

Title: IC SYNCHRONOUS UP/DOWN COUNTERS**Materials:**

- [1] 74192 synchronous up/down counter IC
- [1] clock (single pulse)
- [1] 7447 BCD-to-seven-segment decoder
- [1] seven-segment LED display

Procedure:

1. Insert the 74192 into the breadboard
2. The 4 LEDs (D, C, B, A), the 7447, and the seven-segment display should still be hooked up and in your board since lab 12.
3. Wire the 74192 counter by connecting the count up input to the clock, the CLR input to a switch, the outputs (Q_D , Q_C , Q_B , Q_A) to the LEDs, and the V_{CC} and GND.
4. Set the clear input to 0 so the 74192 will count.
5. Operate the Decade Up Counter and record the results (both binary and digital) in Table 15-3.
6. Change the clock input to the count down pin of the 74192. It is now a Decade Down Counter.
7. Operate the Decade Down Counter and record the results (both binary and digital) in Table 15-3. **Get Instructor's Signature (be ready to show how you make it an up or a down counter).**

Questions:

1. A logical _____ (0, 1) must be placed on the CLR input of the 74192 IC to clear the output to 0000. A logical _____ (0, 1) is placed on the CLR input to enable the 74192 to count.
2. The output from the 74192 IC counter is in _____ (BCD, decimal form).
3. How do you convert the 74192 from an up to a down counter?
4. If the CLR input of the 74192 were left floating (not connected), what would happen?
5. **Draw** a logic diagram of the 74192 IC being used as a modulo-7 up counter. Use an extra 3-input AND gate to reset the counter to 0000. The AND gate feeds back into the CLR on the 74192.
6. List the counting sequence of the modulo-7 up counter you drew in question 5 (begin with 0000_2 and list the next 7 in the sequence).

Input pulse number	Output									
	Decade Up Counter					Decade Down Counter				
	Binary readout				Digital readout	Binary readout				Digital readout
D	C	B	A	D		C	B	A		
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										

Table 15-3 TT for 2 counters

