

Domain: Power Supply

Unit: Transformer

Skill: Adapting Wall Transformer

Tools and Parts Required:

- 1) Machine that requires a transformer
- 2) Assorted wall transformers
- 3) Wire cutter/stripper
- 4) Soldering iron
- 5) Solder
- 6) Multimeter
- 7) Heat shrink tubing and heat source (may substitute electrical tape)

Introduction

A transformer is a device that changes electrical energy from one voltage to another voltage. Step up transformers increase the voltage. Step down transformers decrease the voltage. Wall transformers can also change alternating current (AC) into direct current (DC). Wall transformers turn electricity from an electrical wall outlet into an appropriate voltage and current for a device or machine. This unit explains how to find a replacement wall transformer or to adapt one to suit your needs.

Example

Many devices use wall transformers. Common examples are cell phone chargers, power tools, and medical equipment. Below is a picture of a wall transformer.

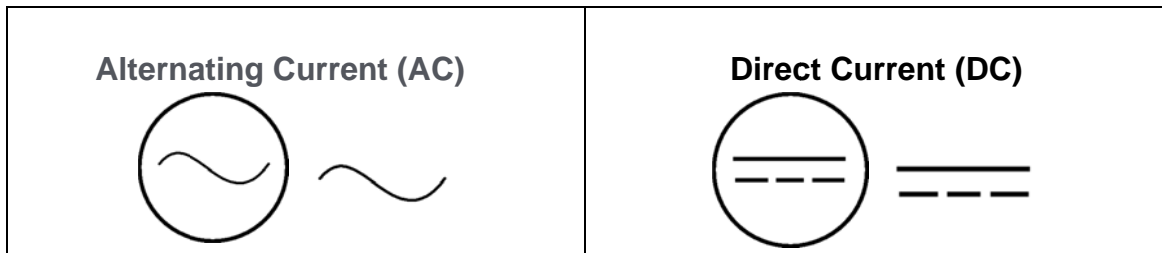


Identification and Diagnosis

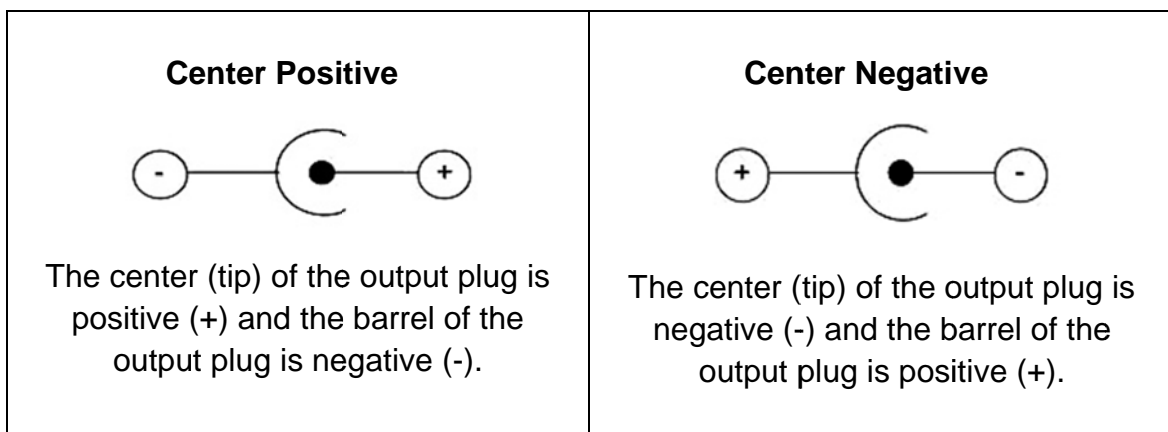
If you have a broken or missing wall transformer, you will need to replace the transformer. If you cannot find an exact replacement, you can adapt another transformer.

Here are some useful symbols to recognize:

Current - These symbols indicate whether the current is direct or alternating. They are drawn with and without the exterior circle.

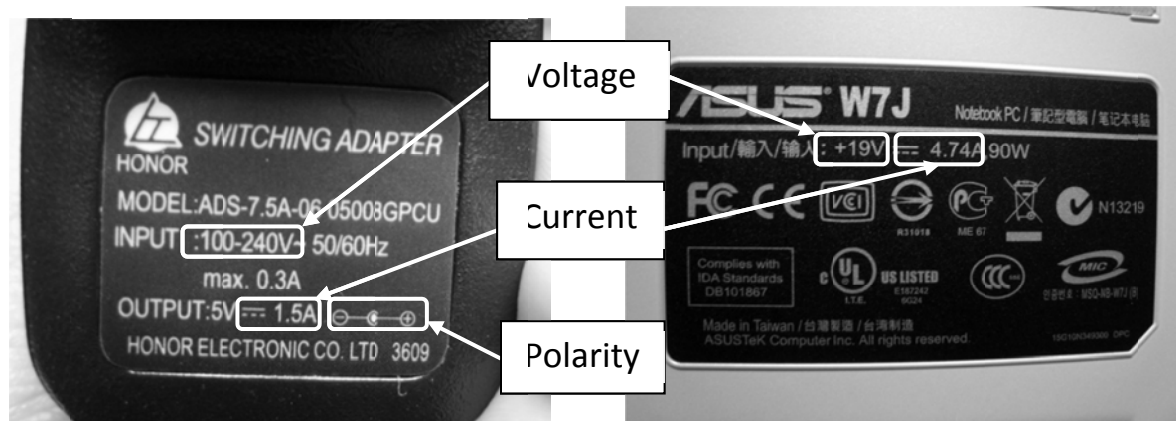


Polarity - These symbols refer to the polarity of output plugs of transformers.

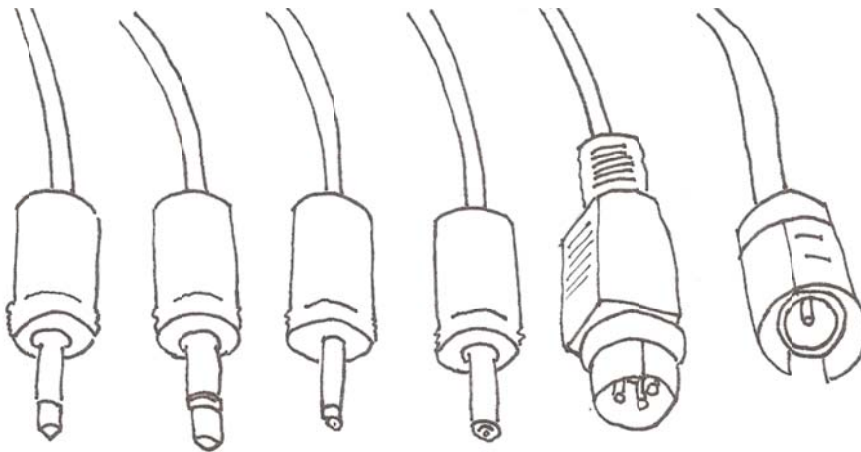


Procedure

1. **Identify the input rating.** This rating is the voltage and frequency of the wall electricity. This rating will depend on where you live. For example, in most of Africa and Europe, electricity is distributed in alternating current (AC) at 220 volts and a frequency of 50Hz.
2. **Identify the output rating.** The electrical rating is the voltage and current, and whether it is alternating or direct current (AC or DC). On the original wall transformer, read the "output" numbers from the label (pictured below). If you do not have the original wall transformer, look on the machine for a rating plate or in the instruction manual (pictured below).



3. **Identify the type of connector.** If you have the original transformer, look at the connector. Below are some examples of connectors. If you do not have the original transformer, look at the machine. The transformer's label may indicate the polarity of the plug (see polarity symbols in Identification and Diagnosis section.) You also need to know the diameter and shape of the connector. If you have the original transformer, you can bring it with you to the market or cut the connector from the original and reuse it. If you do not have the original transformer, you will need to bring the entire machine to the market to make sure the replacement transformer plugs into the machine.



4. **Using the information you gathered in steps 1-3, find an appropriate replacement transformer**
 - The input voltage and frequency must exactly match the electrical wall outlet rating. Some transformers can tolerate multiple voltages and frequencies. They will be labeled, for example, 110V-240V AC, 50-60Hz.
 - The output voltage must exactly match the machine requirements.
 - The output current (amperage) should be equal or higher than necessary. If absolutely necessary, the replacement transformer can be 10% less than

necessary. (For example, if the machine needs 200mA input, a transformer with an output of 180mA or more will work).

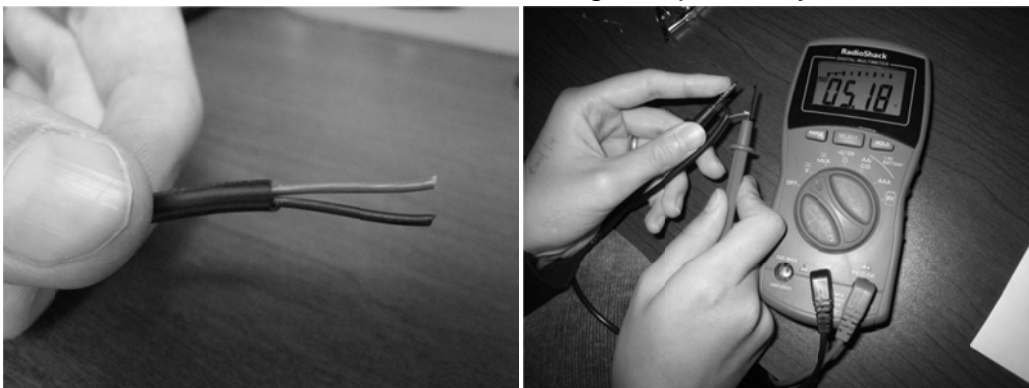
- You must match the output of the transformer to be either AC or DC, as required by your machine.
- Ideally, the connector should match exactly. (Note: if the connector is the same shape, but the polarity is reversed, you can reverse the wires. Follow steps 5-10.)

5. If the connector does not match, locate another transformer with the desired connector.



6. Using wire cutters, cut the desired transformer from its connector. Cut the wire 4-5 cm away from the connector. Strip 1-2 cm off the wire insulation on the transformer end. Insure the bare wire is exposed.

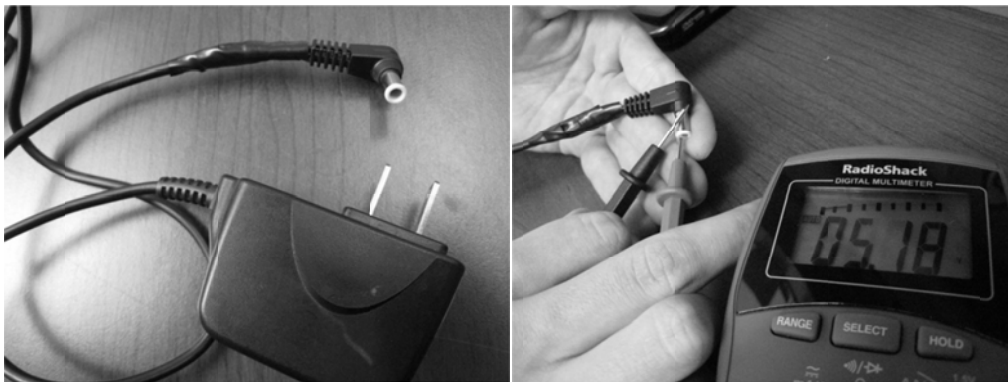
If the transformer is DC, you must also insure that the polarity is correct. Plug the transformer into the wall. Test for the voltage output with your multimeter.



7. Cut the desired connector off from the transformer with wire cutters. Cut 4-5 cm away from the connector. Strip 1-2 cm off the wire insulation on the connector end. Insure the bare wire is exposed.
8. Determine which wires are positive, and which are negative. You can do this by checking the pin (internal) for continuity with one of the two wires. Note whether the pin is positive or negative.
9. Solder the desired transformer and the desired connector together. Match the polarity. Cover with heat shrink and electrical tape. (Refer to the units on soldering wires and heat shrink)



10. Plug the transformer into the wall. Test for the voltage output with the multimeter. The voltage output should be the desired output. .



Exercise

Look at the transformers below. Write down the maximum input rating for the machine or device they plug into.



Maximum Machine Input Rating:

- _____
- _____
- _____
- _____

Your instructor will give you a machine with a missing or broken transformer. Write down the input and output rating needed. Find a replacement transformer. If necessary, solder on a new connector.

Your instructor must verify your work before you continue.

Preventative Maintenance and Calibration

Always calibrate every medical device before returning it to use.