Digital Electronics

&

Chip Design

Lab Manual II:
Invasion of the Caltech Barbarians
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Please see the attached "For Your Eyes Only" document describing the objectives of this lab before proceeding.

Part I: Truth Table

Based on the mission statement, draw a truth table. The table should have three inputs (W = West, C = Case, S = Sprague) and three outputs (L = LAX, R = Route 66, P = Pitzer Field).

Get your truth table checked off before proceeding.

Part II: Schematics

Using your schematics from part 1, draw a circuit that solves the problem. Use three of your switches as inputs and three LEDs as outputs. Then label each gate with the number of the chip on which it is located and the pin numbers of each input and output. You may find the 7411 3-input AND gates and 7404 NOT gates especially useful.

Have your schematics checked off before proceeding.

Part III: Construction

Now, build your circuit on your breadboard. First, place each of your chips. Connect power and ground to each chip. Then make each of the connections shown in your schematic, checking it off as you proceed.

Remember that all of the holes along the vertical blue line are ground (zero volts) and all the holes along the red line are 5 volts are power (five volts). Each of the five holes in a horizontal strip are connected.

When you are done, turn on the power switch and test your circuit. If it works, have it checked off. If not, you have the exciting opportunity to learn about debugging! Ask for help debugging the circuit. Again, don't be shy to ask for help; after all, the fate of Harvey Mudd rests in your hands!

For Your Eyes Only

To: Freshman Digital Electronics Class
From: ASHMC
Subj: Red Alert! Invasion Pending!

Red Alert! Our intelligence officers have just intercepted a message that the Caltech Barbarians are planning an invasion against Harvey Mudd. We need your help to defeat these marauders!

Intelligence suggests three possible routes of invasion: along Route 66, across the Pitzer athletic fields, or flying in to LAX. Thus we have established guard stations. The first is on the roof of Sprague Library. The second is hiding behind a wall of stereo equipment in West Hall. The third is standing watch at Case.

Each station has a button. The guards will press their buttons if they can sight the barbarians approaching. Your job is to build a logic circuit that will determine the invasion route based on the information provided by the watch stations. Our scientists have designed the following table of functionality that you will need to implement:

- If the barbarians are visible from West Hall and Sprague, but not Case, they are coming along Route 66 and agents must jackknife a Lucky's delivery truck to block them.

- If the barbarians are visible from only Case, they are charging across the Pitzer fields and we must send out unicycle-mounted cavalry for hand-to-hand combat.

- If the barbarians are visible from Sprague and Case but not West hall, they are flying into LAX. We can safely ignore them because they'll never get through the commute alive.

Today it is your highest priority to design this circuit. Do not fail, or the consequences may be disastrous for the civilized world.

You are reminded that this is a Top Secret document. Do not let it fall into the hands of the enemy!