

TRUTH TABLE FOR THE 3 BIT UP-DOWN COUNTER

Q_2	Q_1	Q_0	M	Q_{2next}	Q_{1next}	Q_{0next}	J_2	K_2	J_1	K_1	J_0	K_0
0	0	0	0	0	0	1	0	X	0	X	1	X
0	0	1	0	0	1	0	0	X	1	X	X	1
0	1	0	0	0	1	1	0	X	X	0	1	X
0	1	1	0	1	0	0	1	X	X	1	X	1
1	0	0	0	1	0	1	X	0	0	X	1	X
1	0	1	0	1	1	0	X	0	1	X	X	1
1	1	0	0	1	1	1	X	0	X	0	1	X
1	1	1	0	0	0	0	X	1	X	1	X	1
0	0	0	1	1	1	1	1	X	1	X	1	X
0	0	1	1	0	0	0	0	X	0	X	X	1
0	1	0	1	0	0	1	0	X	X	1	1	X
0	1	1	1	0	1	0	0	X	X	0	X	1
1	0	0	1	0	1	1	X	1	1	X	1	X
1	0	1	1	1	0	0	X	0	0	X	X	1
1	1	0	1	1	0	1	X	0	X	1	1	X
1	1	1	1	1	1	0	X	0	X	0	X	1

K-MAPS:

J2 *Q0,M*

	00	01	11	10
<i>Q2,Q1</i> 00	0	1	0	0
01	0	0	0	1
11	-	-	-	-
10	-	-	-	-

K2 *Q0,M*

	00	01	11	10
<i>Q2,Q1</i> 00	-	-	-	-
01	-	-	-	-
11	0	0	0	1
10	0	1	0	0

j1 *Q0,M*

	00	01	11	10
<i>Q2,Q1</i> 00	0	1	0	1
01	-	-	-	-
11	-	-	-	-
10	0	1	0	1

K1 *Q0,M*

	00	01	11	10
<i>Q2,Q1</i> 00	-	-	-	-
01	0	1	0	1
11	0	1	0	1
10	-	-	-	-

J0 *Q0,M*

	00	01	11	10
<i>Q2,Q1</i> 00	1	1	-	-
01	1	1	-	-
11	1	1	-	-
10	1	1	-	-

K0 *Q0,M*

	00	01	11	10
<i>Q2,Q1</i> 00	-	-	1	1
01	-	-	1	1
11	-	-	1	1
10	-	-	1	1

$$J2 = Q1'Q0'M + Q1Q0M'$$

$$K2 = Q1'Q0'M + Q1Q0M'$$

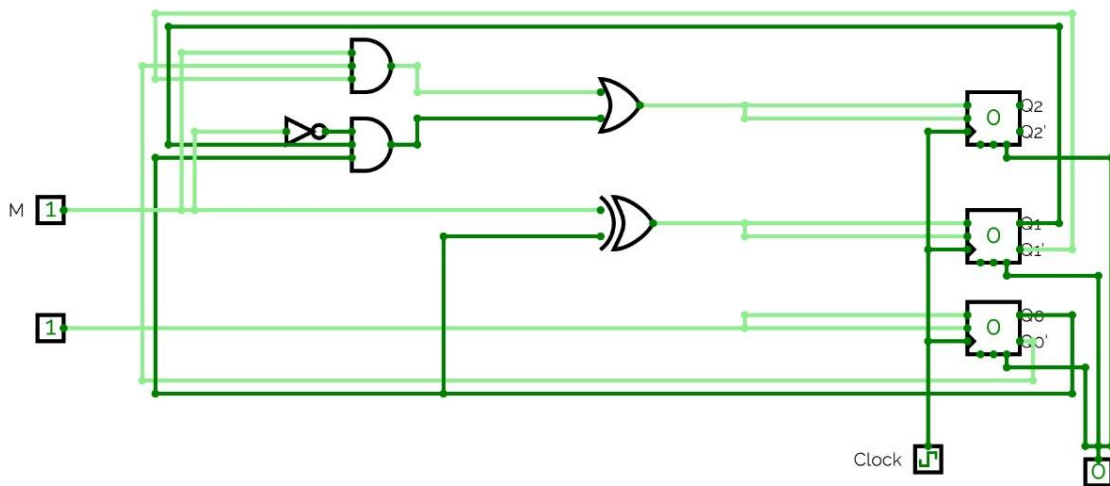
$$J1 = Q0'M + Q0M'$$

$$K1 = Q0'M + Q0M'$$

$$J0 = 1$$

$$K0 = 1$$

CIRCUIT DIAGRAM:



Link to circuit:

<https://circuitverse.org/users/107641/projects/elp201-project-e72c1793-e995-4ebf-b4db-99e8b08cfe47>