AN213
Wet Coaxial 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 looks at how to recognize water's signature on a step TDR and how to measure the size of a wet cable section.

General

Water is a cable's worst enemy. Once inside a cable it will move via capillary action and gravity to the lowest points in the cable and remain there causing irreparable damage. The water permits electrical conduction across any two points with a difference in electrical charge. This leads to the matriculation of metal molecules from the negative conductor to the positive conductor through the dielectric, seriously reducing its insulating value. Since the water usually displaces air in the cable, the capacitance increases and the impedance of the wet cable section is reduced. Additionally, the speed or Velocity Factor of that cable section slows by some random value which invalidates any distance measurements in and beyond the wet section.

Recognizing Water's Signature

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

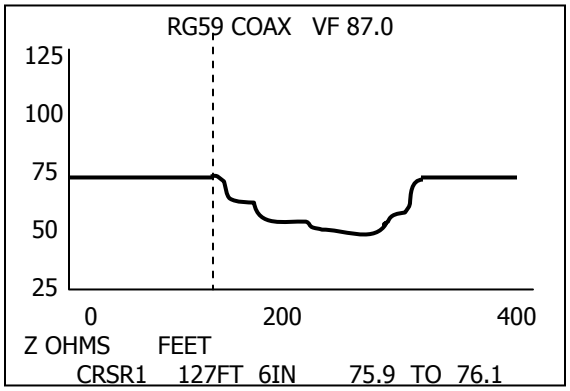

Figure 1

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Measuring a Wet Cable Section

A wet cable has a droop in the impedance curve that looks very similar to the pinched coaxial cable. If the droop lasts for a longer distance, the damaged area of the cable is also longer. If there is good cable beyond the wet section, impedance returns close to the expected level. Note: If water damage appears, do not trust the distance measurements over the length of the low impedance zone or from the wet zone to any point beyond the zone. The VF in wet cable is seriously reduced and this makes the distance in and after these areas very inaccurate. Trust only the distance measurement from the TDR to the start of the wet area. 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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