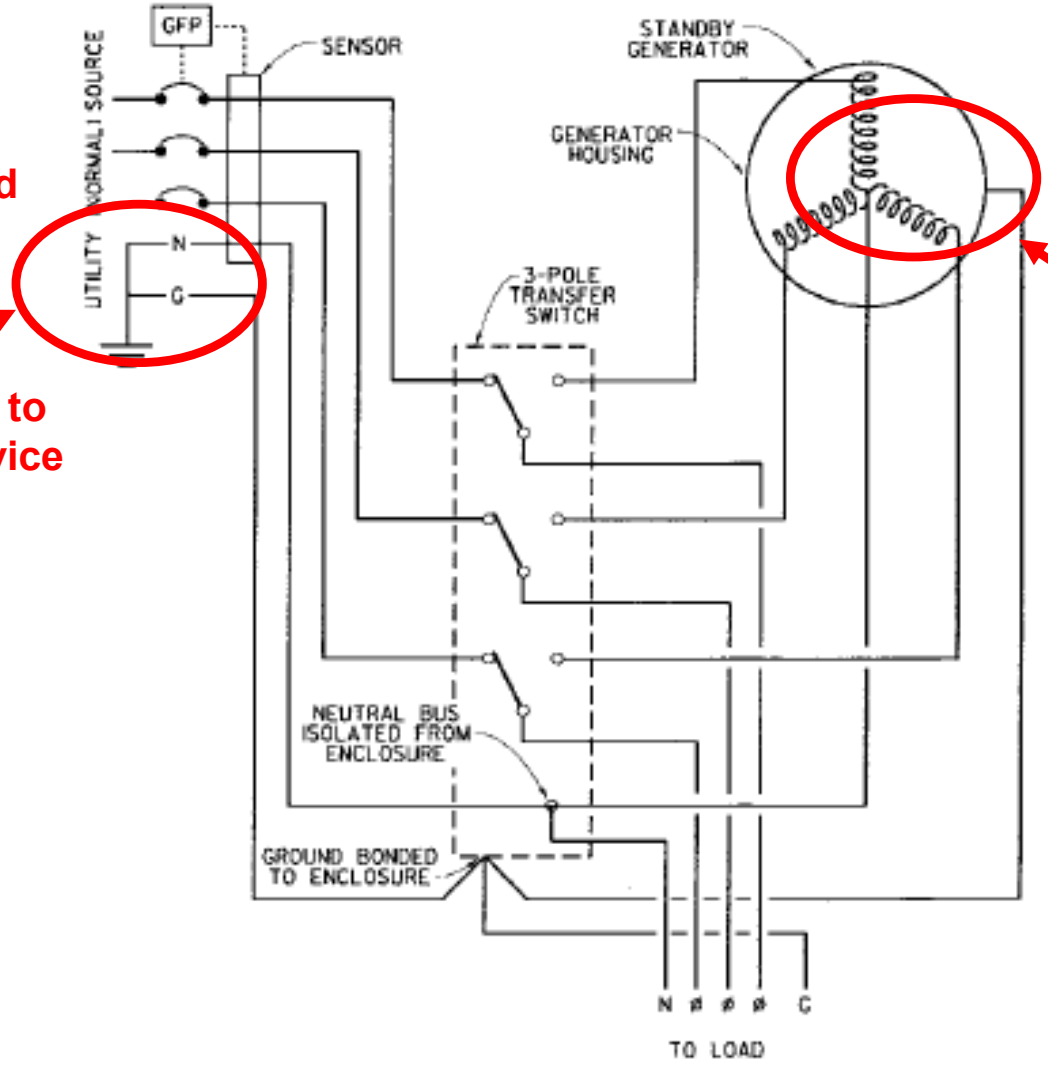
Standard 3-pole ATS and Generator neutral NOT bonded at the gen (not Separately Derived)

Utility service = Separately Derived

Neutral is bonded to ground at the service



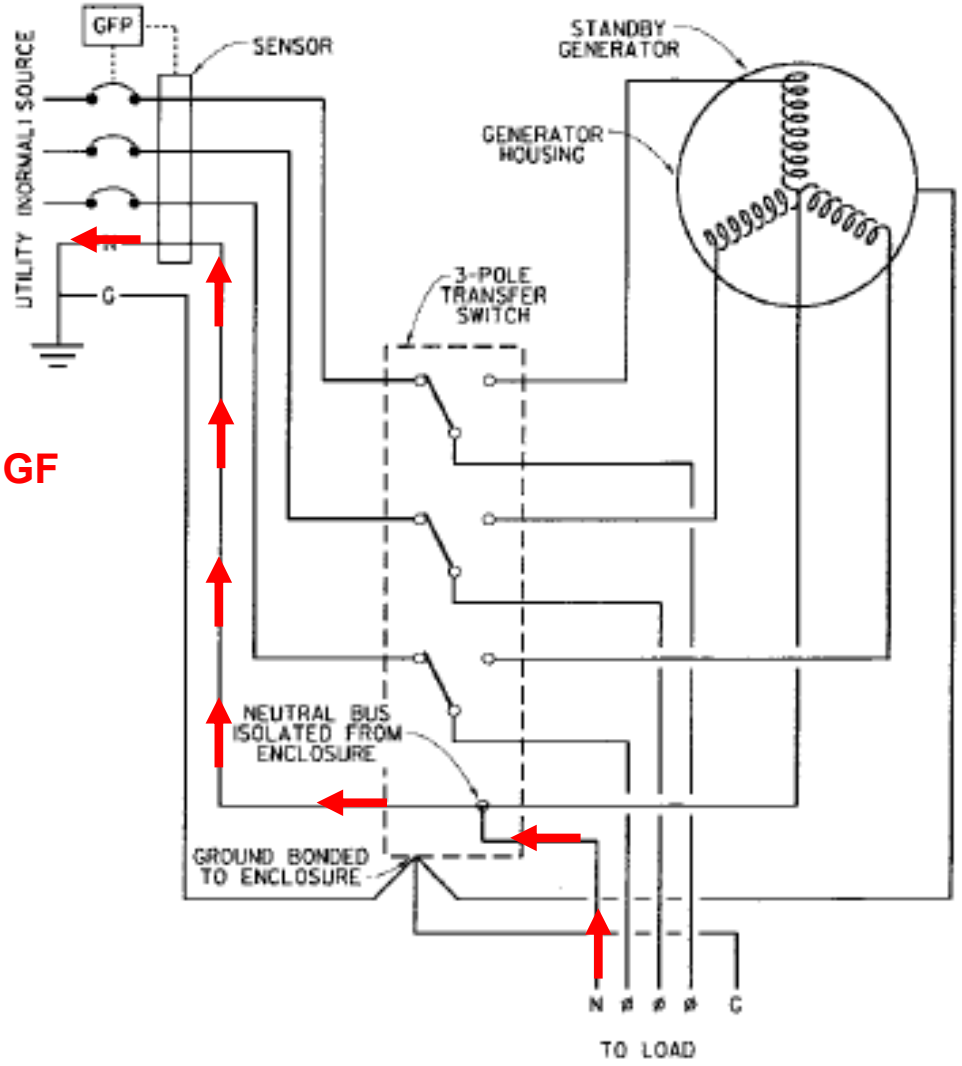
Generator source = NOT Separately Derived

Neutral is NOT bonded to ground at the generator

Standard 3-pole ATS and Generator neutral NOT bonded at the gen (not Separately Derived)

Only path for neutral current is through the neutral sensor

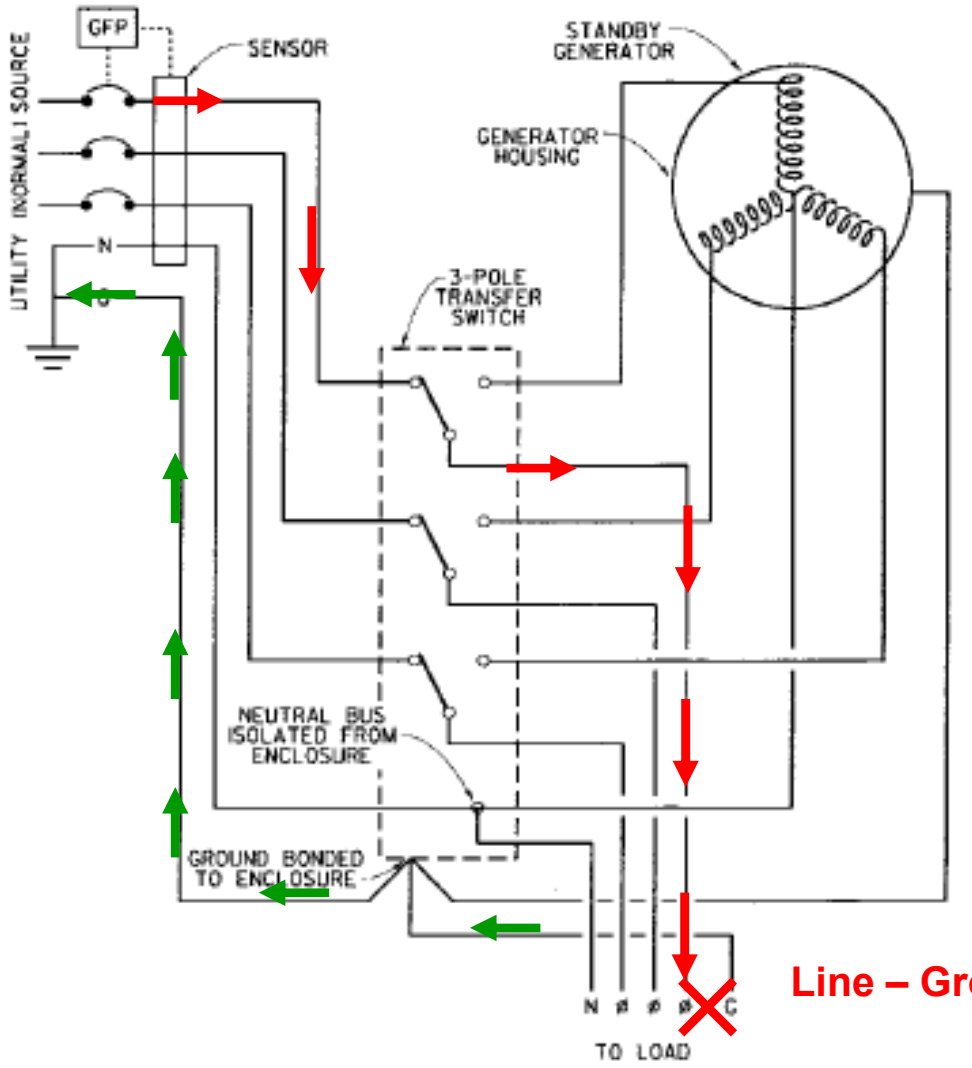
Results:
- Correct detection of GF



Standard 3-pole ATS and Generator neutral NOT bonded at the gen (not Separately Derived)

Ground Fault current travels back on the ground conductor and around the neutral sensor

Results:
- Correct detection of ground fault condition



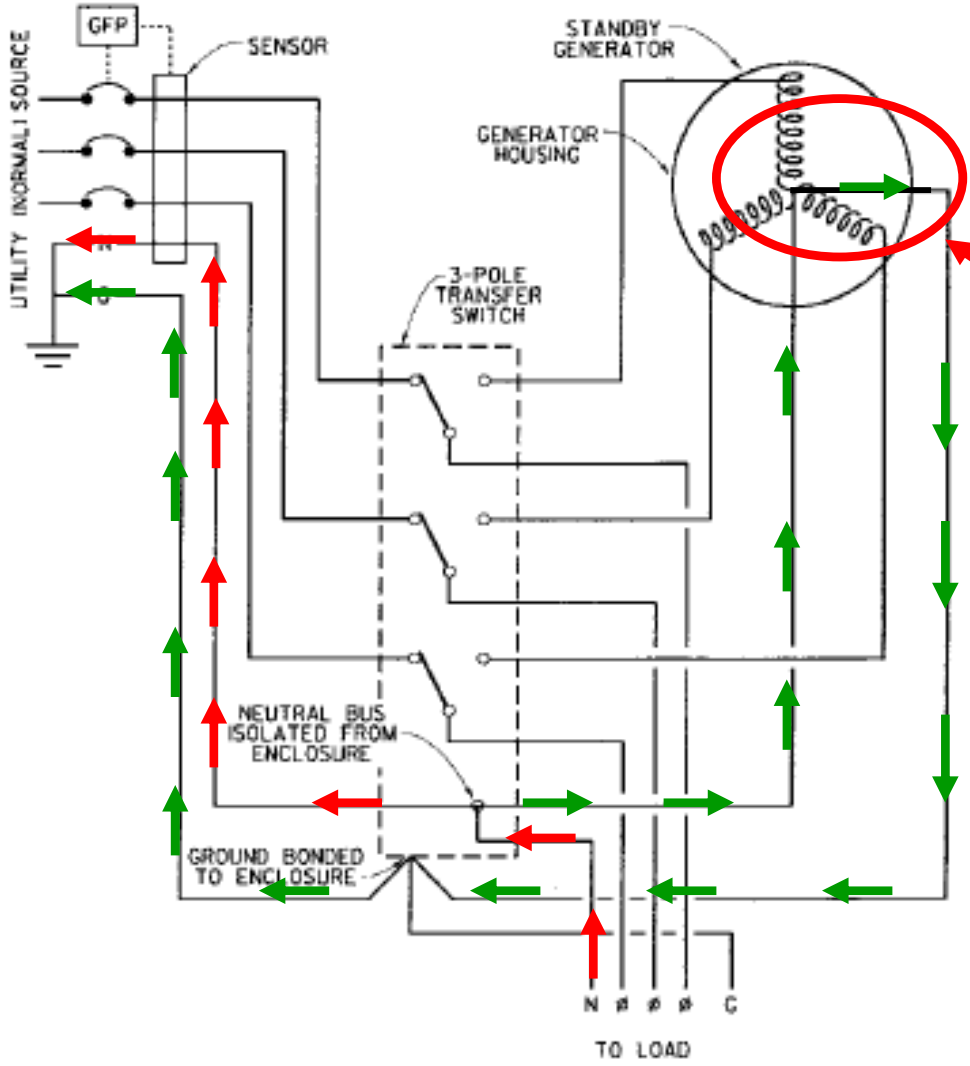
Line – Ground Fault

Standard 3-pole ATS and Generator neutral bonded at the gen (2 Separately Derived systems)

Neutral current can return through the ground path AND around the neutral sensor

Results:

- Possible nuisance tripping of the GF protection during normal operation



Generator source = Separately Derived

Neutral is bonded to ground at the generator

Standard 3-pole ATS and Generator neutral bonded at the gen (2 Separately Derived systems)

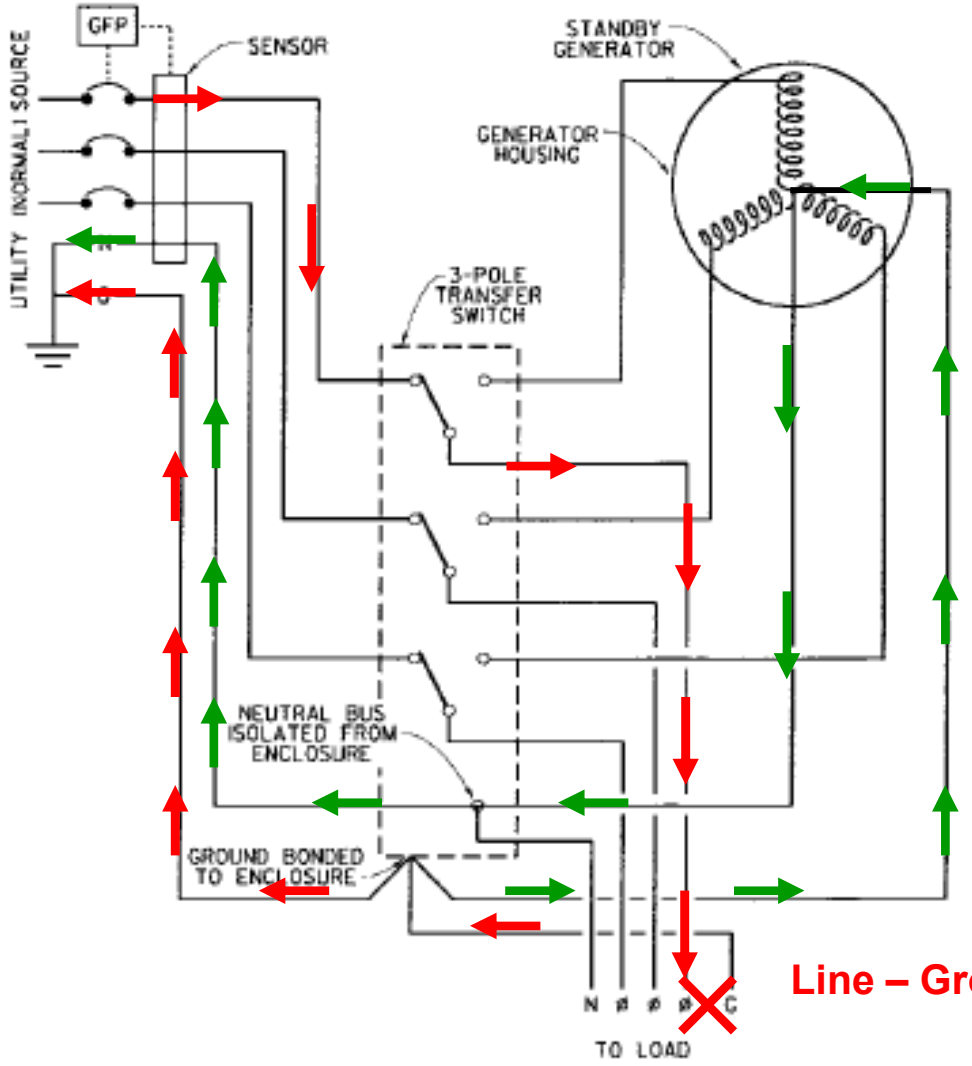
Fault current can return through the neutral path and thru the neutral sensor

Results:

- Some GF current flows through the neutral sensor

- Desensitizes GF protection

- Violates NEC because neutral is grounded at two locations



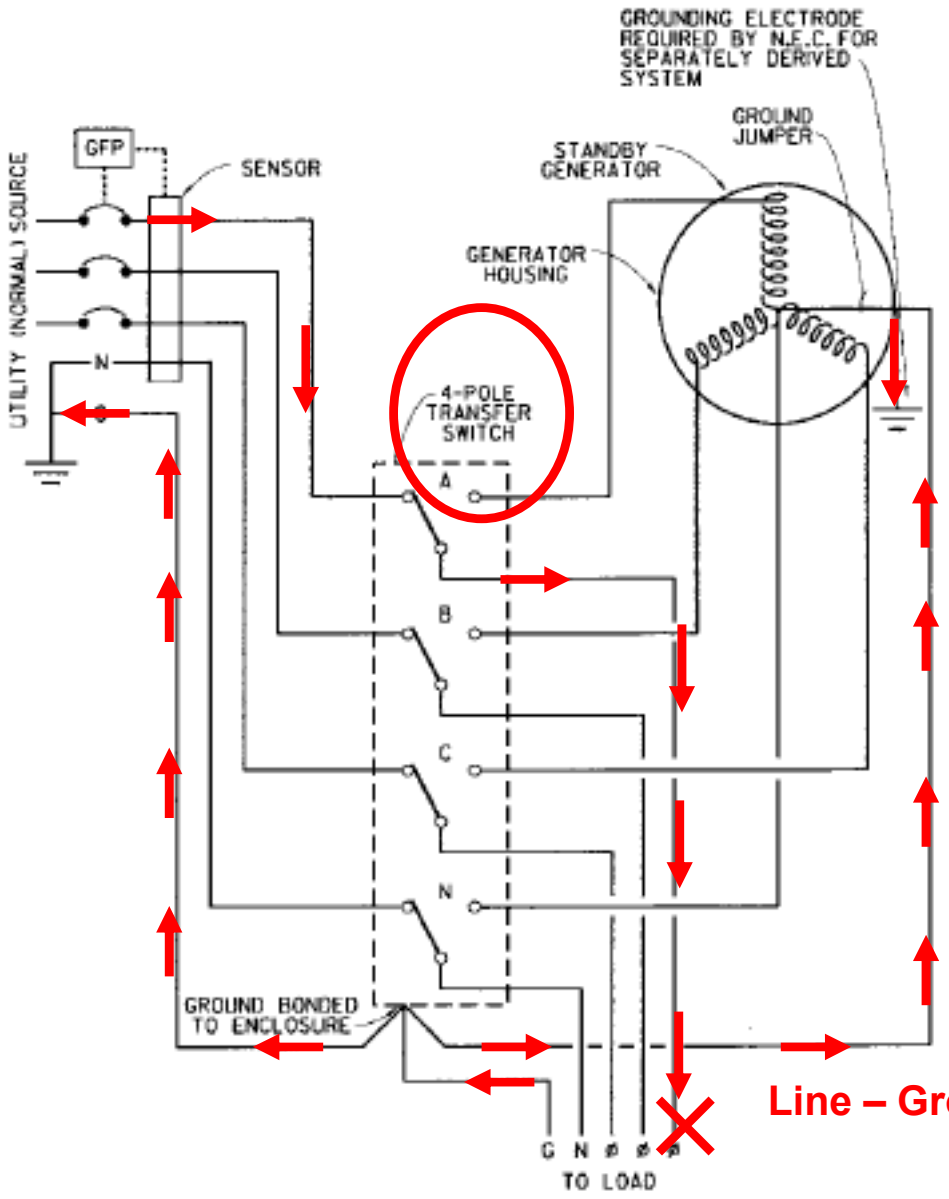
Line – Ground Fault

Standard 4-pole ATS and Generator neutral bonded at the gen (2 Separately Derived systems)

Fault current can only return through the ground path

Results:

- Correct sensing of neutral and ground fault current
- Meets NEC because neutrals for each system are only grounded at one location



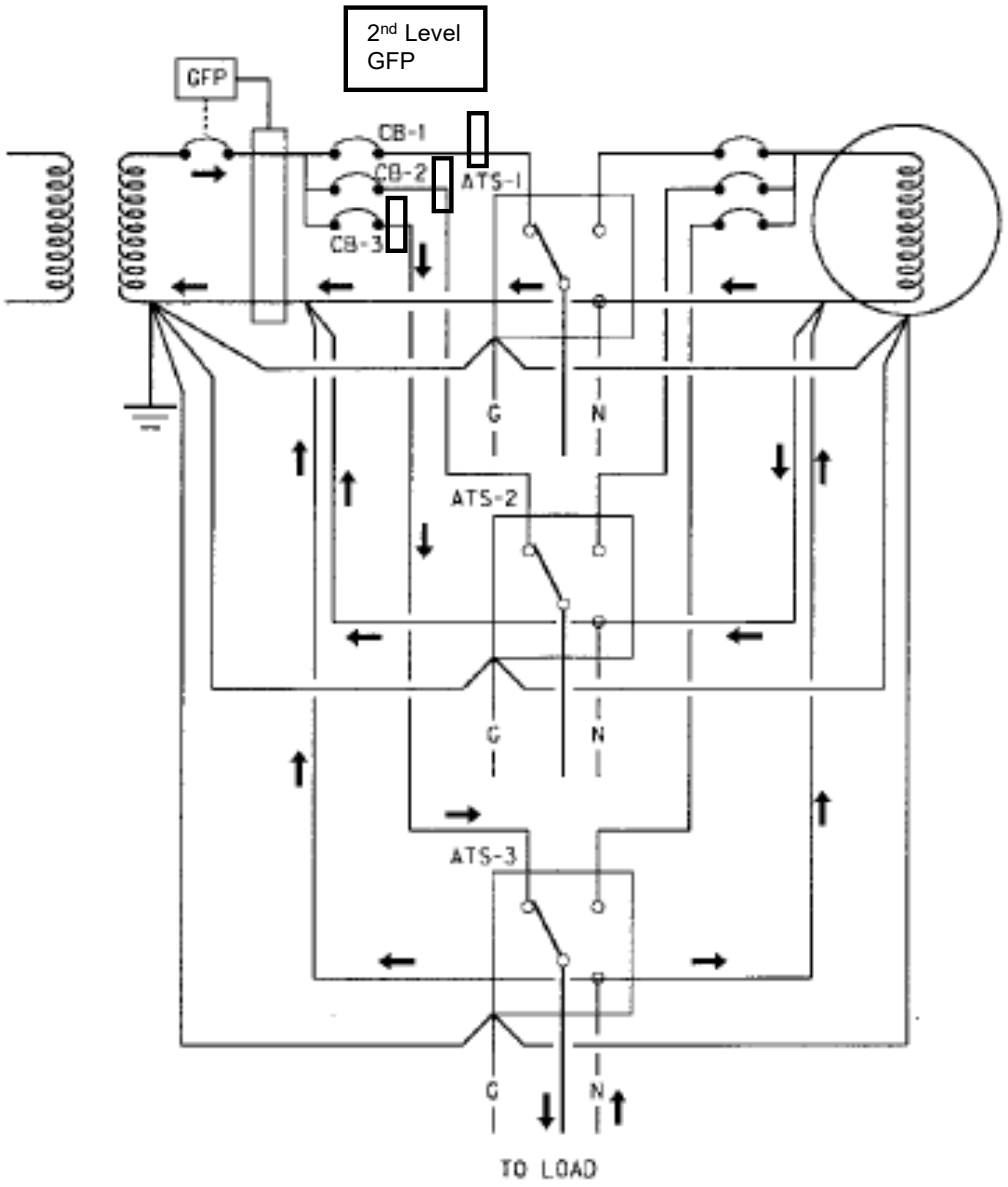
Line – Ground Fault

Single service, Gen(s) not separately derived, Multiple 3-Pole ATS

Neutral current can return through multiple paths (any ATS). Amount of current to flow depends on the impedance of each path.

Results:

- Correct sensing of neutral current for Main Breaker GFP
- Feeder Breaker (2nd Level) GFP may not see all neutral current
- Can cause nuisance tripping of Feeder GFP if settings are too low
- Same condition can also affect GF Alarms when on Emergency Source

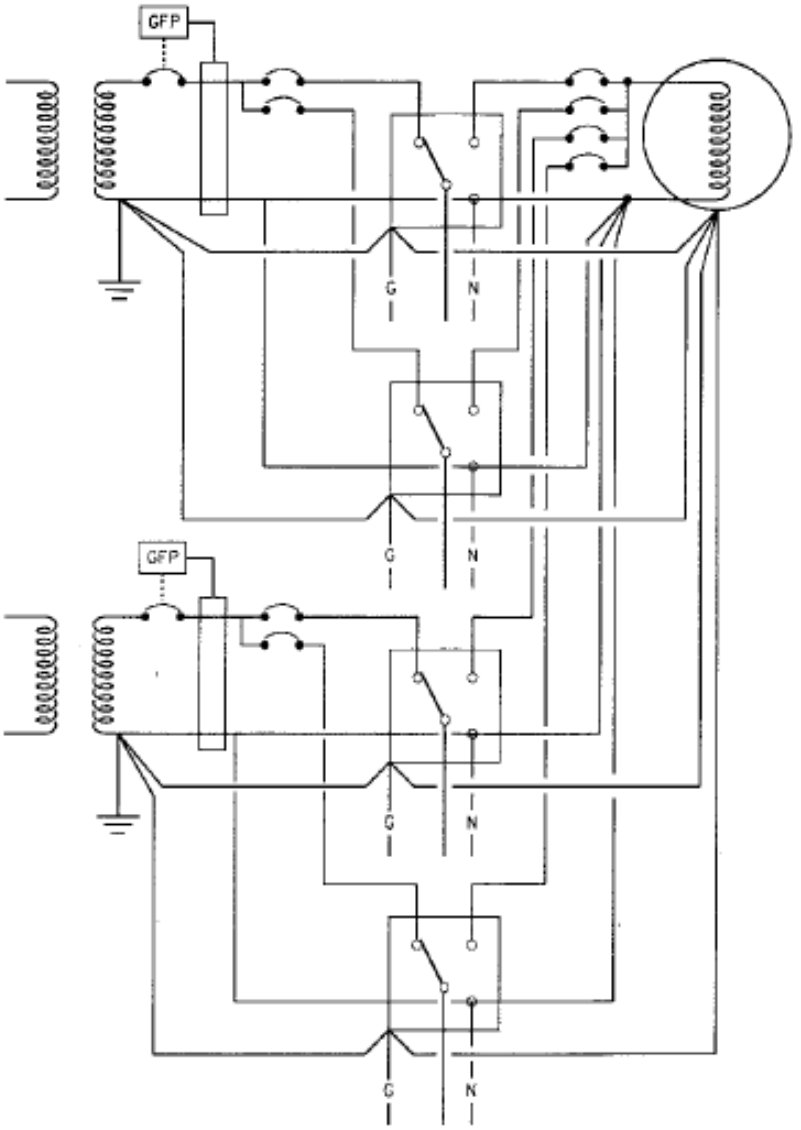


Multiple Services, Gen(s) not separately derived, Multiple 3-Pole ATS

Neutral current can return through multiple paths due to multiple ground points and ATS. Amount of current to flow depends on the impedance of each path.

Results:

- Violates NEC because of multiple neutral ground bonding points
- Multiple paths for neutral current and ground current
- Can cause nuisance tripping of GFP if settings are too low
- Same condition can also affect GF Alarms when on Emergency Source

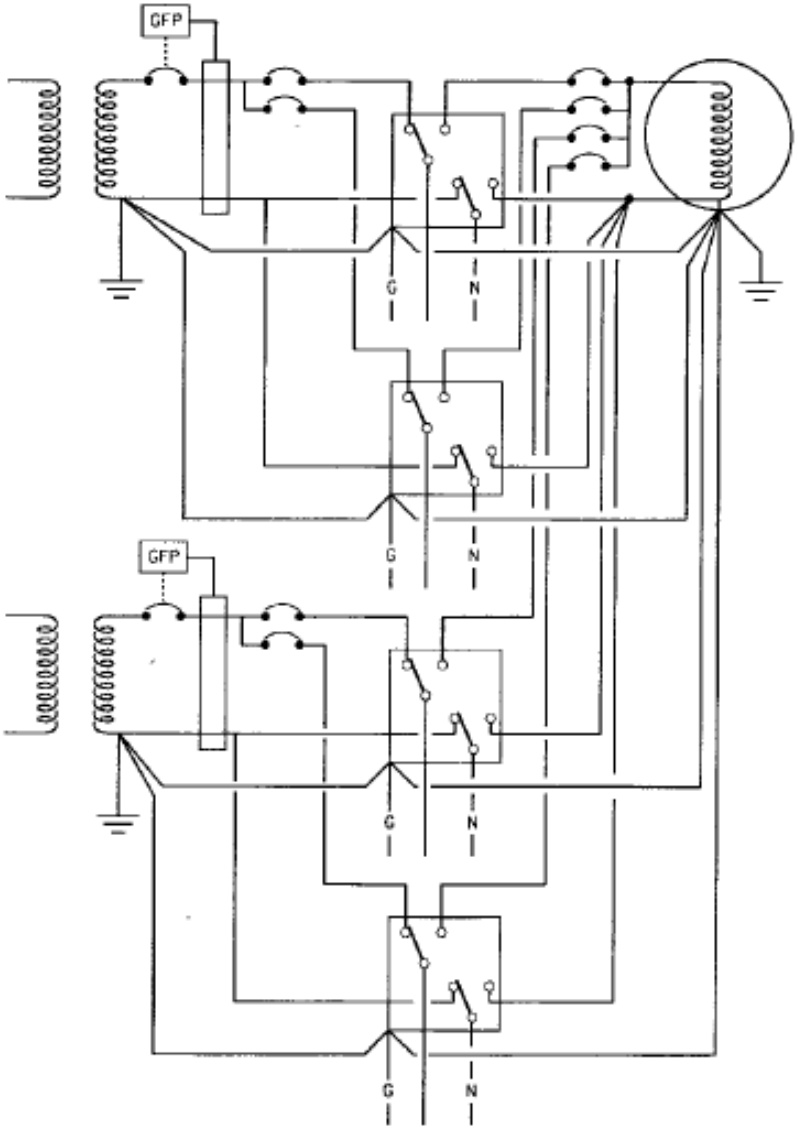


Multiple Services, Gen(s) separately derived, Multiple 4-Pole ATS

Neutral current can only return through the correct neutral sensor

Results:

- NEC compliant (3 separately derived services)
- Correct sensing of neutral currents and ground fault currents



Transfer Switch and Grounding Options Summary

Services	Generators	Transfer Switches	Notes
Single	Single	3-pole	NEC Compliant if gen not separately derived
		4-pole	NEC Compliant if gen is separately derived (Not typically necessary)
	Multiple	3-pole	NEC Compliant if gen not separately derived
		4-pole	NEC Compliant if gen is separately derived (Not typically necessary)
Multiple	Single	3-pole	Violates NEC because neutral is grounded in multiple places
		4-pole	NEC Compliant if gen is separately derived
	Multiple	3-pole	Violates NEC because neutral is grounded in multiple places
		4-pole	NEC Compliant if gen is separately derived

- Use 4-pole anytime the generator is separately derived (bonded at the gen)
- Recommend 4-pole anytime there are multiple utility services
- Avoid mixing the use of 3-pole and 4-pole ATS
- Consider future expansion – If new service is likely to be added, use 4-pole ATS
- Number of generators typically is irrelevant since they are typically all separately derived, or none are separately derived
- Take care to balance loads at all ATS to minimize problems