



Technician License Course Chapter 9

Lesson Module 20: Electrical Safety



ARRL *The national association for
AMATEUR RADIO*

Electrical Safety

Avoiding contact with voltages in circuits is the most effective way of practicing electrical safety. Voltages higher than 30 Volts should be considered dangerous.

- Most modern radio equipments use voltages that are not as dangerous as older equipment but precautions still must be taken.
- 115VAC Power is the most dangerous.
- RF Amplifiers with tubes use high voltages.
 - Shielding keeps your hands out.
 - Interlocks prevent operation without shielding.
- Transmitting antennas can have high voltages.



Electrical Injuries

Shocks –

- Usually caused by voltages higher than 30 Volts.
- Causes muscles to contract.

Burns –

- Caused by current through skin or tissue.
- Skin condition can increase current.

Table 7-1
Effects of Electric Current Through the Body of an Average Person

<i>Current (1 Second Contact)</i>	<i>Effect</i>
1 mA	Just Perceptible.
5 mA	Maximum harmless current.
10 - 20 mA	Lower limit for sustained muscular contractions.
30 - 50 mA	Pain
50 mA	Pain, possible fainting. "Can't let go" current.
100 - 300 mA	Normal heart rhythm disrupted. Electrocutation if sustained current.
6 A	Sustained heart contractions. Burns if current density is high.



Mitigating Electrical Hazards

Following safety rules is important to avoid shocks.

- Turn off power when working inside equipment!
- Make sure the power is off.
- Large power supplies (and small ones) have power stored in capacitors. Know how to discharge them.
- Don't depend on interlocks and don't bypass them!
- Keep one hand in your pocket when probing in energized high voltage circuits.
- Batteries can deliver lots of energy when shorted.
- Remove rings and jewelry, especially around RF.
- Avoid working alone on energized equipment.



Responding to Electrical Injury

REMOVE POWER if you can! You don't want to become part of the incident.

- ON/OFF switches and circuit breakers should be clearly marked.
- A single master switch is the best insurance.

Remove the victim from the power if you can't turn it off.

- Call for help.
- Learn CPR and first aid.



AC Power and Safety Grounding

Not all homes are wired to current NEC codes but even old wiring can be made safe. Most ham equipment does not require special wiring or circuits.

- Use 3-wire power cords. If your outlets are 2-wire, you can change them to a GFCI outlet but ...
- Use circuit breakers, circuit breaker outlets, or Ground Fault Circuit Interrupter (GFCI) circuit breakers or outlets of the proper size.
- Don't overload single outlets.
- If your house wiring isn't adequate, scale down your station or re-wire.



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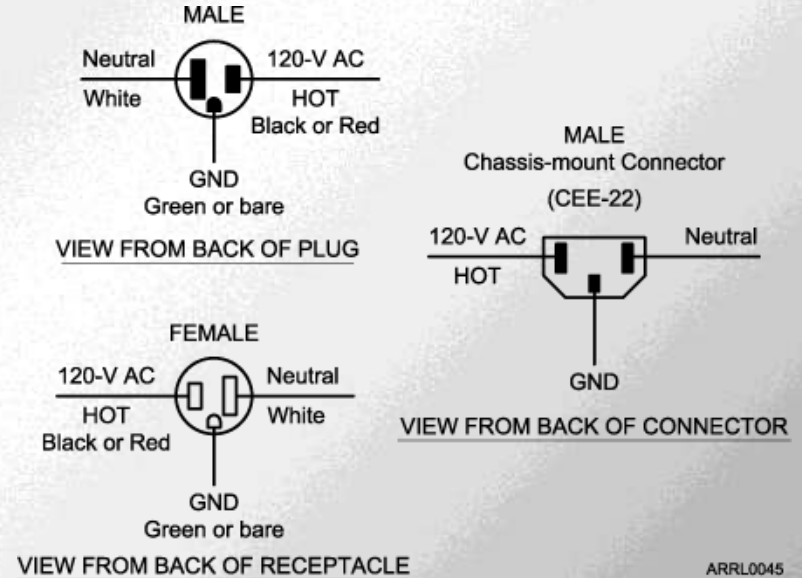
AC Power Wiring

The hot wire should include a fuse or circuit breaker. Neutral wire is the “grounded conductor” and is connected to house ground at the CB panel. Hot wire and neutral wire must have the same current. A ground fault current will cause a difference.

The ground wire should be the same size as hot and neutral. Use AWG12 wire for 20Amps.



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Note that the Ground wire is Green or Bare.



Lightning Safety

Antennas are not struck any more frequently than trees or tall structures. Lightning protection can protect your house and equipment.

- Ground all towers, masts, and antenna mounts to ground rods with short direct large conductors.
- Use lightning arrestors on cables at the entrance to the house.
 - Mount arrestors on a grounded metal plate.
 - Ground all equipment to the ground plate.
- Disconnect antenna cables and power cords during storms.
- Disconnect telephone lines from computer modems.

