AN215
Mixed or Poor Cable Types

Written by Paul DeWinter for
AEA Technology Inc.
www.aeatechnology.com

Abstract

Whenever cables of different impedances (Zo) are mixed in a single coaxial run a serious impedance mismatch will result in a high amount of reflected signal. A step TDR can best identify the mismatched cable, its start, and its end.

General

Cable used in any transmission system or network must meet the correct impedance requirements for the equipment connected to the cable. Additionally, the cable should be within industry specifications for the impedance and resistance specified for both the system and the cable type. A Step TDR can verify both factors very quickly and pinpoint incorrect cables, mixed cables and lossy cables.

Mixed Cable Types

Mixed cable types are the easiest to spot on a step TDR. Figure 1 is a TDR PC Vision screen shot clearly showing a 10 foot piece of RG-58, 50 Ohm coax connected to a 22 foot piece of RG-59, 75 Ohm coax. Whether this cable run connects to a 50 Ohm or 75 Ohm system, it introduces some serious mismatch. Note how the step TDR clearly shows which section measures 50 Ohms and which measures 75 Ohm.
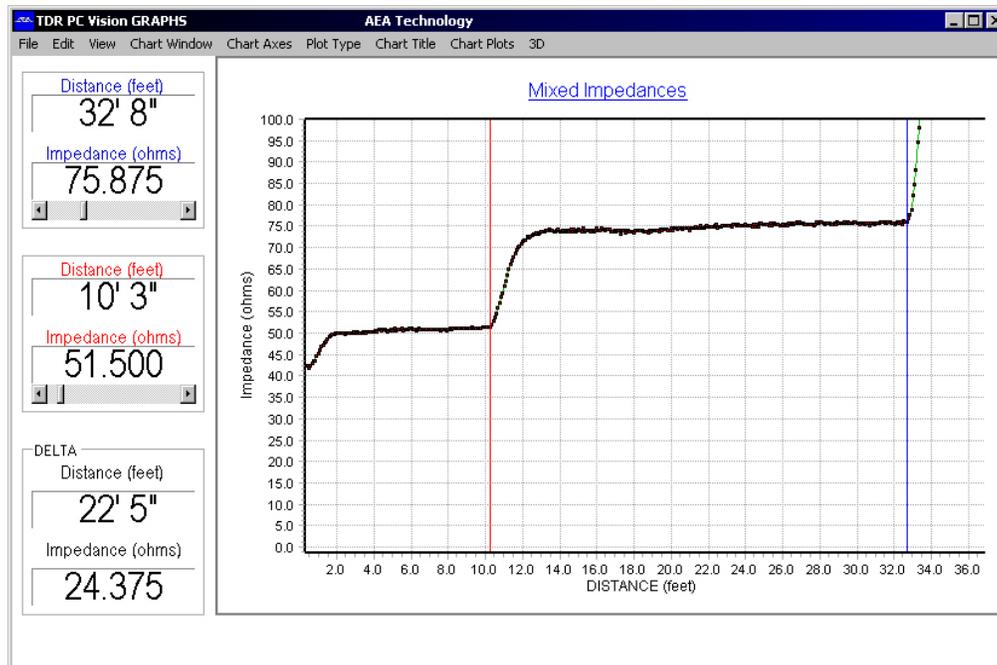

Figure 1

Poor Quality Cables

Old or cheaply made cables may create impedance mismatches. Though not as pronounced as the mixed cable example, these cables can contribute to undesired levels of reflect signal and signal attenuation. Figures 2 and 3 depict to types of poor cable. Figure 2 is the trace for a section of cable with lower impedance than the system's 75 Ohm specification. Although both cables were marked 75 Ohms on the jacket the TDR verifies the one section has gone out of specification.
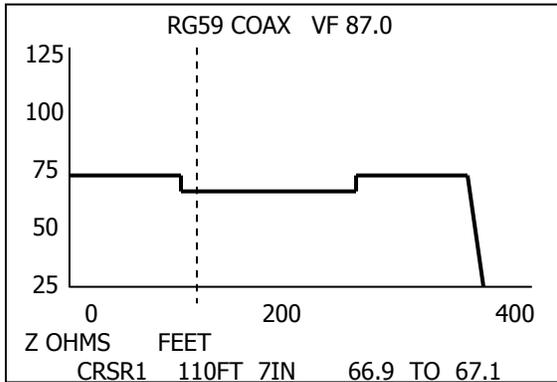
RG59 COAX   VF 87.0

Z OHMS   FEET
CRSR1   110FT 7IN   66.9 TO 67.1

Figure 2

Another type of poor quality cable is one with a higher than normal resistance. These are known as "Lossy Cables." They excessively attenuate transmitted signals. Figure 3 depicts what a lossy cable looks like on the 20/20 TDR's display. The first 500 feet is good coax and the next 250 feet is lossy. Since the resistance of the cable is additive over its length, it appears as an upwards slope in trace's impedance. A good cable will have a low slope and a lossy cable will have a high slope.
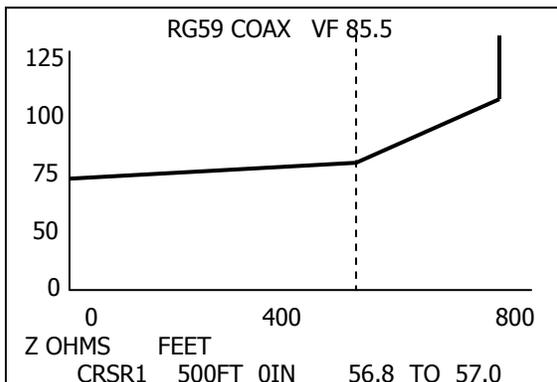
RG59 COAX   VF 85.5

Z OHMS   FEET
CRSR1   500FT 0IN   56.8 TO 57.0

Figure 3