

## DIY: Digital Mood Ring

In this project, you will investigate temperature measurement using a temperature sensor and then build a digital mood ring that changes the color of the TI-Innovator Hub's Red, Green, and Blue (RGB) light emitting diode (LED) as the temperature of your finger changes. You can even display what mood you are in on your calculator!



### Background:

The mood ring was invented by Joshua Reynolds. Mood rings enjoyed fad popularity in the 1970s and are still around today. The stone of the ring changes color, supposedly according to the mood of the wearer. The 'stone' of a mood ring is really a hollow glass shell containing *thermotropic* liquid crystals. Modern mood rings are made from a flat plastic strip containing liquid crystals that is inserted into the hollow glass and mounted within the bezel of the mood ring. The crystals respond to changes in temperature by twisting in a regular way. The twisting changes their molecular geometry, which alters the wavelengths of light that are reflected from the crystals. Wavelengths of light are another way of saying color, so when the temperature of the liquid crystals changes, so does the color reflected from the stone. Thus, the ring changes color with the hand temperature of the wearer.

### Activity Materials:

- Temperature Sensor
- TI-Innovator™ Hub
- TI-Nspire CX (OS vs. 4.5)
- Cellophane tape
- Colored pipe cleaner (Chenille stem)
- A mood to be measured!

### Project Tasks:

1. Write a program that displays a text message on the calculator using the Disp command.
2. Use a loop to display your message from task 1 ten times.
3. Write a program that explores the different colors produced on the Hub RGB LED by setting the red, green and blue components with the COLOR command.
4. Write a program that reads and displays your skin temperature every second when the sensor is attached to your finger. Do this by reading the temperature in a For loop with a Wait, then use the Disp command to display the value read from the sensor.
5. DIY Mood Ring:
  - Design and build a digital mood ring using the pipe cleaner that fits snugly on your finger, placement should be similar to any ring worn on the finger. Be sure the flat part of the temperature sensor is touching your skin.
  - Write a program that sets at least three different colors depending on your skin temperature. Use the disp command to display the mood each temperature represents.
  - Use your creativity to modify the ring and the program to make a better mood ring!

**Example TI-BASIC Code for TI-Nspire CX:**

Code snippet to set the RGB LED to yellow on the Hub:

```
Send "SET COLOR 255 128 0"
```

Code snippet to display a message on the calculator:

```
Disp "I AM HAPPY"
```

Code snippet to connect and read the temperature sensor:

```
Send "CONNECT TEMPERATURE 1 TO IN 1"
Wait 0.5
Send "READ TEMPERATURE 1"
Get t
Disp "TEMPERATURE IS ",t
```

Code snippet to read and display the temperature sensor every second for twenty times using a For statement:

```
For n,1,20
  Send "READ TEMPERATURE 1"
  Get t
  Disp "TEMPERATURE IS ",t
  Wait 0.1
EndFor
```

Code snippet to read temperature every .5 second for 1 minute and storing time into variable array *time* and temperature into variable array *temp*.

```
time:={}
temp:={}
For n,1,120
  Send "READ TEMPERATURE 1"
  Get t
  Disp "TEMPERATURE IS ",t
  Wait 0.1
  time[n]:=n*0.5
  temp[n]:=t
EndFor
```

Code snippet to make decisions using the If statement:

```
If t > 10 Then
  Disp "t is greater than 10"
EndIf
```

Code snippet to make decisions using the If Else statement:

```
If t > 10 Then
  Disp "t is greater than 10"
Else
  Disp "t is less than or equal to 10"
EndIf
```

**To break a program press and hold the ON key until you receive a dialogue box.**

**Sensor and actuator Hub connections:**

