



Chapter 4 – Practical Circuits

Batteries and Chargers Connectors



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Batteries

Two basic types:

- *Primary* or Non-rechargeable.
- *Secondary* or Rechargeable.
- Rechargeable battery types based on battery chemistry. Over-discharging will reduce battery life.
 - NiCd, NiMH – Low internal resistance, high discharge
 - Li-Ion – Large energy density makes for small size
 - Lead Acid – *Storage Batteries*
 - 2.3 Volts per cell
 - 13.6 Volt battery useful down to 10.5 Volts



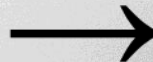
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Battery Charging

Batteries should be charged at the rate and method recommended by the manufacturer.

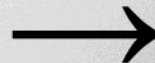
- Use a charger designed for the type of battery.
- NEVER attempt to charge primary batteries such as carbon-zinc, alkaline, or silver-nickel.
- Lead-Acid storage batteries may generate hydrogen gas while charging. Do it in a well ventilated area.



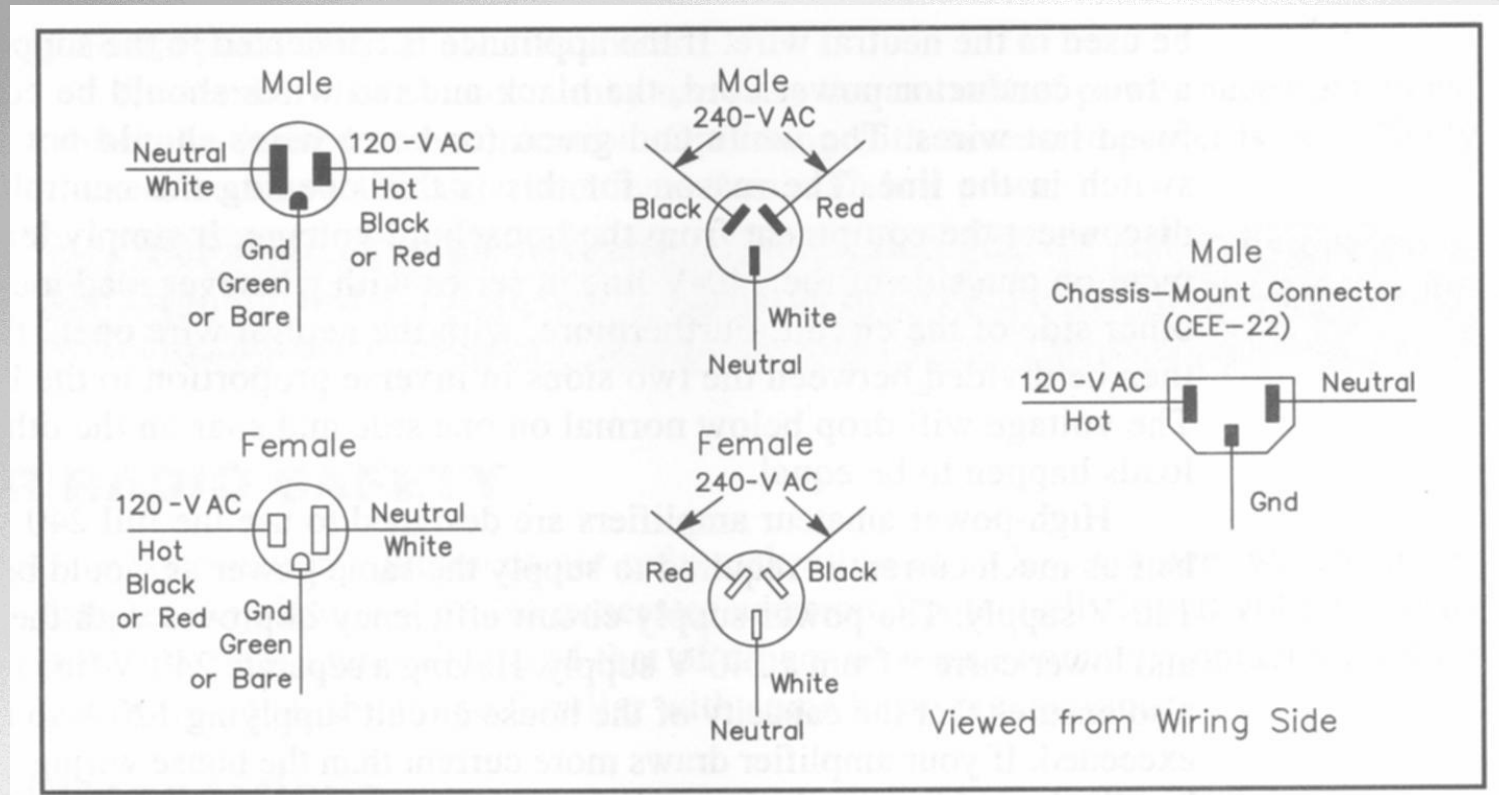
Alternative Power Sources for Off-Grid

Solar power is *Photovoltaic Conversion* using large PN junction cells. Sunlight can be up to 1000 watts per square meter. Efficiency is about 20%.

- Photon's energy causes electrons to cross the PN junction.
- Cell has an open-circuit voltage of 0.5Volts.
- Cells are connected in series-parallel
- A DC to DC converter charges a battery.
- A series diode keeps the cells from discharging the battery in darkness.



AC Power Connectors



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DC Power Connectors

- Molex – White nylon multi-conductor
- Coaxial – Common on “wall warts”
- PowerPoles – Sexless single conductor units can be combined into multi-conductor
- Binding Posts – for terminals or bare wires
- Automotive crimped terminals
- Terminals should be crimped with proper tool.
- Don't use solder for high current without a crimped or mechanical connection.



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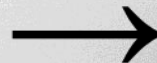
Signal Connectors

Connectors for audio and control signals need reliable contact at low currents.

- Plugs are on cables, Jacks are on equipment.
- Mating connectors should have an index key.
- Placing similar connectors close together can result in mixed up connections.
- RCA Phono plugs and jacks
- DIN and Mini-DIN multi-conductor
- Microphones: 8-Pin Round; RJ-45



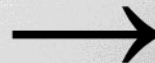
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RF Connectors

RF connectors can cause losses and reflections at higher frequencies. The connector must be rated for the voltage, current, and frequency.

- Common types: UHF, N, C, BNC, SMA
- UHF connector – PL259, SO239 – is OK For HF (and VHF) at amateur power levels.
- For UHF, type N is useable to 10GHz.
- Connectors used outside must be waterproof or sealed.



Data Connectors

Several connector families commonly used in computing equipment and newer amateur equipment.

- D-Type – commonly called DB-25, DB-9, etc. P or S suffix denotes Pins or Sockets, i.e., DB-9P, used for PC COM serial ports.
- USB – Becoming common for radio ↔ computer.
- USB ↔ RS232 adapters
- Ethernet RJ-45

