

BCD ADDER.

A BCD adder is a circuit which performs the BCD addition as follows.

- 1) Add the 2 BCD numbers to obtain sum.
- 2) If the binary sum is greater than 1001_2 add 0110_2 to obtain the sum.

So a BCD adder consists of a

- 1) 4-bit adder for initial addition.
- 2) Circuit to detect whether sum is greater than 1001_2 .
- 3) 4-bit adder to add 0110_2 with the sum if the sum is greater than 1001_2 or carry is 1.

Sum Outputs	Output
$S_3 S_2 S_1 S_0$	Y
0 0 0 0	0
0 0 0 1	0
0 0 1 0	0
0 0 1 1	0
0 1 0 0	0
0 1 0 1	0
0 1 1 0	0
0 1 1 1	0
1 0 0 0	0
1 0 0 1	0
1 0 1 0	1
1 0 1 1	1
1 1 0 0	1
1 1 0 1	1
1 1 1 0	1
1 1 1 1	1

	$S_3 S_2$	$S_1 S_0$	00	01	11	10
00			0	0	0	0
01			0	0	0	0
11			1	1	1	1
10			0	0	1	1

$$Y = S_3 S_2 + S_3 S_1$$

Even though the sum $S_3 S_2 S_1 S_0$ is less than or equal to 9 and if the carry is 1 ($C_{out} = 1$), 0110_2 must be added to the sum output.

$$\text{Output carry } C = Y + C_{out} = S_3 S_2 + S_3 S_1 + C_{out}$$

