What are Terminators and Why use Terminators?

Terminators are used near the load or termination to overcome the mismatch. The reflected signal will interfere with the incoming signal and give noise like components.

For this purpose BNC terminators are used near the load or termination to overcome the mismatch. The terminators are used usually with a BNC-‘T’ junction, one side connected to the signal cable and the other side to the terminator. Few varieties of terminator can be installed directly on the cable without a T joint.

The terminators absorb the electrical energy of the signal or current as it reaches the end of the cable thus avoiding reflection of the signal and hence prevents noise. This ensures smooth flow of current from one device to another.

Also the BNC terminator is used to close open terminations such as one end of the BNC-‘T’ junction to avoid some parasitic signal to enter the circuit through that point.

When two devices are connected, e.g., a photodiode and an oscilloscope, to avoid noise, the impedance has to be matched at the oscilloscope by using proper cable (RG58U for 50 Ohm impedance) and a 50 Ohm or 75 Ohm terminator using a BNC-T-junction. In general, majority of the equipments have 50 Ohm impedance.

But for video signals 75 Ohm impedance matching is essential to avoid distortion of the signal.

There are two major types of coaxial cables terminators: BNC type and F type. The BNC type has both 50Ω and 75Ω impedance, while the F type has 75Ω. For low to medium frequency signals a 50Ω terminator is suitable. For higher frequencies (like in TV signals, VHF, UHF, etc.) a higher impedance terminator is suitable in order to have less reflection on the electromagnetic wave.

**This impedance \( Z \) is the wave impedance of the line (i.e., of the coaxial cable),

\[
Z = \frac{Z_0}{2\pi \sqrt{\varepsilon_r}} \cdot \ln(D/d),
\]

where \( Z_0 = 376.73\Omega \) the impedance of the free space, \( \varepsilon_r \) = the dielectric permittivity of the material, \( D \) the external and \( d \) the internal diameter of the coaxial cable i.e., the BNC connector.

This impedance has nothing to do with the well known impedance of a line, when the electromagnetic waves are not taken into consideration (i.e AC electric circuits with \( f = 50 \) or 60Hz).