

# *Isolation*



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## **Why ISOLATE a Cow?**

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

Stop **current flow** through the animal.

Current flow may cause **animal reaction**

## **What are the sources of electricity on or about a farm?**

Electric fences  
Cow trainers  
Hand held units  
Electrified crowd gates

## **Voltages NOT intended to contact an animal:**

Lightning  
Distribution system  
Farm electrical system  
"Stray Voltages"

## **"Stray Voltages"**

Can not shock a human

Can not kill an animal or human.

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

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

There are two (2) sources:

Off-farm

On-farm

## **Typical Off-farm sources:**

Neighbors home or farm

Remote gas line

Primary neutral to earth voltage

## **Typical On-farm sources:**

Your farm or home

Multiple grounds on the farm system

Secondary neutral to earth voltage

## **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.

## **How do I separate the electrical systems?**

Use the pwr supplier's transformer.

Install your own isolation transformer(s).

Use active suppression.

# Primary Neutral Voltage

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**One of many OFF-farm sources:**

*Primary Neutral to earth voltages.....*

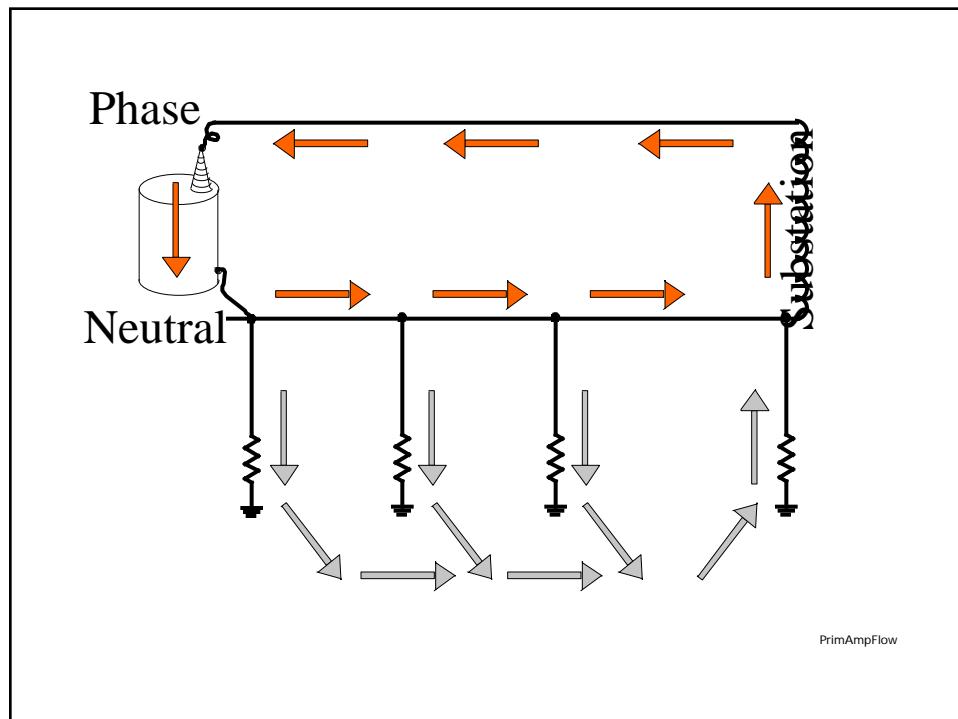
Phase and neutral wires both carry current and have "voltage drops" along the wire.

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

*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**



*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.

## **How do I stop ON-Farm Sources?**

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

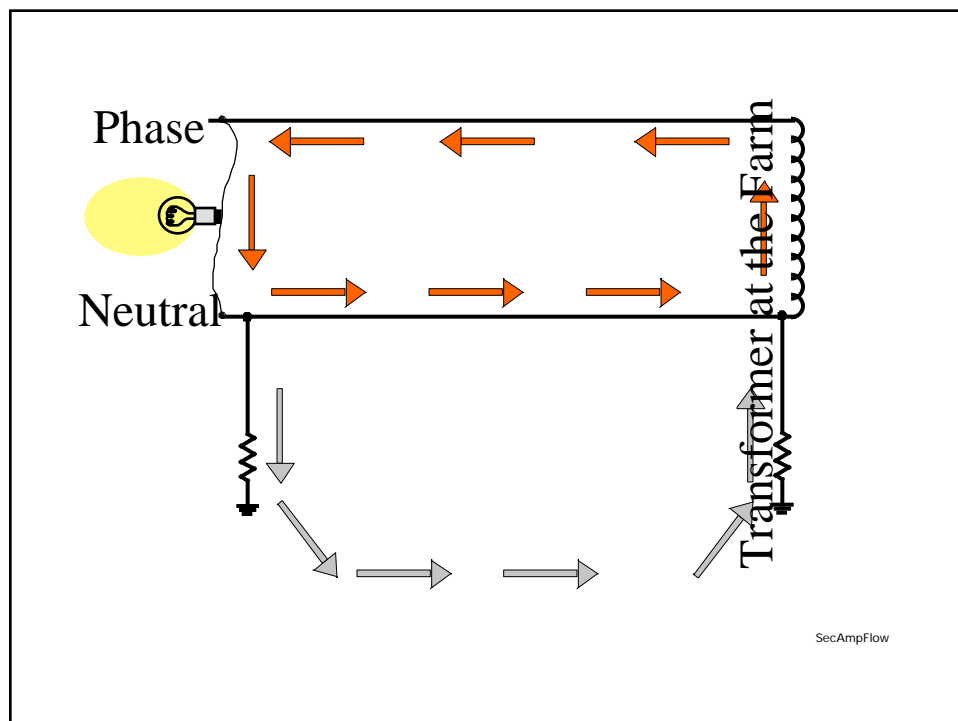
The voltage drop on the **phase** wire **does not** cause stray voltage concerns



*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.



*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.

## **If we find “Stray Volts”?**

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

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

## **How about a 4 wire system?**

Assuming there are no improperly wired or functioning 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.

## **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.

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

Good wiring  
Good grounding  
Isolate

**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.

*but I have limited resources?.....*

2. Have your electrician make sure all the wiring on the farm is intact and of good quality

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

*but I have limited resources?.....*

3. 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.

## **What if I want the level lower?**

Wisc. PSC 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.

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

You do not have to accept 0.5 volts at cow contact. 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 remain in service.

*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.

## **Is isolation safe?**

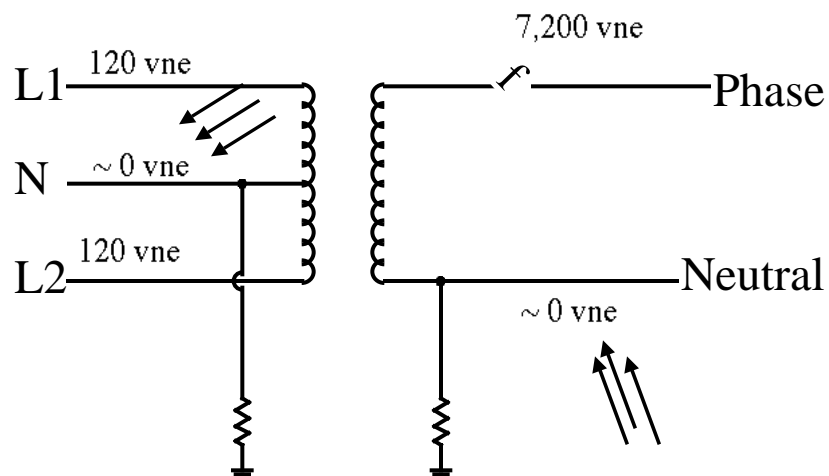
Not entirely, when you remove the **safety ground jumper** from the primary to secondary system, you isolate the farm, but an unsafe condition may occur.

*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.

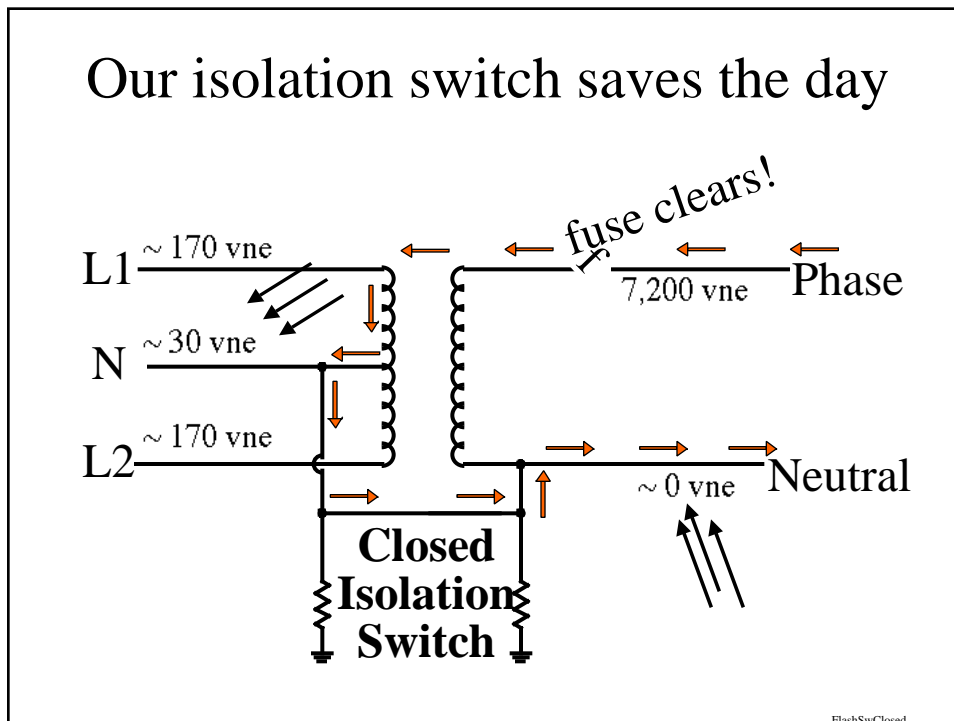
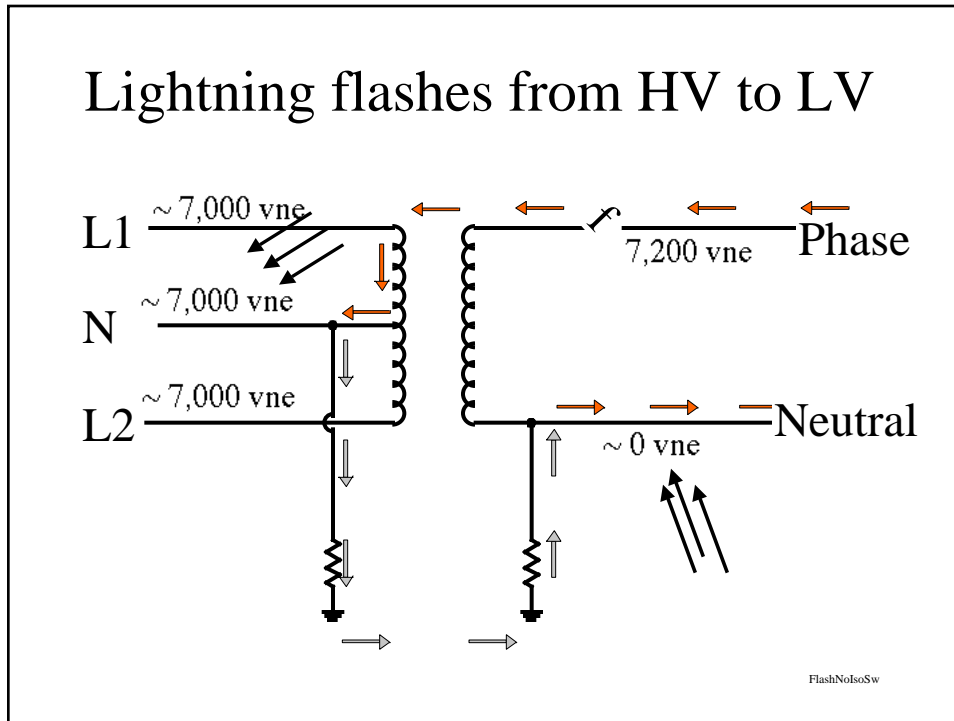
The 7,200 volt power will continue to flow onto the farm electrical system, resulting in fire and/or death unless it is disconnected or interrupted.

### A isolated service



FlashNoIsoSw





*Is isolation safe?.....*

The safety ground jumper'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.

*Is isolation safe?.....*

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

## **Do I need an isolation transformer?**

Utility uses a two winding isolation transformer of very high quality.

The isolation feature is defeated by the addition of a grounding jumper which is done for safety reasons.

*Do I need an isolation transformer?.....*

Power supplier transformer functions as an isolation transformer.

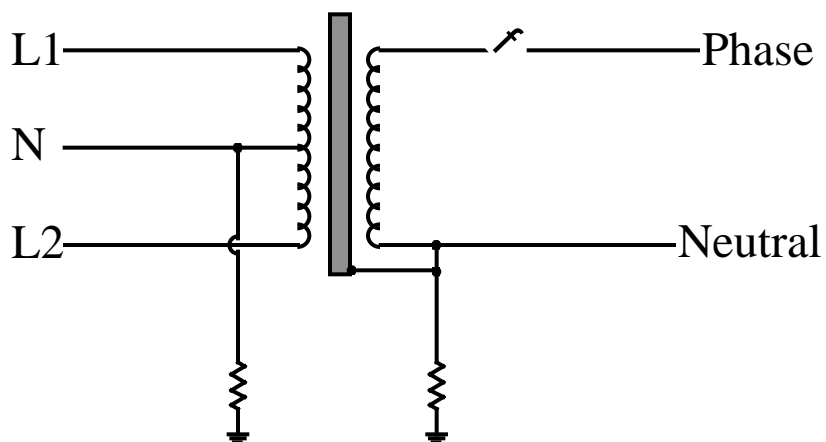
Less voltage drop with only one transformer in series.

*Do I need an isolation transformer?.....*

What is a Faraday shield?

Does the power supplier's transformer have one?

*Do I need an isolation transformer?.....*



FaradayShield

**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.

*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.

*To prevent stray voltage concerns:.....*

At this point 99% of the farm owners will be satisfied with the performance of the primary and secondary electrical systems.

## **What if I am still 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.

*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. It is hard to justify spending a great deal of money without reviewing the dozens of other proven items that can affect production.

## **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:

*If your production is low:.....*

How much will this cost?

Is this solution guaranteed to increase my production?

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

*If your production is low:.....*

How long will the proposed solution work?

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



*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!

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

Chuck Forster