MORGAN SYSTEMS

Technical Bulletin

Grounding Coaxial Cable Shields:Why, Where, and How

Even today it's a controversial subject - but we don't know why. The purpose and importance of grounding coaxial line shields is so critical to safe and clean telecommunication station operation that it should not be a matter of discussion, except as a how-to subject such as this paper represents.

Coaxial cable used in radio and television work is referred to as unbalanced line primarily because the center conductor carries the current and signal voltage nearly all to itself. The shield of the transmission line is just that - a shield. It carries no current except for a small induced current flowing as the result of induction by length. In a perfectly matched system the current in the shield is almost nil. That's also why in most modern applications coaxial cable shields are fitted to connectors without soldering - only compression fitting. Center conductors carry the current during transmission so they are generally soldered in place.

But that doesn't mean that the shield has no work to do, and that's the purpose of this brief technical narrative. Coaxial shields provide a protection for the center conductor and prevent ground level line leakage during transmission, noise pickup from external local sources during reception, continuous impedance matching, and physical rigidity to the line.

Short distance grounding of coaxial shields introduces an earthen neutral integrity to the shield and provides a drain source for the very types of disturbances the shield is designed to resist. It's very common to hear of stories relating how interference to other services disappeared or reception noise was reduced when shield grounding was accomplished. In lightning protection applications the shield is an exposed element, and when lightning strikes overhead or a direct "hit" occurs to antennas and tower frames it's not unusual to find as much as 80% of the applied current seeking ground through the transmission line flows down the shield. If the lightning currents do not find earth through a dissipation point before reaching the radio equipment chassis then damage to the station gear will nearly always result. In severe cases injury or loss of structure can occur.

Grounding of shields is easy and requires little experience or effort. The connections for grounding should always be done at ground level if maximum

value is to be obtained, and the lead length from shield to earth entry point (the dirt) should be kept as short as possible - less than a foot if possible. Using a commercial grounding block is a very neat way of accomplishing the task, but making your own shield connections can, be done as well. Cutting the cable, inserting connectors and grounding the shield by attachment to the connectors is a common method but suffers from the inevitable impedance "bump" in the line at that point and the possibility of exposure to water or contaminants. Removing the outer plastic with a sharp knife carefully, wrapping a solid copper wire around the exposed shield and then grounding the wire is another method that seems to work well and doesn't leave an impedance irregularity in the line.

However the work is done is far less important than making sure it gets done, and establishing a common point for multiple shield grounding makes sense in stations that use many different transmission lines. But the most important element is to be sure that the coaxial cable lines are ALWAYS brought to the ground surface first, and that shield grounding, is accomplished at that point BEFORE the cable continues on its way to reach station equipment. Keep the connections clean, tight, and waterproof - then relax and enjoy the benefits of your efforts!

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