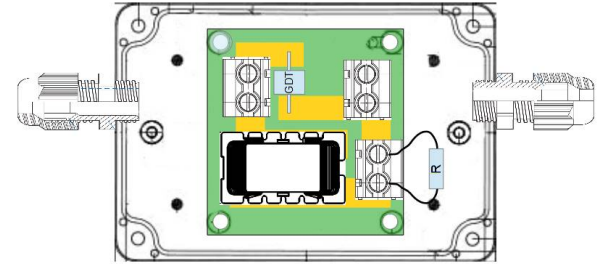


McAfee NCB Protocol

Installing the Nuisance Current Blocker



Zipse's Law: "In order to have and maintain a safe electrical installation: All continuous flowing current shall be contained within an insulated conductor or if a bare conductor, the conductor shall be installed on insulators, insulated from earth, except at one place within the system and only one place can the neutral be connected to earth.¹

How Does Current Get on our Grounding System?

The 4 Most Common Ways:

- 1) A neutral to equipment grounding conductor connection on the load side of the main disconnect which violates at least NEC 250.24 and 250.142.
- 2) A grounding conductor or water/gas bond connecting two service panels together.
- 3) Any grounding conductor making a loop with a pipe, a coolant line or appliance between the service and a sub-panel.
- 4) Foreign current sources like from primary side transformer return current, or Primary Return Current (PRC), local AM radio stations, secondary side open neutral current, will use the water pipe, cable Internet, phone bond, and any conductive path connected to the house grounding system and travel through the earth/soil, back to its source.
- 5) A motor or appliance leaking current to its equipment grounding conductor, especially Variable Speed Drives or Variable Frequency Drives (VSD, VFD)

¹ Zipse, D.W.. (2003). The Hazardous Multigrounded Neutral Distribution System and Dangerous Stray Currents. 23 - 45. 10.1109/PCICON.2003.1242596.

1st, Fix the Wiring Problems (allow 3+ days)

- 1) NFA 1000 9 Point Bed Map (a “before we start” snapshot of the conditions)
- 2) Power company/electrician confirms neutral is working properly.
- 3) Add meter/disconnect combo if needed. See [Meter/Disconnect Installation Notes](#).
- 4) Separate N/G (neutrals from the equipment grounding conductors) after meter/disconnect. See [Addendum IEEE 1695](#)
- 5) Panel diagnostics and correct all N/N and N/G wiring errors in sub-panels.
- 6) Cut water pipe and plumbing drain if metal, insert PVC or PEX to stop all current from outside home. See [Water Pipe Solution](#).
- 7) Replace Grounding Electrode Conductor (GEC) with 1/0 copper stranded insulated conductor. Confirm two electrodes (ground rods). Add Intersystem Bonding Termination (IBT) if needed.
- 8) Install ground loop isolator in cable Internet box to block that current source before it hits bond wire.
- 9) Bring all earth/ground bonds and references for lightning strikes to the GEC IBT including,
 - a) Cable Internet
 - b) Lightning array
 - c) Dish or other antenna
 - d) Phone bond
 - e) Auxiliary grounding systems (solar panels, metal roof, etc.)
- 10) Reroute Romex wires, Metal Clad (MC) cable, anything with grounding conductors, away from pipes, motors, appliances, doorbell transformers, electric breaker panels, anything that creates an electromagnetic field.

Standards for EMI E176-1017²

- 13.6.9 Identify conductors (VFD) with the highest levels of emission and physically separate them from other wires.
- 13.6.10 Route power line and ground wires at least 30 cm (~1 ft.) away from other wires.

2 <https://store-us.semi.org/products/e17600-semi-e176-guide-to-assess-and-minimize-electromagnetic-interference-emi-in-a-semiconductor-manufacturing-environment>

Install the McAfee Nuisance Current Blocker (NCB)

As per allowed by **NEC 250.6(B)** and **(E)** and **SEMI E176:**

Standards for EMI E176-1017

13.6 Mitigation of Conducted Emission Recommendations

13.6.5 Install ground filters in line with internal grounding of the equipment.

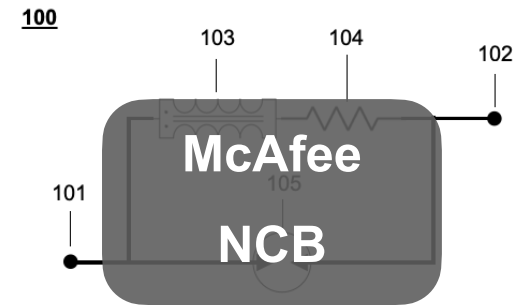


FIG. 1

- 1) **NFA 1000 9 Point Bed Map:** Update the records to track the changes made with the NCB.
- 2) **Outdoors:** Fig. 3. Add NCB in line/series on any equipment grounding conductors with circuit breaker protection in sub-panels, cabinets, that still has current even after all the repair work is done.
 - a) Well pump (321)
 - b) Sump pump
 - c) Flood drain grinder pump or sewage pumps
 - d) Heat/AC air handler grounded 12V transformers, inductive current on pipes, etc.
 - e) Any bonds/grounding conductors still carrying current.
 - f) VSD, VFD appliances
 - g) Pool grid bonds or pool pump motor sub-panel.
- 3) **Indoors:** Fig. 2. Install between grounded object and equipment grounding conductor in convenience receptacle/outlet. Grounded items may include grounded bed sheets, grounding mats, RF shielding paint (indoors or outdoor grounded reference), static discharge mats, etc. It is best to test the electric field with an NFA 1000 and contact current levels with a Fluke 287/289 before and after installation. Body voltage testing with a multimeter is not an accurate means of measurement for electric fields or current. #1 rule: turn power off to rooms using RF shielding paint.
- 4) **Isolate Service Neutral Noise:** If power company will not install a neutral isolator, or home owner cannot afford an isolation transformer, a contaminated service neutral bringing PRC noise into the home requires the equipment grounding conductor to be filtered. Certain clients may qualify for a specially made NCB model installed on main equipment grounding conductor feed, after the neutral bond at the service, to block PRC neutral/grid frequencies from entering the equipment grounding conductor system. See Addendum IEEE 1695.

Outdoor Grounded Appliances

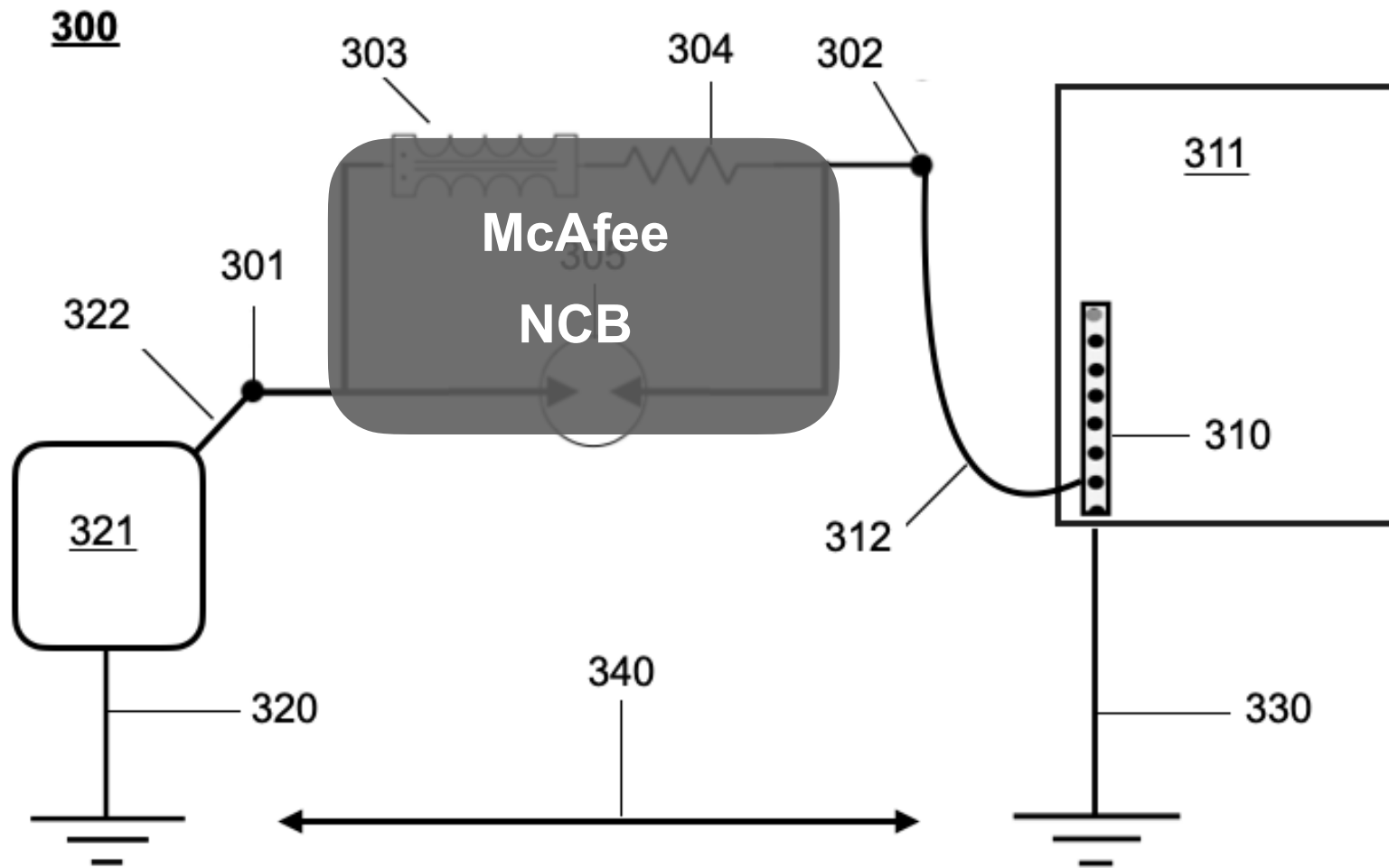
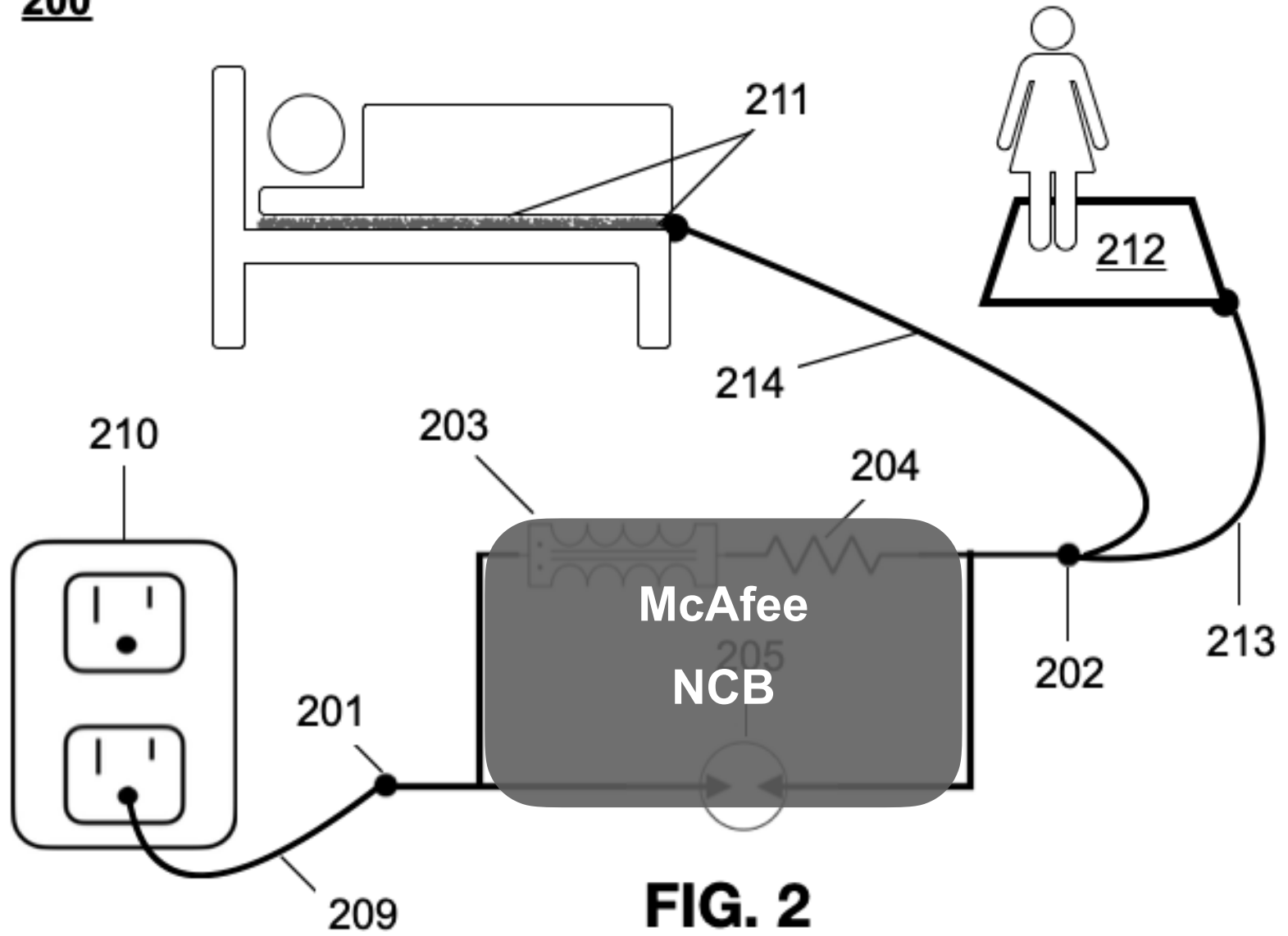
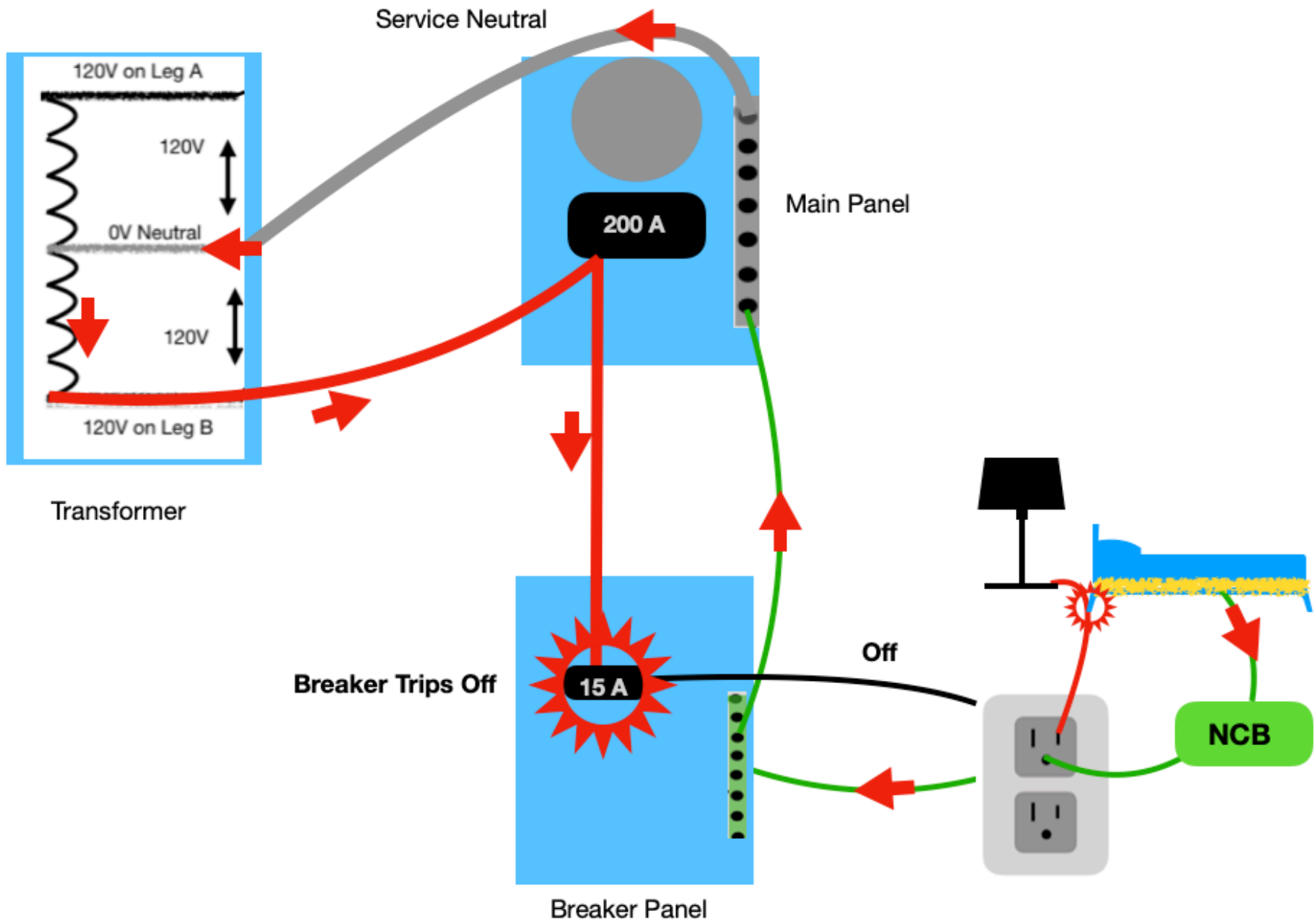


FIG. 3

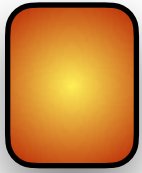
Indoor Applications

200





Remove Loops



Loops on any system, especially the grounding system, will allow current to flow as it is a circuit. See [Addendum IEEE 1695](#). Some appliances leak current to the EGC when running, but this won't show up in a N/G continuity test.

The water bond and gas bond will be retired as we will replace that code requisite with another section of the code which allow the equipment grounding conductor from the appliance served to be the bond.

Cutting the water pipe eliminates it as an “electrode” so no longer required to be bonded within five feet of entering the basement wall. Ensure water pipe is connected to an appliance with an EGC sized adequately to remove fault current. See [Water Pipe Solution](#) for supporting code and numerous details.

Gas pipe will have a dielectric union installed to insure no current either AC/DC will enter the wiring premises. And, add as many dielectric unions at the junctions to ensure that there are no loops, only home runs on each section of pipe back to an appliance EGC to clear any potential faults, or provide adequate bonding for lightning or grid surges to go directly to earth (GEC), never into the home wiring.

Pool bonds, pool lighting equipment, and pool pumps EGC are all bonded together by code. They will bring NEV and PRC into the home. Cut pool lighting circuits and replace with floating battery operated night lights if needed. Pool lights will have a path back to the sub-panel with PRC.

The pool pump motor probably needs an OnFilter VFD motor filter installed to reduce the harmonics and dirty electricity. Even if there is no NEV/PRC or code violations putting current onto the grounding system, a VSD or VFD motor will leak dirty electricity noise and current onto the grounding system and end up in the pool water, saturating people with dirty electricity.

After that, the NCB should be installed where the PRC is best removed, either on the pool pump EGC or at the sub-panel. The pool equipotential grid and the pool motor are still solidly bonded, while only the EGC into the main panel has the PRC removed to stop that larger circulation into the home.

Solar panels may have their own grounding system if installed on pole mounts.

Propane tanks with buried lines, secondary sheds, remote garages or workshops with ground rods, buried bunkers, safe rooms, or anything that connects to the earth other than the GEC at the service has the potential for PNC and a ground current loop.

Addendum IEEE 1695: Diagnosis Stray and Contact Current

IEEE Std 1695-2016

IEEE Guide to Understanding, Diagnosing, and Mitigating Stray and Contact Voltage

Greater than 0.5 V: If the maximum off-farm contribution to voltage at cow contact locations with neutrals tied is greater than 0.5 V, the investigator, working with utility personnel, should take whatever action is necessary to lower utility contribution to a level below 0.5 V.

If the primary and secondary neutrals of a farm's electrical system are separated, the telephone and/or cable television companies serving the farm should be notified of the separation.

Notification procedures vary between the various communication companies. Should the stray voltage investigation reveal that the telephone or cable television systems provide a parallel path for off-farm contribution, and, this path prohibits effective isolation from off-farm sources, the investigator can seek immediate assistance from the appropriate communication company.

Use separate neutral and ground conductors to all sub-panels: Configure single- or multi-phase electrical systems with separate neutral and equipment grounding conductors from the service entrance equipment (e.g., single-phase, four-wire service).

Ensure all equipment and sub-panels are properly grounded; that all neutral conductors are isolated from ground conductors at all equipment and within sub-panels; and that the electrical system neutral and ground conductors are bonded only at the service entrance equipment (e.g., yard pole or meter location).

Figure 23 shows earth current return paths on a single-phase, three-wire electrical system eliminated by conversion to a single-phase, four-wire system.

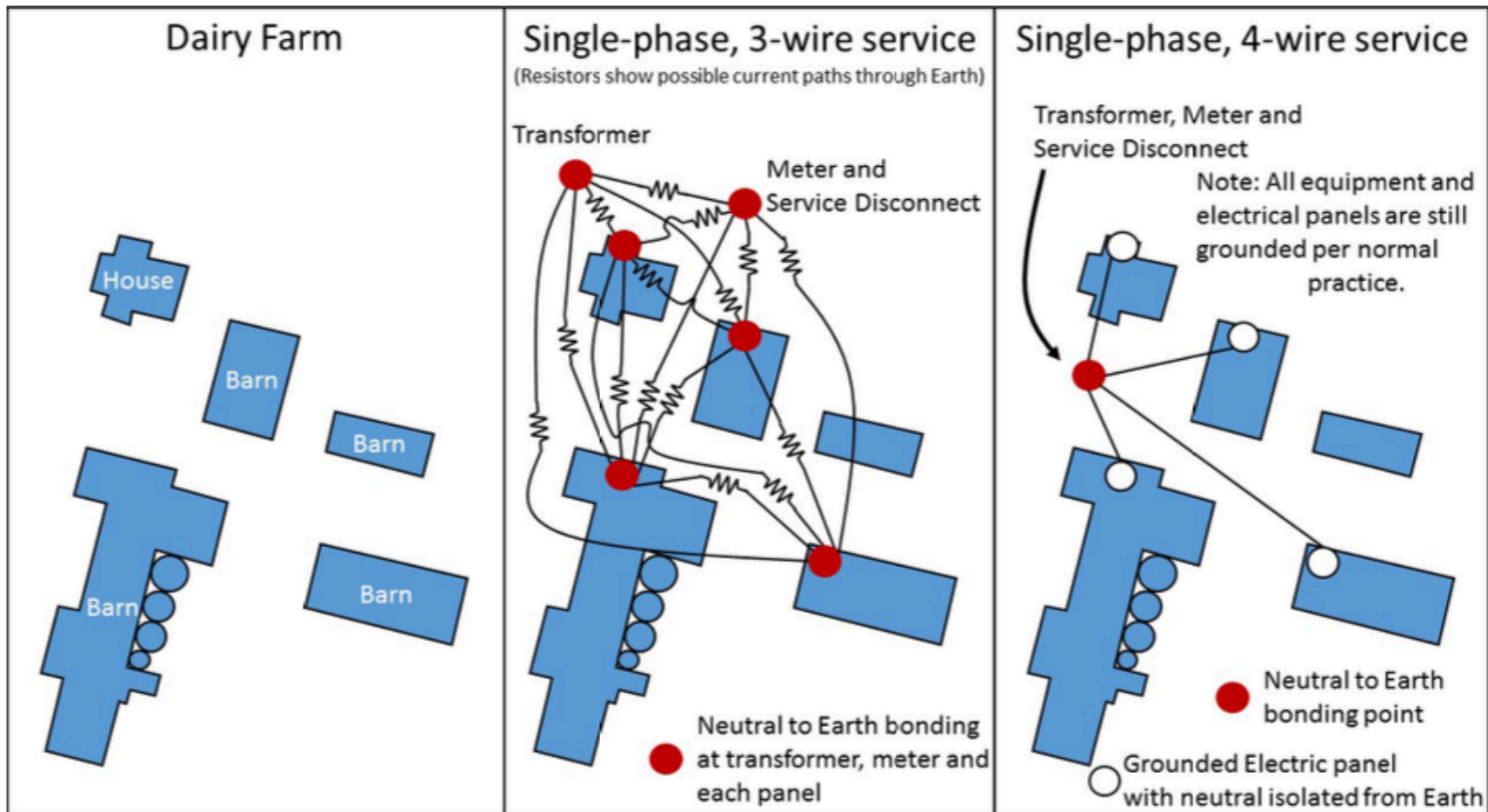


Figure 23—Elimination of multiple earth current return paths with a 4-wire electrical system

Establish Qualified Reference

- Determine an acceptable location and install a remote reference ground rod. If possible the ground rod should be installed in moist soil 30 m (i.e., ~100 ft) or more from the pool and any conductive underground structures such as water pipes, well casings, building grounds, etc.

Make primary neutral to remote reference and secondary neutral to remote reference voltage measurements with and without a 500- Ω shunt resistor. If there is a significant (50%) change in measured voltage an attempt can be made to reduce the ground resistance of the qualified reference before proceeding.

However, too low of a ground resistance may be an indication that the rod is too close to underground facilities connected to the neutral/ground network.

Electric Fields and the Equipotential Plane

The thinking is that if the voltages are low enough, you won't die because low voltage = low current flow between those two points. The electric field and current can still be there as has been shown in homes wired with all MC cable but infected with grid current. The MC cable was ruined since the main panel had all the branch neutrals connected to the EGCs.

No conversation on the equipotential plane, grid or bonding theory, is complete without referencing the work of Donald Zipse, **Equipotential Planes, a Figment of the Imagination**.³ He shows how the Equipotential Plane is “harmful not only to animals such as cows and pigs, but also to humans.”

The solution is to install a meter/disconnect combo and not have any appliances at the first means of disconnect. Ensure that is the only N/G point on the entire premises. Then isolate the neutral from any grounding conductor from then on. And, remove all other grounding electrodes or reference points to earth to remove NEV/PRC from circulating in/out of the home's MC cable system.

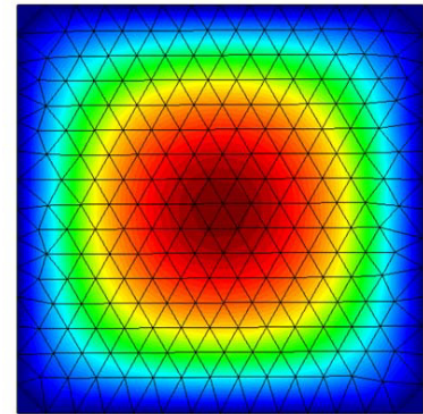


Figure 12—Plate with voltage excitation at the boundary

EEE Std C95.3.1TM-2010:

“Figure 12 shows a plate with a constant boundary excitation of 30V. The charge density is zero over the plate. In the middle of the plate, a peak voltage of 324V is calculated.”

Even if the home has all MC cable, if all the neutrals and all the EGC are bonded together, as required by code at the first means of disconnect, NEV will infect the entire MC grounded network. The electric fields will INCREASE. An effectively bonded equipotential grid system will NOT remove the electric field nor will it remove current. It just spreads it around. It shares the current all the way across the plane. Figure 12.⁴

As Figure 12 shows, the electric field can actually be amplified or concentrated in an area. The current must be removed from the grounding system and multiple earth or voltage contacts must be removed to avoid hot spots.

3 Equipotential Planes, a Figment of the Imagination. Donald Zipse. Copyright Material IEEE. https://www.mikeholt.com/download.php?file=PDF/EQUIPOTENTIAL_PLANES.pdf

4 IEEE Std C95.3.1TM-2010. Recommended Practice for Measurements and Computations of Electric, Magnetic, and Electromagnetic Fields with Respect to Human Exposure to Such Fields, 0 Hz to 100 kHz

Ultimate Goal?

The ENTIRE paradigm will change if an appropriate health target is established. I propose, based upon IEEE and EPRI research, that the electrical contact exposure limits should be less than 2 μ A RMS contact current and 2 mV RMS or 10 mV peak to peak contact voltage, and the radiated emission levels no more than 0.3 V/m RMS for the electric and 0.2 mG RMS for the magnetic field. The last two have already been embraced by Building Biologists. I will have a contact testing protocols established in a future document.

Current less than 1 mA on a grounding system has been shown to effect electrically sensitive persons. That subtle magnetic field it creates through a home's wiring can be measured and confirmed with the NFA 1000 in a 9 point bed map.

With these end points, the multi-grounded neutral system current employed in North America will have to change. Delta/Delta transformers will need to replace Delta/Wye neutral grounded transformers and an insulated neutral four-wire system will need to replace the bare neutral three-wire service drop.

Removing a grounded neutral from the wiring premises will be a requirement.

No residential transformer will be allowed to bond the primary to the secondary side.

The communication systems will also be required to not allow current from their systems to enter a home's wiring premises. Until these landmark changes are made (likely after a national electrical grid disaster blamed upon the weather, an EMP blast, or other excuse, where congress bails out the utility companies with trillions of tax payer dollars to reconfigure the grid), we are left to our own "devices" to protect ourselves from this gross, and arguably criminal negligence.