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Power Supply, PSU, AC Adapter or Wall Wart - FAQ

As electronics technicians, we are constantly asked for advice concerning replacement power supplies for effects pedals. So... we have decided to put this FAQ sheet together in the interests of self-help for anyone who needs to know!

Q. How can I work out what size power supply I need?

A. Most effects pedals or units state the amount of current it 'draws' on the bottom of the unit. If not, ask the maker for this information. It is usually stated in a variety of ways, which all add up to the same value fortunately. It can be, for example: 9VDC @ 300mA, or 0.3A, 2.7W or 2.7VA.

Milliamps = mA, Amps = A, Watts = W and Volt/Amps = VA. For the purpose of effects pedals etc, W and VA can be considered as exactly the same.

Q. How can I convert Watts into mA or A?

A. Easy... just divide the power figure, 2.7W in this case, by the voltage. So... $2.7 \div 9 = 0.3 = 300\text{mA} = 0.3\text{A}$.

Q. How can I work out the size of power supply needed for multiple pedals?

A. Just note the current drawn by each pedal, as stated on their bottom plates, and add them all together. You will most likely have to convert all the different methods of stating the current or power into a common 'measurement unit', by using the methods stated earlier, before you can add them all together.



A quality PSU by Mascot, Norway

Q. What does 'unregulated' mean?

A. It means that the specified output voltage is delivered ONLY when the rated current is drawn by the load (pedals). In other words, if the power supply says that it is a 9VDC @ 300mA unit, then its output will be 9VDC ONLY when the load is drawing 300mA from the power supply. If the effect unit (load) only draws 50% of the rated current specified by the power supply, the output voltage will generally be higher than 9VDC. The amount by which it is higher will vary

with different power supplies and how they have been designed. So there is no universal yardstick to go by. If you measure the output of an unregulated power supply with a voltmeter, you can expect to see up to around 14VDC when nothing is connected to the power supply. This is known as the 'no load' or 'off load' output voltage.

Q. What does 'regulated' mean?

A. When a power supply is regulated, it delivers a constant voltage output to the appliance regardless of the current being drawn from it by the load (pedal). It has additional electronic circuitry which enables this feature. The regulating circuitry also significantly removes unwanted hum or noise from the output and results in the noise performance being very close to that of a battery. It is good practice to try and use a power supply that has a current capacity about twice that of what is expected to be drawn from it by the effects pedals. This way, at least, a very good low noise supply can be expected. Also, it will run cooler and last for many years longer. Heat is always the biggest 'life shortening' factor with all electronic components... so keep 'em cool guys!

Q. Voltage and current, aren't they the same?

A. No. Comparing electricity supplies to water supplies, voltage is like water pressure. It's the force at which electricity is 'delivered' to an appliance. Current is like the amount or 'volume' of water that is being used by the appliance. So current flow is what would be measured by a water meter, in water terms. The amount of current being used is decided by the appliance connected to the power supply. This means that current is 'drawn' from the supply - not supplied.

Q. When I connect lots of pedals to my power supply, why can I here some hum in the background.

A. The main reason is that the power supply is probably being overloaded. By this we mean that there are too many pedals connected and the 'current' rating of the power supply is being exceeded.

Remember that some types of pedals are very current thirsty. Distortion, overdrives, mixers, wahs, etc, are all relatively low current devices and should not present too many problems.

Next up the current chain are phasers, choruses, simple echoes/delays (up to 300mA).

The giants of heavy current consumers are the multi-FX units and early 70s/80s digital single FX units. Frankly, it's probably best use these with their own dedicated power supply, because often they are very RF noisy and can inject RF noise into other sensitive pedals via the power supply and cause them to behave badly.

Q. How can I tell if my power supply is overloaded?

A. Well, apart from the hum that you can hear in with the instrument signal, the power supply casing will heat up. If it feels excessively hot to the touch, then it is almost certainly overloaded. However, a little warmth from the power supply, even with nothing connected to it, is quite normal. This is due to unavoidable imperfections inside the transformer, so power is always consumed (wasted) when connected to the main AC supply.

Q. Is it better to use a power supply or a battery?

A. This question is a bit of an old favourite and, speaking as formally qualified technicians, we'd have to say... NEITHER ARE BETTER OR WORSE THAN EACH OTHER! But that needs to be qualified. If, for example, you use a power supply that is inadequate for the pedal, then you should expect some kind of malfunction with the pedal. So you have to be sensible and ensure that the power supply will enable the pedal to work as designed. So, if the power supply is correctly specified for the job, there should be absolutely NO detectable difference, apart from (maybe) a very small and acceptable background hum (depending on the quality and rating of the power supply).

Other convenience considerations may make a battery more desirable... like not having a to find an AC outlet, or for quick set-ups. But other than that, the power supply option will give as good results and save £hundreds on batteries over the years.

Q. Do different makes and types of power supplies change the sound of the pedal?

A. In short, NO! Some players think they can detect differences, but we'd say they're probably fooling themselves. You see, a DC voltage is not able to change the tone or the harmonic structure of the signals passing through the pedals. However, again, if the power supply is not right for the pedals, then it could cause the pedals to malfunction and create unwanted sounds combined with the instrument's signals. But then, this is not really changing the tone in the sense implied, but creating undesirable distortions.

If you can hear unwanted sounds in the output of your pedals, then take care to establish that the power supply is set to the right voltage and is at least twice the current rating of the added-together current drawn by ALL of the pedals connected to it.

Golden Rule!

It's not a good idea to locate power supplies near to audio signal cables. The transformers inside power supplies will 'radiate' hum into the cables and cause a hum in the background with the instrument's signal.

This kind of 'electro-magnetic' radiation **cannot** be stopped by the cable's internal screening conductors. The screening is only intended to stop 'electro-static' noise radiation... so you have been warned!

We would recommend you to keep **all** power supplies at a distance of at least **one metre** from your audio cables, depending on the size of the power supplies, if practicable.



Other larger quality PSUs made by Mascot

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