Electrical Amp Loads

WARNING: Replacing a standard fuse with one that has a higher amp rating may be dangerous because the higher amp fuse may not provide adequate protection against overloading and overheating the wiring circuit.

For example, replacing a 20 amp fuse with a 30 amp fuse may prevent an overloaded circuit from blowing the fuse, but it will also allow up to 50 percent more current to flow through that circuit. This may cause the wiring to overheat and short out if the gauge of the wire is not heavy enough to handle the extra load.

The gauge of the wiring and the amp rating of the fuse that protects the circuit must be matched to the load on the circuit. As a rule, the wiring and fuse should be able to handle maybe 25 to 30 percent more load than the peak load that would be expected in that circuit. This will give you some margin for overloads that might otherwise blow the fuse or damage the wiring.

Typical Current Loads for Automotive Systems, Lighting and Accessories:

Engine Idling (no lights or accessories on) **- 35 to 50 amps**. This will vary depending on the number of cylinders (more cylinders draw more power for the fuel injectors and coils), the type of fuel injectors (some draw higher amp loads than others), the type of ignition system (single coil or multi-coil), the amp draw of the PCM, and the fuel pump (the amp draw will be higher with higher pressure systems).

Engine Off (nothing on) **- 40 to 50 milliamps** (power drain by modules in sleep mode, antitheft system and keyless entry)

Ignition Coil (single oil-filled coil older vehicle)

- 3 to 4 amps.

Ignition Coil (single DIS coil newer vehicle) **- 5 to 6 amps at peak output.**

Ignition Coil (coil-on-plug) **- 6 amps per coil at peak output.**

Ignition System (primary circuit) **- 6 to 20 amps.**

Fuel Injectors - 4 to 6 amps peak, 1 amp hold

Electric Fuel Pump (depends on pressure and flow) **- 4 to 12 amps**

Electric Cooling Fan (depends on size) **- 6 to 30 amps**

Headlights (halogen low beam) **- 8 to 9 amps per pair**

Headlights (halogen high beam) **- 9 to 10 amps per pair**

Headlights (halogen high and low beams combined) **- 17 to 19 amps**

Headlights (High Energy Discharge) **- 12 to 14 amps during initial start, 7 to 8 amps once bulbs are hot**

Headlights (LED) **- 0.6 to 1 amps per bulb**

Small bulbs (incandescent) **- 0.3 to 0.4 amps per bulb**

Small bulbs (LED) **- 0.04 to 0.06 amps per bulb**

Starter Motor - 200 to 350 amps

500 Watt Sound System - 13 to 30 amps (depending on the efficiency of the amplifier and level of sound output)

Electric Rear Window Defroster - 10 to 20 amps

Windshield wipers - 2 to 10 amps depending on load

Heated Seats - 3 to 4 amps per seat

Power Windows - 3 amps

Electric Power Steering - 2 to 40 amps depending on load

Air Conditioner Compressor Clutch - 2.5 to 5 amps

Heater A/C blower motor (depends on load, size and speed setting) **- 2 to 30 amps**

Measuring Amp Loads

One way to measure the amp load in a circuit or device is to use a multimeter that can read amps. Connect the meter in series with the device, then apply 12 volts to see what the current reads. Make sure the multimeter can safely handle a large amp load if the

device or circuit is a high load device or circuit. Most inexpensive handheld multimeters cannot handle currents larger than 10 to 15 amps.

Another method is to use a multimeter with an inductive amp probe. There are both high amp and low amp probes available for measuring currents in live circuits. The probe is clamped around a wire in the circuit, and the meter displays the current when the circuit is powered.

An unusually low amp reading would indicate excessive resistance in the circuit or device, while an unusually high amp reading would indicate low resistance or a short circuit.

Measuring current draw with a multimeter.
This can help you find components and circuits that are
drawing too much current from the battery and charging system.
Current draw on most vehicles should be less than 40 to 50 milliamps
after 30 minutes once the engine is turned off.

How to Calculate Current Amp Loads

If you don't know the current draw of an electrical component or accessory, but it has a watt rating, you can do some simple math to calculate the amp load. Divide the Watt rating by the system voltage. Use 12.8 volts if the key is off and the circuit is pulling current directly from the battery, or use 13.8 volts if the engine is running and the current is coming from the alternator. Dividing watts by voltage will tell you how much current the device will draw on the electrical system.

Example: a 500 Watt sound system working at 75% efficiency might draw as much as 27 amps at peak output (500 watts times .75 efficiency divided by 13.8 volts). Just keep in

mind that sound systems may be 50 to 90 percent efficient, and only draw about one third of their rated output for playing music at normal sound levels. Crank up the volume and the power consumption goes up.

How Amp Loads Affect the Charging System and Battery

Most of the electrical power required by the electrical and electronic devices in a vehicle is provided by the alternator. The battery provides cranking amps to start the engine. After that, the alternator takes over as soon as the engine is running to supply the current needs of the vehicle while also recharging the battery. If the alternator's output cannot keep up with the electrical demands that are being placed on it, the additional current that's needed will be pulled out of the battery. Eventually, this may cause the battery to run down if the vehicle is not driven long enough or fast enough for the alternator to make up the difference.

Many high power aftermarket accessories such as offroad lighting or high wattage sound systems may require replacing the stock alternator with a high output alternator and/or adding a second backup battery to provide extra power as needed.