

Remote data logging

This week, the lab is done as a team. Everyone on your team will get the same lab grade and the lab will factor into your regular lab grades, only this one will be graded on a 5 point scale rather than the usual 10. There is no analysis for this lab, and your lab report should consist of 1 figure of data and a short explanation of the figure. The whole report should be one page. You should get an A, just getting it to work.

The objective of the lab is to show you some different hardware which can be leveraged for making experiments remote. In many cases it is not feasible to send a laptop along to collect data when doing field experiments, thus it is convenient to have a low-cost device to log data for you. We will use an Arduino-based platform simply because it is a common and low-cost device.

To use the Arduino as a data logger, we have a custom printed circuit board which will snap onto the Arduino. There is a small prototyping area where you can solder your own circuit in a breadboard like environment. The custom board is explained in detail in the Hardware/Software description document. We will also show you in class how to work with the circuit board.

The software for the device is more or less ready to use. We have some sample codes which you can use or slightly modify. We will demo the software in class and it is also described in the documentation.

The experiment you will run is a long time scale temperature experiment. We will use a very simple temperature sensor, the LM35. You can find the data sheet on the internet. It is very easy to use. Since there are several of you, you will need to decide how to divide up the work. There are several steps to getting everything working.

- 1) Get a circuit board and get the base circuit board soldered together. You can't do anything without this board. We will have all the components. This will take a while if you haven't soldered before. Be careful to do this correctly as it is hard to undo. Also, be fast when you actually start to apply the solder. Do not leave the soldering iron on the IC chip pins for more than a fraction of a second, you can destroy the chips easily. You may want to use IC sockets so you don't have to worry about it. If you don't know how to solder, ask one of the instructors so we can help you with the proper technique.
- 2) Get a LM35 sensor, look up the data sheet and quickly build the circuit on a breadboard to test it out. You want to make sure you understand and test the sensor before soldering.
- 3) Get all the software installed and tested. You can get the basic Arduino software installed without the circuit board. You can't test the custom software until you have at least the base board soldered together.

Once you have thoroughly tested everything in the lab, you are ready to do the experiment. The exact experiment is up to you. Since you can set the sample rate to be rather slow, you can collect data for a day or more if you like. One option might be to leave it in your room and see how often the heat comes on. Another option might be to put the whole thing in a weather tight container (a zip lock) and leave outside for 24 hrs or more.