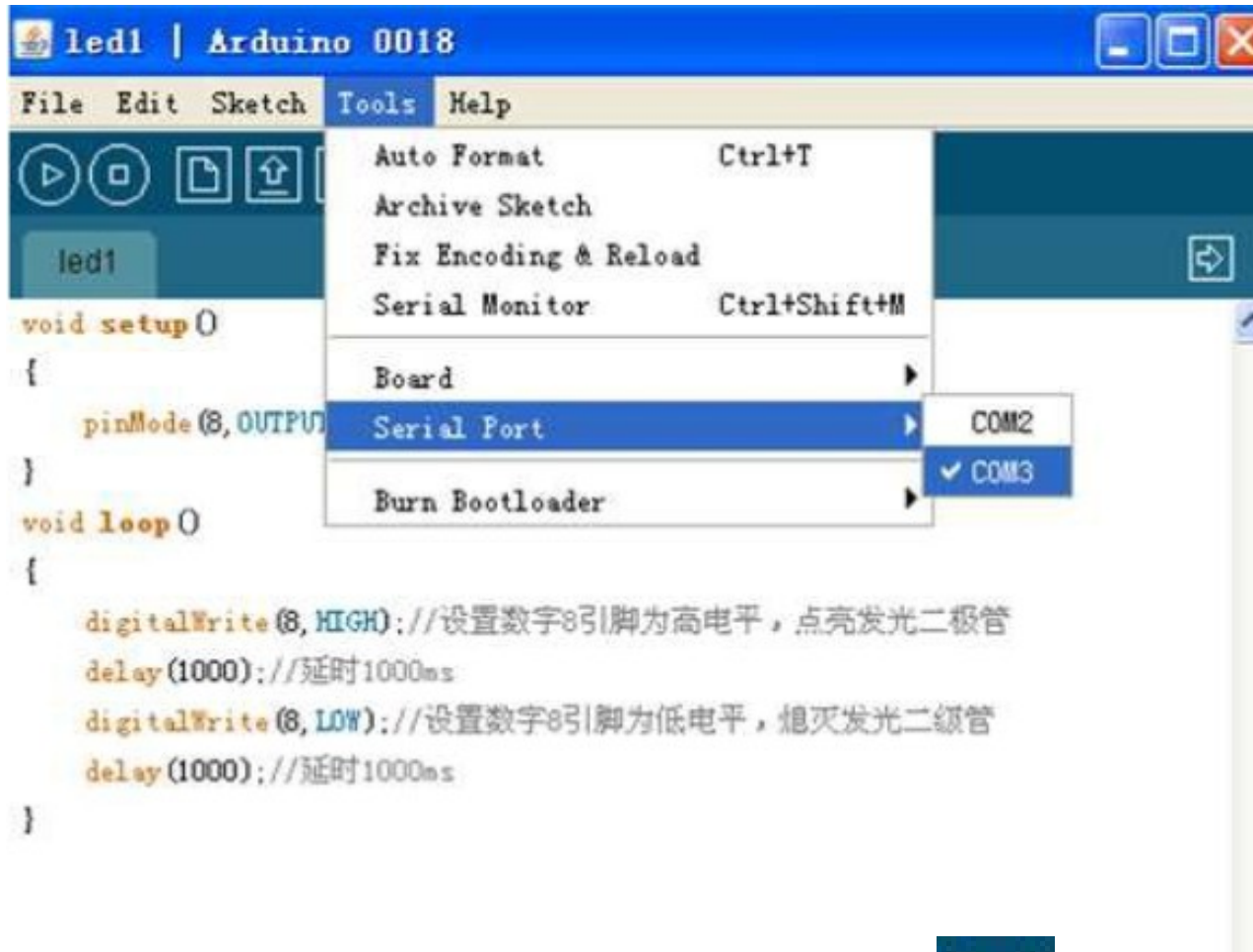




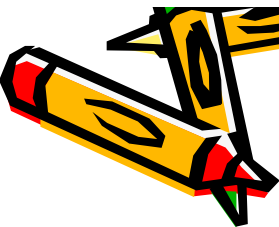
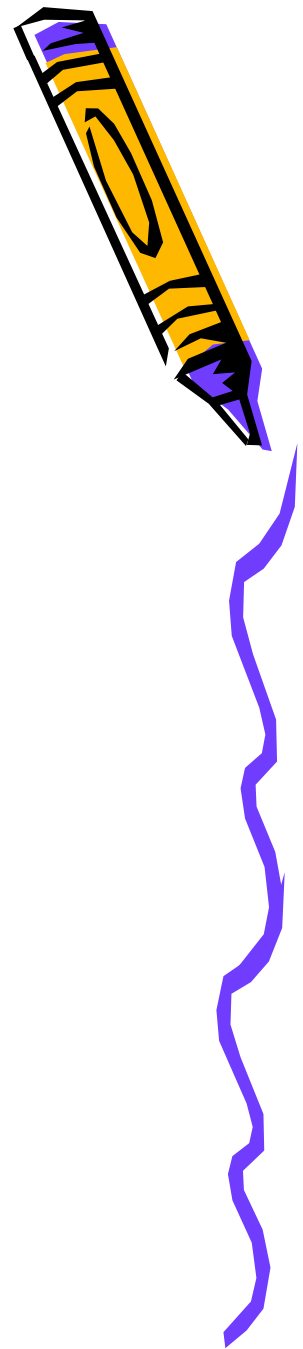
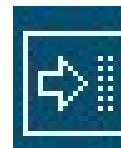
LED flash, it means processor works ok.

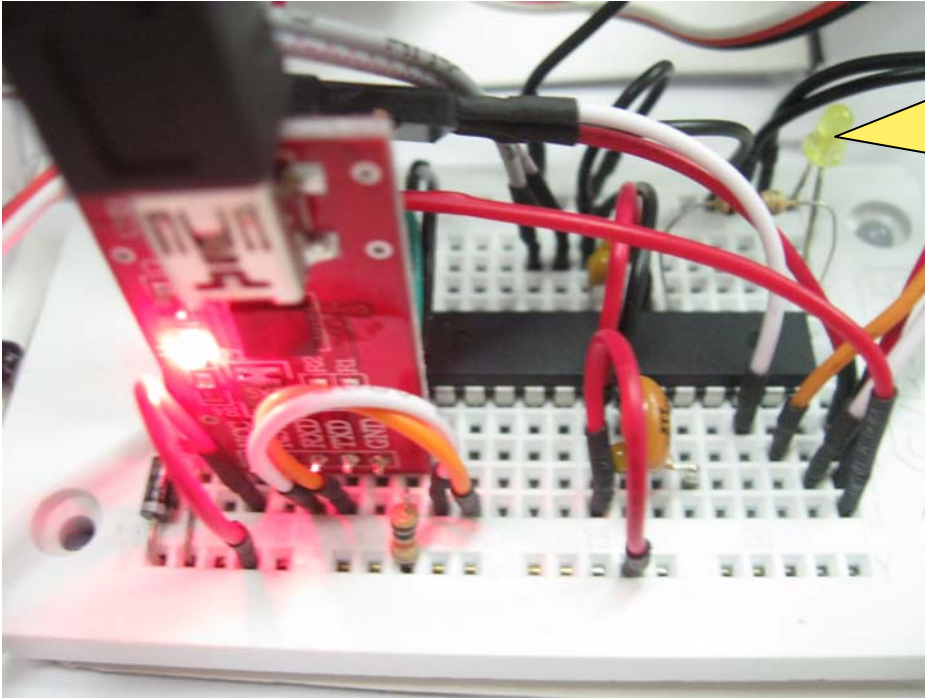


Click Tools->Serial Port



After selecting COM, press this button





When programming, LED keeps flashing until it finish programming.

After finish, you will see Done uploading, it means it success in downloading program.



```
Done uploading.  
Binary sketch size: 3230 bytes (of a 7168 byte maximum)
```

1



Let's study servo program

```
//  
int ld = 1;  
int rd = 5;  
int bd = 3;  
int hd = 3;
```

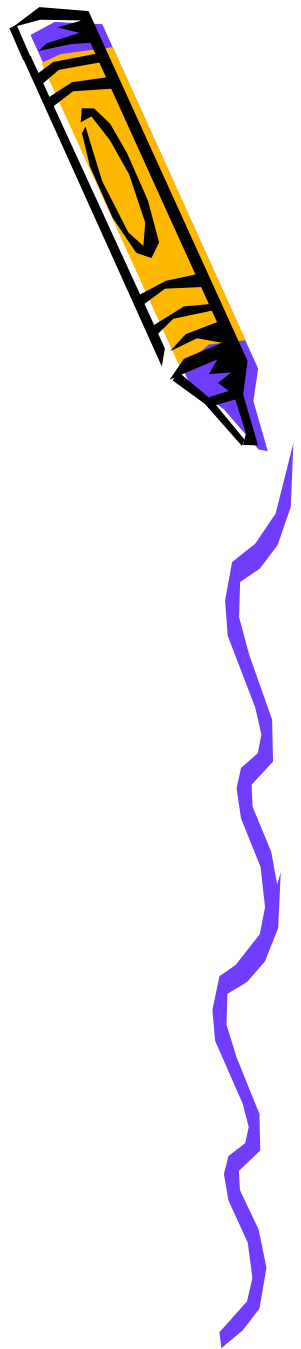
definition

```
int lp = 1500;  
int rp = 1500;  
int bp = 1500;  
int hp = 1500;  
//Servo svl;  
Servo svr;  
Servo svb;  
Servo svh;
```

Servo data



```
void setup()  
{  
    svl.attach(9,800,2200); 800-2200  
    svr.attach(10,800,2200);  
    svb.attach(11,800,2200);  
    svh.attach(12,800,2200);  
  
    pinMode(5,OUTPUT); pinMode(6,OUTPUT);  
    pinMode(7,OUTPUT);  
    pinMode(8,OUTPUT);  
  
}
```



```
void loop()
```

```
{
```

```
  lp+=ld;
```

```
  rp+=rd;
```

```
  bp+=bd;
```

```
  hp+=hd;
```

```
  if(lp<1000 || lp>2000) ld=-ld;
```

```
  if(rp<1400 || rp>1600) rd=-rd;
```

```
  if(bp<800 || bp>2200) bd=-bd;
```

```
  if(hp<800 || hp>2200) hd=-hd;
```

```
  svl.writeMicroseconds(lp);
```

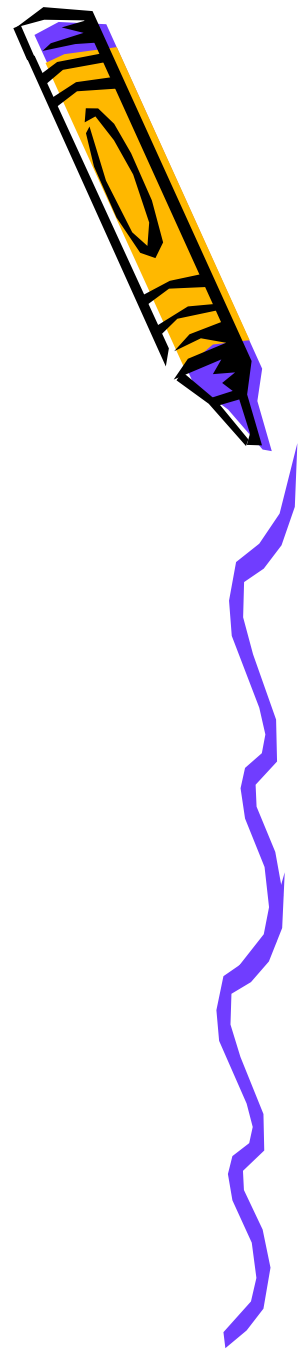
```
  svr.writeMicroseconds(rp);
```

```
  svb.writeMicroseconds(bp);
```

```
  svh.writeMicroseconds(hp);
```

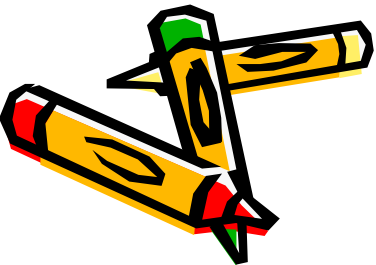
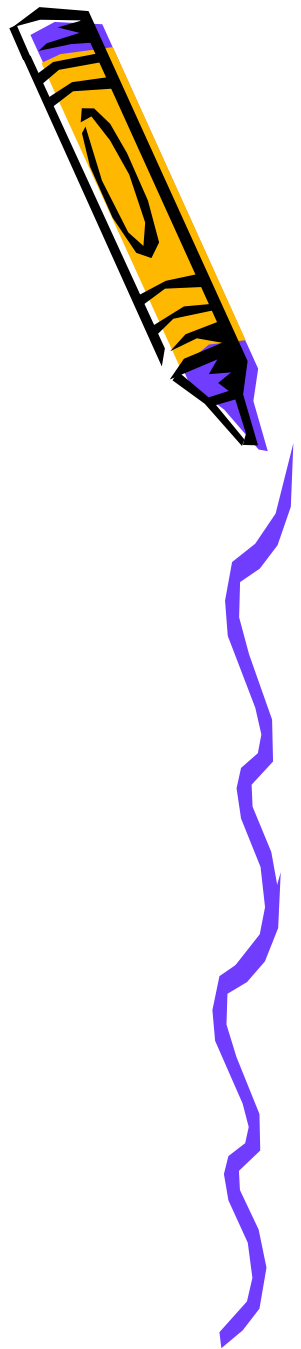
```
  delay (15);
```

```
}
```



Speaker program

```
void setup()
{
  pinMode(5,OUTPUT);
  int melody[] = {
    262,196,196,220,196,1,247,262  };
  int noteDurations[] = {
    4,8,8,4,4,4,4,4  };
  for (byte Note = 0; Note < 8; Note++)      //
  {
    long pulselength = 1000000/melody[Note];
    long noteDuration = 1000/noteDurations[Note];
    long pulses=noteDuration*1000/pulselength;
    if (pulselength>100000)                  // {
      delay(noteDuration);
    }
  }
}
```



```
else
{
  for(int p=0;p<pulses;p++)    //
  {
    digitalWrite(4,HIGH);
    delayMicroseconds(pulselength/2);
    digitalWrite(4,LOW);
    delayMicroseconds(pulselength/2);
  }
  int pauseBetweenNotes = noteDuration * 0.30;
  delay(pauseBetweenNotes);
}
}
```

