

How Customer Feedback Shaped and Improved Series 4

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Selling a product to working musicians can be a humbling experience. No matter how well you have tested or stressed a product in design and production, whatever weaknesses it has will be exposed. Sometimes you think you have designed in a great new feature only to find out that it didn't work out as expected. Periodically, I like to collect the feedback from these many experiences and reflect on what we could do to improve our products. Let me tell you about one aspect of our designs that I have spent quite a bit of time on recently.

The duplicitous issue of power....

The question of "how much power?" is a tricky one. On one hand, it seems that more power is always better. I have written about the benefits of the extra headroom that more power can provide. On the other hand, too much power can be a dangerous thing. Let me give you a real world example: a bassist who uses one of our 800 Watt Coda+ combos is always careful with his amp and it performs flawlessly. But, at one particular gig, he found himself in a situation where he had to play much louder than usual – in an outdoor setting where the lack of reflecting surfaces made him turn the amp up even more. At the end of the night, he noticed that there was a lot more distortion coming from the amplifier than he was used to hearing. It turns out, running the 1x10 speaker system beyond its volume capabilities over a sustained period of time (with an amp that can put out more power than the speaker can handle) had caused the woofer to fail. In this case, the extra power that made the amp sound "smoother" at moderate volumes was actually a liability. In fact, "woofer Mondays" are a reality around our shop. After the weekend (and an abundance of gigs for our customers), we often get calls from a customer or two who pushed their woofers beyond design capacity.

....and how it's handled

A related problem is one where the output of our 800 Watt amp is accidentally shorted (on rare occasions, this has happened when the player is not there and the sound tech is moving equipment around the stage and rearranging cables; the player then comes back for the concert and the amp doesn't work). In the past, we have built our amps so that they can deliver full power almost instantaneously so that they handle all transients without any clipping. This maximizes fidelity, but given the large amount of power available, the amp becomes vulnerable to failure due to mishandling.

The quest for an answer

So, we asked ourselves how these problems could be solved. Can we come up with a power amp that has "enough" power but not too much? Can we protect the power amp and speaker without compromising fidelity? After a lot of work, I can say: "Yes, we can" (or more accurately, "Yes, we have" through the new Series 4).



Before I go into the details, let me remind you of what I have said previously about power requirements and amplifier power ratings. You may recall that transient signal reproduction is very important for music instrument amps since music signals are mostly transients. The average power required is moderate (40 to 50 Watts), while the peak power is often up to 10 times higher with the typical music signal. Said another way, it's not high continuous power output that is needed, it is high transient power output. Optimizing the power amp for this type of performance allows us to reduce its size and weight even further.

How did we find the answer in Series 4? First of all, we reduced slightly the continuous power output. Our new amp has a rating of 500 Watts rms continuous power at 4 ohms (compared to the older amp's rating of 800 Watts, a modest 2dB reduction). It also has a peak transient power rating of better than 1000 Watts at 4 ohms which gives it plenty of headroom for even the most demanding applications. As you can see, the design of the new amp emphasizes transient power capability since this is far more important for reproduction of music signals than average power. Cutting to the chase, our new power amp is capable of driving any and all of our speaker cabinets to their full acoustic output with better fidelity than ever. This is important from a system design point of view: the modest decrease in continuous power output did not change the maximum output of our combo systems, which points out that we had too much power in the earlier design. Under almost all operating conditions (especially those that we, as players, will regularly encounter), the only audible differences between the new amp and the old one are improvements in fidelity noted below.

The many systemic advantages

One large benefit from this change is that the size of the power amp/power supply module in Series 4 models has shrunk to less than half of the size of the one in the older 800 Watt amps so our amps lose a little weight. In addition, the new power module is actually less expensive, which means we will be better able to hold the line on price increases and/or add more features for the same or lower cost. By standardizing on one power amp unit for all of our amps, we are able to increase the volume of units manufactured which also helps lower the cost. Higher volume manufacture of a single unit also improves the overall reliability of that unit through process improvements and "learning curve" effects. Finally, as I said earlier, noise and distortion in the new power amp are both reduced (the noise reduction is especially noticeable). Our amps already set the industry standard for fidelity and we're now pushing the bar even higher.

The other thing we did was tighten up short circuit protection. The result is that the amp becomes almost indestructible. This will lower the field failure rate and improve reliability even further. A minor issue resulting from better short circuit protection is that under extreme playing conditions (e.g. high volume, low impedance situations where large transients like slapping are being reproduced), the protection circuit can "kick in" and interrupt the signal. To overcome this problem, we have added a switchable limiter that will allow the player to continue without interruption under these conditions



with an almost inaudible compromise in fidelity. The player who doesn't need the limiter can defeat it and have the absolute ultimate in fidelity.

Conclusion

In making these improvements in Series 4, we took a "system level" view. By considering the most important characteristics of the amp/speaker system (acoustic output level, fidelity of signal reproduction, portability, reliability and cost), we were able to improve some aspects of an already great system (fidelity, portability, reliability and cost) without degradation in others (acoustic output level).

Will a customer be able to damage an amp by playing it beyond its capabilities? Probably, but I think we've made it a lot harder.