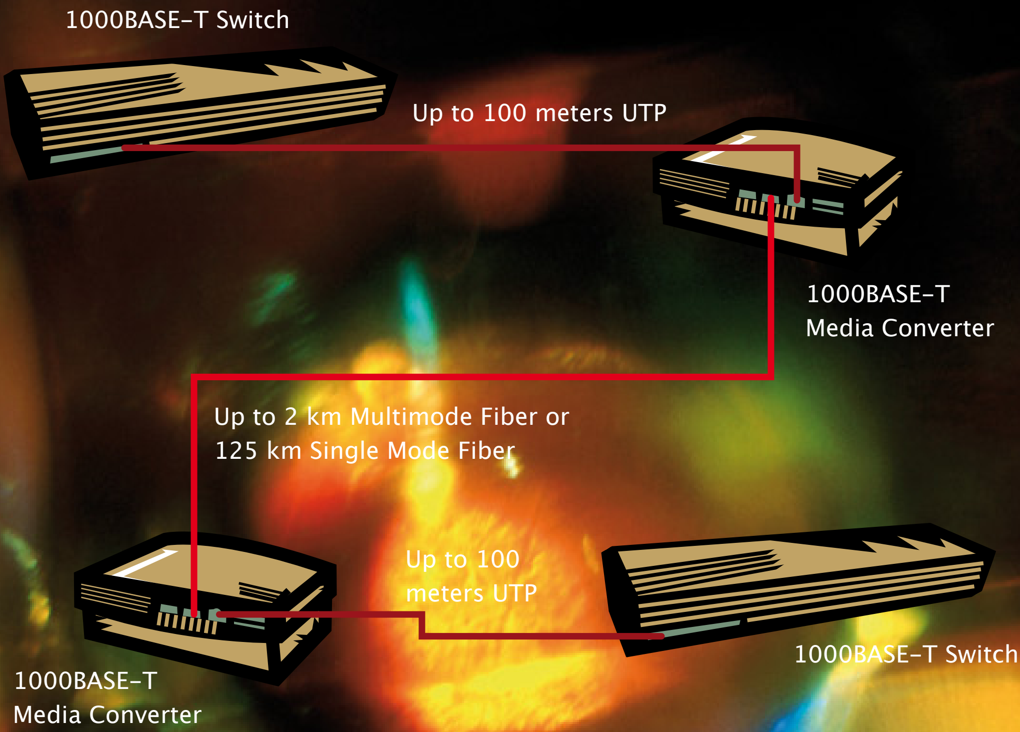
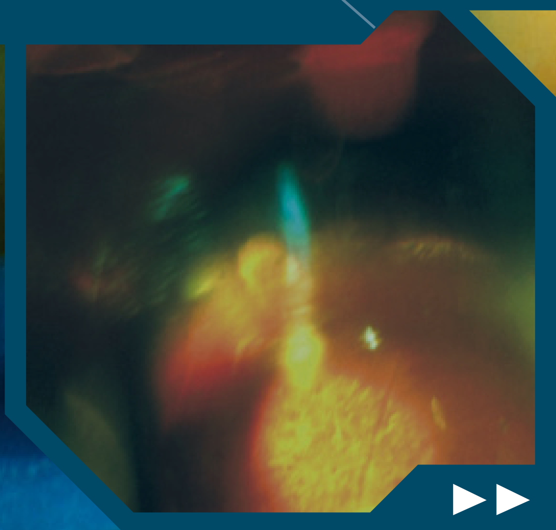


DIMENSIONING



Multi Mode Calculations

According to the example, mentioned on page 44, it is requested to establish a fiber connection between to distribution frames, with a distance of 200 meters between the two distribution frames. It is also requested to use drop – and patch cables at both ends. The required speed is 1Gbit. Due to the patch cables, we shall need three pairs of connectors.

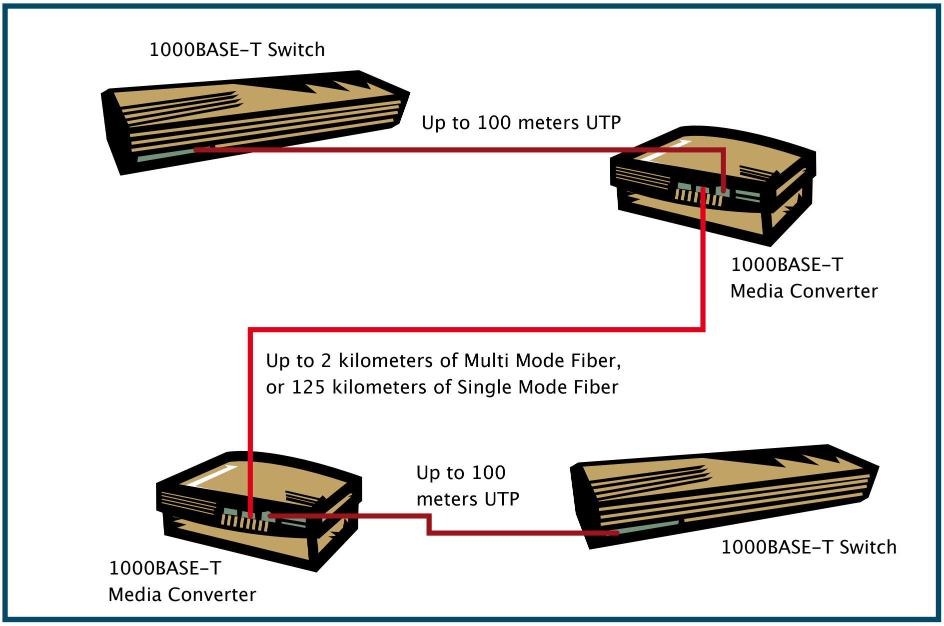
Losses

Fiber Loss (at 850nm)	2,5dB pr Km	0,5dB
Connector loss	0,4dB pr. pairs	1,2dB (3 pairs)
Splicings, if necessary	0,05dB pr. splicing	
Expected Loss		1,7dB
Reserve for repairs,if necessary		3,0dB

In other words, we will need a pair of media converters with a budget of at least 4,7dB.

Below, an example from Transition

Figure 1



There are different kinds of media converter modules, capable of different distances. Assuming a speed of 1Gbit, distances up to 2 kilometers will be possible, by using multi mode fiber. If we use single mode fiber in stead, the maximum distance may be increased to 125 kilometers.

1000BASE-T (RJ-45) [100 m/328 ft.]
1000BASE-SX 850nm MM (SC)
220 m / 722 ft.) Link Budget: 7.0 dB
550 m / 1804 ft.) Link Budget: 7.0 dB

This converter can manage distances between 220 and 550 meters. If you use 62,5µm fiber, the distance will be only 220 meters. If you on the other hand use 50µm fiber (which, over time, has become the most commonly used fiber), the distance will be 550 meters. With regard to losses there is a total budget of 7dB, that is, no problems at all.

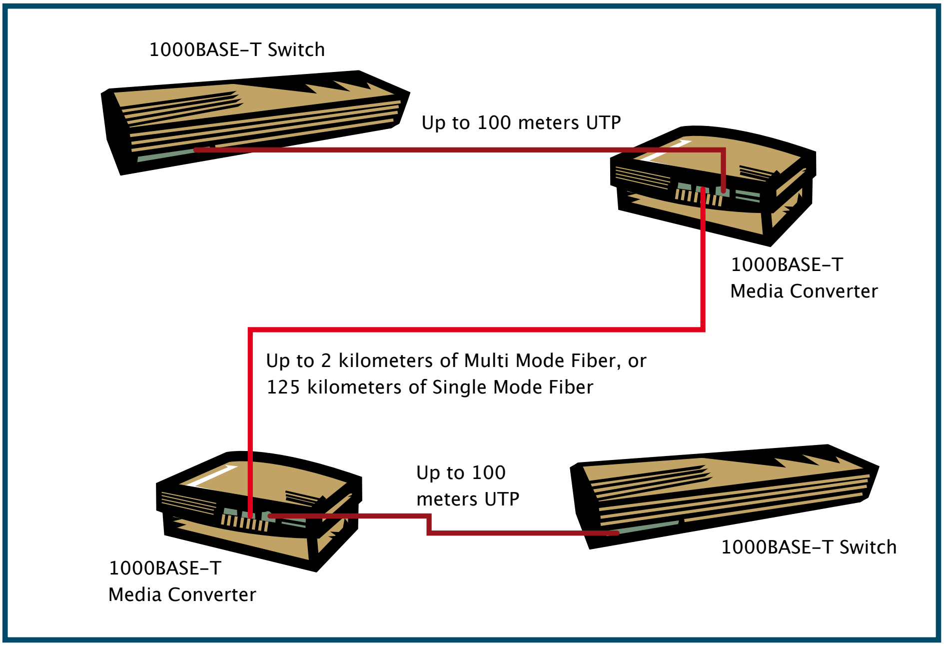
Single Mode Calculations

Let us take another example. It is requested to establish a fiber connection between two distribution frames, placed in separate buildings. The distance between the distribution frames is 30 km. Drop - and patch cables will be used at both ends. The requested speed is 1Gbit. Due to the patch cables at both ends, 3 pairs of connectors must be included.

Fiber loss (at 1310nm)	0,4dB pr. km	12dB
Connector loss	0,4dB pr. pairs	1,2dB (3 pairs)
6 splicings	0,05dB pr. splicing	0,3dB
Expected loss		13,5dB
Reserve for repairs, if necessary		3,0dB
Total budget		16,5dB

The reason for the 6 splicings in the budget is due to the fact, that you can not buy fiber drums longer than 5-8 kilometers as the cable drum otherwise would become too big.

Figure 2



As you can see, the installation is the same as in figure 1.

1000BASE-T (RJ-45) [100 m/328 ft.]
1000BASE-LX 1550nm SM (SC)
[65 km/40.4 mi.] Link Budget: 21.0 dB

Using the information in the table above, it is possible to calculate a budget for a distance of 30 kilometers. If we have a media converter budget of 21dB and a consumption of 16,5dB, we do not have any problems at all. The 100 meters, referred to in the table, is the copper connection. The length of the copper connection must not exceed 100 meters (90 meters of fixed wiring).