1 Overview

This handout will familiarize you with the equipment and procedures used to program your R31JP.

2 Burning ROMs

- The R31JP has three chips in zero-insertion-force (ZIF) sockets: the 8051, a ROM, and a RAM. The ZIF sockets are blue and have silver levers. By lifting the lever on the socket, you will release the chip and it should be easy to remove—just lift it gently. The ROM is seated in the middle ZIF socket; you will have to remove and program it several times throughout the course. It will typically be either an Atmel AT28C64B or a Catalyst CAT28C64.

- There are two ROM burners in the 6.115 lab, located in opposite corners by the printers. Look for the "ALL-11C" screensaver to find them.

- The ROM burners each have a printed sheet describing their use. If you have problems with the directions, see a TA or LA for help.

- Follow the diagram on the burner *exactly* when inserting the chip. The chip's orientation (as determined by the notch) **always** matters.

- At your familiarization, program MINMON into your ROM.

3 Introduction to Rasm

- You will be programming your R31JP in 8051 assembly. You can create **.asm** files using the text editor of your choice (Emacs, vi, edit, Notepad, etc.).

- **THE COMPUTERS ARE NOT A SAFE PLACE TO KEEP YOUR FILES**.
  We *will* clean the computers of extraneous files occasionally, so don't store anything important on them. Use either floppy disks, USB drives, or the network to store your files somewhere safe. WinSCP is available on all of the machines to transfer files to and from Athena, and the use of a version control system like Subversion is strongly recommended.

- Rasm is the 8051 assembler installed on the lab computers. We have created a batch file with the appropriate flags so that it is easy and convenient to use. To run it, open a command prompt, change into the directory containing your **.asm** file, and type:

      rasm filename.asm

  It will create the Intel HEX format object file (`filename.obj`) in the current directory. This is the file that you will download to your R31JP.

4 Connecting your R31JP

- Be sure your kit is not powered before proceeding.

- Your R31JP connects to your lab kit with two ribbon cables. Connect K1 to K1, and connect K2 to K2. **Double check that both cables are connected correctly.** Switching them around **will** damage the R31JP. Verify that they are pushed down completely at both ends.

- Your R31JP will communicate with the computer at your bench through the serial cable provided— connect this cable to your R31JP. You can use the cable in your kit to extend the one on the bench, if necessary.

- Turn on your lab kit. The R31JP is powered through the two ribbon cables.

5   Introduction to Hyperterminal

- All of the computers in lab have a shortcut to Hyperterminal on their desktop (**9600 baud R31JP**).

- Hyperterminal will allow you to communicate with your R31JP through the serial cable. The characters you type in the terminal screen are sent to the R31JP. Similarly, what you see on the screen are the characters sent by the R31JP.

- Often, you will need to send whole files to your R31JP. To do this, go to **Transfer → Send Text File**. Change the **Files of type** drop box to "All Files". Typically, you will send **.obj** or **.hex** files to your R31JP.

6   Introduction to MINMON and running your own code

- MINMON ("minimal monitor") is a small operating system that runs on your R31JP. It is burned into your ROM. Your R31JP also has RAM from which you can execute code. On power-up, the R31JP *always* starts executing code from address **0000h**.

- Address **0000h** can be the first address in either the ROM or the RAM depending on which mode the R31JP is in. There are two modes, selectable by the black slide switch beside the red and green LEDs:

Switch	ROM addr.	RAM addr.	Execution begins in:
MON (Red)	**0000h**	**8000h**	**ROM**
RUN (Green)	**8000h**	**0000h**	**RAM**

- To switch modes, press and hold reset, slide the switch, then let go of reset. Holding reset while switching modes is important because it ensures that the 8051 is not trying to run code while you're changing memory addresses around.

- To download code onto the R31JP:

  - Start R31JP in MON mode to run MINMON.
  - Type "D" at the MINMON prompt.
  - Send your **.obj** file using Hyperterminal's **Send Text File** function.

- You can run your code in two ways:

  1. jump directly to it from MINMON by typing **G8000**, or
  2. switch to RUN mode.

7   Using the Amulet boards

- The Amulet board uses HTML-formatted code to describe the display and interface. See the Amulet section of the 6.115 webpage for more details: `http://web.mit.edu/6.115/www/`

- To download code, use the "HTMLCompiler" application in the "Amulet" folder. Use **File → Open** to open your HTML file. Then, ensure that the switch on the Amulet is in the "PC" position and use the **Program Flash** button to load and execute your code.