11.5   Procedure / Summary Sheet

(1)   Complete and attach a detailed functional diagram, using Sections 1.3 and 7.9 in the textbook for guidance. Submit this on a separate sheet of paper.

(2)   Use an ASCII editor (e.g., Windows Notepad or MS Word - Text Only) to create the program "PWM_cal.bas" listed in Section 11.3. Save the file in a folder in your network file space.

(3)   Follow the procedure in Section 9.4 of Lab 9 to store your program in a PIC microcontroller that you can insert into your circuit.

(4)   Build the circuit shown in Figure 11.5 and insert the PIC programmed with "PWM_cal." You can omit the motor driver circuit for now because it is not used in the calibration program.

(5)   Report the nominal Pot values displayed for your program for each of the active keypad buttons. Be sure to hold each button down long enough (for 2 green LED blinks) to start the red LED sequence.

pot_val for the 1-key: 100s: _____   10s: _____   1s: _____   value: _____

pot_val for the 4-key: 100s: _____   10s: _____   1s: _____   value: _____

pot_val for the *-key: 100s: _____   10s: _____   1s: _____   value: _____

(6)   Repeat Steps 2 and 3 for the "PWM.bas" program, replacing the "PWM_cal" program on your PIC. **Modify the "pot_val" ranges in the PWM.bas "speed change loop"** *If* **statements, if necessary based on the values you found in Step 5.** Add the motor driver circuit to your board if you haven't done so already. Insert the reprogrammed PIC into your circuit.

(7)   **See Section 11.4 if your circuit is assembled correctly but does not work properly.** One thing worth checking is whether or not the motor PWM signal is working as expected. To do this, disconnect the transistor and look at the PIC output signal on the oscilloscope as the speed is changed.

(8)   Show your functioning circuit to your TA so he or she can verify it is working.

LAB 11 QUESTIONS

Group: _____   Names: _____   _____

_____   _____

(1)   Did your circuit work the first time, without modifications? If not, what things did you try from Section 11.4? Which things worked, and why do you think they worked?

(2)   Explain in detail how you think the Pot command works.

(3)   In the PWM.bas program, we used 30,000 microseconds for the PWM period. What frequency f (in Hz) does this correspond to?

(4) How would the motor respond to a very low (close to 0%) duty cycle PWM signal?

How would changing the PWM signal frequency f (i.e., making it much lower or much higher) change the motor response?

(5) What would happen if other keys (besides the 1-key, 4-key, and *-key) are pressed down during the keypad loop?

What would happen if two of the three valid keys are pressed and held down at once (e.g., the 1-key and the *-key)?

(6) In PicBasic Pro, to what values would the following expressions evaluate? Hint: PicBasic Pro uses integer division and performs one operation at a time.

a) 2 / 3 * 4

b) 2 * 4 / 3