**Program Statement 3**

Read the ADC and display the value in LCD in the range 0 to 15.0 (display decimal value) when the voltage is increased from 0 to 5V at the Analog input. If the voltage goes below 10.5 display the message LOW VOLTAGE in the second line. If the voltage goes above 13.5V display the message HIGH VOLTAGE. At other times display the message NORMAL. Follow the submission guidelines.

**Interface Diagram:**

Diagram, schematic

Description automatically generated

**Code:**

// Functions Initialization

void ADC\_LCD\_Init(void);

void LCD\_Command(unsigned char);

void LCD\_Data(unsigned char);

void LCD\_Output(unsigned int);

void LCD\_Display(unsigned char \*string);

// Variables Initialization

unsigned char ADC\_Data[3];

unsigned int Voltage,Value;

void main()

{

ADC\_LCD\_Init(); // ADC and LCD Initialization

while(1)

{

ADCON0 = 0x81; // Configure the A/D control registers

ADCON0 |= 0x04; // Start ADC conversion

while(ADCON0&0x04); // Wait for conversion to complete

Value = (ADRESH << 8) | ADRESL; // Load the 10bit result into Value

Voltage = (Value\*0.1466); // Scale the value to the range 0 to 15

LCD\_Output(Voltage); // LCD Display

Delay\_ms(5); // Delay of 5 millisecond

}

}

void ADC\_LCD\_Init(void) // Initialization

{

TRISA = 0X01; // PORTA RA0 is made as input

TRISD = 0X00; // PORTD is made as output

TRISE = 0x00; // PORTE is made as output

ADCON0 = 0X81; // Configure the A/D control registers

ADCON1 = 0X8E;

LCD\_Command(0x38); // Initialize the 2 lines of 16 x 2 Matrix LCD

LCD\_Command(0x06); // Increment cursor (shift cursor to right)

LCD\_Command(0x0C); // Display on, cursor off

LCD\_Command(0x01); // Clear display screen

}

void LCD\_Output(unsigned int i)

{

LCD\_Command(0x80); // Cursor at First Line of LCD

ADC\_Data[0] = (i%1000)/100 + 0x30; // First Character

ADC\_Data[1] = (i%100)/10 + 0x30; // Second Character

ADC\_Data[2] = (i%10) + 0x30; // Third Character

LCD\_Data(ADC\_Data[0]); // Writing the First Character

LCD\_Data(ADC\_Data[1]); // Writing the Second Character

LCD\_Data(0x2E); // Writing '.'

LCD\_Data(ADC\_Data[2]); // Writing the Third Character

LCD\_Display("V"); // Display 'V'

LCD\_Command(0xC0); // Cursor at Second Line of LCD

if (i >= 0 && i< 105) // Voltage Range between 0V to 10.5V showing Low Voltage

LCD\_Display("LOW VOLTAGE ");

if (Voltage >= 105 && Voltage <= 135) // Voltage Range between 10.5V to 13.5V showing Normal Voltage

LCD\_Display("NORMAL VOLTAGE");

if (Voltage > 135) // Voltage Range between 13.5V to 15V showing High Voltage

LCD\_Display("HIGH VOLTAGE ");

}

void LCD\_Command(unsigned char i)

{

PORTE &= ~(0x04); // RS=0

PORTD = i;

PORTE |= 0x02; // RS=0, R/W=0, EN=1

PORTE &= ~(0x02); // RS=0, R/W=0, EN=0

Delay\_ms(5); // Delay of 5 millisecond

}

void LCD\_Data(unsigned char i)

{

PORTE |= 0x04; // RS=1

PORTD = i;

PORTE |= 0x02; // RS=1, R/W=0, EN=1

PORTE &= ~(0x02); // RS=0, R/W=0, EN=0

Delay\_ms(5); // Delay of 5 millisecond

}

void LCD\_Display(unsigned char \*string) // Display String

{

while(\*string) // Run until all the characters are done

LCD\_Data(\*string++); // Character Increment

Delay\_ms(5); // Delay of 5 millisecond

}

A screenshot of a computer

Description automatically generated with medium confidence**PICSimLab Results and Output:**

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**Code Description:**

1. Made PORTA (RA0) as Input (Analog Input/ Potentiometer).  
2. Made PORTD (LCD Output Lines) and PORTE (Pin Select of LCD) as Output.

3. Configured ADCON0 and ADCON1 Registers.

4. Configured and Initialized LCD.

5. Start Analog to Digital Conversion and wait until conversion.

6. Load the ADRESH and ADRESL Data.

7. Convert the loaded data in the range of 0 to 15V (Float Data Type).

8. Distribute the three-digit number and display it (individually) on the First Line of 16x2 LCD.

9. If Voltage is in the range of 0 to 10.4V, Display ‘LOW VOLTAGE’ on Second Line of 16x2 LCD.

10. If Voltage is in the range of 10.5 to 13.5V, Display ‘NORMAL VOLTAGE’ on Second Line of 16x2 LCD.

11. If Voltage is in the range of 13.6 to 15V, Display ‘HIGH VOLTAGE’ on Second Line of 16x2 LCD.

**Flowchart:**

Diagram

Description automatically generated

Diagram

Description automatically generated

***---------------------------------END OF PROGRAM---------------------------------***