

12 VDC Distribution & Components

A Short Overview

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Adapted and enlarged from the
original ARRL article by :

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It's as clear as

Black and Red

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What Voltage is it?

- 15.5V **Absolute Maximum for most Radios**
- 14.4V (2.4) **Full Charge**
- 13.8V (2.3) **Alternator output; Gel Cell Float voltage**
- 13.5V **Radio Design; Auto engine running**
- 13.2V (2.2)
- 12.6V (2.1)
- 12.2V **Ignition off**
- 12.0V (2.0)
- 11.5V **Minimum for most radios**
- 10.5V (1.75) **Battery discharged**



Typical Amateur Radio Power Requirements

➤ HF Equipment

- 2 Amps Receive
- 20 Amps Transmit

Receive Time (per hour)	Transmit Time (per hour)	Required Capacity (AH)	Available battery hours (105AH)
0,75	0,25	6,5	16,2
0,5	0,5	11,0	9,5
0,25	0,75	15,5	6,7



Typical Amateur Radio Power Requirements

➤ VHF Mobile Rigs

- 1 Amp Receive
- 10 Amps Transmit

Receive Time (per hour)	Transmit Time (per hour)	Required Capacity (AH)	Available battery hours (105AH)
0,75	0,25	3,25	32,3
0,5	0,5	5,5	19,1
0,25	0,75	7,75	13,5



DC Power Sources

➤ Linear Power Supplies

- Big & Heavy
- Indestructible

➤ Switching Power Supplies

- Lightweight
- More complex
- Can generate noise (RF and AF)



12 Volt Batteries

- Work when AC mains fail
- Require maintenance
- Involve chemistry
- Need venting
- Require charging Source
 - Mains
 - Alternative
 - Generator
 - Solar
 - Wind
 - Hydro-Electric



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Lead Acid Batteries

➤ Automotive Type

- They're everywhere!
- Designed for
 - Short, high current discharge bursts
 - Followed by immediate recharge

**Repeated Deep cycle use
will kill them**



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Lead Acid Batteries

➤ Deep Cycle (Marine/RV)

- Designed for deep discharge use
- Check water & charge state monthly
 - If not of “Maintenance Free” type



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Lead Acid Batteries

➤ GelCels

- Smaller capacity
- Most are spill proof
- Check charge state monthly
- Can be stand-by floated with isolation
- Installation orientation independent



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Testing Gel cells.

- > 12.8 Open voltage
- Less than .5 Volt drop after test
- < 10 amp hour
 - Load of “C” for one minute
- > 10 amp Hour
 - 1 minute full key down into dummy load.



Cable for 12VDC

- Keep leads short
- Match wire gauge to anticipated peak load and fuse accordingly
 - 8 Gauge – 60 Amps - 8 mm² (10 mm²)
 - 10 Gauge – 40 Amps - 5 mm² (6 mm²)
 - 12 Gauge – 25 Amps - 3 mm² (4 mm²)
 - 14 Gauge – 20 Amps - 2 mm² (2.5 mm²)
 - 16 Gauge – 10 Amps - 1 mm² (1.5 mm²)
 - 18 Gauge – 8 Amps - 0.8 mm² (1.0 mm²)



Wire standards for 12VDC

- **Red** for Positive
- **Black** for Negative (typically also earth)

- **Red/Black** zip cord keep things neat!



Why Battery Fusing?

- Batteries can deliver 100's of amps
 - CCA 550A for a 105AH battery such as Deltec M27MF
 - i.e. $550A \times 12V = 6600W$
 - or $550A \times 7.5V = 4175W$
- This energy can melt wires, create fires and boil (violent gassing) battery acid



Why Battery Fusing?

- All batteries need to be fused at **LEAST** at the positive terminal!
- Always cover the positive terminal
 - for negative earthed vehicles
- Fusing and covering the negative terminal is also good practice



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Fuse Storage

- Store spare fuses with/near the battery
 - Fishing tackle boxes
 - Film canisters



Battery Fusing

- Blade Fuses
- Mini-Blade Fuses
- Ceramic Fuses
- Glass Fuses – 32mm
- Glass Fuses – 20mm
- Thermal Fuses (resetable)
- Circuit Breakers
 - **Use ONLY specifically designed and rated DC circuit breakers**



Battery Fusing

- Ceramic Fuses
- Glass Fuses
 - 32mm
 - 20mm



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