

HOGTUNES

Audio Solutions For The Great American Cruiser

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Ohms Law and Real World Amp Ratings

In any kind of electronics, we have a basic set of “rules” called Ohms law. Ohms Law gives us a very simple, but finite set of equations to easily calculate volts, amps, and power for any given situation.

In a previous article “Amplifier Efficiency” we explain how the 2006-current charging systems are rated to produce 50 amps of power, and that bikes needs 20-25 of that just to run (fuel injection, headlight etc). We also explained that if an amplifier is 80% efficient, this means that, of the 100% of power coming into the amp from the bikes electrical system, 80% gets turned into music, and the other 20% is “wasted” off as heat.

To make the math for this article easy, we will assume that of the 50 amps available from your bike, only 20 is being used by the bike to run, which leaves us 30 amps available to power all your accessories. So we are all clear, this math assumes no added lighting, heated grips, heated clothing etc, all which would subtract from the available current to power accessories.

Ohms law says power (watts from the amplifier in this case) equals voltage times current (amps), or $P=VI$. To keep the math simple, we will assume your charging system is perfect, and charging at 14.4 volts. If we take an amplifier that comes with a 30 amp fuse and do the math, this works out to 14.4 volts x 30 amps or 432 watts BEFORE we account for amplifier efficiency. It should be noted that Class D Amps (like ours) are typically 80% efficient at full power. Other designs like Class G-H are more like 60 % and Class AB is closer to 50%-again at full power. If we take the 432 watts, and work off an 80% efficiency, this lowers the maximum watts that amp can produce to 345.6 watts. If it's a four channel amplifier, we divide the 345.6 by 4 for a maximum power of 86.4 watts x 4! All this is assuming everything in your charging system is perfect, and you have no other electrical accessories on your bike. Although HD specs the charging systems to produce 50 amps of current, if you look in a service manual, they say that when checking the charging systems performance, the bike should be at 3000 RPM, and the charging system should measure between 35 and 50 amps. Maybe take a minute and re-do the math above based on only 15 amps of power available from your charging system for accessories, or worse yet, 15 amps, and only 12.6 volts at the battery.

Now let's take the guys putting big car audio amplifiers on their bike. They may have an amplifier that says it will produce over 800 watts, but the fact is (assuming it can actually make 800 watts), to make 800 watts with a perfect charging system (14.4v), this means the current needed is 55.5555 amps, and that's BEFORE we account for amplifier efficiency! What's the point of putting (paying for) an amp that can never make its rated power when installed on a bike?

We have 5 people that work directly at, or with Hogtunes that were heavily involved with a major U.S. car amplifier company. If we wanted to offer high wattage amps for bikes, it would be ZERO issue, but as we have been saying for years, the limiting factor in any audio system on a bike is the bikes charging system... **PERIOD.** We have tested many amps at our Phoenix facility and I am sad to report that to date, no amp vendors (including us) have been able to “beat” Ohms law. One way to see if the wattage you are paying for is the wattage you're getting is to see what fuse comes with the amplifier and work out the math. We have seen a few cases where you're wallet just might thank-you.....