Return Loss
(in support of comment 36)

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Return Loss and Receiver Reflectance

- Past multi-mode link standards (802.3cm, .3cd, .3bm, .3ba) have specified

  Optical return loss tolerance (max)   12 dB
  Receiver reflectance (max)   -12 dB

- 802.3db D2.0 specifies the same values for optical return loss tolerance and receiver reflectance

- Model for return loss shows that for a reasonable value of connector loss (0.4 dB), the maximum receiver reflectance can be specified as -12 dB

Symbols and Simplifications
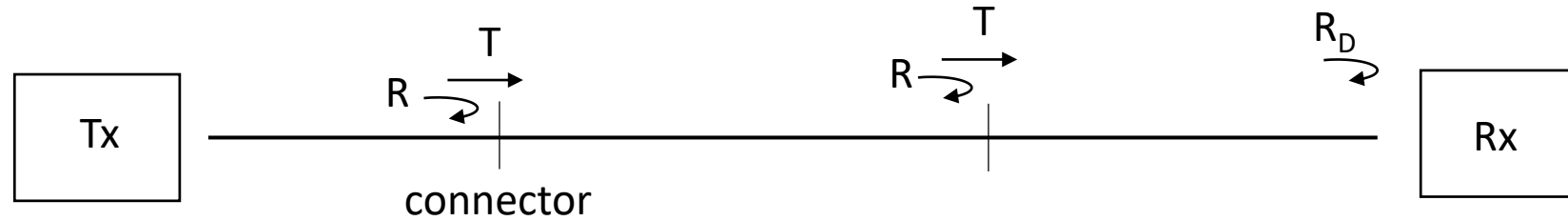
Optical return loss tolerance $\qquad$ T_0
Receiver reflectance $\qquad$ R_D
Connector reflectance (into waveguide) $\qquad$ R
Connector transmittance (into waveguide) $\qquad$ T
Number of connectors $\qquad$ N

Simplifications:
1. Incoherent addition of reflected intensity
2. No fiber attenuation
3. Multiple reflections from a connector are ignored

Return Loss

There is some loss at the connector, i.e., R + T < 1.

For a given optical return loss tolerance T_0 and connector reflectance R, the maximum receiver reflectance R_D is shown as a function of T for N = 0, 1, 2, and 3 connectors.

At a particular connector transmittance T*, $|R_D| = T_0$, independent of the number of connectors.

$$T^* = \sqrt{1 - \frac{R}{T_0}}$$

For $T_0 = |R_D| = 12$ dB, T* $\approx 0.92 \approx -0.37$ dB

There is nothing special about -0.37 dB connector transmittance but it's a reasonable value.

D2.0 Specifications
Receiver reflectance (max)   -12 dB
Optical return loss tolerance (max)   12 dB

Optical return loss tolerance T_0 12 dB
Connector reflectance R   -20 dB