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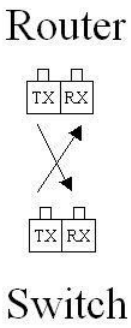
# Fiber Polarity

by Jerry Dillard, CTO/Co-Founder

**Summary:**
*Usually connecting two fiber optic devices together goes smoothly. However things can go wrong and the cabling in a network can somehow change which port on the duplex LC coupler is receiving the light. The result will be the user thinks the TAP is defective when it isn't. Here is what happens and why the TAP isn't defective.*

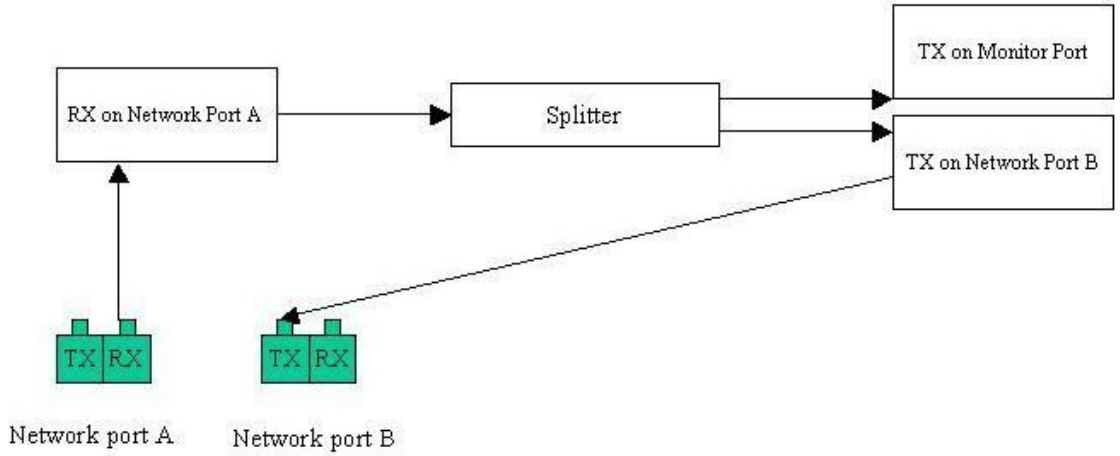
First, let's talk about a router and switch connected together. The Fiber optic cable between the two is a crossover cable – this takes the light from the TX of one device to the RX of the other ***as shown in the figure to our right:***




Notice the light ingresses the right side of the SFP connector or LC coupler (whatever is on the switch and router) in both cases (with the tabs oriented up). The crossover cable makes sure of that.

Our fiber optic TAPs follow the same convention on the network ports. We want the light to ingress the right side of the LC coupler with the tabs oriented upward.

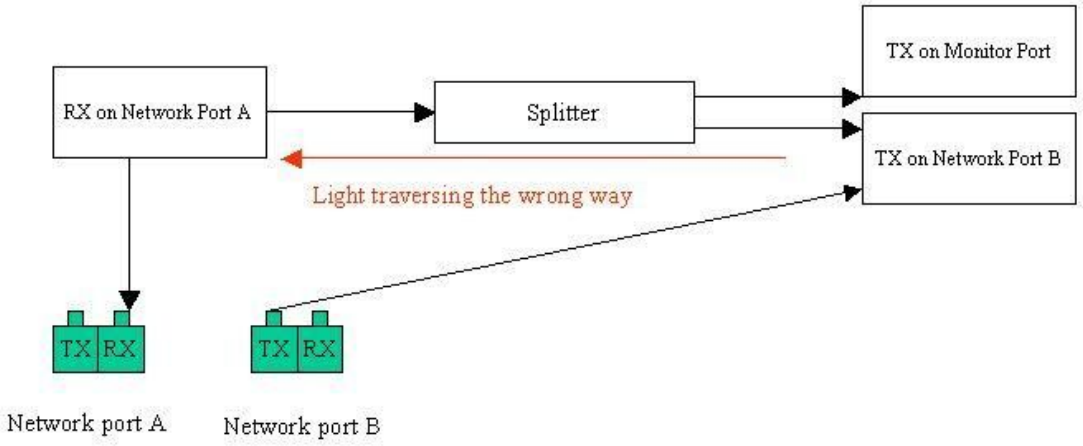
**So let's follow the light inside our TAP:**
Light ingresses our network port and travels down an optical device then is split – exiting the optical splitter out two ports on the other end. One of those goes out the other network port and the other goes out the monitor port. ***Let's look at the figure below*** - a simplified version of how the light traverses the TAP so I can show you what happens when this convention is not followed.



The light ingresses port A's RX port of the LC connector and enters the splitter. The light traverses the splitter and since light travels in a straight line some light will egress the two outputs on the right side of the picture and we achieve what we want – light egresses port B's TX port and some light egresses one of the monitor ports.

Likewise the light would enter the right side of network port B and would egress the TX port of port A and the monitor port – this path isn't shown but it is the same as the path from port A to port B and the monitor port. This path uses a second Splitter that isn't shown.

Now let's talk about what happens in some cases. For some reason, the cabling ends up such that when the fibers are plugged into the network ports of the TAP they have the wrong polarity. They send the light into the left side of the LC coupler instead of the right (again when the LC coupler is positioned with the TABS up). I am going to show what happens when we reverse the light path I show above. ***Look at the following figure below:***




We still have a straight-line path from the light ingressing port B going to port A. So the light still makes its way from the device connected on port B to the device connected to port A of the TAP. Likewise the reverse path – i.e. light from the device connected to port A will have a straight-line path from port A to port B of the TAP (this path isn't shown). ***So the two devices connected to the network ports link!***

But we have a problem. There is no straight-line path for the light to egress the monitor port. ***Look at the above figure,*** the light is now entering the side of the splitter which should be the output - but the splitter isn't designed to send that light out the top right connection shown in the figure (to the monitor port). So we get a VERY weak signal out the monitor ports or none at all. Sometimes if the monitoring tool has very sensitive SFPs it will work but we would not want to trust that since it is only marginal. A lot of the times they don't link at all.

**The Solution:**
Unplug the LC couplers on the TAPs' network ports A and B and reverse the polarity – ***but only on the end connected to the TAP***. If you were to do this on both ends of the fibers connected to the network ports you would be right back where you started.

So, in a nutshell if the devices connected to the TAPs' network ports link but the monitoring ports do not, we have often fixed the problem with reversing the polarity on the network ports.

Of course, this is assuming that the correct SFPs (singlemode or multimode, SR, LR, etc.) were used in the devices connected to the network and monitoring tools.

If you have verified that the network ports have the correct polarity and the monitoring tool you are using doesn't link, then check to make sure the correct optics (SFPs, etc.) are being used. Another frequent problem is the customer will be using a tool that needs to have the port set to ***receive only*** since it is only receiving light from our monitor port and not able to transmit light back into the network. Thus. auto-negotiation will not work.

**For questions, please contact Garland Technical Support at:**

8 AM – 9 PM (CST) Monday – Friday (except for observed US Holidays)

+1.716.242.8500 support@garlandtechnology.com