AEA Technology, Inc.

AN223
Wet Twisted Pair Cable

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Abstract

Water can damage a cable system's connections through corrosion, but it can also intrude into the cable itself and significantly reduce the impedance with its presence. The follow application note will look at how to recognize water's signature on a step TDR and how to measure the length of a wet cable section.

General

Water is a cable's worst enemy. Once inside the cable it moves via capillary action and gravity to the lowest points in the cable and remains there causing irreparable damage. The water permits electrical conduction across any two wires with a difference in electrical charge. This leads to the matriculation of metal molecules from the negative conductor to the positive conductor through their insulation, seriously reducing their insulating value. The water has a higher dielectric constant than the air it displaces, which increases the capacitance; hence the impedance of the wet cable section is reduced. Anyone who opens a wet Telco cable will notice all the bright colors of the plastic insulation have a copperish color to them. Additionally, the speed, or Velocity Factor (VF), of that cable section is slowed by some random value making distance measurements beyond the start of the wet zone inaccurate.

Recognizing Water's Signature

Water inside a cable leaves a recognizable signature of erratic reductions in impedance as depicted in Figures 1 and 2.

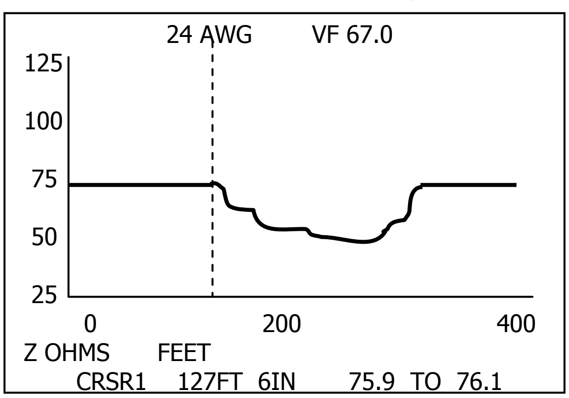

Figure 1

Figure 2 shows an actual wet cable with a short slug of water starting at 25 feet (blue cursor mark). The plot shown here was generated by AEA's TDR PC Vision™ software. The length measurement at the red cursor is invalid as the velocity factor of the cable is reduced by the water. The cable's length might be 50 or even 60 feet long. Only the length measurement from the TDR to the blue cursor is valid.

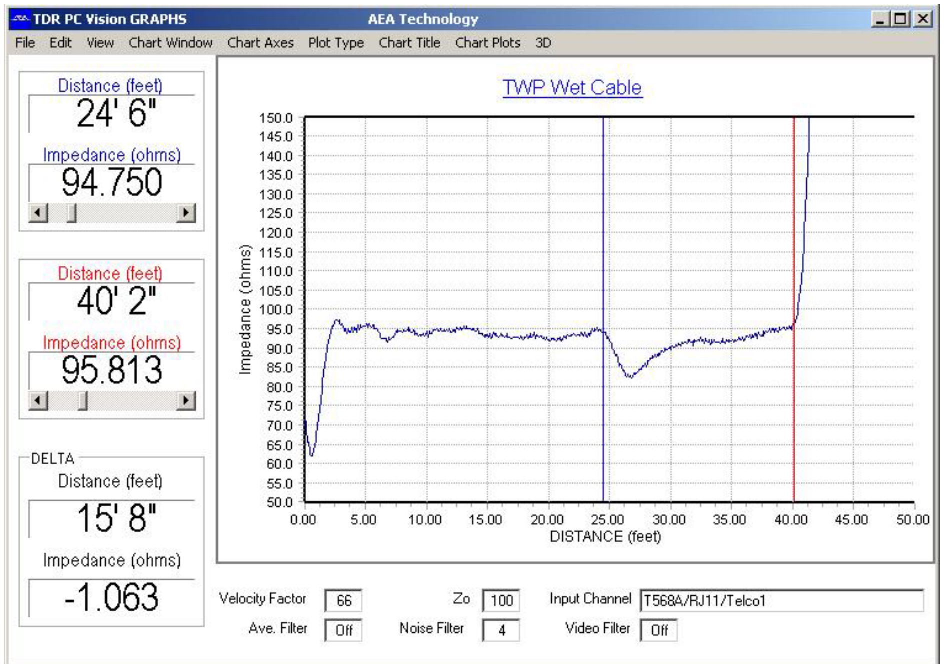

Figure 2

Measuring a Wet Cable

If you require a measurement of the wet area, follow these steps:

1. Chose two access points on your cable map with a known distance between them that are either side of the wet zone.
2. At the first access point, measure the distance from the TDR to the start of the wet zone. Write down the measurement or save the plot.
3. At the opposite access point, measure the distance from the TDR to the start of the wet zone. Again, write down the measurement or save the plot.
4. Add the two measured distances together and subtract that total from the distance between the access points as shown on the cable map. The result will be the length of the wet zone.

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