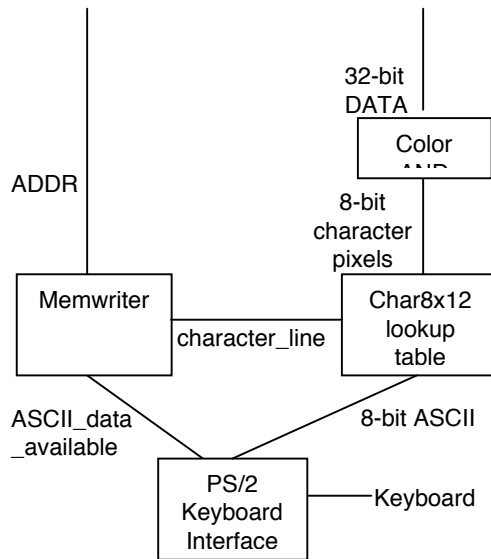
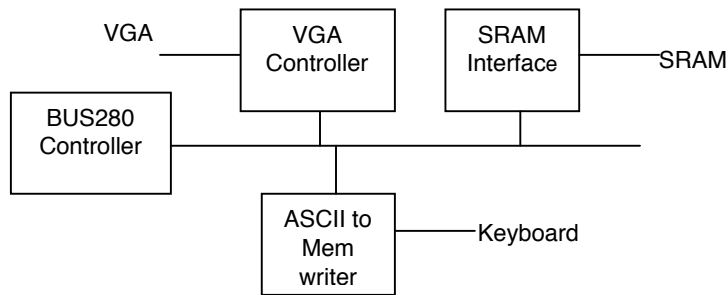


ECE 280 Lab 9

Fall 2005

The goal of this lab is to modify your VGA controller from the last lab so that it can write text to the screen. You will replace your writer module from the last lab with an `ascii_to_mem` module that will take input from the keyboard and then write the appropriate bits to memory. The text will be in a 80x40 grid, so each character is 8 pixels wide and 12 pixels high. A `char8x12_lookup_table` module will be provided to you. This module takes an 8-bit `ascii` character encoding as well as a line number that ranges from 0 to 11 identifying which line in the character you want. The module outputs a 8 bits corresponding to the line in the character. The eight bits are monochrome, so you will need to AND this with a color field so that you can write a full 32-bits to memory. The `ascii` character will come from the keyboard interface that you designed in lab 5.



Some things to be aware of:

Every time you press a character, you will need to write 12 words to memory – one word for each line in the character.

You will need to keep track of where you are in the 80x40 grid. You can use a column counter that counts from 0-79 and a row counter that counts from 0-39. You can calculate the memory address for the top line of a character as follows:

$$\text{Addr} \leq \text{row} * 80 * 12 + \text{column};$$

Each subsequent line in the character adds 80 to the address or in other words:

$$\text{Addr} \leq \text{row} * 80 * 12 + \text{column} + 80 * \text{line};$$

You will need to initialize the SRAM to zeros when you reset the board. Otherwise, you will end up displaying random data from the SRAM on reset.