

AN201

Step vs. Pulse TDR Technology

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Abstract

Time Domain Reflectometers are divided into two distinct technologies or types of operation; “Step” and “Pulse” TDRs. The following information describes the difference between these types of TDRs and the advantages of the Step over the Pulse type TDR when trying to find a fault on a cable.

General

Pulse

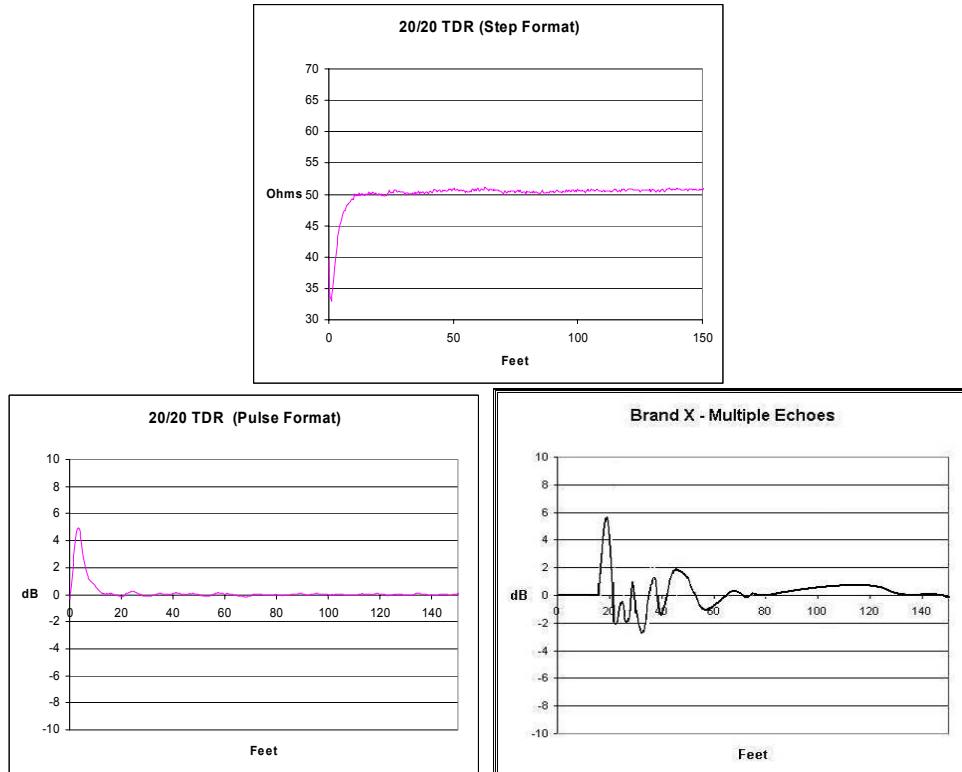
Pulse technology is similar to AM Radar, where a short burst of a sine wave is transmitted. The transmitter emits a single pulse then shuts off. The TDR then enables the receiver to listen for reflections. The longer the transmitted pulse, the longer the distance before the receiver can start looking for reflections. This is called the “Dead Zone” or “blind spot”, and can be quite long in less expensive units. Pulse technology can only measure the time between reflections and cannot interpret information between reflections such as gradual cable losses. In pulse TDRs, the width of the pulse needs to be set by the operator. Using a shorter pulse width will reduce the Dead Zone, but it also limits the TDR’s range. The longer pulse widths have good range, but a correspondingly larger Dead Zone. The pulse TDR, when compared to a step TDR, has less signal energy which results in a plot that has a lower signal to noise ratio and a less clear picture of the cable.

Step

Step Technology is more like a Doppler radar, where the transmitter always emits energy while the receiver simultaneously listens for returned signals. This eliminates the “Dead Zone” pitfall of pulse technology, and allows the receiver to “see” right from the TDR’s connector. Since the receiver looks at a constant signal, it accurately detects information that the pulse types cannot such as the cable’s impedance along its length. Due to the higher energy in a step signal TDR, the signal to noise ratio is improved. Couple this with the addition of noise filters and you can effectively reduce or eliminate outside interfering noise with less degradation of the received signal.

Dead Zone and Plot Clarity

Often, pulse TDR units will echo many times between the fault and the TDR, causing distortion that is difficult to interpret. An example of this phenomenon compared to the 20/20 TDR's clear trace is shown in the following figures. Notice the dead zone on the pulse TDR is about 15 feet long.



Conclusion

Step TDR technology presents clearer and easier to interpret cable plots compared to pulse TDR units.

Keywords: Understanding Step vs. Pulse TDR fundamentals, what is TDR dead zone, TDR blind spot, TDR plot clarity, About TDR basics explained