

PARITY BIT GENERATION

Exclusive-OR functions are very useful in systems requiring error-detection and correction codes. The circuit that generates the parity bit in the transmitter is called a parity generator. The circuit that checks the parity in the receiver is called a parity checker.

Fig

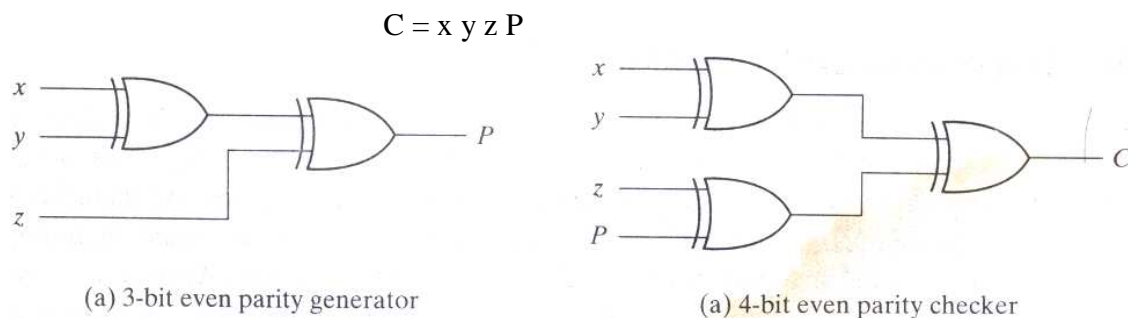
Even-Parity-Generator Truth Table

Three-Bit Message			Parity Bit
<i>x</i>	<i>y</i>	<i>z</i>	<i>P</i>
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

Consider a 3-bit message to be transmitted together with an even parity bit. Table 1 shows the truth table for the parity generator. The three bits x , y , and z constitute the message and are the inputs to the circuit. The parity bit P is the output. For even parity, the bit P must be generated to make the total number of 1's even (including P). From the truth table, we see that P constitutes an odd function because it is equal to 1 for those minterms whose numerical values have an odd number of 1's. Therefore, P can be expressed as a three-variable exclusive-OR function:

$$P = x \oplus y \oplus z$$

The three bits in the message, together with the parity bit, are transmitted to their destination, where they are applied to a parity-checker circuit to check for possible errors in the transmission. Since the information was transmitted with even parity, the four bits received must have an even number of 1's. An error occurs during the transmission if the four bits received have an odd number of 1's, indicating that one bit has changed in value during transmission. The output of the parity checker, denoted by C , will be equal to 1 if an error occurs, that is, if the four bits received have an odd number of 1's. This corresponds to the map of Fig , which represents an odd function. The parity checker can be implemented with exclusive –OR gates:



Even-Parity-Checker Truth Table

Four Bits Received				Parity Error Check
<i>x</i>	<i>y</i>	<i>z</i>	<i>P</i>	<i>C</i>
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0