NOISE IN COMMUNICATION SYSTEMS

Noise : - Unwanted/Undesired introduction of energy tending to interfere with proper reception and reproduction of transmitted signals.

Classification on the basis of Source of Noise

1. EXTERNAL Noise : It is difficult to treat quantitatively . It is created outside/generated outside the circuit.
2. Internal Noise : It is impossible to treat as it is random and easy to observe. It is created by active and Passive components with in the circuit.
3.

1. EXTERNAL NOISE

1.1 Atmospheric Noise (STATIC) – It is unpredictable caused by Lightning and atmospheric disturbances. It originates in the form of Amplitude Modulation.
It interfere more with RADIO then TV. Energy content of atmospheric Noise is inversally proportional to frequency.

1,2 Extra Terrestrial Noise :

1.2.1 Solar Noise : Due to large size and High Temp of SUN.

1.2.2 Cosmic Noise : Due to absorption by Hydrogen in Space (STARS and Galaxy)

1.3 Industrial Nolise : (Man Made Noise) Due to arc discharge by Automobiles and aircraft ignition.

2. INTERNAL NOISE

2.1 Thermal Agitation (WHITE / JOHNSON NOISE) : It occurs in resistors due to motion of moelcules.
AVERAGE POWER = K bar * T * B
T = Absolute Temperature
B = Bandwidth of Interest
k bar = Boltzmans Constant = 1.38 * 10 to the power of 23 Joules/Degree Kelvin.

2.2 SHOT Noise : It occurs in Diode due to random diffusion of electrons in semiconductors.
RMS SHOT NOISE CURRENT = In

In = sqr root of (2 * e * Ip *B)

Ip = Direct Diode Current
e = Charge of electron

2.3 PARTITION Noise : It occurs in TRIODE VALVE and Transistor due to partition of current or division of current into two or more paths.
Note : That's why DIODE is preferred in place of Transistor in MIXER.

NOISE VOLTAGE :

It is defined as root mean square (RMS) Voltage due to Thrermal Noise , Vn, generated in a Resistance R (Ohms) over Bnadwidth B Htz.

$$Vn = \sqrt{4kTRB}$$

Where, k = Boltzman Constant = $1.38 \times 10^{-23} J/0_K$

T = Temperature in degree Kelvin

R = Resistance in ohm

B = Bandwidth in Hertz, in which Noise observed.

NOISE POWER :

It is defined as Power dissipated due to Thermal Noise Vn, generated in a Resistance R Ohms over bandwidth B Htz.

$$P_n = \frac{V_n^2}{4\,R} = \text{kTB}$$

Noise Power in dB_w= P(dB_w) = 10 log (KTB)