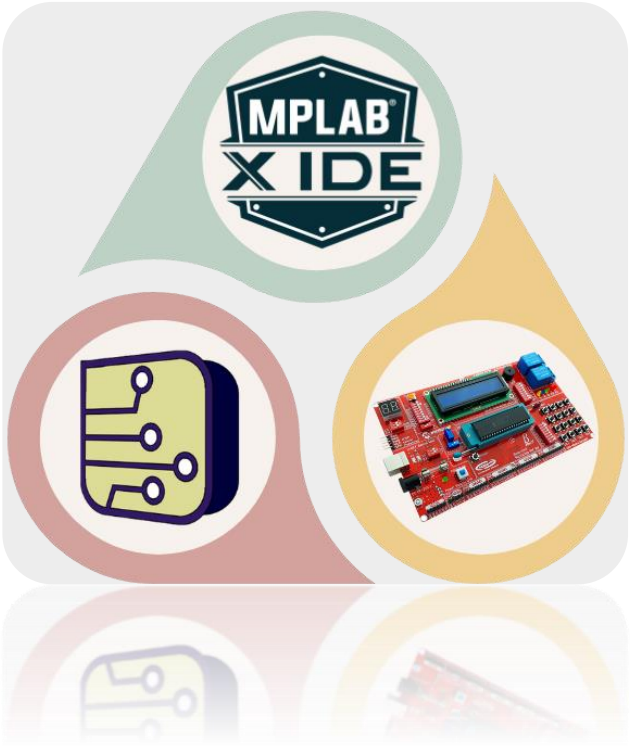
TIMER and PWM (DC Motor Speed Control Application)

Practical Lab 3



Objective:

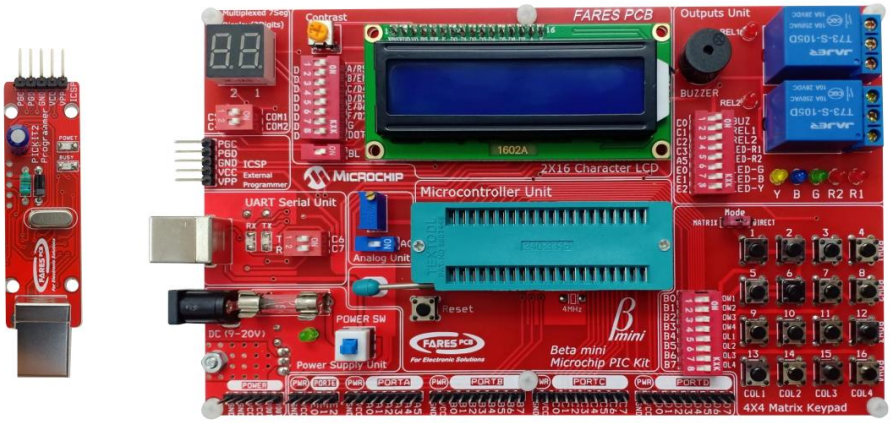
In this lab we'll use a simple integration between Timer0 and PWM to control the intensity of a Led and Speed of DC Motor.

Requirements:

- **Software**:

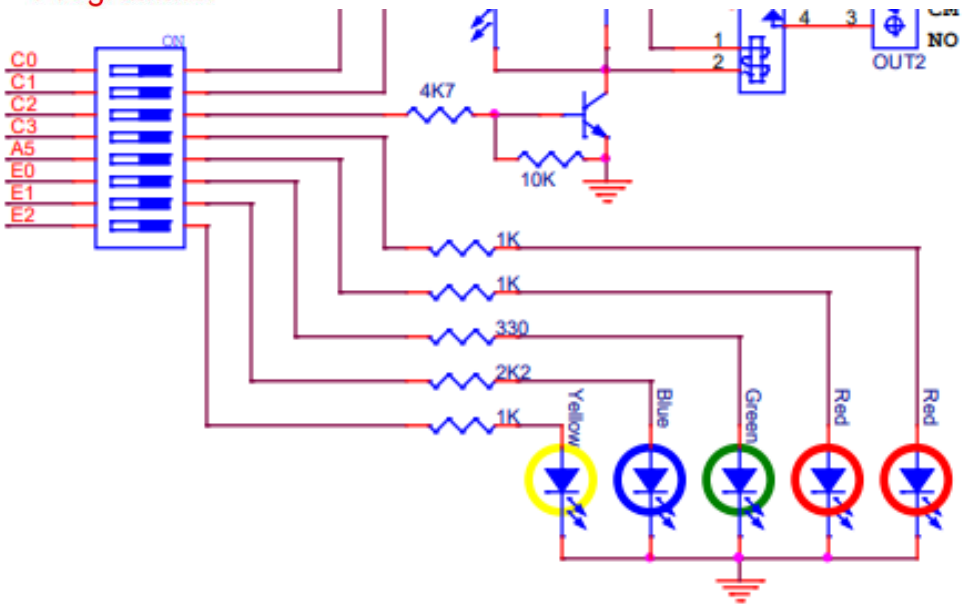
1. MPLAB
2. Simulide
3. Betamini Kit

Betamini Kit Overview:



PICKit 2 Programmer

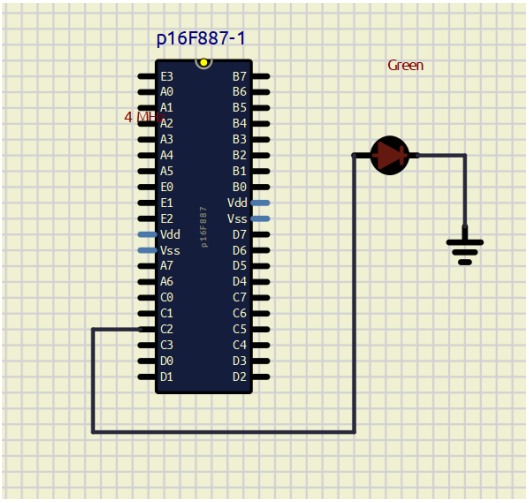
Betamini Kit



Experiment Steps:

1. **Prepare the Circuit in the SimulIDE**

   a. Add the PIC16F887 and the 1 LED on PORT C2.



   b. open MPLAP and write the delay function using Timer 0

```
void my_delay_ms(unsigned int m_s)
{
  double clk_period = (1/(selected_clock_MHZ * 1000000.0)); // convert clk period  //to sec
  double user_period = m_s /(1000.0); // convert user_input to sec.
  unsigned long no_of_counts = (user_period/(4.0*clk_period *prescalar ));//calculate no. of counts needed
  calculated_overflow_counts = no_of_counts / 256; // calculate the overflow counts needed
  TMR0 = 0; // start counting from 0
  while(overflow_counts != calculated_overflow_counts);//wait until overflow counts=the needed overflow counts
  overflow_counts = 0; // reset
  calculated_overflow_counts = 0; //reset
}
```

   c. Write the ISR of the Timer 0

```
void __interrupt() ISR(void) {
 overflow_counts++;              // overflow counts incremented by 1
 TMR0 = 0;                       // Timer TMR0 is returned its initial value
 INTCON = 0x20;                  // Bit T0IE is set, bit T0IF is cleared
}
```

d. Write the code header and the main

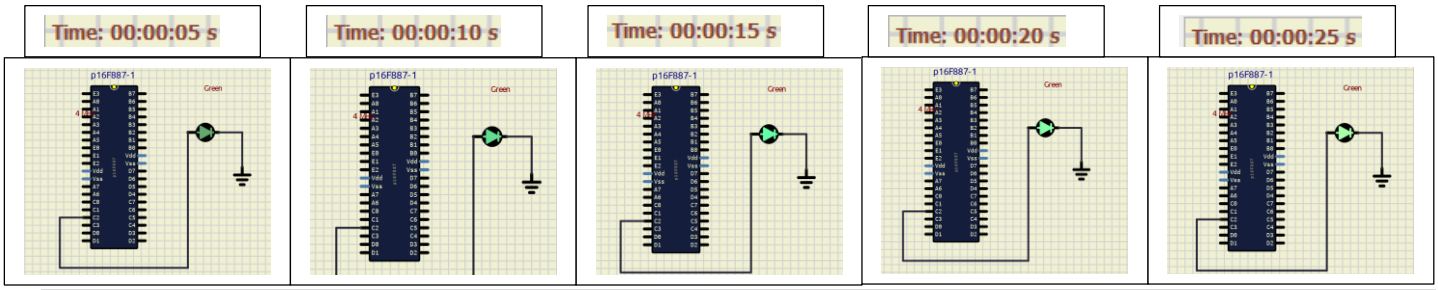
```
#include "xc.h"
void my_delay_ms(unsigned int m_s);
#define prescalar 64.0
#define selected_clock_MHZ  4.0  // 4MHZ
unsigned short pwm_val;
unsigned long overflow_counts = 0;
unsigned long calculated_overflow_counts = 0;
```

```
int main() {
    //----------[1] configure all pins to be digital [REG : ANSELH and ANSEL]----------
    OPTION_REG = 0x84; // Prescaler is assigned to timer TMR0
    OPTION_REG |=((1<<2)|(1<<0));
    ANSEL = 0; // All I/O pins are configured as digital
    ANSELH = 0;
    CCP1CON = 0x0F;      // Select the PWM mode.
    TRISC = 0x00;        // Configure PORTC as output(RC2-PWM1, RC1-PWM2)
    PR2 = 124;
    T2CON |=(1<<0); // set the prescalar to be 1:4 in the T2CKPS1 and T2CKPS0 pins
    DC1B0 = 0;    // (step6) - set the PWM Duty cycle
    DC1B1 = 0;
    CCPR1L = 0;          // initialize the duty cycle
    TMR2ON = 1;          //Start the Timer for PWM generation
    INTCON = 0xA0;                // Enable interrupt TMR0
```

```
    while (1)
    {
        my_delay_ms(5000);
        if(pwm_val<500)
            pwm_val += 100;
        else if ( pwm_val == 500)
            pwm_val = 0;
        DC1B0 = (pwm_val&(1<<0))>>0;
        DC1B1 = (pwm_val&(1<<1))>>1;
        CCPR1L = pwm_val >>2;
```

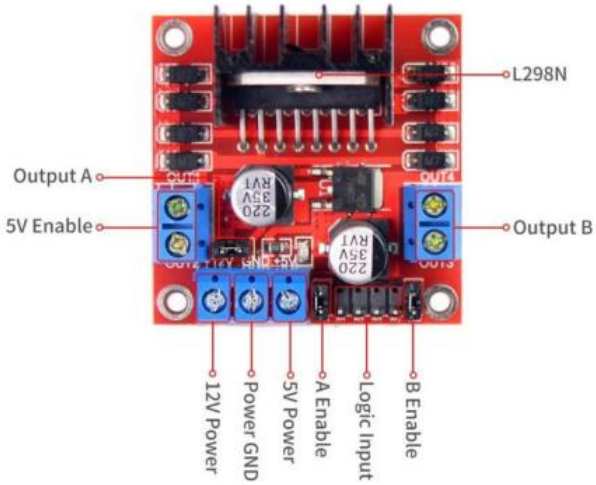
e. Test on simulIDE:

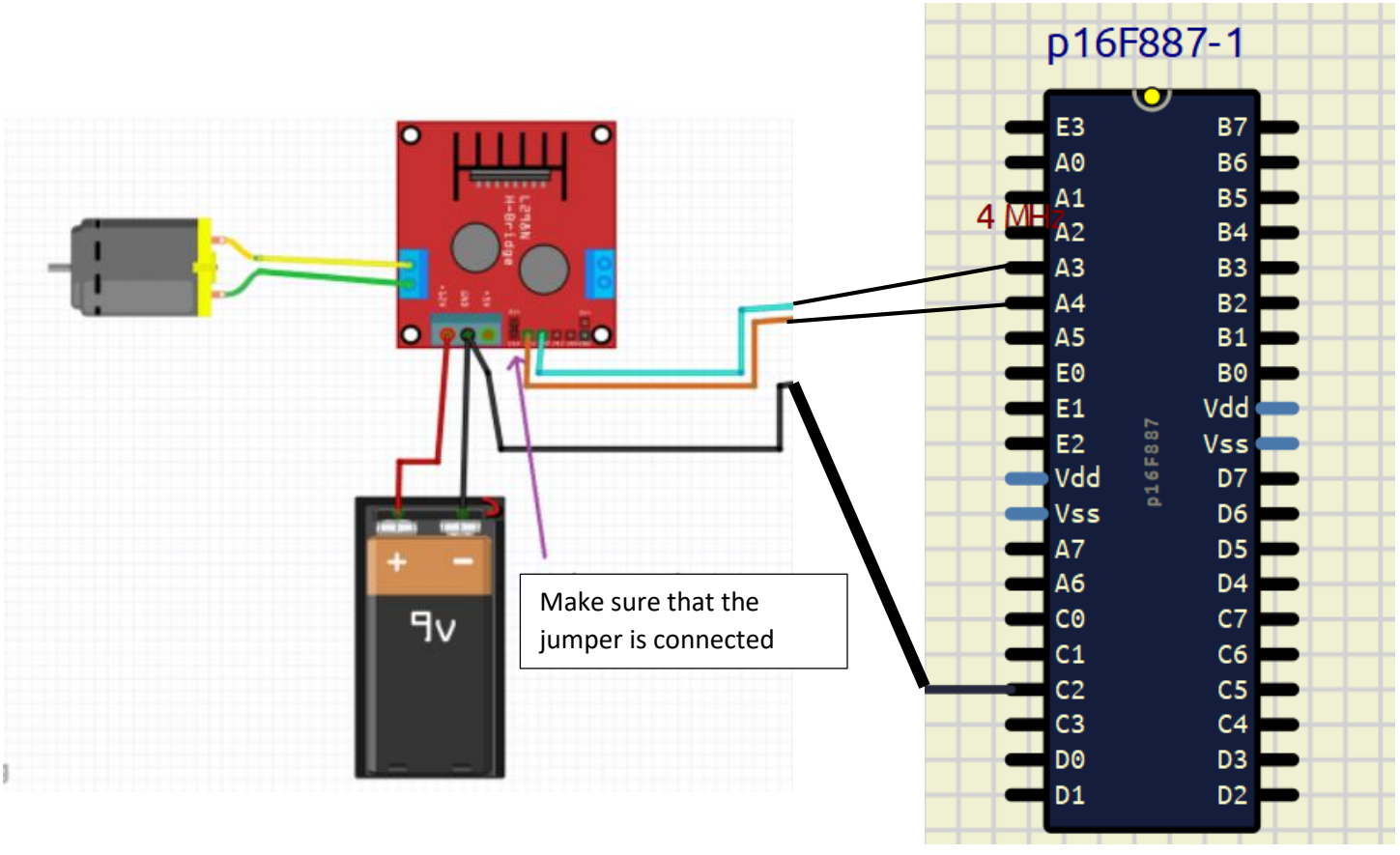
- **You should see that LED increase its' intensity every 5 sec.**
- **After 25 sec, this is the maximum intensity**
- **after another 5 seconds intensity will be equal zero**



2- How to speed control the Motor using the L293D chip:

	A	B
Stop	Low	Low
Clockwise	Low	High
Anticlockwise	High	Low
Stop	High	High





Lab report:

Submit a PDF file with Code, snapshots and “Small Video for the practical work” of the work you did and upload the project file.