

# Technician License Course

## Chapter 5

Lesson Plan Module 12 –  
Power Sources and RF Interference (RFI)



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## Power Supplies

- Most modern radio equipment runs from 12 volts dc.
  - Actual preferred voltage is 13.8 volts.
- Household ac power is 120 volts ac.
- Power supplies convert 120 volts ac to regulated, filtered dc.
  - If you use a lab-type 12 volt power supply, be sure it is adjustable to 13.8 volts.



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## Types of Power Supplies

- Linear:
  - Use iron transformers
  - Heavy (physically)
  - Do not emit RF, generally immune to strong RF
- Switching:
  - Electronics instead of transformers
  - Lightweight and small
  - Can emit RF if not properly filtered
    - Check product reviews



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## Power Supply Ratings

### Voltage and Current

- Continuous duty – how much current can be supplied continuously.
- Intermittent duty – how much current can be supplied for short surges, such as on voice peaks.
- Regulation – how well the power supply maintains a constant output voltage.



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## Mobile Power Wiring Safety

- Car batteries hold lots of energy – shorting a battery could cause a fire.
- Special requirements for safe car wiring:
  - Fuse both positive and negative leads.
  - Connect radio's negative lead to negative terminal or engine block ground strap.
  - Use grommets or protective sleeves to protect wires.
  - Don't assume all metal in the car is grounded; modern cars are as much plastic as metal.



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## Batteries

- Create current through a chemical reaction
  - Individual cells connected in series or parallel
  - Cell chemistry determines voltage per cell
- Battery types
  - Disposable (primary batteries)
  - Rechargeable (secondary batteries)
  - Storage
- Energy capabilities rated in Ampere-hours
  - Amps X time (at a constant voltage)



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## Battery Charging

- Some batteries can be recharged, some cannot.
- Use the proper charger for the battery being charged.
- Batteries will lose capacity with each cycle.
- Best if batteries are maintained fully charged.
  - Over-charging will cause heating and could damage the battery.
- Lead-acid batteries release explosive hydrogen during charging or rapid discharge so adequate ventilation is required.



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## Battery Charging

- Automobiles can be a good emergency power source by recharging batteries
- A 12-volt lead-acid station battery can be recharged by connecting it to an automobile's electrical system
  - Monitor battery temperature
  - Make sure battery is well-ventilated



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## Handheld Transceivers

- Battery packs – packages of several individual rechargeable batteries connected together.
  - NiCd (nickel-cadmium)
  - NiMH (nickel-metal hydride)
  - Li-ion (lithium-ion)
- For emergencies, have a battery pack that can use disposable batteries (AA size).



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## Radio Frequency Interference (RFI)

- Signals that interfere with radio reception.
- Interference can be FROM your station or TO your station.
- Solving the problem might take a little detective work!



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## Types of RFI

- Direct detection – offending signals get into the electronic circuits to cause interference.
- Overload – strong signal that overwhelms the ability of the receiver to reject it.
- RF Current – can be picked up by cables of consumer equipment.
- Transmitted harmonics – must be filtered out at the transmitter.



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## Filters

- Filters attenuate (reduce) signals
- High-pass – reduce low-frequency signals
- Low-pass – reduce high-frequency signals
- Band-pass – only pass a range of signals
- Notch – reduces a narrow range of signals
- Selecting correct filter requires understanding the source of the interference



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## Ferrite Chokes

- Creates impedance (opposition to ac) on cables and wires.
- Can be used to block RF current that causes interference to entertainment equipment, microphones, monitors, amplifiers, etc.
- Wind cable through ferrite core to create blocking impedance.



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## Cable TV Interference

- Usually the result of broken shielding somewhere in the cable.
  - Loose connections
  - Broken connections
  - Corroded connections
- Usually solved by proper cable maintenance by cable supplier.



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## Noise Sources

- Electrical arcs (motors, thermostats, electric fences, neon signs)
- Power lines
- Motor vehicle ignitions or alternators
- Switching power supplies
- Computers, networks and TV sets



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## RFI Guidelines

- Operate your equipment properly.
- Eliminate interference in your own home.
- Use good station building practices to eliminate unwanted signals.
  - Shielded wire and cables
  - Shielded equipment
  - Good connections and filters



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## Dealing with RFI

- Take interference complaints seriously.
- Make sure that you're really not the cause (demonstrate that you don't interfere within your own home).
- Offer to help eliminate the RFI, even if you are not at fault.
- Consult ARRL RFI Resources for help and assistance.



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## Part 15 Rules

- Applies only to unlicensed devices
- Unlicensed devices may not interfere with licensed services, such as amateur radio
- Unlicensed devices must accept any interference they receive from licensed services
- RFI from and to unlicensed devices is the responsibility of the users of such devices



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## What the Rules Say

- Bottom line – If your station is operating properly, you are protected against interference complaints
- BUT – Be a good neighbor because they are probably not familiar with Part 15 rules and regulations



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## Electrical Safety Grounding and Circuit Protection (in the Home)

- Make sure your home is “up to code.”
- Most ham equipment does not require special wiring or circuits.
  - Use 3-wire power cords.
  - Use circuit breakers, circuit breaker outlets, or Ground Fault Interrupter (GFI) circuit breakers.
  - Use proper fuse or circuit breaker size.
  - Don't overload single outlets.



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## RF “Grounding”

- Not the same as ac safety grounding
- “Bonding” is more accurate
- Keep all equipment at the same RF voltage
  - Current will not flow between pieces of equipment which can cause RF feedback
  - Minimizes RF “hot spots” (RF burns)
  - Use solid strap or wire for best RF connection

