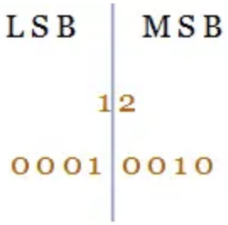
Binary to BCD code converter

In BCD code, 0 to 9 numbers represent the equivalent binary numbers. For the numbers above 10, LSB of a decimal number is represented by its equivalent binary number and MSB of a decimal number is also represented by their equivalent binary numbers.

For example, the BCD code of 12 is represented as



The BCD code for 12 is 10010

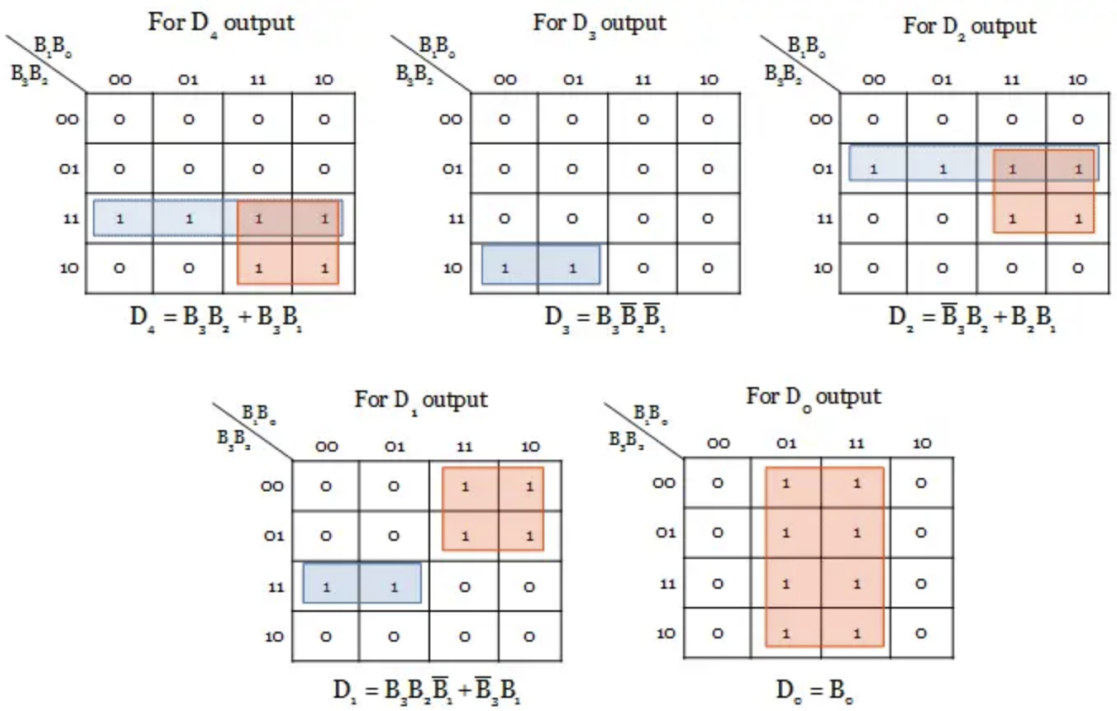
The following truth table shows the conversion between the binary code input and the BCD code output. As you see from the table, the 4-bit binary number is converted into 5-bit BCD code. Decimal code is added in the table to understand the equivalence of Binary and BCD code.

Decimal Number	Binary code (Input)				BCD code (Output)				
	B_3	B_2	B_1	B_0	D_4	D_3	D_2	D_1	D_0
0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	0	1
2	0	0	1	0	0	0	0	1	0
3	0	0	1	1	0	0	0	1	1
4	0	1	0	0	0	0	1	0	0
5	0	1	0	1	0	0	1	0	1
6	0	1	1	0	0	0	1	1	0
7	0	1	1	1	0	0	1	1	1
8	1	0	0	0	0	1	0	0	0
9	1	0	0	1	0	1	0	0	1
10	1	0	1	0	1	0	0	0	0
11	1	0	1	1	1	0	0	0	1
12	1	1	0	0	1	0	0	1	0
13	1	1	0	1	1	0	0	1	1
14	1	1	1	0	1	0	1	0	0
15	1	1	1	1	1	0	1	0	1

The converter has 5 outputs D_0, D_1, D_2, D_3 and D_4. From the truth table, the minterms can be obtained for each output.

$D_4 = \sum m(10, 11, 12, 13, 14, 15)$, $D_3 = \sum m(8, 9)$, $D_2 = \sum m(4, 5, 6, 7, 14, 15)$, $D_1 = \sum m(2, 3, 6, 7, 12, 13)$, $D_0 = \sum m(1, 3, 5, 7, 9, 11, 13, 15)$

The minterms are plotted in the karnaugh map and the simplified boolean expressions are obtained. Learn, How to minimize a boolean function using K-map?



The digital logic circuit for Binary to BCD code converter is designed from the simplified output expressions obtained from karnaugh map.