



Application Note

2x2 Coupler Splits

Keywords

Application, Coupler, Fiber-optics, Splitter

Summary

The output splits of a 2x2 coupler will flip-flop, depending on which input is used.

Scenario

A customer has a 2x2 coupler (i.e. two inputs and two outputs). The coupler does not seem to work properly, if the customer uses the alternate input.

Question

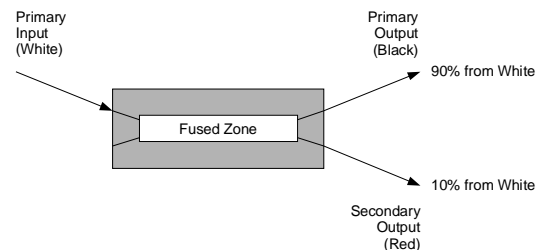
Which output gets the “high” split in a 2x2 coupler?

Notes/Answer

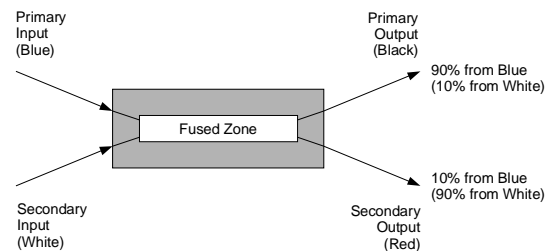
The simple answer is both, depending which input is used. If one understands how a coupler/splitter transfers power, then one will understand the effect of using both 2x2 coupler inputs.

A coupler is made from two fibers. One is the primary, and the other is the secondary. These two fibers are fused (i.e. melted) together, using a specially controlled process. During coupler production, light enters the primary fiber. Then, the light, on both outputs, is measured. When the correct power split is measured across both outputs, the coupler is done.

In the coupler's fused zone, some proportion of light (i.e. the lower number in the split ratio) is transferred to the opposite fiber. Therefore, in a 1x2 coupler, power is transferred from the primary fiber to the secondary fiber. In a 2x2 coupler, power is also transferred from the primary fiber to the secondary fiber. Additionally, power is transferred from the secondary fiber to the primary fiber. Therefore, the amount, of light from each output, depends on the used input.



For example, consider the 90/10 couplers in the adjacent diagrams. The top view is a 1x2 coupler. The bottom view is a 2x2 coupler. The colors indicate the jacket color of a “medium-duty” (i.e. 900-micron coated fiber) coupler. *Note: the input colors are reversed between a 1x2 and a 2x2.*



The “low” value of the split ratio is 10%. Therefore, whether one uses the primary or secondary input, the “opposite” fiber gets the 10% power transfer. If light enters the 2x2's primary input (Blue coated fiber), then 10% of that light exits on the opposite, or secondary, fiber (i.e. the Red coated fiber). If light enters the 2x2's secondary input (White coated fiber), then 10% of that light exits on its opposite fiber, or the primary fiber (i.e. Black coated fiber). In either case, 90% of the input power stays on the input fiber – primary to primary, and secondary to secondary.