

Isolation



Phasor Labs

5420 Glenway Circle Oregon, Wisconsin 53575

608-835-9605 voice
608-835-9039 fax
cforster@phasorlabs.com

Reviewed 2012

cforster@phasorlabs.com

Why ISOLATE a Cow?

Prevent **voltages impressed across the body** of the cow.

Stop **current flow** through the animal.

Current flow may cause an **animal reaction**.

Reviewed 2012

cforster@phasorlabs.com

**What are the sources of
electricity on or about a farm
that are intended to contact an
animal?**

Electric fences

Cow trainers

Hand held units

Electrified crowd gates

Reviewed 2012

cforster@phasorlabs.com

**Voltage sources that are NOT
intended to contact an animal:**

Lightning

Distribution system

Farm electrical system

"Stray Voltages"

Reviewed 2012

cforster@phasorlabs.com

Facts about "Stray Voltages"

They can not shock a human.

They can not kill an animal or human.

If you feel a shock, you have a potentially lethal voltage present, **NOT** stray voltage.

Reviewed 2012

cforster@phasorlabs.com

What are sources of LOW LEVEL stray voltage on a farm that can effect a cow?

There are two (2) sources:

Off-farm

On-farm

Reviewed 2012

cforster@phasorlabs.com

What are typical Off-farm sources:

Neighbors home or farm

Remote gas lines

Primary neutral to earth voltages

Reviewed 2012

cforster@phasorlabs.com

What are typical On-farm sources:

Your farm or home

Multiple grounds on the farm electrical system

Secondary neutral to earth voltages

Reviewed 2012

cforster@phasorlabs.com

How do I stop Off-Farm Sources?

Separate high voltage (Utility owned) and low voltage (Farm owned) power systems.

Do not let telephone, CATV, gas or water lines bypass the intended isolation.

Reviewed 2012

cforster@phasorlabs.com

How do I separate the electrical systems?

Use the pwr supplier's transformer.

Install your own isolation transformer(s).

Use active suppression.

Reviewed 2012

cforster@phasorlabs.com

Primary Neutral Voltage

One of many OFF-farm sources:

Reviewed 2012

cforster@phasorlabs.com

Primary Neutral to earth voltages.....

Phase and neutral wires both carry current and have "voltage drops" along the wire.

The voltage drop on the **phase** wire **does not** cause stray voltage concerns.

Reviewed 2012

cforster@phasorlabs.com

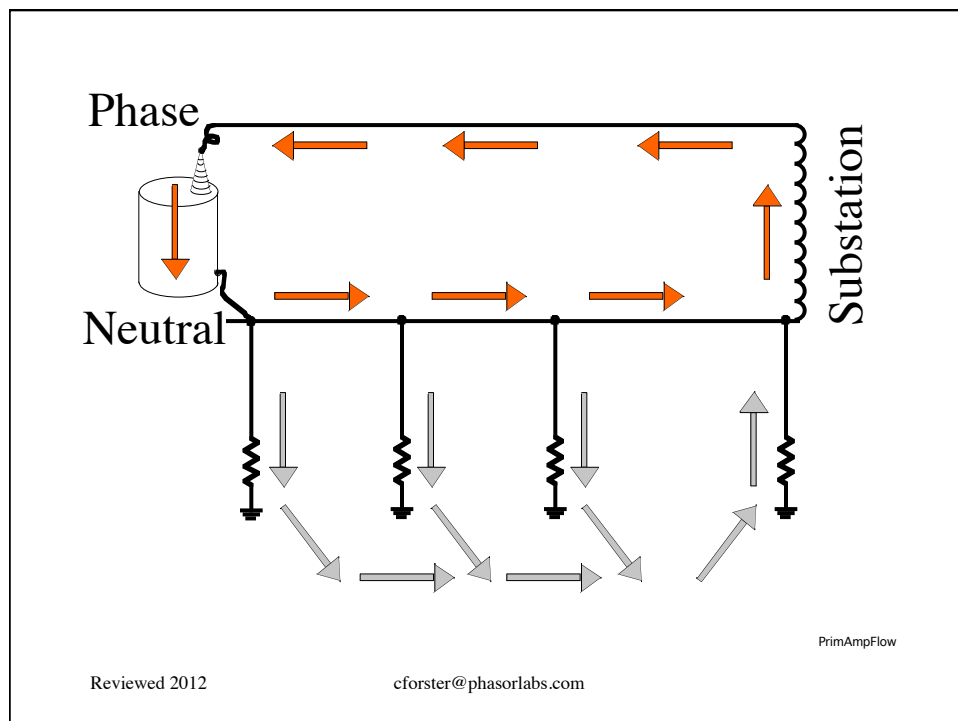
Primary Neutral to earth voltages.....

The neutral wire is grounded to the earth about 4 to 9 times per mile.

The voltage drop on the neutral wire is impressed upon the ground rods, plus a **parallel path for neutral wire current is formed.**

Reviewed 2012

cforster@phasorlabs.com



Primary Neutral to earth voltages.....

We try to minimize this current flow as much as practical and still **meet grounding guidelines.**

One advantage we have is that the earth currents **disperse** to very low levels and do not normally create a concern.

Reviewed 2012

cforster@phasorlabs.com

How do I stop ON-Farm Sources?

Phase and neutral wires both carry current and have "voltage drops" along the wire.

The voltage drop on the **phase** wire **does not** cause stray voltage concerns.

Reviewed 2012

cforster@phasorlabs.com

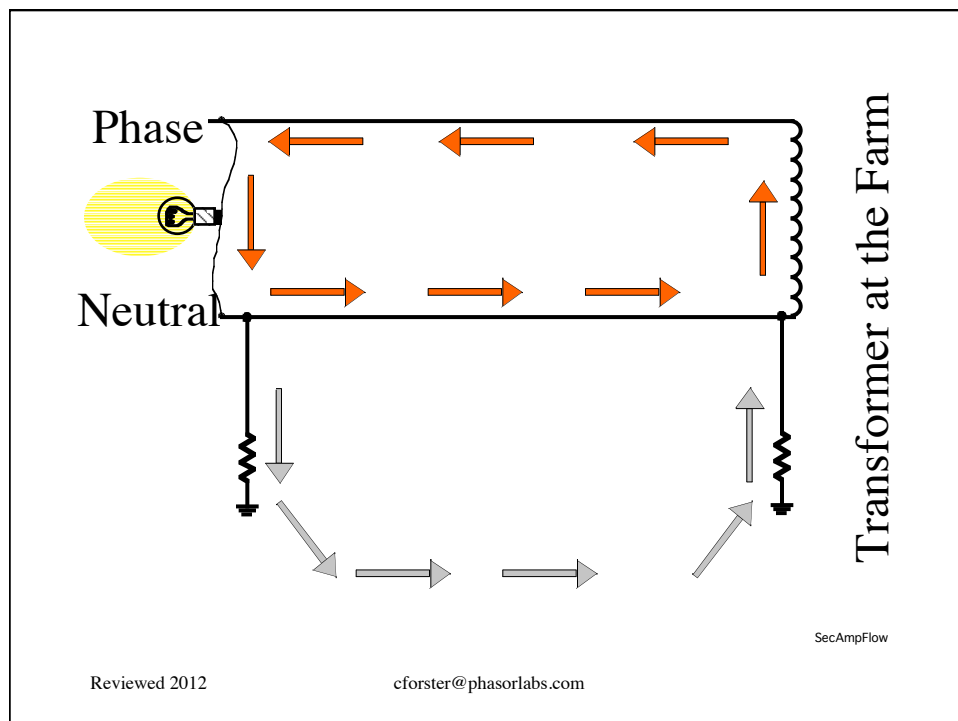
How do I stop ON-Farm Sources?.....

The secondary neutral wire is grounded to the earth at least once at each building for safety reasons .

The voltage drop on the neutral wire is impressed upon the farm ground rods, plus a parallel path for secondary neutral wire current is formed.

Reviewed 2012

cforster@phasorlabs.com



Reviewed 2012

cforster@phasorlabs.com

How do I stop ON-Farm Sources?.....

We try to minimize secondary current flow as much as practical.

Secondary earth currents are contained within a small area.

This can create a stray voltage concern.

Reviewed 2012

cforster@phasorlabs.com

If we find “Stray Voltage”?

During a stray voltage investigation we try to determine if any primary or secondary neutral to earth voltages are detected at cow contact points.

If they are, the power supplier and the farmer's electrician have methods to reduce their magnitudes.

Reviewed 2012

cforster@phasorlabs.com

How about a 4 wire system?

Assuming there are no improperly wired or malfunctioning electrical devices on the farm, it is good to take advantage of the NEC electrical code exception for farm operations and install a four (4) wire electrical system.

Reviewed 2012

cforster@phasorlabs.com

How do I positively eliminate the chance of stray voltage on my farm?

The only positive way is to not have electricity on the farm, but this is not practical.

Reviewed 2012

cforster@phasorlabs.com

How do I minimize the chance of stray voltage on my farm?

**Good wiring
Good grounding
Isolate (If required)**

Reviewed 2012

cforster@phasorlabs.com

What if I have limited \$\$\$\$\$?

1. Have your electrician and your power supplier work together to perform a stray voltage inspection. Expect to pay your electrician for his/her time.

Reviewed 2012

cforster@phasorlabs.com

but I have limited resources?.....

2. Have your electrician make sure all the wiring on the farm is in good repair.

Have your electrician make sure all grounding is correct per the NEC.

Reviewed 2012

cforster@phasorlabs.com

but I have limited resources?.....

3. The power supplier can inspect the high voltage system.

About 50% of the time the above primary and secondary work will reduce stray voltage on the farm to acceptable levels.

Reviewed 2012

cforster@phasorlabs.com

What if I want the level lower?

The PSC of Wisc. says at 1.0 volts AC RMS (at cow contact), you should take corrective action.

The 1.0 volt level allows 0.5 volts from the primary system and 0.5 volts from the secondary system.

Reviewed 2012

cforster@phasorlabs.com

What if I want the level lower?.....

The 0.5 volts voltage level is simply a practical breakpoint to determine at what point the farmer must to contribute to the solution.

You can ask that an isolation switch be placed in service.

Reviewed 2012

cforster@phasorlabs.com

What if I want the level lower?.....

I expect that 99% of the farm owners will be satisfied with the above mitigation technique.

It is designed to provide maximum service to the farm owner at minimum cost.

Reviewed 2012

cforster@phasorlabs.com

Is isolation safe?

Not entirely, when you remove the **safety ground connection** from the primary to secondary system, you isolate the farm, but an unsafe condition may occur.

Reviewed 2012

cforster@phasorlabs.com

Is isolation safe?

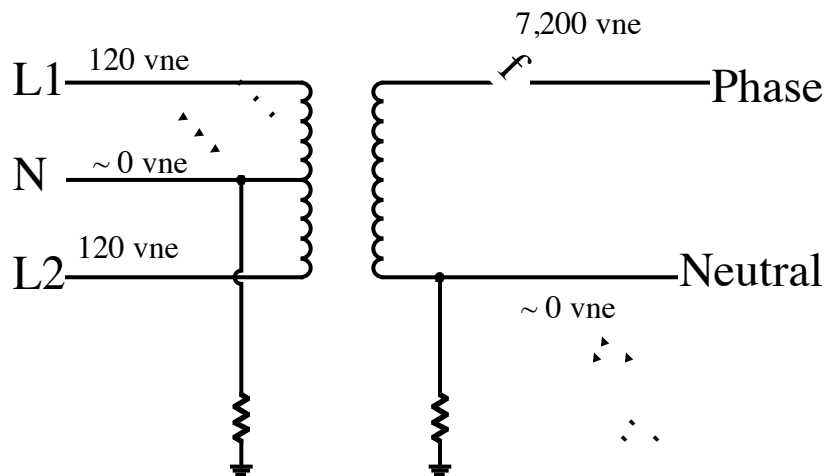
If lightning strikes the power line, an arc from the 7,200 volt system to the 120/240 volt system can occur.

The 7,200 volt power will continue to flow onto the farm electrical system, resulting in fire and/or death unless it is disconnected or interrupted.

Reviewed 2012

cforster@phasorlabs.com

An isolated service

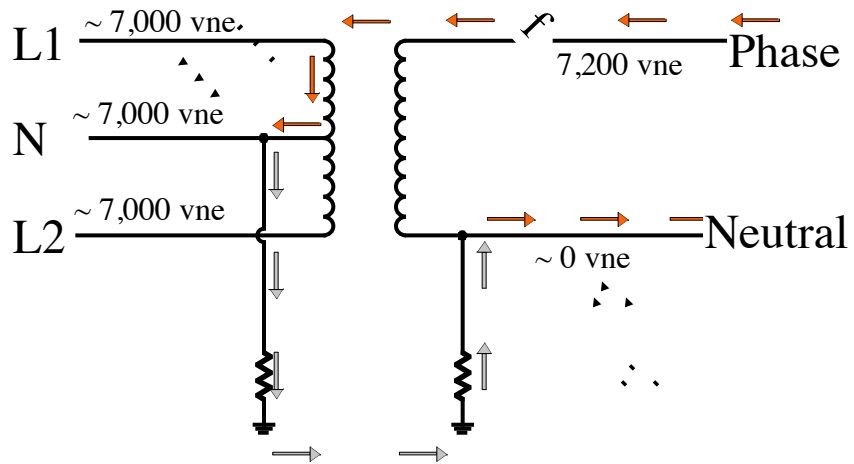


Reviewed 2012

cforster@phasorlabs.com

FlashNolsoSw

Lightning flashes from HV to LV

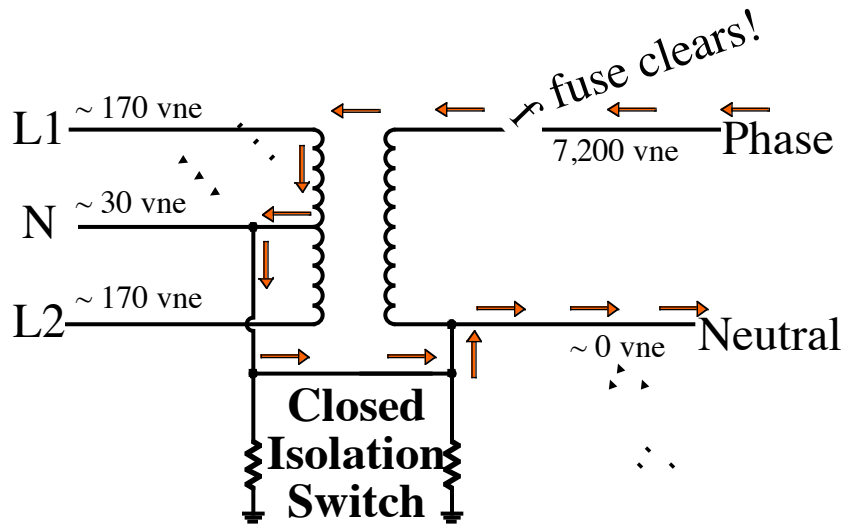


Reviewed 2012

cforster@phasorlabs.com

FlashNotoSw

Our isolation switch saves the day



Reviewed 2012

cforster@phasorlabs.com

FlashSwClosed

Is isolation safe?

The safety ground connection's purpose is to cause a high voltage fuse or circuit breaker to clear the fault and stop the flow of electricity, returning the system to a safe but de-energized condition.

Reviewed 2012

cforster@phasorlabs.com

Is isolation safe?

The isolation switch performs the function of the safety ground jumper when the need arises.

Reviewed 2012

cforster@phasorlabs.com

Do I need an isolation transformer?

The power supplier uses a two winding transformer of very high quality.

The isolation feature is not available by the addition of a grounding connection, which is done for safety reasons.

Reviewed 2012

cforster@phasorlabs.com

Do I need an isolation transformer?

The power supplier transformer functions as an isolation transformer.

Reviewed 2012

cforster@phasorlabs.com

To prevent stray voltage concerns:

Contact your electrician to examine your on-farm wiring.

Contact your power supplier to work with your electrician to perform a stray voltage investigation.

Reviewed 2012

cforster@phasorlabs.com

To prevent stray voltage concerns:.....

Ask for temporary isolation.

Retest the farm after all upgrades have been made.

If you are not satisfied with the cow contact voltage levels recorded, ask for permanent isolation.

Reviewed 2012

cforster@phasorlabs.com

To prevent stray voltage concerns:.....

At this point 99.9% of the farm owners will be satisfied with the performance of the primary and secondary electrical systems.

Reviewed 2012

cforster@phasorlabs.com

What if I you still are not satisfied?

People may tell you that transient voltage spikes, even those that do not reach the cow, can cause production problems.

You may hear how currents through the earth and currents in metallic pipelines can affect production.

Reviewed 2012

cforster@phasorlabs.com

What if I am still not satisfied?

You may hear how magnetic fields can affect production.

The majority of these claims can not be justified as of ~~1998~~ 2011. It is hard to justify spending a great deal of money without reviewing the dozens of other proven items that can affect production.

Reviewed 2012

cforster@phasorlabs.com

If your production is low:

List ALL of the items that can be of concern.
Improve the low cost items and then move on to the more expensive and elaborate solutions.

When someone suggests an expensive solution ask some hard questions and get good answers before proceeding.

Reviewed 2012

cforster@phasorlabs.com

If your production is low:.....

Ask how much this will this cost?

Ask if the solution is guaranteed to increase my production?

Ask what other work items may be required if the initial work does not solve my production problems?

Reviewed 2012

cforster@phasorlabs.com

If your production is low:.....

Ask how long will the proposed solution work?

As of 1998, I knew of two (2) isolation transformer installers that predicted only 80% of their "solutions" will work on the first try and more will not work after a brief period of time.

Reviewed 2012

cforster@phasorlabs.com

If your production is low:.....

Get complete documentation of all tests.

Get an explanation of exactly how the measurements justify the solutions.

If the cost to you to try a solution is minimal, try it!

Reviewed 2012

cforster@phasorlabs.com

Good luck on improving your production and profits. If you have questions, I can be emailed at <cforster@phasorlabs.com>

Chuck Forster

Reviewed 2012

cforster@phasorlabs.com