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Lab 1 Report

Push Buttons

Our push buttons work in the same way they did in experiment 5. Push buttons 1 and 2 set the counter to up and down respectively. Push button 0 changes the value of the stop_count variable.

Counter

Our counter checks 2 cases:

1. The counter has reached the decimal value of 24 and the direction is up
2. The counter has reached the decimal value of 0 and the direction is down

If these cases are met then the stop_count variable is set to stop and the direction is changed

2-Digit BCD

As our counter counts up, we check if the least significant digit is >4 . If it is, the most significant digit is increased by 1, and the value of the 1st digit is reset. As our counter counts down, we check if the least significant digit $=0$. If it does, the most significant digit is decreased by 1, and in the next clock cycle the 1st digit is set back to the highest digit (4).

LEDs

1. LEDs 0-3 - First we check to see if switch 15 is either high or low. If it's the first case and switch 15 is high we parse through each switch using a for loop from switch 15 to 0, and the first high switch we encounter (least significant) is the position Leds 3 to 0 display. If it's the latter case and switch 15 is low we parse through each switch using a for loop from switch 15 to 0, and the first low switch we encounter (least significant) is the position that Leds 3 to 0 display
2. LED 4 - All switches between 7 and 0 have to be in the high position so we used an AND operation
3. LED 5 - One switch between 15 and 8 have to be in the low position so we used an OR operation
4. LED 6 - Switches between 15 and 8 have to be high and between 7 and 0 have to be low. We used an AND operation and OR operation respectively, and the results were combined with an AND.
5. LED 7 - There has to be an even number of switches on. We used an XNOR operation. It will return 1 if there is an even number of inputs at logic high, and 0 if there is an odd number.
6. LED 8 - Always on so we set the value to logic high