Now that you have designed registers and register transfers, modify the adder you designed in an earlier lab to include registers. Use two 4-bit registers (A and B) to contain the two numbers to be added and add a third, 4-bit register to capture the sum.

You may use the keypad (Hexadecimal pad) for input to the registers and the *Plus* or *One* device to control the input to the flip-flops. These devices generate a constant value of one which, when connected to the C input will enable the flip-flop to capture the value from the keypad.

Use a *Push* device (modified switch) to enable the sum register to collect the sum of A and B.

Using 4-bit registers limits the number system to 0..15 for unsigned numbers and 0..7, -1..-7 for signed numbers. Add another 4-bit register to serve as the flags register. This register will be set to capture the results of the add operation as follows: Carry, Overflow, Sign, and Zero. The flip-flops for these registers use another push device similar to the one used for the sum register. The carry flip-flop will use the input from the carry out of your current adder circuit. The Sign flag uses the sign from the sum register, and is on when the sign is positive. The zero flag is set when the values in the sum register are all zero. Thus the zero flag shows one when the value in sum is zero.

The second push device is necessary to allow the inputs from the add operation to settle into the sum register. While this may not be necessary for the simulated circuit this control is necessary for standard add operations because the push signal is short-lived and the results have to be "settled" into the flip-flops before you use the outputs for other logic devices.