LABORATORY #1

INTRODUCTION TO THE GLOBAL SPECIALTIES PB-505

OBJECTIVE:

The objective of this experiment is to become familiar with breadboard design equipment used in a digital design process. The laboratory exercise requires investigation of the breadboard, use of a digital signal monitor, analysis of a common computer circuit, and generation of a concise lab report.

PREPARATION:

Read over this lab handout carefully before coming to lab. Make sure that you understand it. If you do not understand it ask the instructor or TA. Predict your results and write them in your prelab.

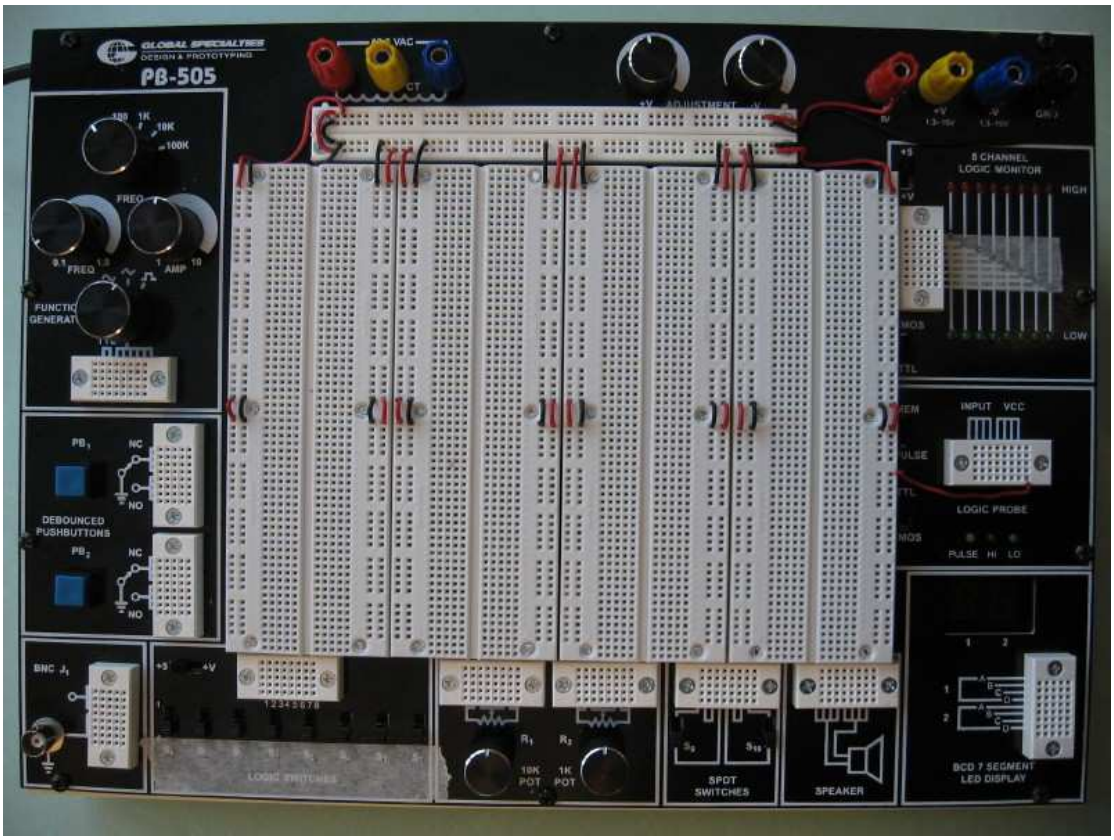
EQUIPMENT REQUIRED:

Global Specialties Design and Prototyping PB-505
Wire Leads
1 7486 TTL Integrated Circuit

PROCEDURE:

PB-505 FUNCTION

The PB-505 Digital Lab provides a laboratory breadboard on which digital circuits can be assembled and exercised. Below is a photo of the Digital Lab.



1. The lamp monitors (labeled 8 CHANNEL LOGIC MONITOR: 7 through 0) are available to check logic voltage levels on the board. Use the wire leads to test the lamps yourself. It is also good practice to test the wires you will use to build your circuit for continuity.

2. Explore the function of the logic switches (labeled LOGIC SWITCHES: S7 through S0) by using the lamp monitors. Indicate the effects in your lab notebook.

3. Explore the function of the momentary push buttons (labeled DEBOUNCED PUSHBUTTONS: PB1 and PB2) Note your results in your notebook. Be sure to check out all the logic signals, i.e., PB1 NC, PB1 NO, PB2 NC, PB2 NO.

4. The breadboard has internal connections within the vertical bus lines on the sides of the four individual breadboards. There are also horizontal internal connections found in sets of five on either side of the large gap running vertically on each of the four boards. Avoid the IC which is in place and verify these connections using the lamp monitors. Note the results in your lab notebook with a simple diagram and description.

LOGIC PROBE FUNCTION

a) Note that the red lead of the logic probe is connected to +5 volts. This is necessary to provide the logic probe with a reference voltage to which 'HI' is associated with. Do not move the TTL/CMOS switch from the TTL position unless instructed to do so. Now experiment with the probe by connecting the probe tip to various outputs on the PB-505 as instructed below.

a) Connect the probe tip to S7 and move the switch back and fourth. *Record what you observe.*

b) Connect the probe to the PB1 NC pushbutton and push the button. *Record what you observe.* Repeat for PB1 NO, and then for PB2 NC and PB2 NO again *recording what you observe*.

c) Note the PULSE light. *When does it illuminate? What about when the MEM/ PULSE switch is set to MEM?*

LOGIC CIRCUIT ANALYSIS

1. The pin numbers on an integrated circuit (IC) are identified by the "cut out" or dot on one end of the IC package as shown in Figure 1. You will encounter IC packages of different sizes, however, all will have pin number 1 in the same place with the other pins numbered sequentially in the same manner.

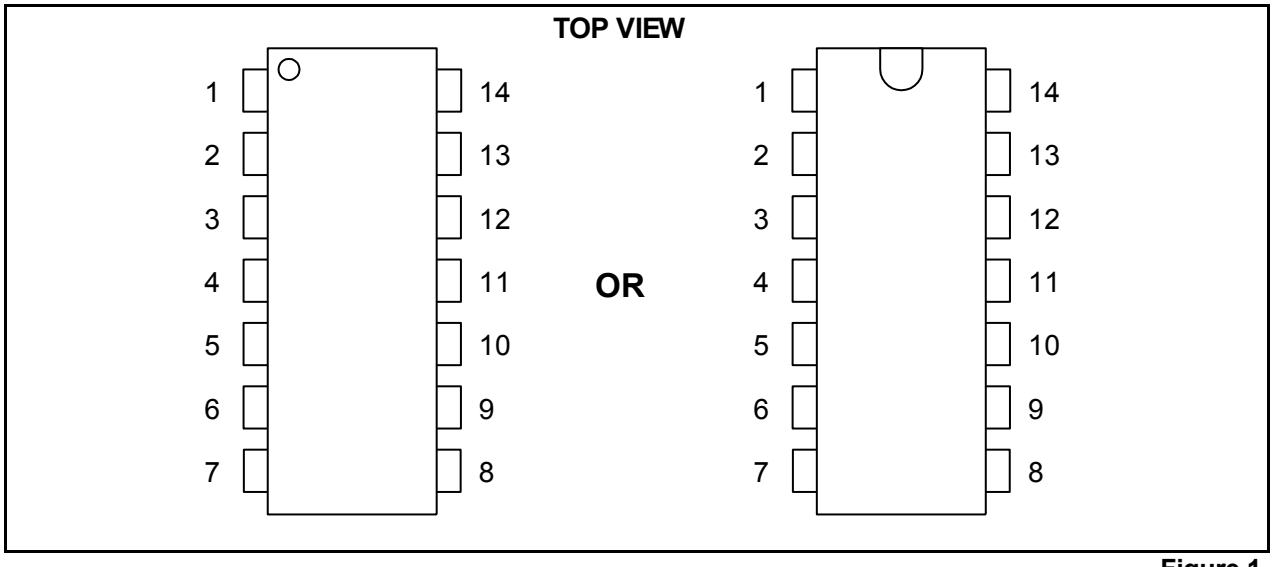


Figure 1

- Turn power to the PB-505 OFF and wire the IC chip according to Figure 2. The logical switches labeled S3, S2, S1, and S0 provide the input binary number. The lamp in the logic monitor labeled "0" should provide the visual output signal. HAVE YOUR CIRCUIT CHECKED BY THE INSTRUCTOR PRIOR TO APPLYING POWER AGAIN!!

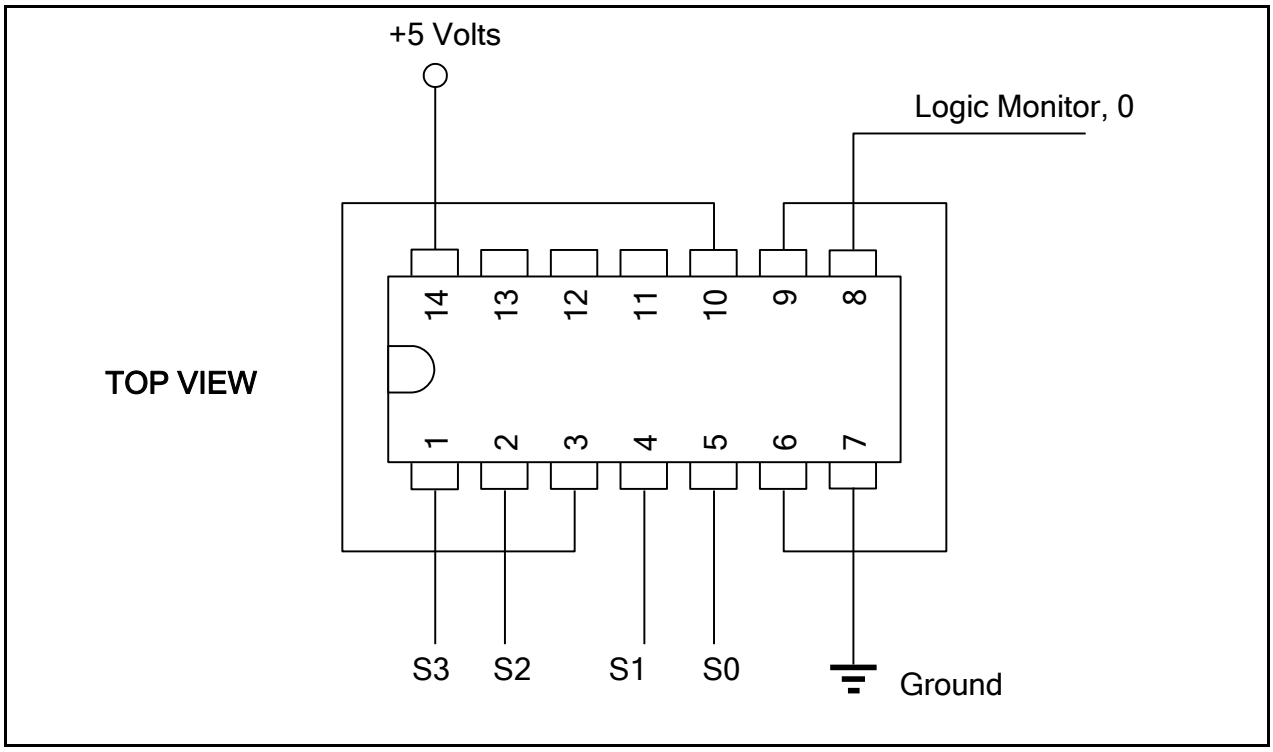


FIGURE 2

- The circuit you have wired can be represented as a block diagram as shown in Figure 3. Each block represents a logic gate and in the middle of each block is a number which indicates which chip the element is contained in. This is necessary when more than one chip is used to create a logic function. In addition, each input and output pin of the logic element is labeled so that wiring can proceed easily. These pin numbers correspond to the IC package pin numbers. Use this method whenever you make a circuit diagram with the exception that standard symbols for gates are to be used in place of the square boxes.

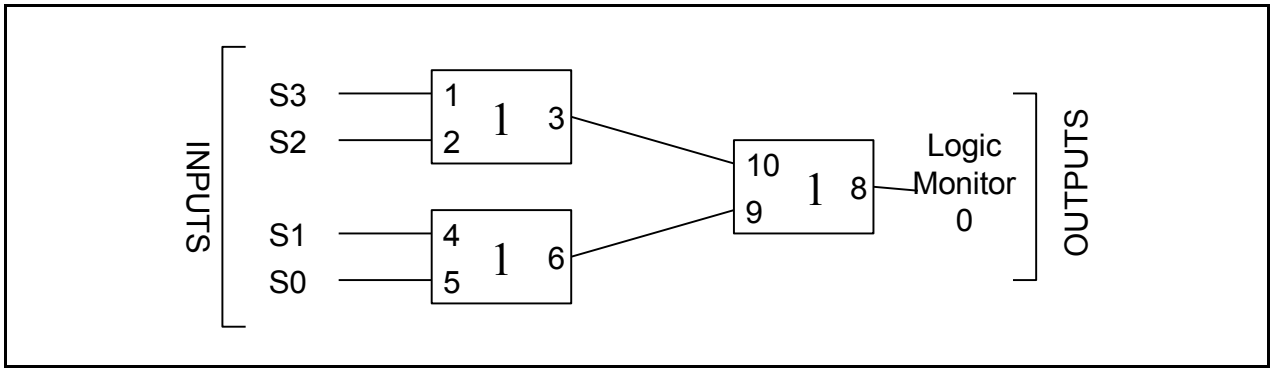


FIGURE 3

2. Sequence the switches through the binary numbers 0000 through 1111 where: MSB corresponds to S3 and LSB corresponds to S0.

Document your results in your lab notebook in a tabular form as shown below. Make sure you note the intermediate results from the first two gates as well.

Inputs				Intermediates		Output
S3	**S2**	**S1**	**S0**	**Chip 1, Pin 3**	**Chip 1, Pin 6**	**Logic Monitor, 0**
0	0	0	0	?	?	?
0	0	0	1	?	?	?
0	0	1	0	?	?	?
0	0	1	1	?	?	?
0	1	0	0	?	?	?
0	1	0	1	?	?	?
0	1	1	0	?	?	?
0	1	1	1	?	?	?
1	0	0	0	?	?	?
1	0	0	1	?	?	?
1	0	1	0	?	?	?
1	0	1	1	?	?	?
1	1	0	0	?	?	?
1	1	0	1	?	?	?
1	1	1	0	?	?	?
1	1	1	1	?	?	?