

# But This Goes to 11...

Welcome to the world of bass rigs.

**R**ight then, the glorious P-Bass: a big chunk of stiff maple and resonant ash/alder, with maybe some rosewood on top of the maple, one rather unique pickup in a multifaceted spot and the most minimalist tone controls possible.

A pickup on a bass contains magnets which create a magnetic field in which the strings move. The movement of the strings distorts the magnetic field and this generates a small voltage in the coils within the pickup. This voltage causes a tiny current to flow through the volume potentiometer (aka pot), past the tone pot and down your instrument lead to your amp. So, two questions: what is voltage and what is current? The best way to look at this is to use the water analogy. Voltage is the head or pressure of the water, while current is the volume of water per second flowing through the pipe. The amount of work per second, i.e. power, that water can do if you ask it to turn a turbine or a waterwheel is directly proportional to the pressure multiplied by the current. So a small jet at high pressure can produce equal power to a large jet at low pressure.

Now, why should you, a bass player, benefit from knowing what voltage and current are? Because it will help you set up your gear for optimum tone, help you understand how to select gear more effectively and help you troubleshoot when you have problems, especially in high-pressure environments

like important gigs – technical issues are much less scary when you understand them and can methodically diagnose them. 'Potentiometer' is just a fancy word for a variable resistor, so those pots on your bass can provide extra resistance to the electric current and thus reduce the voltage. They cannot make it louder, they can only make it quieter. This is true for all passive electronics – no extra energy is going in, so no extra energy can come out. Turning down the tone pot might make your bass sound bassier, but it's achieving that by reducing the treble, not by increasing the bass.

Let's plug your P-Bass into a practice amp with an input jack on the front, plus four knobs – gain, bass, treble and volume. Your amplifier is basically divided into three sections – the preamplifier, the power amplifier and the power supply. The first part of the preamp takes the low-voltage tiny current signal from your bass and turns it into a lowish-voltage low-current signal. This signal then passes through your EQ, in this case a simple bass and treble shelving control, and then on to the power amp. The power amp's job is to turn the lowish-voltage low-current signal into a higher-voltage higher-current signal so it can drive a speaker. As you may have realised, the first three knobs control the preamp, while the fourth knob controls the power amp. Each knob controls gain, which is a way of describing how voltage is controlled, either increasing or

decreasing. The bass and treble knobs only affect the gain within a certain segment of the sonic spectrum, but that still affects the voltage flowing through the amp, especially when adjusting the lows.

A common question is: 'How can I get more output from my practice amp? Will a boost pedal help?' Let's look at what's actually going on with the voltages in the system. In the diagram below, the signal at each stage is represented by a rectangle whose height corresponds to voltage, and whose width corresponds to current. To make the rectangles bigger, power needs to come from somewhere – in this case, it comes from the 230V mains into the power supply section of your practice amp.

We have a small voltage and a tiny current coming from the pickup (but only when you pluck a string, and the softer you pluck it, the smaller the voltage), then the same voltage passing through the pots (assuming volume and tone are at max – if not it will be less voltage), and then it goes down the lead to the input of the practice amp. The input gain knob on the practice amp controls the amount of voltage gain in the preamp. The preamp can only handle a certain amount of voltage – if you combine too hot an input to the preamp with too much gain, then you will end up with the preamp running out of headroom (hitting that thick black bar), which causes distortion. The same is true for the power amp, though the voltage is much higher.

So what happens if we put a gain or boost pedal in between your bass and your amplifier? We increase the voltage going into the preamp stage but we still come up against the same headroom issue. And even if the preamp has so much headroom that it doesn't clip, the power amp stage will run out of headroom and be unable to produce any more power (ie loudness!). If you're wondering what voltage a 50 W practice amp can produce, 50 W into an 8-ohm load equates to 20 V. When you consider that a hot passive pickup can produce peaks of as much as 5 V on loud notes, then you can see that you don't need much gain to reach full power. Which leads us neatly to the origin of this column's title – but we'll save that for next time!



## About The Author C. ALEXANDER CLABER

Alex first picked up a bass when studying engineering at university, and his quest for sonic perfection led him to found Barefaced Audio, while also leading The Reluctant, an alt-ska/funk outfit.

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This column is brought to you in association with Barefaced Ltd who manufacture high-output speaker cabs for the gigging bassist, ranging from the 9 kg Midget to the 19 kg Big One. An archive of previous articles plus a glossary of terms can be found at [www.barefacedbass.com](http://www.barefacedbass.com)

