



MICROCONTROLLER PROJECT LABORATORY

EDUCATIONAL STUDIES PROGRAM – HIGH SCHOOL STUDIES PROGRAM – SUMMER 2001
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

CLASS 5 NEWS

1 In-Class: Programming!

- I have vanquished the computer difficulties, so we're right on track to finish programming Lab 2 today.
- I also have some new switches. You can pick up a red push button now, and I'll solder some power switches and slide switches for Thursday (you can take one today if you can solder at home).

Your checklist for today is:

- Get a working serial connection. You should be able to echo a "U" from the PC to the μ C.
 - Connect the keypad and test out `keytest.asm`.
 - Connect the LCD and test out `lcdtest.asm`.
 - Set up the trigger as described in Lab II part 4, and test out `secure2.asm`.
- That's the end of Lab II! You can do the extra credit parts for fun if you have time.

2 Homework: Learn to program at home

Your assignment is to get your home computer set up to program your microcontroller. If you can get it working in the lab, that will mean your hardware is fine, so it will just take a little work to encourage your home computer to behave. You can e-mail me questions at dricket@mit.edu.

3 Challenge problems

If you're sitting twiddling your thumbs, longing to do more with microcontrollers, then take a crack at these and mail me the answers by Wednesday night. I'll give out prizes on Thursday.

You are not expected to know how to do these problems.

3.1 Keypad Construction

We looked at a few ways of building keypads in class 4. An n -key keypad made of all 2-pin push-buttons requires $2n$ pins (32 for a 4x4 keypad). An improvement is to use one common line on one side of all the switches, and have a single line out for every switch – that gives $1+n$ pins (17 for us). Our keypad uses a matrix of perpendicular lines, 4 rows and 4 columns, with a switch at each intersection, yielding on 8 pins for 16 keys.

- A) What is the formula for the number of pins of an n -key keypad made in this way?
- B) What is the least number of pins possible to encode our keypad?
- C) What is the least number of pins possible to encode a n -key keypad?
- D) Draw a schematic for the 16-key keypad with the least number of pins.

3.2 In the `secure2.asm` program, the light flashes on when the word "Alarm!" is gone. Without changing the code, change the transistors so that the light flights when "Alarm!" is present. The light doesn't have to be as bright as the original.

E-mail me schematics in .gif or .jpg format or as web link. They don't have to be pretty.