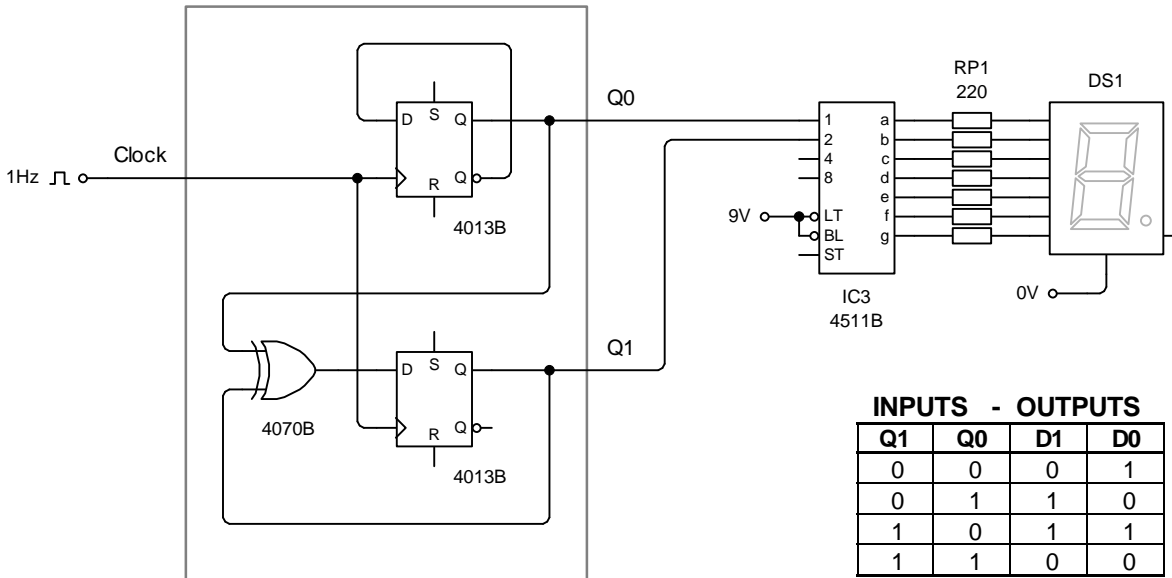


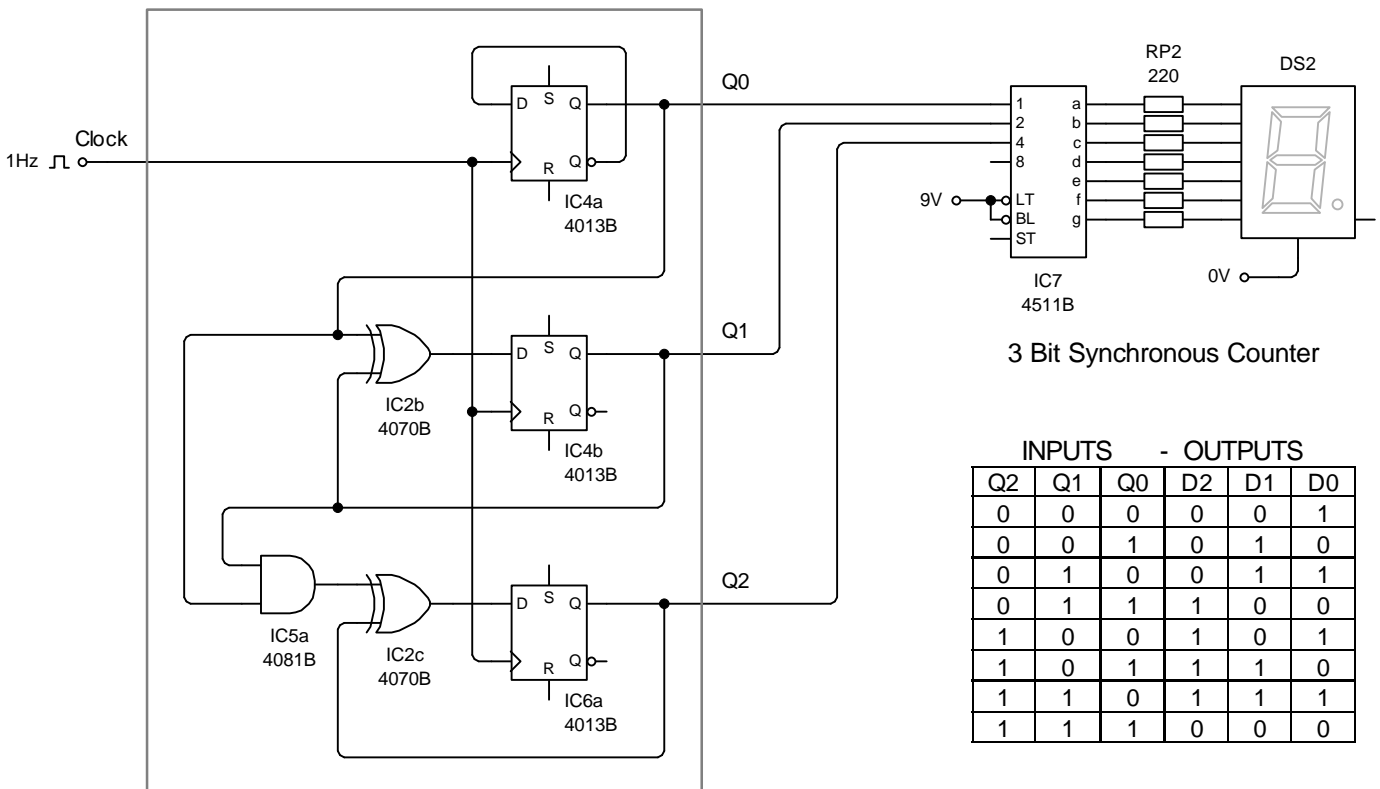
SYNCHRONOUS COUNTERS

These are counters that don't suffer from "race-hazard" spikes experienced with ripple counters. Each time an output changes, the data for the next count is already present at the data inputs to the D-type flip-flops.

2 BIT COUNTER

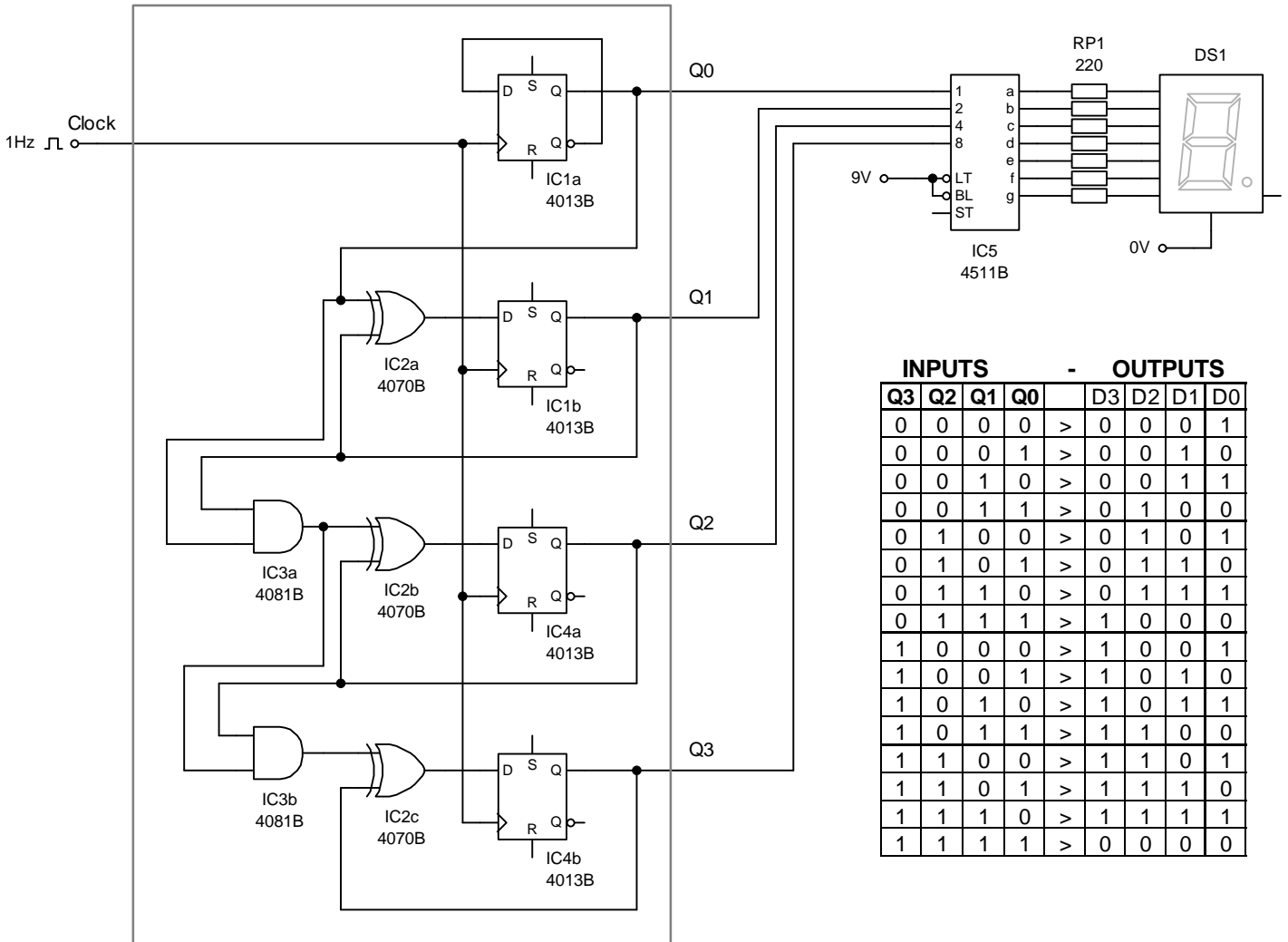


3 BIT COUNTER

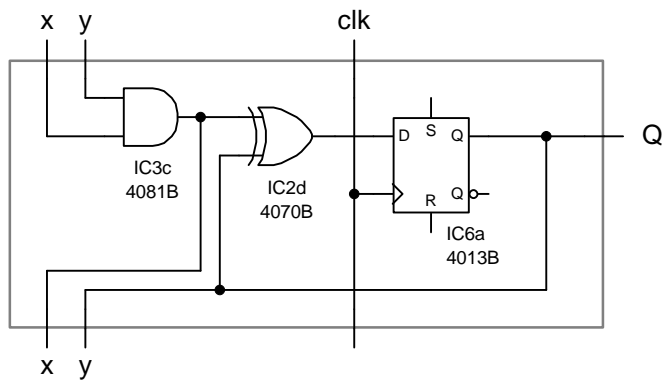


SYNCHRONOUS COUNTERS

4-BIT COUNTER



INPUTS				- OUTPUTS				
Q3	Q2	Q1	Q0	D3	D2	D1	D0	
0	0	0	0	>	0	0	0	1
0	0	0	1	>	0	0	1	0
0	0	1	0	>	0	0	1	1
0	0	1	1	>	0	1	0	0
0	1	0	0	>	0	1	0	1
0	1	0	1	>	0	1	1	0
0	1	1	0	>	0	1	1	1
0	1	1	1	>	1	0	0	0
1	0	0	0	>	1	0	0	1
1	0	0	1	>	1	0	1	0
1	0	1	0	>	1	0	1	1
1	0	1	1	>	1	1	0	0
1	1	0	0	>	1	1	0	1
1	1	0	1	>	1	1	1	0
1	1	1	0	>	1	1	1	1
1	1	1	1	>	0	0	0	0



It is simple to add further stages to the binary counter by repeatedly adding the circuit shown left.