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'-----Title-----
' File.....pwm1.pbp
' Started....4/25/06
' Microcontroller used: Microchip Technology 16F88
'                        microchip.com
' PicBasic Pro Code: micro-Engineering Labs, Inc.
'                        melabs.com

'-----Program Description-----

' pwm1.pbp drives a dc motor at different speeds

'-----Related Lesson-----

' pwm1.pbp is used in the lesson MOTOR CONTROL WITH PWM at:
' http://www.cornerstonerobotics.
org/curriculum/lessons_year2/erii21_motor_control_pwm.pdf

'-----Comments-----

' Rather than reducing the voltage to a motor through
' a potentiometer for example, PWM cuts the time a
' motor receives voltage by turning pulses on and off
' very quickly. This pulse can feed a transistor switch
' which then drives the motor at different speeds.

'-----New PicBasic Pro Commands-----

' The PicBasic Pro Compiler Manual is on line at:
' http://www.microengineeringlabs.com/resources/index.htm#Manuals
'
' PWM Pin, Duty, Cycle

' Pin is the output pin for the pulse.
' Duty adjusts the amount of time the pulse is on and off.
' Duty ranges from 0 (0% on time and 100% off time)
' to 255 (100% on time and 0% off time).
' Look around page 122 in the PicBasic Pro Compiler Manual
' The Jameco motors that we tested would not turn with
' duty values less than 140 (a 55% duty cycle). See the
' Jameco gear head motor charts listed in the table.
' Cycle is the number of cycles the pulse is sent.

'-----Revision History-----

' 11/25/07 Change MCU from 16F84A to 16F88
' 11/25/08 Convert from PIC16F84A to PIC16F88,
' add PIC16F88 oscillator and ANSEL = 0 initializations.

'-----Initialization-----

        ANSEL = 0          ' Configure all pins to digital
                          ' operation since not using ADC
                          ' (Analog to Digital Converter)
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OSCCON = $60          ' Sets the internal oscillator in the
                      ' 16F88 to 4 MHz

'-----Main Code-----

start:

  PWM 0,255,200      ' Pulse sent to PORTB.0 at a duty
                    ' value of 255(100% duty cycle) for
                    ' 200 cycles.  At 4MHz, each cycle
                    ' is about 5 ms long, so the total
                    ' time for 200 cycles is:
                    ' Total Time = 200*5 ms = 1000 ms or 1 sec.

  PWM 0,190,200      ' Pulse sent to PORTB.0 at a duty
                    ' value of 190(75% duty cycle) for
                    ' 200 cycles.  Motor rotational speed
                    ' approximately 50% of maximum rpm
                    ' for the Jameco motors used.

  PWM 0,140,200      ' Pulse sent to PORTB.0 at a duty
                    ' value of 140(55% duty cycle) for
                    ' 200 cycles.  Motor rotational speed
                    ' approximately 20-24% of maximum rpm
                    ' for the Jameco motors used.

  GOTO start        ' Jump to start label

  END
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