Controlling Data Bus Systems with Fiber Optic Bypass Switches

Today's technological world operates with many different types of data buses from drop and repeat highway traffic control systems to linked cell phone towers. A large number of these utilize fiber optic cables to connect between individual locations. Figure 1 shows the two of the most common types of systems. The loop type data bus has a fiber optic conductor traveling from one node to another in a complete loop. All locations can receive and transmit data from or onto the bus and as long as there is no loss of power at any node the system operates properly. If any node fails however, the entire system goes down. Similarly the linear data bus operates in much the same manner but in this case there are two fibers going to and leaving each node. This produces a separate path in each direction and is somewhat more robust. If a node fails however, the system still fails after the defective node.

Both of these systems can be made much more robust by the use of a fiber optic bypass switch at each node. Figure 2 shows how such a switch operates. When power is present and everything is normal the switch is in the first position shown. Light coming into the switch is routed to the receive port of the node and light leaving the transmit port of the node is sent on to the next node. Since the switch is purely optical the data rate or modulation scheme of the light within the fiber is not modified in any way and data rates from low Kb/s rates to Gb/s rates are easily accommodated. If power fails at the node however, the switch immediately reverts to the second position shown in the diagram. Now light coming to the node is immediately routed to the next node effectively bypassing the defective node. When the fiber optic bypass switch is connected to the same operating power as the rest of the node the transfer is automatic. Most fiber optic bypass switches also have a separate input that can be used to activate the switch from an external source to allow bypassing a node when desired, not just when a power failure occurs.

Figure 3 is a picture of a typical fiber optic bypass switch manufactured by Liteway, Inc. This picture is of a single switch as shown in figure 2 however a dual switch, containing two single switches in the same package and controlled together is also available for use with linear type data buses. Both switches contain indicating LEDs showing the position the switch is in, a front panel manual switch to force the switch into the bypass or normal mode for testing purposes and a set of external relay contacts that can be used to signal external equipment in the event of a failure or bypass condition. Both switches are also available with all common optical connectors and for use with all types of multimode and single-mode optical fiber and operating voltages from 12 to 60 volts DC, negative or positive ground.

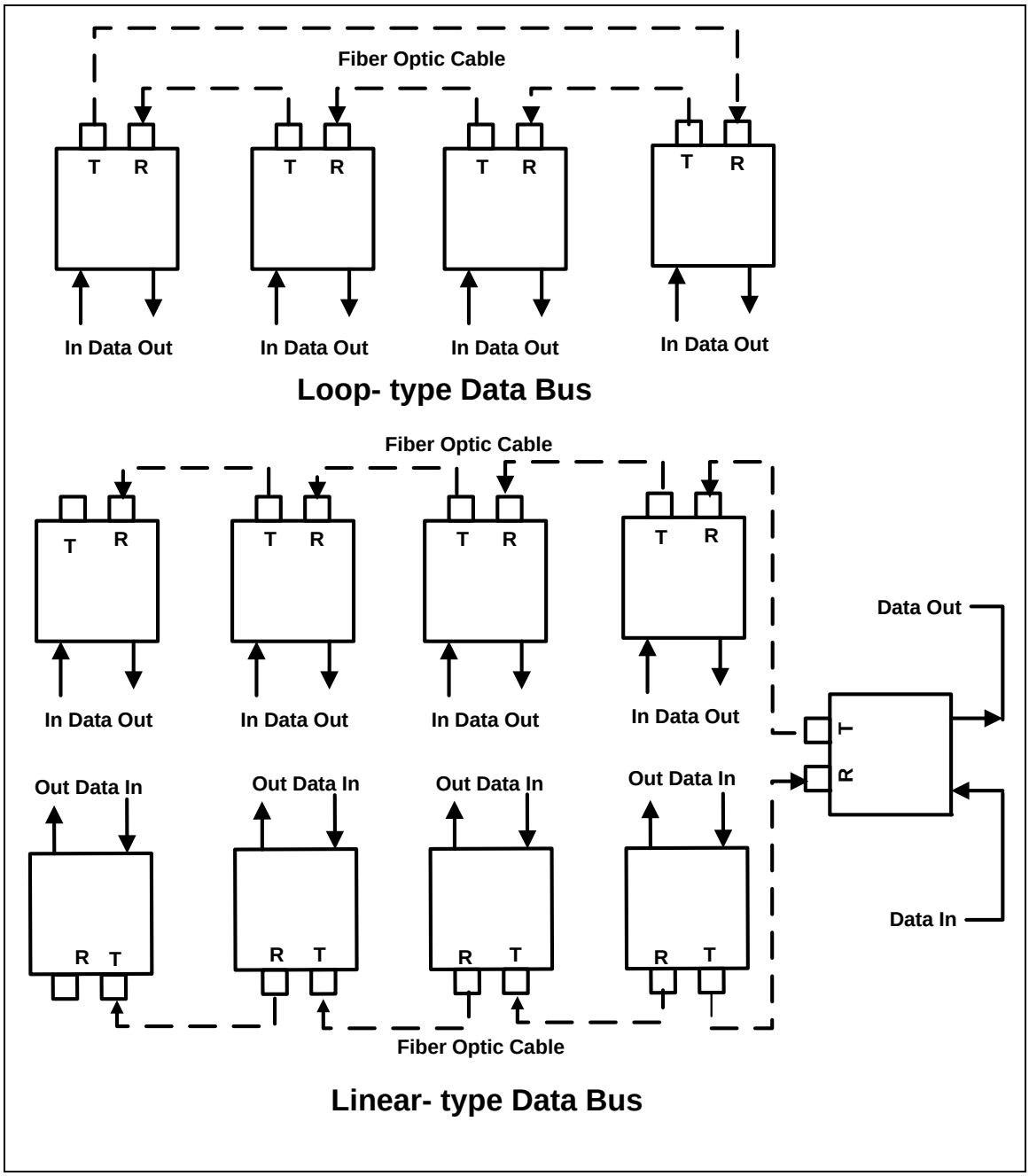

Figure 1, Two Common Data Bus Configurations

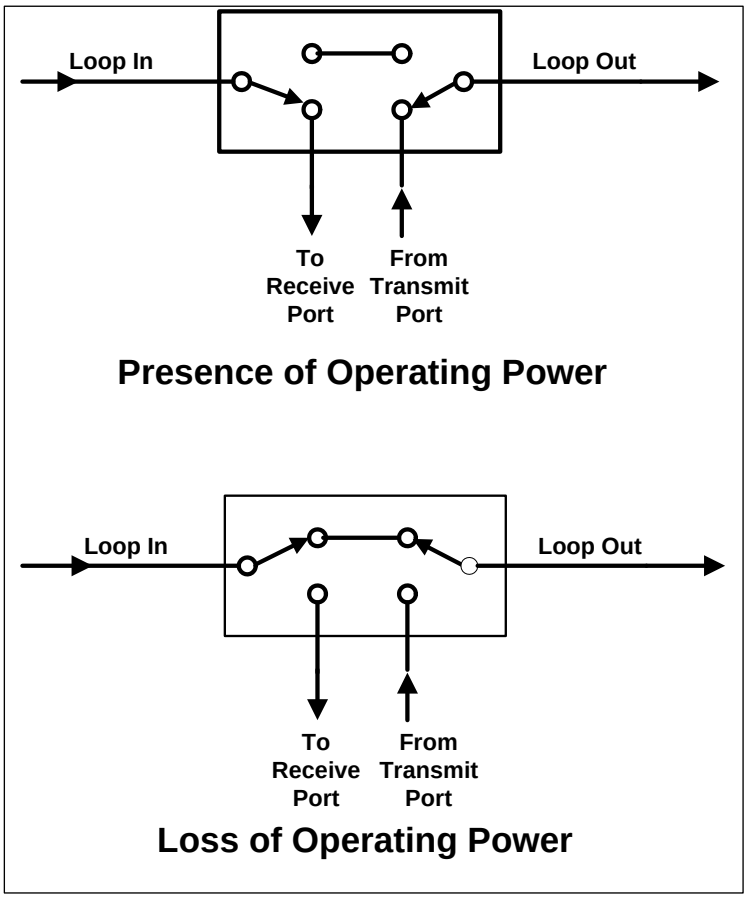

Figure 2, Operation of Fiber Optic Bypass Switch

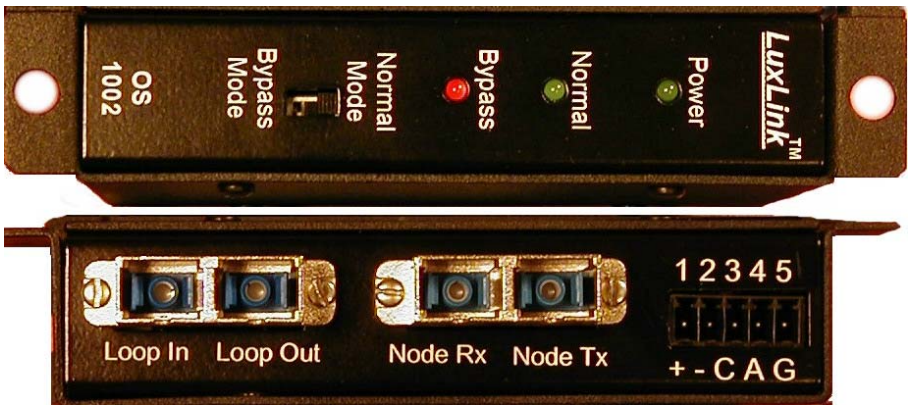

Figure 3, Typical Liteway Fiber Optic Single Bypass Switch

*For more information contact **Liteway Inc.** at 516-931-2800 or at sales2@liteway.com*