

Welcome

2017 MREC Conference

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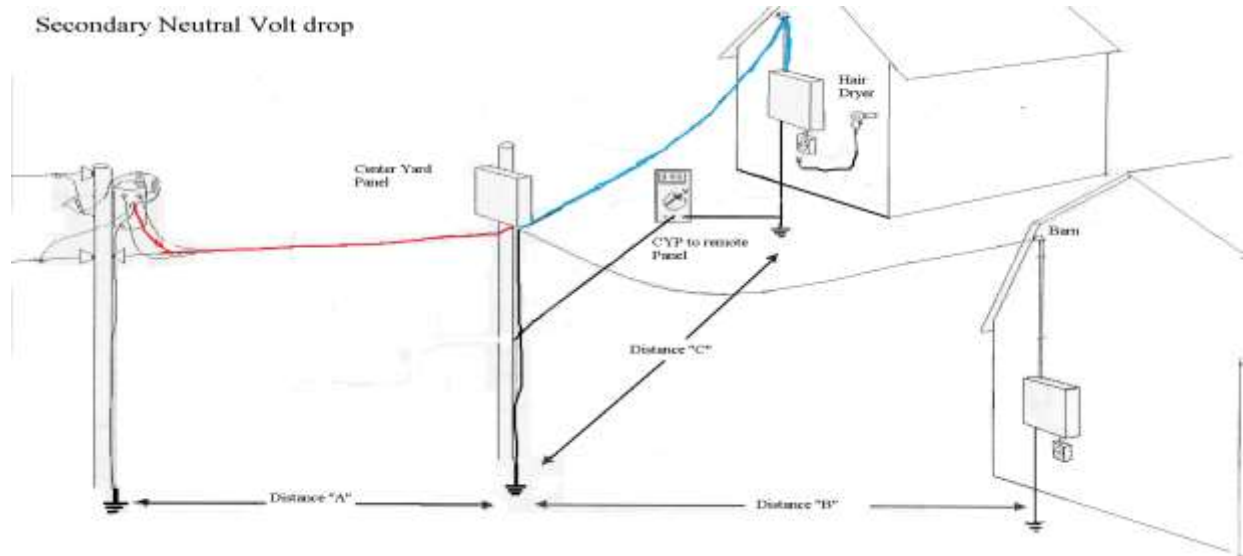
Alliant Energy

Testing of 4-Wire Systems on Farms



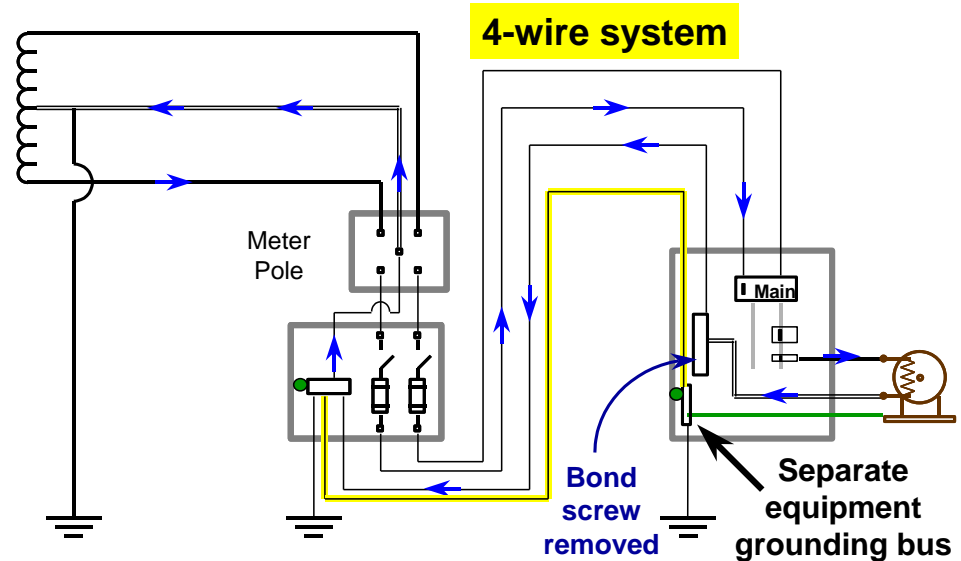
Why Do We Want a 4-Wire System?

Minimize on-farm contribution to stray voltage from 120 volt loads.



Four wire System

- Neutral only connected to earth and equipment grounding at one point (usually the service point)
- Neutrals and equipment grounds are separated at all other points in the electrical system.



Why do we want to eliminate N-G ties in a 4-wire system?

- Minimize on-farm contribution to stray voltage
- 4-wire with N-G tie may lower neutral resistance compared to a 3-wire system, but it could be a safety concern.
- If neutral return path is lost due to a poor connection or damaged neutral wire, the current may travel through the N-G tie.

Current Method to Test 4-Wire Systems

1. Turn off all circuit breakers in 4-wire panel, except one 120 volt circuit (be sure loads are unplugged on this circuit)
2. Put a milliamp meter around the 4th wire going back to the main service and take a reading
3. Turn on one 120 volt load (hair dryer) on the circuit that was left on
4. If the milliamp meter reading increases over ~0.250 amps, there may be an intertie between the neutral and grounds
5. Start measuring the equipment ground wires one at a time until the current closest to the initial reading on the 4th wire feeder is found. Trace back on this circuit to find/repair the intertie. Repeat process to insure all interties are found
6. If the current measured on the equipment ground feeder is nearly the same as the neutral, make sure the bond screw at the panel is removed

On-Farm Example

Barn is properly 4-wired, but neutral current was measured on grounding conductor from main service.

Neutral current was traced on the equipment ground circuit marked “water softener”



Neutral current measured on LP line at water heater in milk house and on light gauge cord to power vent blower motor

- **Neutral current from the house that is 3-wired, was traveling on the LP line which ran between the house and the barn**
- **Neutral load may be fused at a very high level**
- **Safety concern exists if neutral to house is lost which forces all of the neutral load through a high resistance path (light gauge cord at water heater in barn)**

Some N-G Ties Aren't Obvious

- **Neutral current measured on 4th wire**
- **May not be what you expect**
- **All wiring appeared to be correct**
- **Neutral current from another source**



Measurements May Be Hard To Get

- **Many circuits in a small area**
- **Old electrical equipment may be hazardous when moved**
- **Several N-G ties may make identifying source harder**
- **Wires not marked properly**



Thank You

Questions ????

