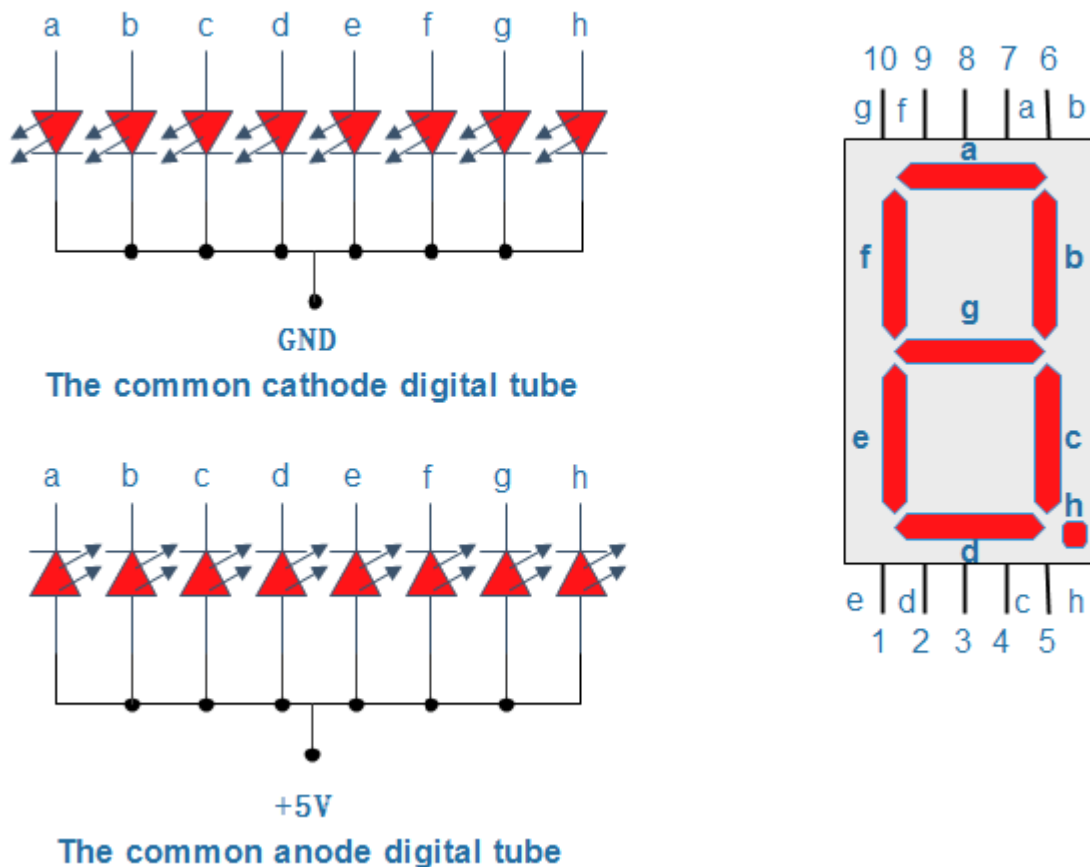


## 7-segment digital tube display experiment

### Introduction of 7-Segment digital tube

Nixie tube is a semiconductor light emitting element, and its basic unit is a light-emitting diode. According to the number of segment, Nixie tube is divided into seven-segment tube and eight-segment tube. Eight-segment tube has one more light-emitting diode unit (one more a decimal point) segment than seven-segment tube. We will use eight-segment tube in this experiment. Light-emitting diode unit can be divided into common anode digital tube and common cathode digital tube according to the connection mode. The common anode digital tube refers to all anodes of a light-emitting linking to +5 v. When the cathode of any one segment of light emitting diode is low level, the corresponding segment will light up; when the cathode is high level, the segment stays unlighted. The common cathode digital tube refers to all cathodes of a light-emitting linking to GND. When the anode of any one segment of light emitting diode is high level, the corresponding segment will light up, when the anode is low level, the segment stays unlighted as well. We used the common anode digital tube in this experiment



Each segment of a Nixie tube is composed of light emitting diode, so to display different numbers, the principle is that the corresponding LEDs are lit up. Say we want to display Number 0, that means “abcdef” is lightened and the other are turned out, so that we only need to see the corresponding the truth table of displayed number.

## Digital tube truth number table

共阴	dp	g	f	e	d	c	b	a	编码
a	0	1	1	1	0	1	1	1	0x77
b	0	1	1	1	1	1	0	0	0x7C
c	0	0	1	1	1	0	0	1	0x39
d	0	1	0	1	1	1	1	0	0x5E
e	0	1	1	1	1	0	0	1	0x79
f	0	1	1	1	0	0	0	1	0x71
g	0	0	1	1	1	1	0	1	0x3D
h	0	1	1	1	0	1	1	0	0x76
i	0	0	0	1	0	0	0	0	0x10
j	0	0	0	1	1	1	1	0	0x1E
k	0	1	1	1	1	0	1	0	0x7A
l	0	0	1	1	1	0	0	0	0x38
m	0	1	0	1	0	1	0	1	0x55
n	0	1	0	1	0	1	0	0	0x54
o	0	1	0	1	1	1	0	0	0x5C
p	0	1	1	1	0	0	1	1	0x73
q	0	1	1	0	0	1	1	1	0x67
r	0	1	0	1	0	0	0	0	0x50
s	0	1	1	0	0	1	0	1	0x65
t	0	1	1	1	1	0	0	0	0x78
u	0	0	1	1	1	1	1	0	0x3E
v	0	1	1	1	1	1	1	0	0x7E
w	0	0	0	1	1	1	0	1	0x1D
x	0	1	1	0	1	0	1	0	0x6A
y	0	1	1	0	1	1	1	0	0x6E
z	0	1	0	0	1	0	0	1	0x49
1	0	0	0	0	0	1	1	0	0x06
2	0	1	0	1	1	0	1	1	0x5B
3	0	1	0	0	1	1	1	1	0x4F
4	0	1	1	0	0	1	1	0	0x66
5	0	1	1	0	1	1	0	1	0x6D
6	0	1	1	1	1	1	0	1	0x7D
7	0	0	1	0	0	1	1	1	0x27

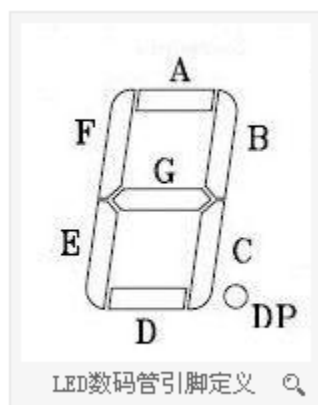
共阳	dp	g	f	e	d	c	b	a	编码
a	1	0	0	0	1	0	0	0	0x88
b	1	0	0	0	0	0	1	1	0x83
c	1	1	0	0	0	1	1	0	0xC6
d	1	0	1	0	0	0	0	1	0xA1
e	1	0	0	0	0	1	1	0	0x86
f	1	0	0	0	1	1	1	0	0x8E
g	1	1	0	0	0	0	1	0	0xC2
h	1	0	0	0	1	0	0	1	0x89
i	1	1	1	0	1	1	1	1	0xEF
j	1	1	1	0	0	0	0	1	0xE1
k	1	0	0	0	0	1	0	1	0x85
l	1	1	0	0	0	1	1	1	0xC7
m	1	0	1	0	1	0	1	0	0xAA
n	1	0	1	0	1	0	1	1	0xAB
o	1	0	1	0	0	0	1	1	0xA3
p	1	0	0	0	1	1	0	0	0x8C
q	1	0	0	1	1	0	0	0	0x98
r	1	0	1	0	1	1	1	1	0xAF
s	1	0	0	1	1	0	1	0	0x9A
t	1	0	0	0	0	1	1	1	0x87
u	1	1	0	0	0	0	0	1	0xC1
v	1	0	0	0	0	0	0	1	0x81
w	1	1	1	0	0	0	1	0	0xE2
x	1	0	0	1	0	1	0	1	0x95
y	1	0	0	1	0	0	0	1	0x91
z	1	0	1	1	0	1	1	0	0xB6
1	1	1	1	1	1	0	0	1	0xF9
2	1	0	1	0	0	1	0	0	0xA4
3	1	0	1	1	0	0	0	0	0xB0
4	1	0	0	1	1	0	0	1	0x99
5	1	0	0	1	0	0	1	0	0x92
6	1	0	0	0	0	0	1	0	0x82
7	1	1	0	1	1	0	0	0	0xD8

8	0	1	1	1	1	1	1	1	0x7F
9	0	1	1	0	1	1	1	1	0x6F
0	0	0	1	1	1	1	1	1	0x3F

8	1	0	0	0	0	0	0	0	0x80
9	1	0	0	1	0	0	0	0	0x90
0	1	1	0	0	0	0	0	0	0xC0

七段数码管英文字符表示

显示	意义	显示	意义	显示	意义
	A		M		Y
	B		N		Z
	C		O		1
	D		P		2
	E		Q		3
	F		R		4
	G		S		5
	H		T		6
	I		U		7
	J		V		8
	K		W		9
	L		X		0



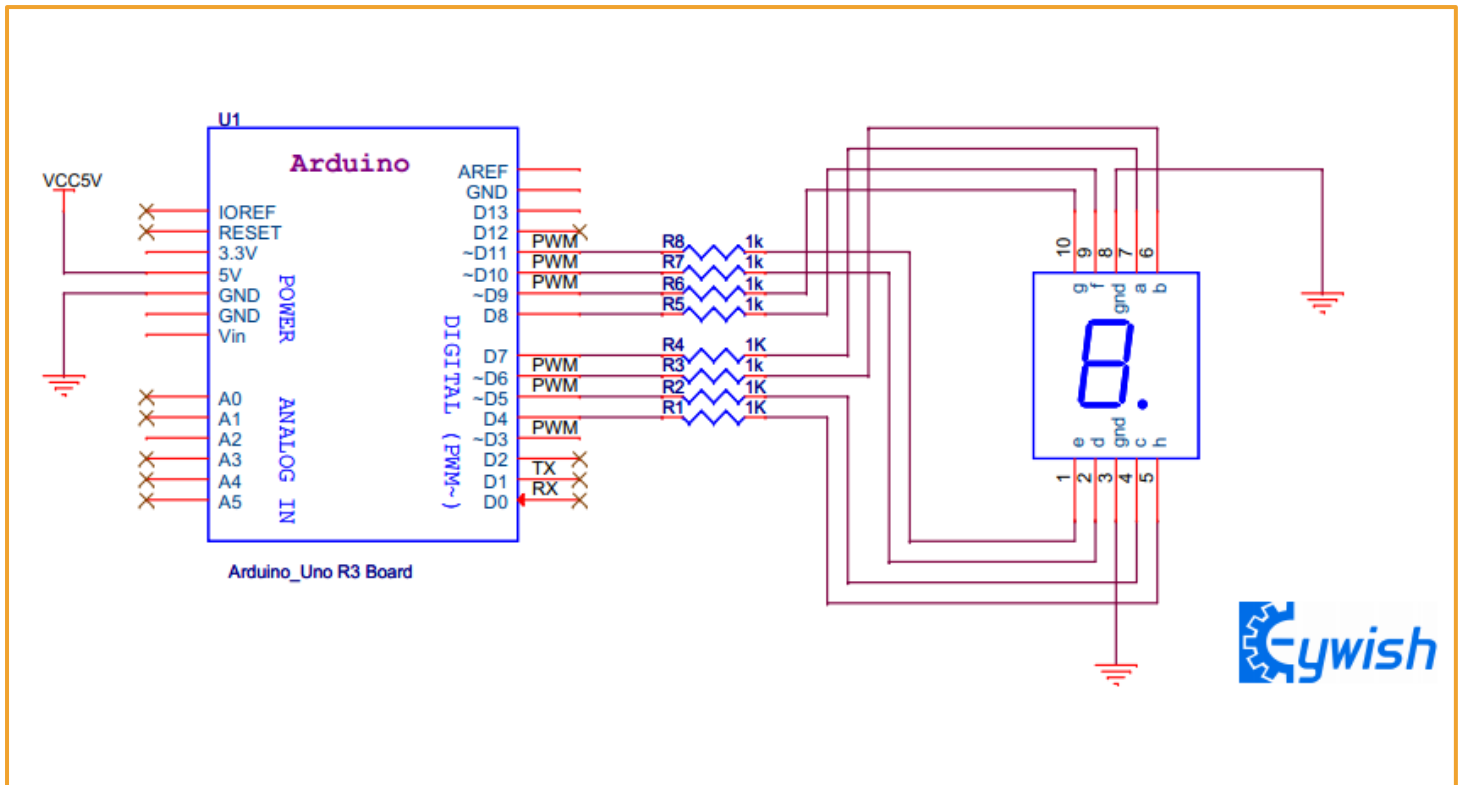
## Experiment Purpose

Display Numbers 0-9 on eight-segment tube.

## Component List

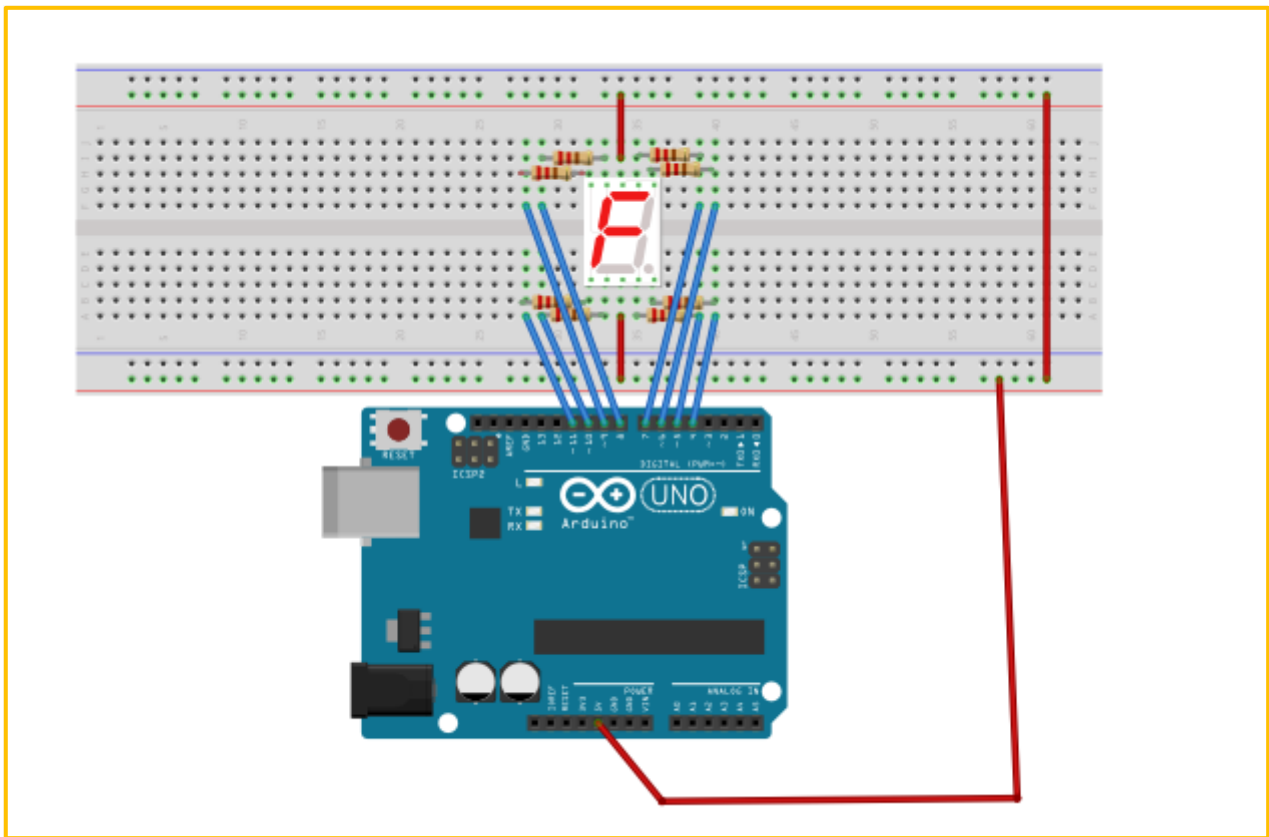
- ◆ Keywish Arduino Uno R3 mainboard
- ◆ Breadboard
- ◆ USB cable
- ◆ 7-segment nixie tube\*1
- ◆ 1kΩ Resistor\*8
- ◆ Several breadboard jumpers

## Schematic Diagram



## Wiring

Arduino Uno R3	七段数码管
7	7 (a)
6	6 (b)
5	4 (c)
10	2 (d)
11	1 (e)
8	9 (f)
9	10 (g)
4	5 (h)
VCC	8 (commom)
VCC	3 (commom)



The seven-segment digital tube has seven segments for displaying Numbers and one for the decimal point. When we want to display Numbers on the tube, we just lighten the corresponding segment. For example, if we want to display the number 1, "b" and "c" will lighten.

## The experiment purpose

Using Arduino mainboard to control the digital tube to display the serial port input Numbers;

## Code

```
#include "SegmentDisplay.h"

#define LED_A 7 // define Arduino GPIO7 for led a
#define LED_B 6 // define Arduino GPIO6 for led b
#define LED_C 5 // define Arduino GPIO5 for led c
#define LED_D 10 // define Arduino GPIO11 for led d
#define LED_E 11 // define Arduino GPIO10 for led e
#define LED_F 8 // define Arduino GPIO8 for led f
#define LED_G 9 // define Arduino GPIO9 for led g
#define LED_H 4 // define Arduino GPIO4 for led h

SegmentDisplay _7SegmentDisplay(LED_A, LED_B, LED_C, LED_D, LED_E, LED_F, LED_G, LED_H);

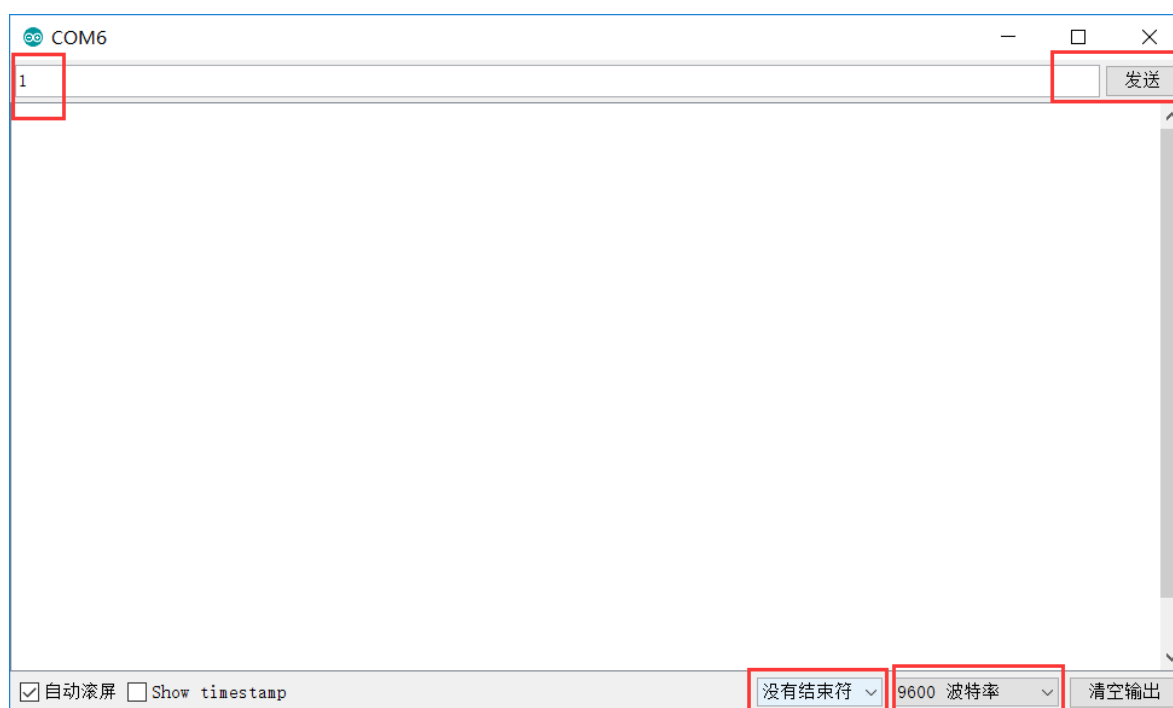
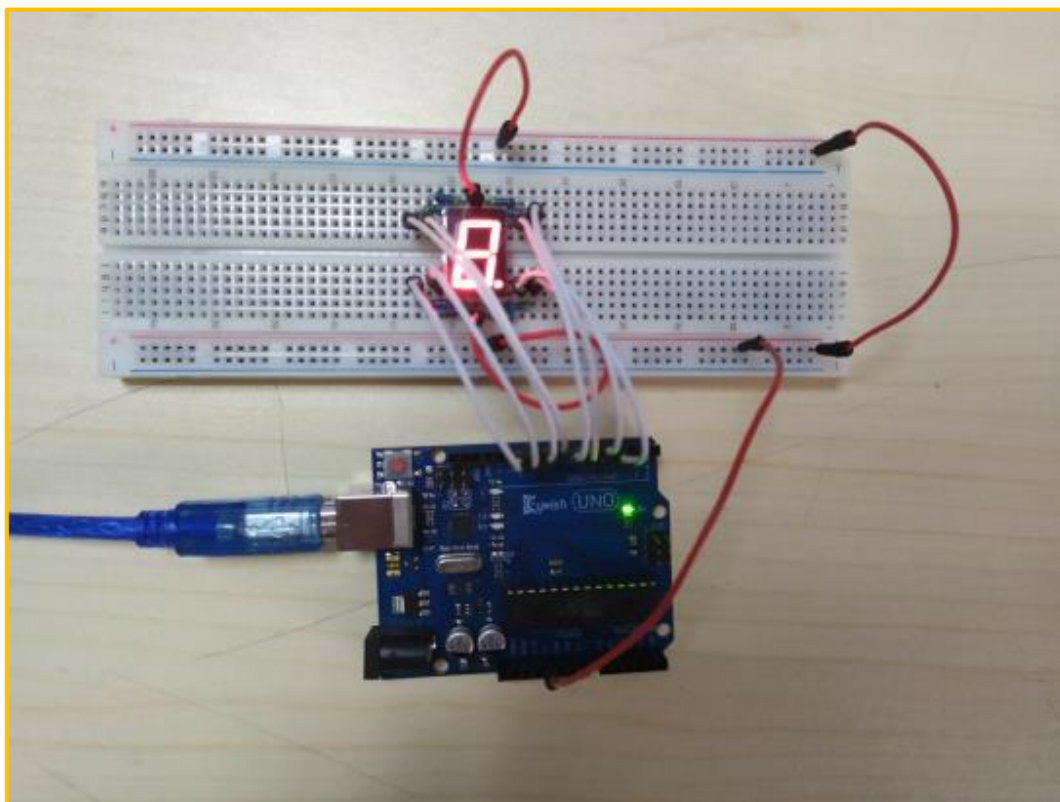
byte value;

void setup()
{
    Serial.begin(9600);
    _7SegmentDisplay.TurnOffAllLed();
}

void loop()
{
    //Serial.println("please input display char \n");
    while (Serial.available()) //确定是否接收到数据 Determine whether the serial data
    {
        value = Serial.parseInt();
        Serial.println(value);
        _7SegmentDisplay.TurnOffAllLed();
        _7SegmentDisplay.DisplayChar(value);
    }
    delay(5);
}
```

## Experiment result

It should be a no-character type. We type in a number and it will show up on our nixie tube.



## Mblock programming program

Mblock wrote 7-Segment Display program as shown in the figure below:

7\_Segment Off

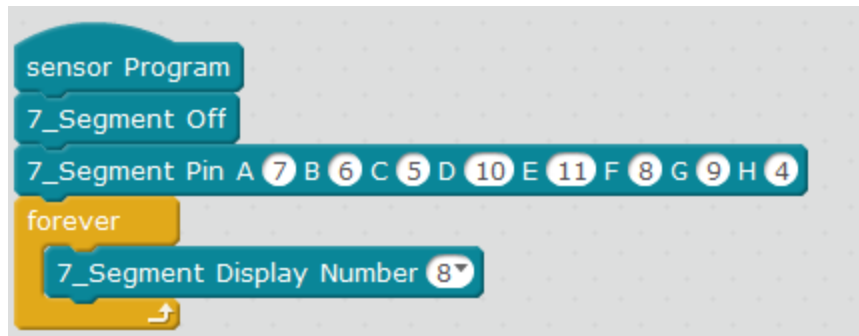
-- Set the initial state of digital tube extinction

7\_Segment Pin A 7 B 6 C 5 D 10 E 11 F 8 G 9 H 4

---Set the control pin of the nixie tube

7\_Segment Display Number 8

-- The serial port selects the digital pin to display to the digital tube



## Mixly programming program

Initialize 7 digital tubes Pin A 7 B 6 C 5 D 10 E pin 11 F 8 G 9 H 4  
7 segments of digital display 1

## MagicBlock programming program

