Impact of Grounding and Bonding on DSL service

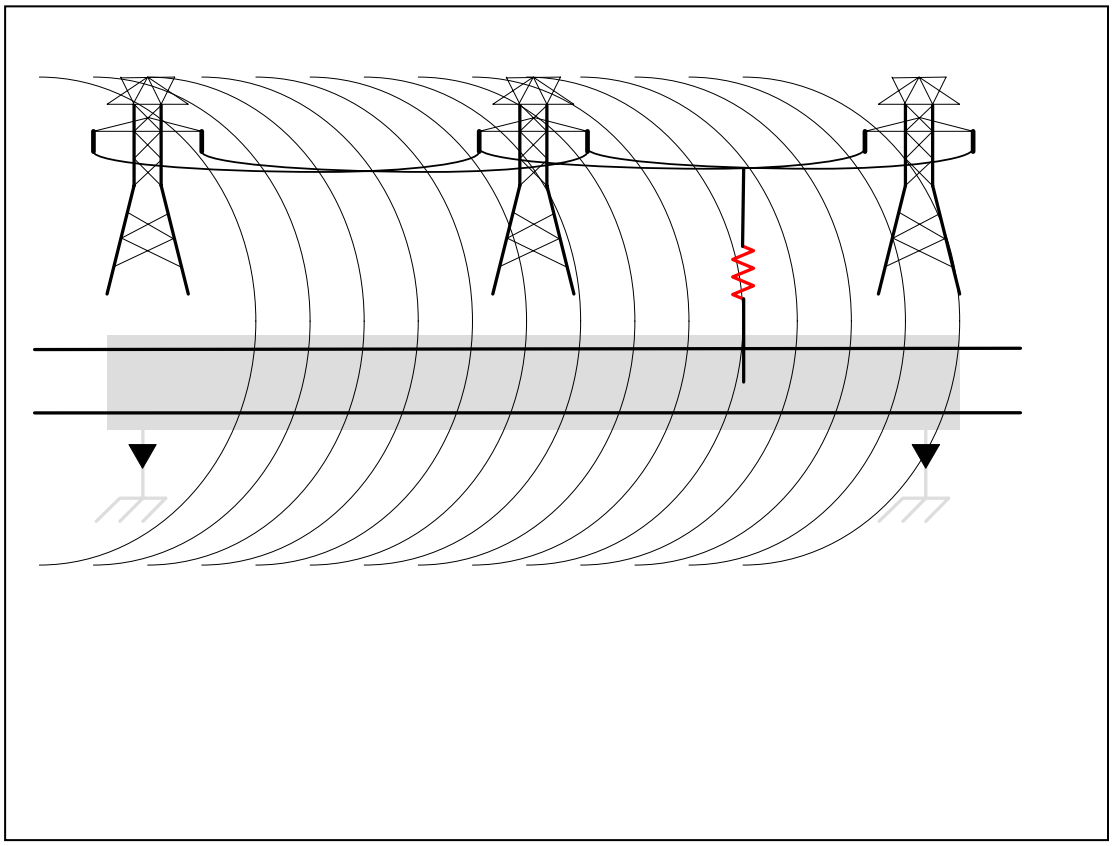
Overview

The quality of the cable shield and its bonding/grounding will impact the ability of the pair to carry POTS and DSL service. It is often discussed if it is recommended to test every terminal for proper bonding and grounding. This document describes the purpose of cable shield bonding/grounding and how to determine its affect on your DSL service.

Purpose of Grounding and Bonding

You may recall from field theory that when you place a wire (the telephone cable = all pairs + the shield) in a changing electric field (the power lines), an electrical field of opposite polarity is produced due to current flowing in the wire (Shield Current). It is the cable shield field that is important. These two fields (electric field produced by power lines & electric field produced by telephone cable shield) tend to cancel one another, such that Power Influence (PI) = Power Line Field – Cable Shield Field.

The diagram below describes the affect of Power Influence.



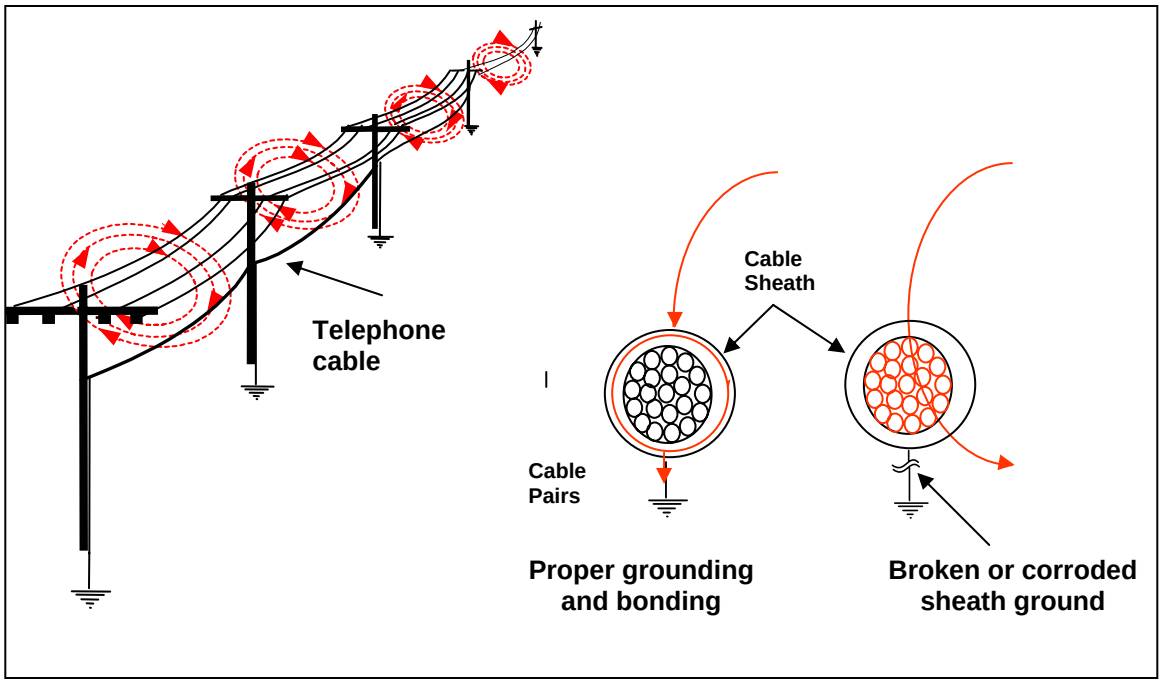
Determining if you have Proper Shield Grounding

One method to test for proper sheath continuity and bonding/grounding to is perform end-to-end test on the sheath and ground. This is usually not practical on a large scale.

An alternative method to determine if you cable has proper shield continuity and bonding/grounding is to measure the Power Influence and Noise Metallic on the pair. This is an effective method to determine if there is a problem with the cable shield and grounding/bonding.

You should measure Power Influence (PI) from Tip-Ring to Ground, and it should not exceed 80 dBrnC. This test is a single-ended test and can be performed at the serving area cross-box.

If the cable shield is “open”, or some of the bonding / grounding points are “open” between the CO and customer, then the ability of the shield’s electric field to reduce the power line field is reduced, causing PI to increase, causing individual pair Nm (metallic noise) to increase.



If there were such things as “perfectly balanced” pairs, then an increase in PI would not cause problems. However, there are no “perfectly balanced” pairs. Low levels of noise (Nm) on a pair will be gained up as PI increases, or attenuated as PI decreases.

Noise Metallic (NM) relates to the amount of audible noise created by high Power Influence. The amount of NM is affected by the balance of the tip and ring to each other and ground.

- Any unbalance between the tip and ring results in potential difference
- Therefore, when the subscriber comes off hook, alternating current flows.
- According to the amount of unbalance, this current flow could be enough to create audible noise.
- This noise is called Metallic Noise (Noise Metallic-NM)
- The units of measure for NM is DbrnC
- A NM reading of above 20 DbrnC will likely cause a customer complaint of hum or interfere with modem speed or caller ID. It could also impact DSL service.

Thus, Power Influence and Noise Metallic are related and it is best to measure both of these values to determine the quality of the cable pair.

Impacts on DSL Service

Since telephone cables and power lines must co-exist, and telephone cables must be able to operate in the presence of PI (below 80 dBrnC). This is also true of DSL service.

The DSL transceivers (DSLAMs and modems) are designed to tolerate a certain amount of Power Influence and noise.

The accepted industry standard for xDSL qualification states that the pair must also conform to the same Power Influence criteria. That is to say that Power Influence should not exceed 80 dBrnC for xDSL services (ADSL, ADSL2+, VDSL).

Summary

As you can see, it is not necessary to measure the actual bonding/grounding at each terminal. A faster and more cost effective approach is to measure the Power Influence and Nose Metallic levels on the cable pair. This is a single ended test that can be performed at the service area cross-box.

If the cable pair is not properly grounded, then you will see the effect in the Power Influence and Noise Metallic test. You can then correct problems on pairs that fail Power Influence test.