TECH 3233
Lab #1
Memory

Name:_____

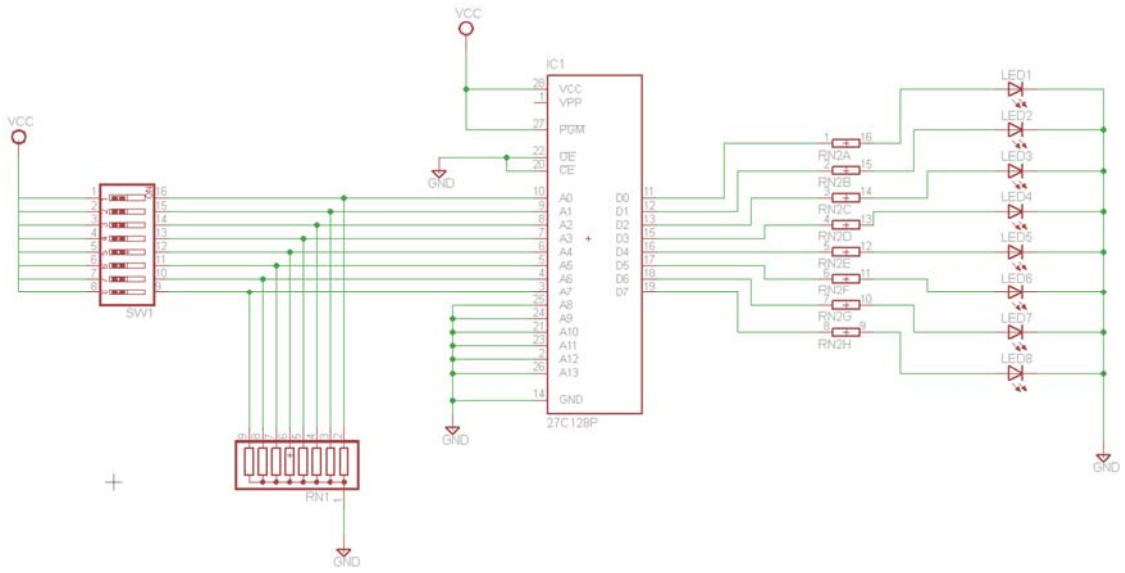
Purpose: To familiarize students with address and data bus architecture.

Discussion: As we discussed in class, a computer uses the address bus to send the address of the memory location to be 'read from' or 'written to' to the corresponding pins of the memory IC. The memory IC then either puts the data requested onto the data bus, in the case of a read function, or takes the data from the data bus and places it in that memory location in the case of a write function.

In this lab we will use the 27C128 EPROM to gain first hand experience with the process of reading data from memory using the Address and Data Bus.

Procedure:

1. Hook up the following circuit. **Make sure you can remove the IC without destroying your wiring** you will replace this IC with a programmed one latter in the procedure.



2. Get a BLANK EPROM from the instructor and program following the following procedure:

    a) Make sure the unit is on and NO IC is in the socket.

    b) Click on the Max Loader

c) Verify the screen says:
Finding USB Device
TM 22333 Found

d) Insert the IC as show (at the bottom of the Zero Insertion Force (ZIF) Socket with the top of the IC towards the lever)

e) Push the lever away from you and down

f) On the menu bar: DEVICE | Select | Device Type | Flash, EEPROM, nvram | Manufacturer | Intel | Device 27128A

g) Click on the file open icon (or do FILE | LOAD) and select Desktop and the file LAB1 then click OPEN.

h) Click on the PROG Icon (make sure there is no error message and the programming was successful)

i) When done, pull arm up and towards you until it is almost upright.

j) Remove the programmed IC.

Replace the temporary IC with the programmed IC.

NOW Place the value $00 on SW1 [1..8] (the **ADDRESS LINES A0..A7**). You should see the binary pattern 01010101 (or a $55) on the LED's, if you do not, **STOP** and ask for help. When you see the pattern, this indicates that the address $00 contained a $55 and that this value is being placed on the **DATA LINES** (outputs).

Now place the value $01 on the Address Lines. Read the data lines as before. It should read $AA, if it does not, **STOP** and ask for help.

Now place the value $10 on the address lines and complete the table below by reading each consecutive memory location. **Stop when the DATA returns a $0A**. Using an ASCII Table (found on the internet) convert the hex values to their ASCII equivalent and write them in the table below (NOTE: the **table is LARGER THAN NEEDED**).

Memory Address	Hex Value	Ascii Character
$10		
$11		
$12		
$13		
$14		
$15		
$16		
$17		
$18		
$19		
$1A		
$1B		
$1C		
$1D		
$1E		
$1F		

Now place the value $30 on the address lines. What is the value in the memory location in hex:

Using https://www.binaryhexconverter.com/hex-to-decimal-converter convert this value to decimal. What is the value:

Now place the value $38 on the address lines. What is the value in the memory location (in hex):

What is the value in decimal?

What is the value assuming the original value was stored in TWO'S Complement?

Now read memory locations $40 AND $41 and record both values (in hex) side by side:

Convert that value to decimal:

Now read memory locations $50 and $51 and record the values in table two. Now convert it into binary then into the Date format as shown.

Memory address		Binary Value															
$50	$51																
		M	M	M	M	D	D	D	D	D	Y	Y	Y	Y	Y	Y	Y

This represents what date? _____

What is the significant of this date in US History? _____

Now move the wire connected to pin 26 (A13) from ground to +5v and set SW1 [1-9] all to 0. What memory location is being addressed?

What is the data in that memory location?

Now add $10 to the address above. Read a total of 4 memory locations (32 bits) and record the hex value below:

Now, using the website http://www.binaryconvert.com/convert_float.htm convert the hex value to a decimal number and record below:

Set the $\overline{OE}$ line inactive and disconnect pin 11 (D0) from the resistor/LED. Use a logic probe to determine the output on the data line D0 and record below:

Set $\overline{OE}$ active once again and set $\overline{CE}$ inactive. With pin pin 11 (D0) still disconnected from the resistor. Place a logic probe on pin 11 to determine the output on the data line D0 and record below:

Using what you have observed above, state how multiple ROMS could be connected to a computer with one additional address line. Keep in mind that both IC's outputs (D7..D0) would be tied together.

Questions:

a. How many address lines does the IC have?

b. How many bytes of information can the IC hold?

c. How many Kilobytes of memory is that?

d. What does the value “128” mean in the IC part number “27128”?

e. Is there a way to determine what a value in memory actually represents? If so explain how it can be determined, if not, state why this is the case.

f. What is the significance of the ASCII Values $0D and $0A? What would these characters do when printed to a monitor at the end of the message?

g. Find the data sheet for the IC used in the lab, state the link to the datasheet in the space below.

Submit the completed document file via the on line assignment submission link on the class website. (Due beginning of next week's lab)