Calculating the EX 8200 series Switch Fiber-Optic Cable Power Margin

Calculate the link's power margin when planning fiber-optic cable layout and distances to ensure that fiber-optic connections have sufficient signal power to overcome system losses and still satisfy the minimum input requirements of the receiver for the required performance level. The power margin (P_M) is the amount of power available after attenuation or link loss (LL) has been subtracted from the power budget (P_B).

When you calculate the power margin, you use a worst-case analysis to provide a margin of error, even though all the parts of an actual system do not operate at worst-case levels. A power margin (P_M) greater than zero indicates that the power budget is sufficient to operate the receiver and that it does not exceed the maximum receiver input power. This means the link will work. A (P_M) that is zero or negative indicates insufficient power to operate the receiver. See the specification for your receiver to find the maximum receiver input power.

Before you begin to calculate the power margin:

- Calculate the power budget. See Calculating the EX 8200 series Switch Fiber-Optic Cable Power Budget.

To calculate the worst-case estimate for the power margin (P_M) for the link:

1. Determine the maximum value for link loss (LL) by adding estimated values for applicable link-loss factors—for example, use the sample values for various factors as provided in Table 1 (here, the link is 2 km long and multimode, and the (P_B) is 13 dBm):

Table 1: Estimated Values for Factors Causing Link Loss

Link-Loss Factor	Estimated Link-Loss Value	Sample (LL) Calculation Values
Higher-order mode losses (HOL)	■ Multimode—0.5 dBm ■ Single mode—None	■ 0.5 dBm ■ 0 dBm
Modal and chromatic dispersion	■ Multimode—None, if product of bandwidth and distance is less than 500 MHz/km ■ Single mode—None	■ 0 dBm ■ 0 dBm
Connector	0.5 dBm	This example assumes 5 connectors. Loss for 5 connectors: 5(0.5 dBm) = 2.5 dBm
Splice	0.5 dBm	This example assumes 2 splices. Loss for two splices: 2(0.5 dBm) = 1dBm

Table 1: Estimated Values for Factors Causing Link Loss *(continued)*

Fiber attenuation	■ Multimode—1 dBm/km ■ Single mode—0.5 dBm/km	This example assumes the link is 2 km long. Fiber attenuation for 2 km: ■ 2 km(1.0 dBm/km) = 2 dBm ■ 2 km(0.5 dBm/km) = 1 dBm
Clock Recovery Module (CRM)	1 dBm	1 dBm

NOTE: For information about the actual amount of signal loss caused by equipment and other factors, see your vendor documentation for that equipment.

2. Calculate the (P_M) by subtracting (LL) from (P_B):

   $P_B - LL = P_M$

   13 dBm – 0.5 dBm [HOL] – 5 (0.5 dBm) – 2 (0.5 dBm) – 2 km (1.0 dBm/km) – 1 dB [CRM] = P_M

   13 dBm – 0.5 dBm – 2.5 dBm – 1 dBm – 2 dBm – 1 dBm = P_M

   P_M = 6 dBm

   The calculated power margin is greater than zero, indicating that the link has sufficient power for transmission. Also, the power margin value does not exceed the maximum receiver input power. Refer to the specification for your receiver to find the maximum receiver input power.

Related Topics

- Calculating the EX 8200 series Switch Fiber-Optic Cable Power Budget
- Optical Interface Support in EX 8200 series Switches
- Understanding EX 8200 series Switch Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion