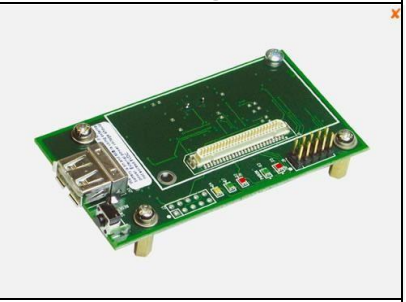
Lab 5 Blink Application
Due: Dec. 1st after lab session

This guide is intended to describe the step-by-step process of setting up the MEMSIC IRIS motes, running simple programs for hardware verification, and to run a few simple programs to get an understanding of the tools used in the process.

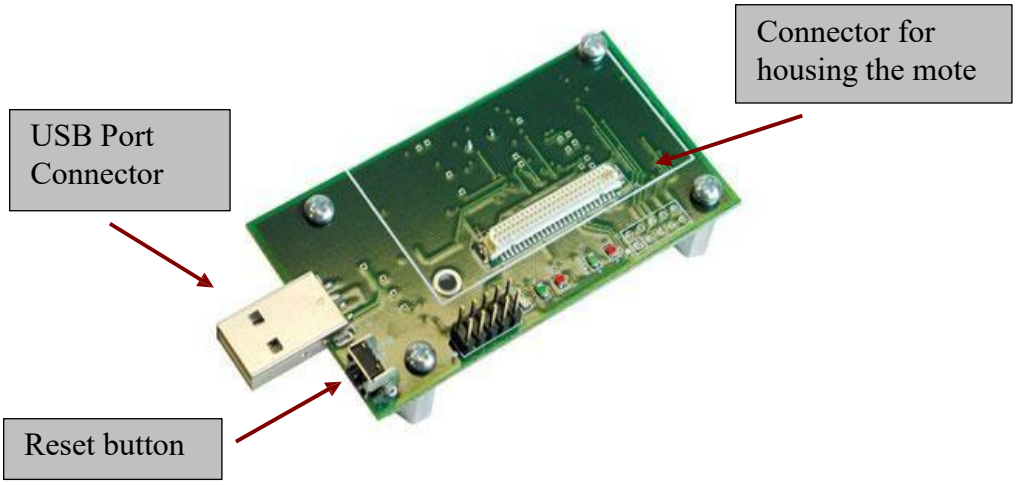
It is assumed the students have a basic understanding of Linux and electronic hardware components.

Section 1: An Overview of the Hardware Used

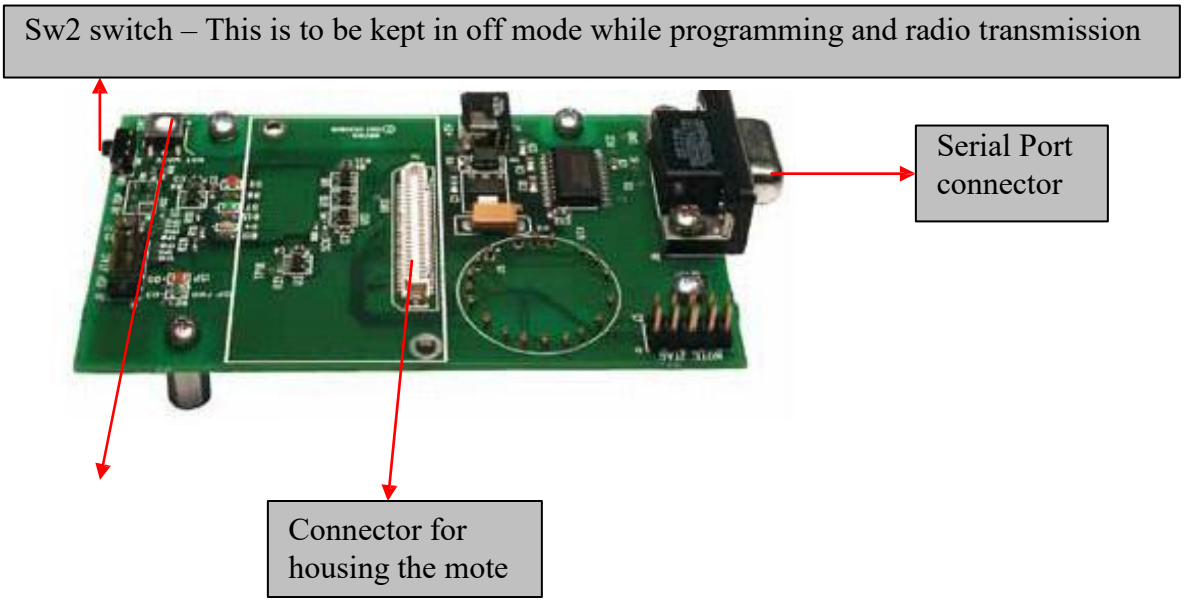
List of hardware components that will be used in the labs.

#	Component	Purpose	Image
1	**Programming Board – MIB520CB**	Used for programming the motes and for housing the base mote for wireless communication. USB based connection. Referred to as gateway.	
2	**Programming Board – MIB510**	Used for programming the motes and for housing the base mote for wireless communication. Non-USB based connection. Referred to as gateway.	
3	**IRIS Mote - XM2110CB**	This includes a processor that runs the TinyOS. It is capable of radio transmission and reception. It has a 51-pin connector for housing the sensor. Uses 2.4 GHz IEEE 802.15.4 standard. Referred to as wireless board.	
4	**Sensing Unit – MTS300**	Has the capability to sense data and transmit it using the processor/radio module. It is attached to the motes via the 51 pin. Referred to as sensor board.	

1. MIB520: The Programming (Interface) board is connected to the PC by a serial port via USB.



2. MIB510: The Programming (Interface) board is connected to the PC by a serial port.



3. **IRIS:** The Motes are connected to the interface board for programming. They house the sensors for sensing and transmission of data.

ON/OFF switch. It is very ***important*** to remove batteries and to keep this switch in off mode while programming

51-pin connector for connecting to the interface board or for housing the sensors

4. **MTS300:** The sensor modules are connected to the motes for sensing and data transmission

51-pin connector for connecting to the mot

Section 2: Testing a Simple Application: Blink

Blink is a basic application that starts a 1Hz timer and toggles the LEDs every time it fires. It is a very simple program that is little more than a demonstration of TinyOS programming.

Connecting the MIB520CB

1. Plug in the MIB520 with the attached mote via a USB port. Make sure that the switch on the mote is in the off position and the batteries are removed when programming it.

   (WARNING! Keeping the power button on or failure to remove the batteries when writing the flash could render the motes unusable).

2. Click the Devices option at the top of the Vmplayer window and navigate to the future devices usb composite device option, hover over it and click connect.

3. Open a cmd shell and run **motelist** take note of the USB device the mote is connected to.

4. If no device is found, run **dmesg** to see the device information. It should be in the format /dev/ttyUSBx.

Verify that you have:

- Removed the batteries from the mote that is to be programmed (whose hardware verification is to be done) and ensure that the power switch is turned off. ***(Keeping the power button on or failure to remove the batteries when writing the flash could render the motes unusable).***

- Connected the female part of the 51-pin connector on the mote to the male part on MIB520 located on the top of the board.

- Now the setup is ready for the flash memory on the mote to be programmed.

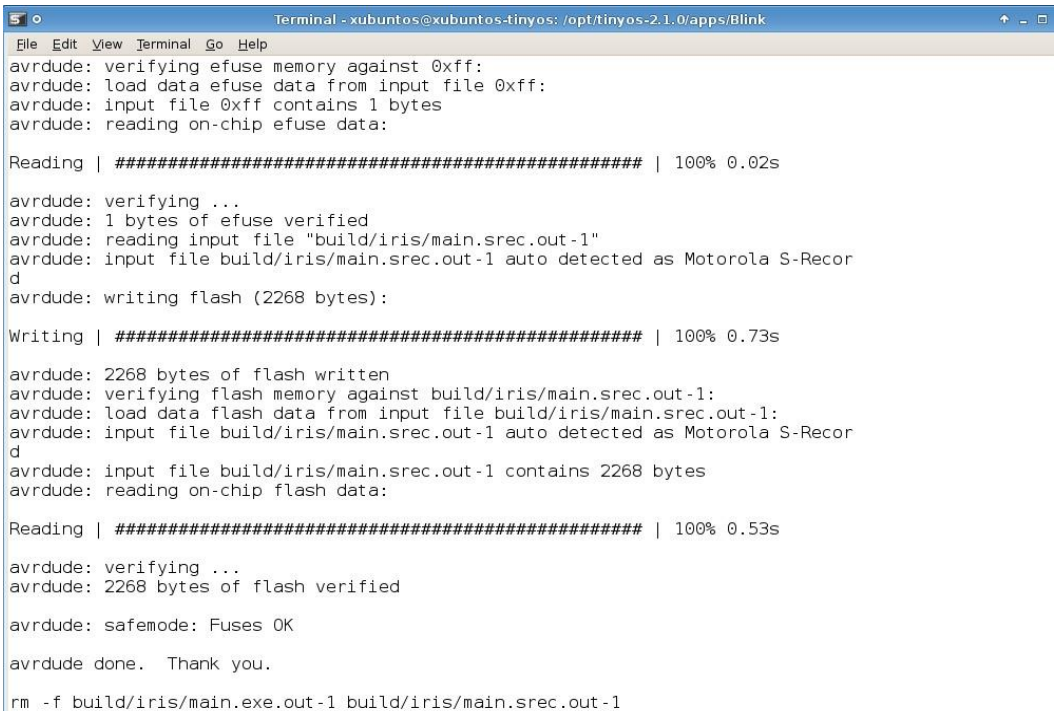
- **Running Blink**

    1. Open a cmd shell and change the directory to: /opt/tinyos-2.1.0/apps/Blink

    2. Run the command "**make iris install,1 mib520,[usb port connected]"** where the usb port is in the form of /dev/ttyUSB0 or similar.

- When the flash is being written the red LED next to the power LED (green LED) will light up.

If everything goes smoothly the following output will be seen:



- The above output demonstrates that the board and the mote are functioning properly.

- **Now if we observe the interface board the lights will be blinking in order.**

- As the next step, you can detach the mote and then install batteries. Now turn the power switch to ON. You should be able to see the lights blinking again.

If the verifications cannot be done, the user may use the following tips to solve different problems:

1. Check whether the switches on programming board and motes are on proper setting.
2. When housing the motes on the board, check whether the motes are firmly connected on board.
3. Use antennas with remote motes.
4. Hit reset button on programming board.
5. Verify proper permissions on the USB port, sudo /bin/chmod 666 [usb port such as:/dev/ttyUSB0]
6. Check the radio frequency setting.

Section 3: Develop A New Blink Application

Read the codes for Blink application carefully. Try to understand the structure. Based on your understanding, develop a new Blink application which can display the last 3 digits of a binary counter.