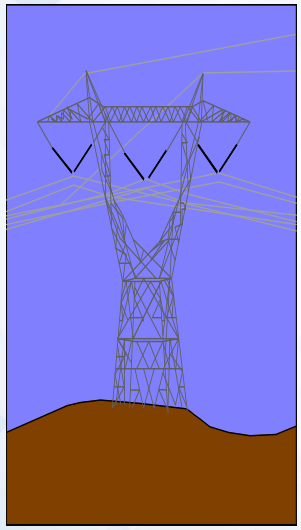
Transformer Seminar



BASIC THEORY

BONDING AND GROUNDING OVERVIEW

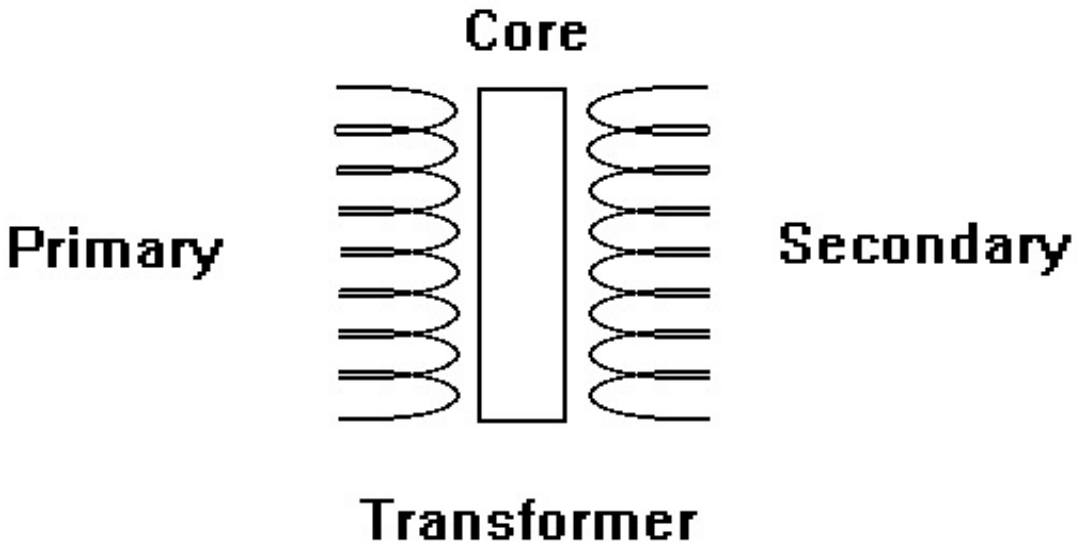
GENERAL PURPOSE TRANSFORMERS

HUBBELL

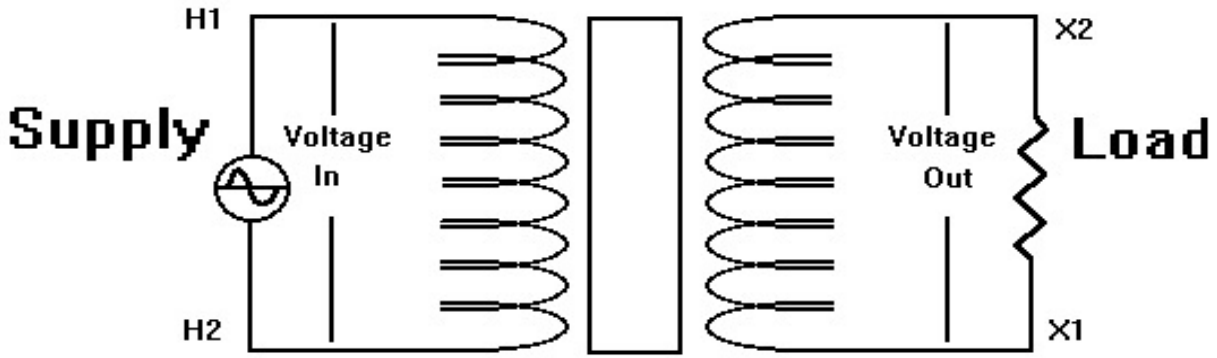
COMMERCIAL CONSTRUCTION

Acme Electric®

Basic Transformer

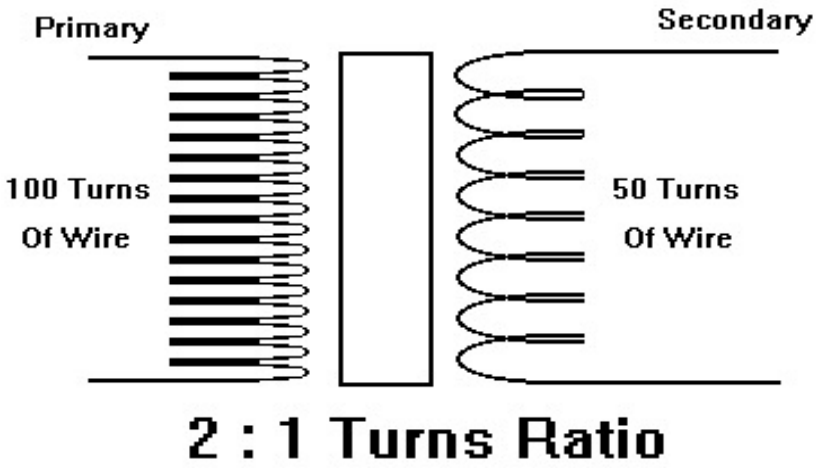


Voltage Transformation

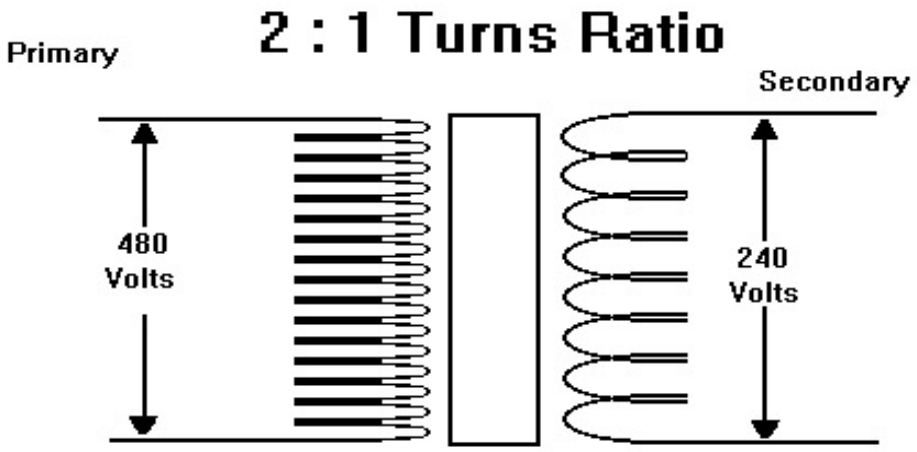


Voltage Transformation

Turns Ratio


Primary
Secondary
100 Turns
Of Wire
50 Turns
Of Wire
2 : 1 Turns Ratio

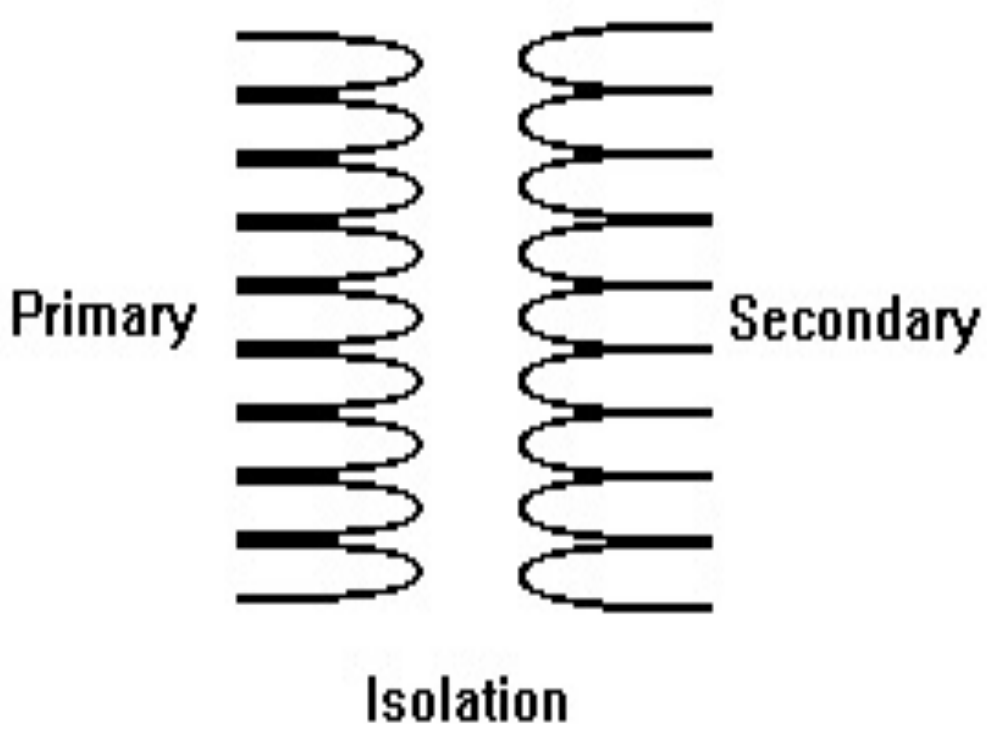
Voltage Ratio



Three Basic Components

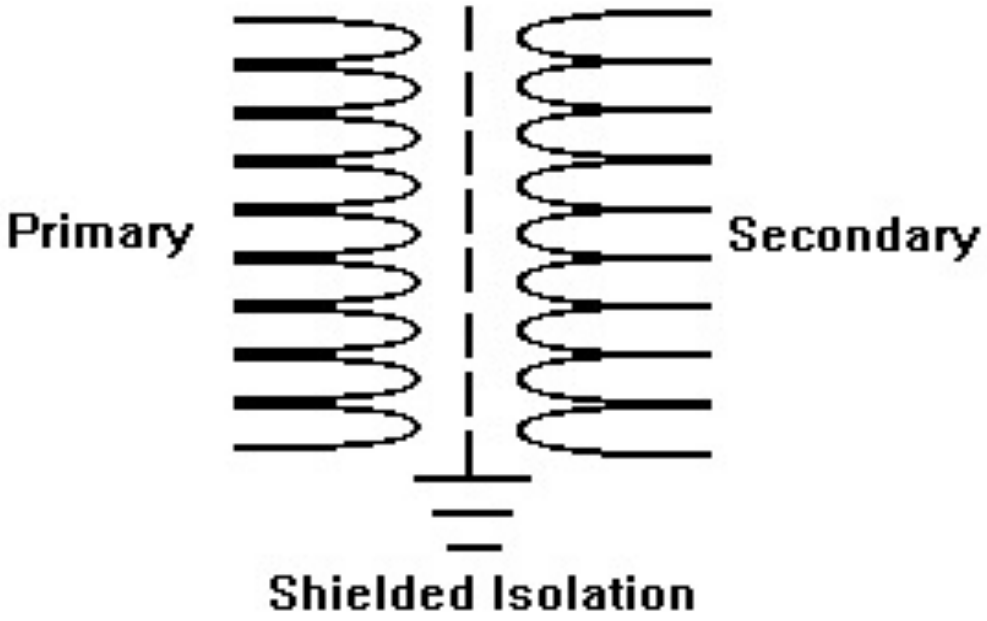
1. Core (magnetics)
2. Coils (conductors)
3. Insulation (paper, etc.)

Electrical Types of Transformers



Electrical Types, cont'd

"SHIELDED ISOLATION"



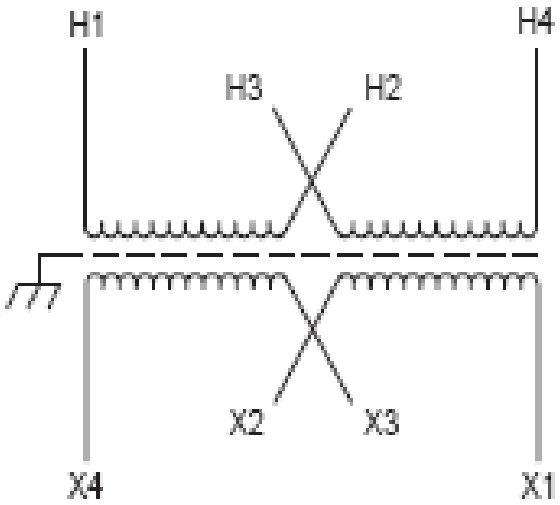
Bonding and Grounding Overview

- All dead metal parts in an electrical system must be grounded per the NEC.
- This includes the metal enclosure of a transformer.
- It should be grounded to the source ground!
- This insures that fault current is safely carried back to the source overcurrent device.

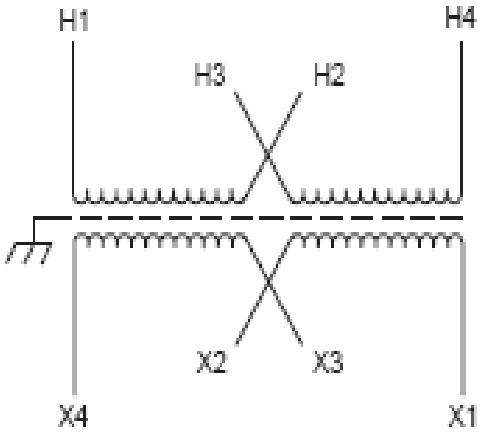
- When installing an “isolation transformer” the output voltage will be “floating” or “isolated” from the supply voltage and from ground.
- An isolation transformer produces what the NEC refers to as a separately derived service.
- It also states that in this case you can now “bond” any point of the transformer output to “ground”.
- If left “floating” to ground no stable or fixed voltage measurements to ground can be obtained.
- A floating output will prevent any GFCI devices from operating.

- Let’s now examine a typical single phase isolation transformer installation and discuss various options for bonding the output to ground.
- In this example we will use a unit with a 240 X 480 primary and a 120/240 secondary.
- This means the input or supply voltage can be either 240 volts or 480 volts.
- The output voltage can be either 120 volts, 240 volts, or both 120 and 240 volts at the same time.

Typical Diagram



- For 120 volt only connect: X1 to X3 and X2 to X4.
- You would measure 120 v across the two pairs but there is no ground reference yet.
- The NEC would consider both output wires “hot” and would require overcurrent protection in both wires.
- If we bond or ground one of these output wires it then becomes “neutral” and no longer requires overcurrent protection.
- Once the neutral is bonded now any GFCI device on this 120 v output will operate.



- For 120/240 output connect: X2 to X3 to make the neutral.
- Connect one leg of 240 v to X1.
- Connect one leg of 240 v to X4.
- You would measure 240 v between X1 and X4 and measure 120 v between X1 and neutral and also X4 to neutral.
- As stated earlier the neutral (X2 and X3) would be considered “hot” unless it were bonded to ground.
- Unbonded neutral would require overcurrent protection.
- GFCI devices will not operate unless the neutral is bonded to ground.

How can you tell if the neutral in any electrical system is bonded to ground or not?

Answer: If the neutral has been bonded to ground then the voltage between neutral and ground will read “Zero” volts.

Questions or Comments

Tech Service contact number:

800-334-5214 option 1