

Application Note: 1047



Conduit Wiring Guidelines

Introduction

The purpose of this application note is to outline the issues that can occur when running low voltage 24 VDC communicating wires in the same conduit as 220 VAC power wires.

Potential Issues

- Electromagnetic coupling: 50/60 Hz fields and switching transients from motors, relays, or VFDs can induce noise.
- Capacitive coupling: parallel conductors in close proximity inject common-mode noise.
- Harmonics and spikes: especially problematic for sensitive or high-baud serial buses.

Best Practices

- Do not run the S1, S2, and S3 wires in a conduit with other wires.
 - If they must share a pathway, use 14-16 AWG twisted/shielded wire with the shield connected at one end only.
- Use differential signaling and keep stubs short.
- Maintain physical separation within trays using dividers and avoid long parallel runs with power feeders.
- Cross power at 90° when paths must intersect.
- Keep communication cables away from VFD outputs and motor leads; if unavoidable, add ferrite cores or CM chokes near device ends.
- Ensure proper grounding and bonding to reduce common-mode noise.

Important Notes

- NEC generally requires separation of power and Class 2/3 circuits unless specific conditions are met, such as all conductors being insulated for the highest voltage in the raceway and being functionally associated.
- Even when allowed, it's often not advisable for reliable comms. Always follow the equipment manufacturer's wiring instructions, which generally always prohibits sharing conduit with power conductors.