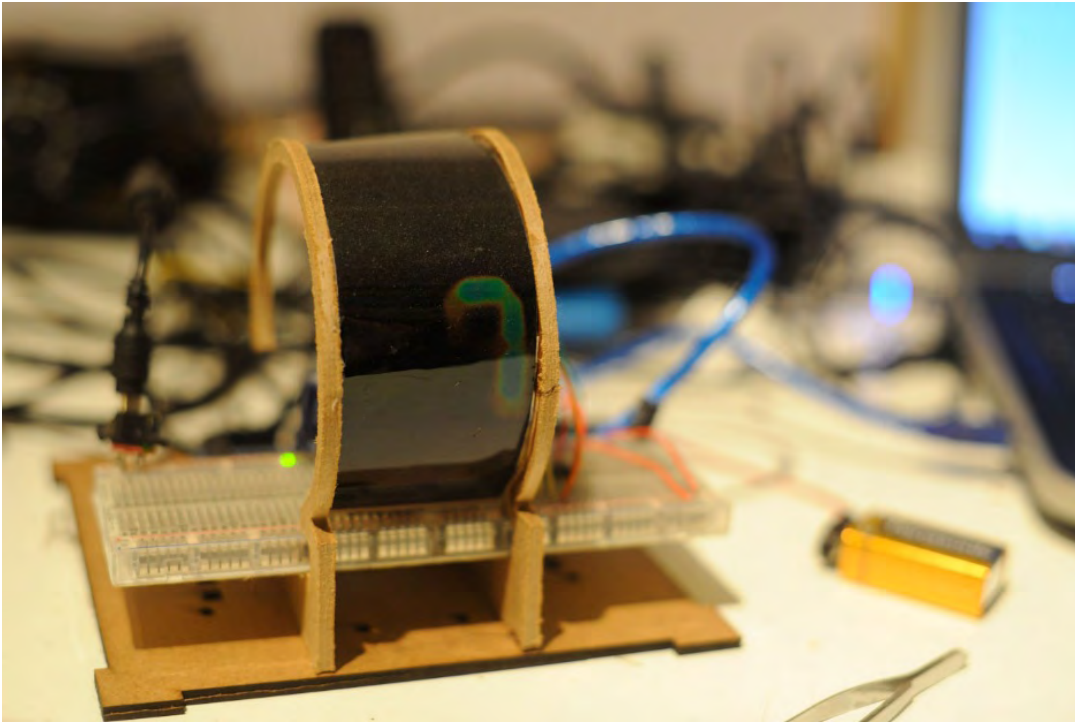


# Prototype of a Flexible Thermochromic Display

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## Building Summary

### Display & Arduino Support

The curved support holds the breadboard and the thermo display.

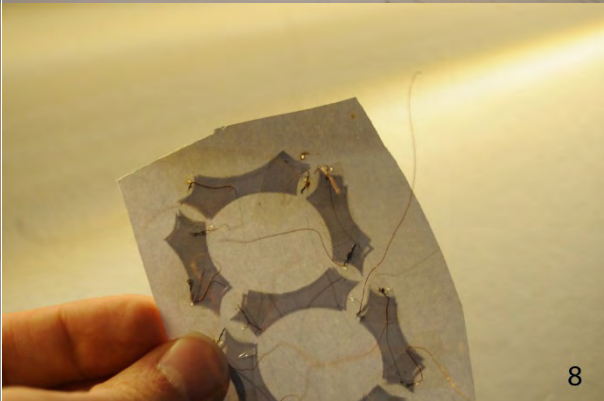
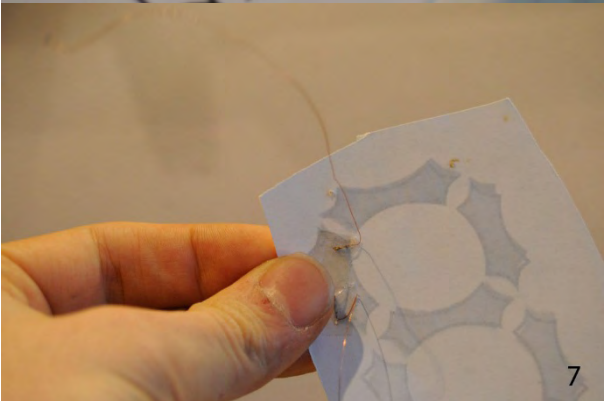
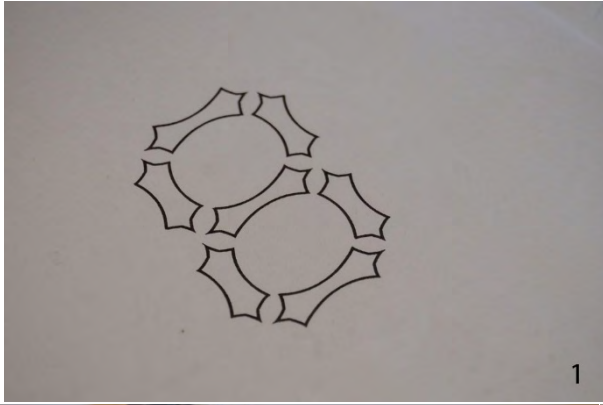
It was made with 4mm Mdf, cut with a CNC, but you can also Laser-cut it or cut by hand. The files “support.dxf” (Dxf) and “watch\_thermo\_1a” (Artcam) are a good reference for the size and shape of the support.

### Power Supply

I used a 24V DC power supply, converted to 20Vdc with a KIA7820A. A 1000uF capacitors reduces noise on the 24V line, and a 220uF reduces noise on the 20V line. The Arduino is Usb powered from the PC.

### Building the Display

- Print the “digits.jpg”. (1)
- Using a common glue stick, glue a piece of aluminum foil to the back of the sheet (2)
- Cover the other side of the sheet with transparent double-sided tape. Then cut out each segment (3)
- Cut 7 pieces of Nickel Chrome wire, each one 10cm long. Check with the multimeter the resistance that should be 10-115ohm. For each segment, remove the cover of the tape, and with the help of a pen or similar tool, place the wire over the tape, with a zig-zag pattern, leaving out about 5mm of wire at each end (4)
- Place each segment over another print of the “Digits.jpg” for a correct placement, with the double-sided tape face down so it will adhere to the print. For each segment make 2 small holes next each end, and make the 2 wires of each segment pass through the paper (5 & 6)
- Now it’s time to create the connections; a possible way is to find very thin enameled or insulated wire. Connect one end of each segment to +20Vdc, and each segment to the corresponding output on the 2803A (7 & 8)
- Glue or tape the segments to the back of the thermochromic sheet.



## Build Instructions

- 1) Connect the arduino board to the 9v battery, use the 9v battery connector.
- 2) Build the circuit on the breadboard
- 3) Make the display using the provided instructions above.
- 4) Connect the arduino board to the pc and upload the provided code.



```

};

boolean valore[10][7] = {
{true, true, true,false,true,true,true}, //0
{false, false, true,false,false,true,false}, //1
{false, true, true,true,true,false,true}, // 2
{false, true, true,true,false,true,true}, //3
{true, false, true,true,false,true,false}, //4
{true, true, false,true,false,true,true}, // 5
{true, true, false,true,true,true,true}, // 6
{false, true, true,false,false,true,false}, // 7
{true, true, true,true,true,true,true}, //8
{true, true, true,true,false,true,true}, //9
};

//int deadtimers[10];

int count;

int numero;

void setup()
{
Serial.begin(9600);

pinMode(2,OUTPUT);

pinMode(3,OUTPUT);

pinMode(8,OUTPUT);

pinMode(9,OUTPUT);

pinMode(10,OUTPUT);

pinMode(12,OUTPUT);

pinMode(11,OUTPUT);

// This to adjust the power to the ambient temperature
for (int i=0;i<10;i++)

```

```

{
for (int j=0 ;j<7;j++)
{
intervalli[i][j]=intervalli[i][j]*1.1;
}}
count=0;
numero=0;
}
/*
    2
    -----

    | |
1 | | 3
    | |
    4
    -----

    | |
5 | | 6
    | |
    7
    -----

*/
void loop()
{
count=count+1;
if (count>150)
{ numero=numero+1;
if (numero>9) { numero=0;}
}
}

```

```
count=0;

Serial.println(numero); // prints hello with ending line break

}

// if (count>5) // black "frames" before change number

{

  if (valore[numero][3]== true)

  { digitalWrite(11,HIGH); // segm 4

    delayMicroseconds(intervalli[numero][3]);

    digitalWrite(11,LOW);

  }

  if (valore[numero][4]== true)

  {

    digitalWrite(12,HIGH); // segm 5

    delayMicroseconds(intervalli[numero][4]);

    digitalWrite(12,LOW);

  }

  if (valore[numero][1]== true)

  {

    digitalWrite(2,HIGH); // segm 2

    delayMicroseconds(intervalli[numero][2]);

    digitalWrite(2,LOW);

  }

  if (valore[numero][6]== true)

  {

    digitalWrite(3,HIGH); // sem 7

    delayMicroseconds(intervalli[numero][6]);

    digitalWrite(3,LOW);

  }

}
```

```
if (valore[numero][2]== true)
{
digitalWrite(8,HIGH); // segm 3
delayMicroseconds(intervalli[numero][2]);
digitalWrite(8,LOW);
}

if (valore[numero][0]== true)
{
digitalWrite(9,HIGH);
delayMicroseconds(intervalli[numero][0]);
digitalWrite(9,LOW);
}

if (valore[numero][5]== true)
{
digitalWrite(10,HIGH);
delayMicroseconds(intervalli[numero][5]);
digitalWrite(10,LOW);
}
}

//if (count<10) // faster transition
// delay(50) ;

//else
delay(200);
}
```

Assembled Display

