

Knowledge Domain: Power Supply

Unit: Transformer

Skill: Voltage conversion transformer

Tools and Parts Required:

- 1) Voltage conversion transformer**
- 2) Gloves, insulating**
- 3) Closed toed shoes**
- 4) Power supply**
- 5) Voltage source**
- 6) Voltmeter or digital multimeter**

Introduction

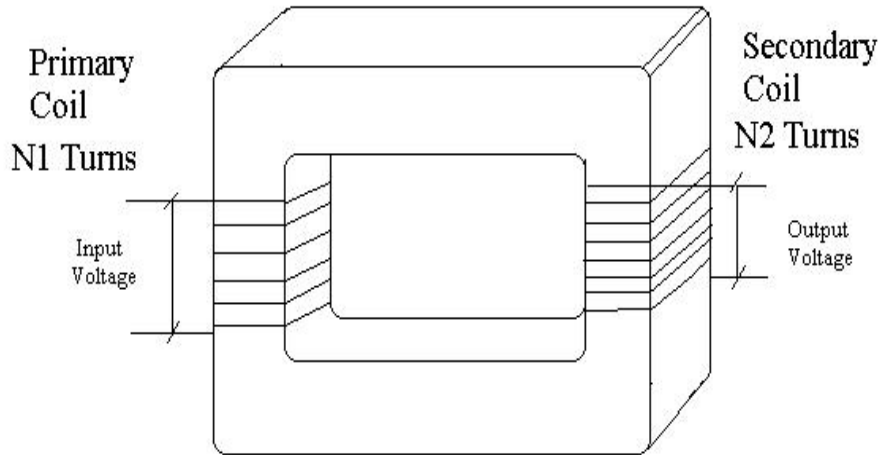
A voltage conversion transformer converts the input AC voltage to the desired output AC voltage. Voltage conversion transformers do not work with DC. These images show voltage conversion transformers used in laboratories. Most pieces of medical equipment will have an AC voltage conversion transformer as the first component coming from the wall power source.



The pictures above show examples of AC voltage transformers. The picture on the right shows the opened voltage transformer.

Example

Below is a diagram of a voltage conversion transformer. The voltage conversion transformer has two coils. The first coil is called the primary coil. The second coil is the secondary coil. The number of turns in these coils determines the change in the input voltage needed to produce the desired output voltage.



Voltage Conversion Transformer

The following equation shows the relationship between the number of turns in each coil and the change in voltage.

$$\frac{\text{Output Voltage}}{\text{Input Voltage}} = \frac{\text{Number of turns in secondary coil}}{\text{Number of turns in primary coil}}$$

Identification and Diagnosis

A voltage conversion transformer can reduce the output voltage level. A voltage conversion transformer that reduces the output voltage is called a step down transformer. A voltage conversion transformer can also increase the output voltage level. A voltage conversion transformer that increases the output voltage is called a step up transformer.

Some voltage conversion transformers do not change the input voltage or output voltage. These voltage conversion transformers provide electrical isolation to other devices. These voltage conversion transformers are called isolation transformers.

Procedure

Use insulating gloves while handling the voltage conversion transformer. Wear closed-toe shoes.

Most voltage conversion transformers use the wall voltage on the input side. To check one of these transformers, connect the wall voltage to the input side of the voltage conversion transformer.

Check the voltage output of the transformer using a digital multimeter across the secondary coil of the voltage conversion transformer. Set the multimeter to measure AC voltage.

If there is any nonzero AC output voltage, the transformer is probably working.

If the output voltage is zero, the transformer may be broken or there may be a broken fuse between the transformer and the wall power.

Check the fuse first. If the fuse is broken, replace the fuse. If the fuse is not broken, the transformer is probably broken.

Before replacing the transformer, remove the output wires and measure the output voltage of the transformer again. If the voltage is zero, the transformer is broken.

To replace the transformer, you must determine the desired output voltage. This might be written on the transformer or in the device manual.

If the transformer is not functioning correctly, you may need to purchase a new transformer. The new transformer must match the original specifications such as wattage of the transformer, output voltage capacity, etc.

Exercise

Your instructor will give you a voltage conversion transformer. It may be contained inside of a piece of medical equipment.

- Locate the connection points for input voltage and output voltage.
- Switch on the power supply to the voltage conversion amplifier. Apply wall voltage to the voltage conversion transformer.
 - Measure the output voltage. Compare the output voltage with the value written on the voltage conversion transformer or in the manual. Does the transformer need to be replaced?

Your instructor must verify your work before you continue.

Preventative Maintenance and Calibration

Always keep the voltage conversion transformer clean. The voltage conversion transformer should not come in contact with water. There are maximum and minimum operating temperature levels for a voltage conversion transformer. Example: The minimum operating temperature level is -40°C . The maximum operating temperature level is $+55^{\circ}\text{C}$. Never exceed these temperature limits.

Always calibrate every medical device before returning it to use.