BCD Code or 8421 Code

The full form of BCD is 'Binary-Coded Decimal.' Since this is a coding scheme relating decimal and binary numbers, four bits are required to code each decimal number. For example, $(35)_{10}$ is represented as 0011 0101 using BCD code, rather than $(100011)_2$. From the example it is clear that it requires more number of bits to code a decimal number using BCD code than using the straight binary code. However, inspite of this disadvantage it is convenient to use BCD code for input and output operations in digital systems.

The code is also known as 8-4-2-1 code. This is because 8, 4, 2, and 1 are the weights of the four bits of the BCD code. The weight of the LSB is 2^0 or 1, that of the next higher order bit is 2^1 or 2, that of the next higher order bit is 2^2 or 4, and that of the MSB is 2^3 or 8. Therefore, this is a *weighted* code and arithmetic operations can be performed using this code, which will be discussed later on. The bit assignment 0101, for example, can be interpreted by the weights to represent the decimal digit 5 because $0 \times 8 + 1 \times 4 + 0 \times 2 + 1 \times 1 = 5$. Since four binary bits are used the maximum decimal equivalent that may be coded is 15_{10} (*i.e.*, 1111_2). But the maximum decimal digit available is 9_{10}. Hence the binary codes 1010, 1011, 1100, 1101, 1110, 1111, representing 10, 11, 12, 13, 14, and 15 in decimal are never being used in BCD code. So these six codes are called forbidden codes and the group of these codes is called the forbidden group in BCD code. BCD code for decimal digits 0 to 9 is shown in the following table.

Decimal digit	*(BCD) 8421*
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

Example 1. *Give the BCD equivalent for the decimal number 589.*

Solution. The decimal number is 5 8 9

BCD code is 0101 1000 1001

Hence, $(589)_{10} = (010110001001)_{BCD}$

Example 2. *Give the BCD equivalent for the decimal number 69.27.*

Solution. The decimal number 6 9 2 7

BCD code is 0110 1001 0010 0111

Hence, $(69.27)_{10} = (01101001.00100111)_{BCD}$