

Electronics

Shannon-Hartley

Shannon-Hartley equation: $Capacity [bits / s] = B \log_2 \left(\frac{S}{N} \right)$

It is the capacity of a channel, where B is the bandwidth, S is the signal and N is the noise.

Problem 1.- A rural telephone line has a signal to noise ratio of 30 dB (a ratio of 1,000). Calculate the maximum transmission rate that it can accommodate if the bandwidth is 4 kHz.

Solution: Using Shannon-Hartley equation:

$$Capacity [bits / s] = B \log_2 \left(\frac{S}{N} \right) = 4,000 Hz \log_2 (1,000) = \mathbf{39,800 \text{ bits/s}}$$