

the ToneQuest Report™

The Player's Guide to Ultimate Tone



'57 FENDER DELUXE 5E3



After a hiatus of 45 years or so, Fender has been carefully re-entering the business of building hand-wired tweed amplifiers with the resurrection of the narrow panel '57 tweed

Twin and the '57 Deluxe. Of course, there are scores of small amps that have been inspired by the Deluxe, and many more 5E3 knock-offs being built today in the "sub-booteek" cottage industry comprised of solo solderers who build in their spare time and often put their work up on eBay. For some cost-conscious players, a tweed Deluxe for \$600-\$800 is a deal that cannot be refused—even if the amp was wired up by an unknown tonehead on a basement



workbench in Akron. But Fender is Fender, and while they chose to ignore the thriving boutique market for hand-wired tweed circuits that blossomed in the early '90s with the appearance of Victoria, they have not forgotten how

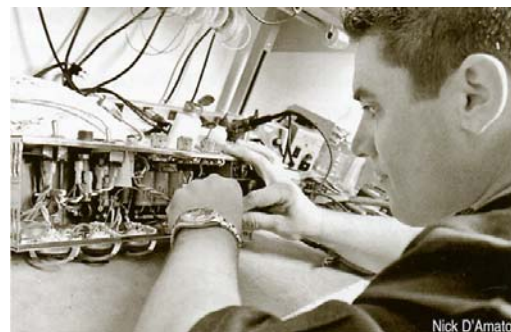
to put an amp together, and in the case of the Deluxe sent to us for review, it stands apart from all the rest with a very unique voice.

We asked Fender's Shane Nicholas and Sergio Hamernik at **Mercury Magnetics** to explain the process of natural selection that evolved during the development of the '57 Deluxe....

TQR: Describe the process in which your design team evaluated various vantage examples of the 5E3 Deluxe, and how widely the actual sound of the vintage amps you listened to varied, specifically?

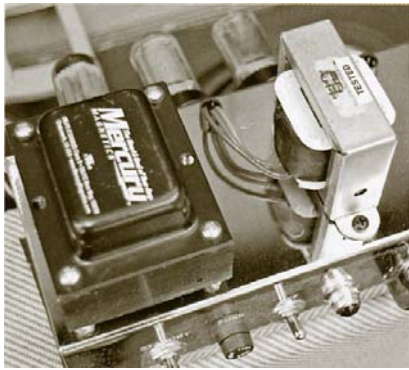
Shane: There are several guys here at Fender who own old amps, and we also have friends who do. When we were ready to begin the '57 Deluxe project, we brought in a few original vintage examples, and a couple of "boutique" versions of this type of amp. We listened to all of them with various guitars, and listened to each amp chassis hooked up to the others' cabinets. Keep in mind that every amp—especially 50-year-old ones, will sound a little different than another one of the same model. It's pretty well documented that Leo Fender sometimes changed components "on the fly," while the official schematic documentation would be updated later. My old Deluxe might have been built with some different stuff than yours, even though they were both "stock" 1957 5E3 models. Then add in aging, abuse, repairs, etc., and it's a wide target that needs to be narrowed. For example, we had one amp here that was much more distorted sounding than the others, so unless you are only laying 1951 Howlin' Wolf

stuff, you probably wouldn't like that amp as much. For me, the ideal is an amp that gives a beautiful



clean tone with the volume set low, and a dirty, harmonically rich tone with the volume set high. You should also be able to set it on, say, "5" and control the amp's distortion by simply varying your pick attack. We decided that one of the old '57s was the most desirable example of a 5E3 Deluxe, and we used it as the golden sample.

Once we got to this point, project engineer Nick D'Amato really got down to business. The final schematic and components we chose were basically picked so the prototype would sound as close as possible to our golden sample amp. Obviously, we use new parts, not 50 year old stuff from a flea market or whatever. We also had to make a few changes in order to pass modern worldwide safety regulations; things like shielding, ground wires, and the three-prong power cord, which negated the use of the old ground polarity switch. We put a Standby switch in its place, which is a good thing. These changes don't really affect tone, but



they do reduce hum and improve playability.

We also decided to go with 12AX7s in the preamp, even though the originals were designed with the 12AY7 in the front end. Our thinking was, not only is the 12AY7

going to be tough for us to get in quantity, but many players in fact prefer the 12AX7s higher gain. If you are playing ZZ Top stuff, for example, you'll probably prefer this. The 12AY7 will work, however, so some owners will buy one and stick it in their amp.

The transformers are also a crucial piece of the puzzle. We auditioned quite a few prototypes, and some of them were too efficient or too distorted, etc. One of the vendors we contacted was *Mercury Magnetics*, whom we've worked with in the past.

They sent us five different power and output samples, each based off an original transformer set found in a vintage Deluxe amp. During A-B tests, one of these closely

matched the OT in our golden sample amp. We worked with *Mercury* to make a few tweaks, and soon we were positive we had the right transformers.

TQR: *How many different types of speakers did you consider?*



Shane: Well, the original Jensen in my old Deluxe really sounds and looks perfect, like you'd expect. We found that

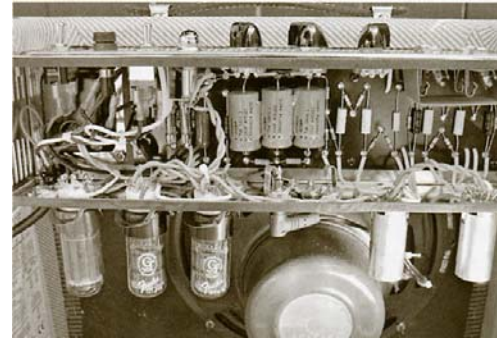
the new Jensen P-12Q sounded close enough, so we stopped looking. In my ten years at Fender, I have discovered that no matter what speaker we supply in a tube amp, a certain percentage of customers are going to try something else.

Celestion, Jensen, Eminence, and boutique guys like Weber all have their supporters and detractors. It's human nature to



tinker with your machinery, and a speaker swap is one of the easiest mods you can do to an amp.

Now, having said all that here's where it gets fun. One of the boutique amps we tried happened to have a Celestion Blue Alnico speaker in it, and it sounded very good. So we tried that speaker with our prototype 5E3 amp, and said, "OH MY WORD!" I had heard that speaker before in different amps, but this combination was stunning. The amp

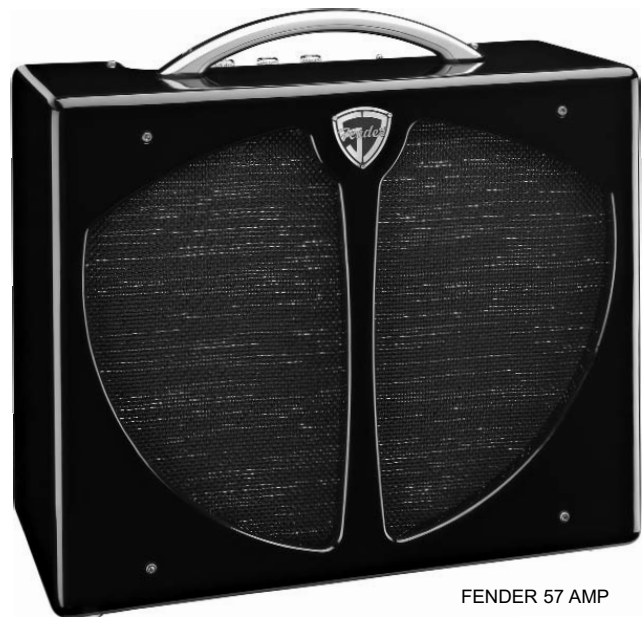


became a lot louder, for one thing. We thought for a minute about using this speaker in the '57 Tweed reissue, but it's not really the authentic,

original sound or look. It's also a lot more expensive. So, we remained sold on the Jensen, but when we developed our limited edition, black lacquered version—the Fender 57 Amp—we decided to equip it with the Celestion Blue.

TQR: *What are the unique challenges involved in building hand-wired amps, compared to those with a printed circuit board?*

Shane: Making it look and perform like the old amp while using readily available parts that we can buy in quantity. I am a stickler for performance, but if our customers didn't care to look inside, we wouldn't worry about the looks of



FENDER 57 AMP

the components and wire so much. For example, Alexander Dumble told me he likes our new '57 Deluxe, and was surprised that we used such heavy wire in the chassis, as it's really not necessary. We can't pass modern safety regulations using cloth wire, so we got the next best thing. I'd also like to mention that, while we build higher quantities

of hand-wired amps than all the other boutique builders, it's still a very small number compared with the number of PCB amps we build, like our Hot Rod series and all the sold-state models. Our factory estimates about eight times the labor in a Vibro-King versus a '65 reissue amp with a PCB.

TQR: *We would assume that Fender has a separate group of employees devoted to building the hand-wired amps.*

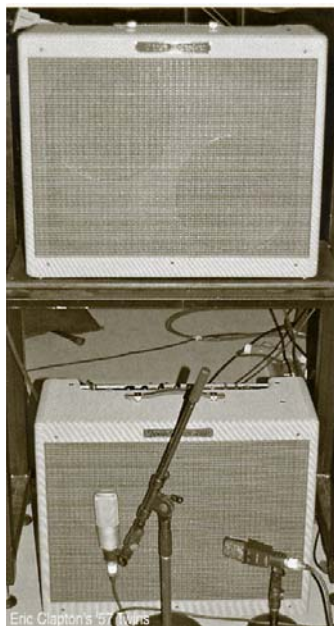
Shane: We do have the hand-wired team in a separate area in the factory. They are highly trained, patient employees who take a lot of care with these amps. Most of them are women, same as Leo's day, maybe because they tend to be more patient than us dudes. And women's hands tend to be smaller, making it easier for them to run wires and solder connections in the tight confines of the amp chassis. I don't know the training regimen off hand, but I believe many of them cut their teeth on guitar wiring before moving on to amplifiers.

TQR: *With the tweed Deluxe in production, are there plans to develop additional hand-wired Fender models of the past?*

Shane: Yes. The list of great old Fender amps begging for reissue is a long one!

www.Fender.com

Sergio Hamernik...
MERCURY MAGNETICS



In case you don't know, **Mercury** is known for having acquired and cloned hundreds of stellar vintage transformer sets that comprise their **ToneClone** and **Radiospares** series....

TQR: *How did you become involved with the development of the 5E3 specifically?*

Sergio: It call came about as a follow up to the '57 Twin-Amp reissue project that we were a part of a few years ago. **Mercury** designed and supplied Fender with the transform-

ers for those amplifiers, which was a very successful endeavor—so much so that Eric Clapton made them his main amps for his own tours and the Cream reunion tour. The momentum started by the '57 Twin-Amp project quickly created a demand for some sort of follow-up amp in this positive vibe, and Fender's decision to reissue the 5E3 tweed Deluxe came as good news to us. It is probably the

most copied circuit on the planet, and I couldn't think of a better project to sink our tranny designer teeth into.

Years ago the late Ken Fischer, of Trainwreck, told me that the Deluxe was an early inspiration for him to get into amp building. He went as far as to refer to the Deluxe



circuit as the cornerstone of the boutique market. It's a truly different dynamic when the company that started it all wants to reintroduce a benchmark in amplified guitar tone, and especially when their goal is to make the amp sound as fresh as it did when it was first launched. We've worked for decades acquiring our extensive library of transformer designs that originate from variants of pre-production to pilot runs of many vintage amps, so amplifier companies often consult with us because we're a small but dedicated group just nutty enough to be the conservators of such things.

TQR: *Describe the process that was involved in selecting the transformer set that was ultimately used as a benchmark for the '57 Deluxe.*

Sergio: Nick D'Amato, Fender's engineer in charge of the 5E3 Deluxe project, indicated to me that he had tone-tested several transformer set prototypes from other current manufacturers that all fell short of his expectations. This didn't come as a surprise to us, since our customers regularly report similar lackluster tonal results from other so-called vintage replacement transformers. These types of transformers are better suited for the amp builder who is on a low budget and isn't too fussy about tone, which certainly wasn't Fender's objective. Nick had clearly done his homework, and they had some bitchin' original 5E3 amps to play and compare. I thought it would be a fun way to meet this



challenge, as well as supplying an effective engineering tool, if we could help retrace most of the stops the original design team at Fender took in the beginning with their transformer development. To that end, we sent them several different transformer sets to test, each with their unique tonal differences. All the design variants were cloned from the earliest serial-numbered tweed Deluxe chassis, as well as some non-numbered Fender prototypes. Plus, we snuck in a full-custom set built for a celebrity player hovering about at the time.



We found evidence of Fender’s original design team intentionally manipulating transformer design parameters—like winding leakage reactance and core permeability. So,

we included a great example of this in one of the output transformers submitted to Fender. It was a *ToneClone* of an original which had an unusual gap put into its core. The size of this gap was much larger than was necessary to do the job it was intended for—no doubt the result of an effort to push design limits just to where things fell off when it came to the amplified guitar tone. Doing this is counter-productive to coaxing tone from the amp’s distortion, and these experiments seem to be more from the result of trial and error-based changes influenced by a lot of playing and listening sessions, rather than just doing the math. I think it’s accurate to say than back in the old days they really didn’t know as much as we do now about transformer design

and its direct impact on guitar tone. However, we have the benefit of 50 years of hindsight.

TQR: Which transformer set passed the test and was chosen to go into production?

Sergio: Ultimately, as in the very beginning, the Fender team made that decision. In order to keep the process of evaluating the transformers as fresh and unbiased as in the original days, we decided no to spoon-feed details which could have skewed things emotionally. In other words, no one as tipped off to what they were getting. They had to test all the trannys, in all combinations, just like they would have done originally. The set that was chosen wasn’t the obvious one. But, it was very different from the typical copies found in “replica” amps.



TQR: In your experience, was the variable nature of the actual vintage Deluxe transformers available to you typical of vintage transformers in general? Are there any amp manufacturers whose transformers were notably consistent or inconsistent?

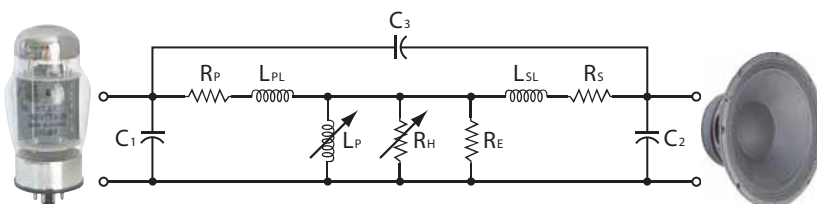
Sergio: Much of the variable nature of vintage transformers you mention (and we might as well throw in vintage amp circuitry in general), can be attributed to the guitar amplifier industry as a whole being quite young at the time. In the case of Fender, those variables seem to be the product of tinkering and massaging components and their values until they got the tone they were looking for. Was this typical? That’s hard to say without guessing. Early Vox transformers suffered inconsistency simply because they went through about five or six vendors inside of the first five years of production, and each version had its own tone. However, the *Radiospares* transformers of that time found in Marshall amps were quite consistent. It is safe to say that most manufacturers tried to keep some level of uniformity in order to maintain a level of control over their products—which is why variants are so rare and valuable.

Unfortunately, transformers being the most expensive components on the chassis, they are often the first things to be cheapened. The result is uniformly strangled and neutered tone. This is often why a good thing never lasts.

TQR: There is a certain line of speakers that are being marketed as having been “cloned” from the very best examples of vintage British



The Output Transformer Circuit Mercury’s circuit equivalent of an Output Transformer



- | | |
|--|---|
| C ₁ Primary Self Capacitance | L _P Primary Inductance |
| C ₂ Secondary Self Capacitance | R _P Primary Resistance |
| C ₃ Interwinding Capacitance | R _S Secondary Resistance |
| L _{PL} Primary Leakage Inductance | R _E Core Eddy Current Losses |
| L _{SL} Secondary Leakage Inductance | R _H Core Hysteresis Losses |

“Blessed are the Tone Makers”

The above circuit reveals the properties of an audio *output transformer*. The transformer is a *reactive* component—its values change depending upon the information feeding it. Transformers for tube-based electric guitar amps are designed to *intentionally provoke* the tubes into distortion—the polar-opposite of demands of *hi-fi*. The best guitar tone comes from harnessing and *manipulating* the inherent flaws of the imperfect transformer. This is where art meets science in our pursuit of great guitar tone.

—Sergio Hamernik

Consider the above vs. this typical dummied-down transformer symbol



speakers. The idea is that since the older speakers also varied greatly in sound, only the “best of the best” were selected to be cloned. It seems logical to question how a new speaker company has managed to eliminate all of the variables that made the old speakers sound different. It’s cloning specific vintage transformer examples as you do with the **ToneClone** and **Radiospares** series subject to the same inconsistencies due to fluctuations in the physical properties of the materials you source, and assembly procedures?

Sergio: **Mercury** made the commitment many years ago to do everything we could to prevent inconsistencies in our build quality and materials, no matter what the cost. We have 100% control over our products because all production is done in-house here in Chatsworth, California. We do not farm out any of our production to outside vendors—nothing “over the border” or “off shore.” Never have, never well. Most of the materials we use cannot be purchased off the shelf. Even our iron still comes from American-minded ore. We maintain tight control over our materials by custom ordering to our proprietary specifications—a multitude of individual material recipes all being constantly tested as we receive them. There’s not a lot left to chance or error, and that is the only way to assure that tight tolerances are maintained. This is one of our many secrets to consistency. In the past, if you swapped a blown transformer for a new one, you would kiss your tone good-bye. With **Mercury**, a replacement will sound exactly the same as the original, because they are tonal duplicates of the *crème del la crème*—the best-of-the-best vintage tranny’s ever produced (intentionally and accidentally, including those highly-prized “happy accidents” we all love!). When we make a Marshall **Radiospares** or **ToneClone**, it will sound exactly like a Marshall of that specific era. If we make a Fender or Vox clone, it will also sound as it should.

TQR: *You must be aware that some people in the business of repairing and building amplifiers (including boutique builders) have resisted embracing the concept you just described?*

Sergio: It’s a fairly baseless argument. But in all fairness, I have to sympathize with those who don’t really get it. Most amp designers and techs have only recently begun to understand the relevance of the transformer in relationship to amp tone. The concept is still relatively new within our industry. Transformers are deceptively simple-looking devices. Yet, they’re the key ingredient to obtaining the best possible amplified guitar tone. Accept anything less than the best possible working environment and you run the risk of having a guitar amp running hotter than a bitch kitty (heat = loss, not gain!). It’s virtually impossible to coax great tone from poorly designed transformers. What you end up with is insufferably uninteresting distortion, ear and listener fatigue, and the uninvited visitors—confusing and monotonous tone. There’s no downside to using quality transformers.

TQR: *You also offer a refurbishing service where older transformers can be re-wound. How close to their original*

specs and sound can you get, and to what extent is the performance of vintage re-winds limited by the original materials that are being reused (iron)?

Sergio: Our rewinding facility is more like a transformer restoration and preservation service. Properly restoring a transformer can take anywhere from one day to one week to accomplish. We are quite meticulous and detail-conscious, and we will take as much time as needed to do the job perfectly. Therefore, the service is expensive and not for the faint of heart. That’s another reason why **ToneClones** and **Radiospares** exist. There are a number of nuances that affect the tonal characteristics of transformer design. It’s easy to permanently ruin a vintage transformer if one doesn’t know what they are doing, and we’ve seen many valuable or one-of-a-kind transformers ruined due to incompetence. Once they’re ruined, they’re gone—there’s no going back. We normally conduct a discussion with the owner of the vintage transformer before the restoration begins. He is given a status report as to the condition of the transformer’s material, including what we can reuse and what needs to be replaced. Once the client is aware of his options, we then proceed with the restoration following his wishes.



TQR: *How many different variations on vintage transformers exist within your company now, and what’s ahead for you? What do you want to accomplish?*

Sergio: A whole bunch—and we’re adding several new variants every single week. One visit to our website will give you an idea, and most people are blown away when they see the huge number of available tonal choices. As far as what’s ahead and what do I want to accomplish? Many instruments have come and gone, but only a few have dug in for the long haul. I see electric guitar tone in the same light. It was the explosion of guitar-based music, soaked in some of the most amazing tone, which made people come together by the thousands. I mean, does anyone really want to hear mediocre tone? When it comes to truly inspirational electric guitar tone, it’s up to us to give the next generation of players a fighting chance. Before it is too late, we can reclaim the sounds and inspiration we had growing up. I truly believe if we equip young players with that kind of tone, that a major new wave of inspired music will follow.

“My head is my only house unless it rains.”—**Don Van Vliet** (Captain Beefheart)

www.MercuryMagnetix.com
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DELUXE REVIEW

*Yes, you could be mine
Tonight and every night
I will be your knight in shining armor
Coming to your emotional rescue...*



In the early days, we would receive frequent requests to publish “shootouts,” usually on various amps or guitar pickups. Ironically, these “shootouts,” in which similar products are subjectively ranked by a panel of judges, were one of the editorial gimmicks used by ad-based guitar magazines that originally

inspired us to launch TQR in the first place. You don’t see many shootouts anymore, ever since the shooters realized that while leaving one company standing, they were leaving five or six current or potential advertisers down on the killing floor. Instead, products are now more often bestowed with an official-looking award, or some other seal of approval less damaging to those that aren’t picked. One can always hope...

Well, you know our take on such convenient, qualitative rankings. The “best” is a moving target subject to personal preference and the undeniable fact that we all hear things differently, or at least, we *prefer* different sounds and dynamic textures. How well an amplifier may or may not suit your particular needs hinges on a host of practical variables, not the least of which include size, weight and portability, the type of guitars and pickups you use, power requirements dictated by the volume level of your band, the venues you play, and the styles of music being played. Then there are the emotional considerations, such as cosmetic appearance and appeal. Brand loyalty, perceived value and reliability, service availability after the sale (yes, feeling secure that if your amp blows up it will be fixed flirts with your emotions), and in some cases, exclusivity (*I waited six months for my Swamp Tone M69 Coon Ass Half Stack!*). But just as important as any of these practical emotional considerations is tone, or, how the amp makes you feel when you play it. Think of a moment of all the amplifiers you’ve owned and those you let go... why do some stay, while others don’t? *You keep the ones that make you feel*



good when you play them... and sometimes you even sell one of those because you didn’t realize how good you felt until you felt not quite as good with another.... uh-huh. Tryin’ to make it real... compared to what?

The crux of the matter when reviewing most amplifiers is just that... all other issues being secondary, tertiary and so forth. Why the long preamble, you ask? To get your mind right. We understand the romance in buying new gear, and we want you to keep your wits about you. It’s our job.



That said, the bottom line on the Fender ’57 Deluxe is this: it produces uncommonly corpulent,

midrange-heavy tones with the right proportion of volume-driven, thick harmonic distortion, the treble tones are produced but never edgy and brittle, and the Fender packs a surprising level of wallop in the bass frequencies with many guitars that will have you doing a double take on the Jensen P12Q speaker. Is this additional low-end response and unusually beefy character necessarily a “better” sound? Maybe. It *does* seem to complement brighter single coil pickups very nicely, perhaps reflecting the types of guitars that were used at Fender when the Deluxe was dialed in. Our blacktop Les Paul, currently loaded with Fralin/RS Greg Martin PsycheBillies, was a bit too thick., heavy and lacking its usual bright character through the Deluxe, and those pickups are normally very spanky with moderate output, proving once again that convenient generalizations about gear will make a liar out of you sooner or later.

During our evaluation we replaced the stock Groove Tubes-labeled Electro-Harmonix 6V6GTs with a pair of reissue



Tung-Sols, and again with a pair of NOS GE’s. The stock tubes sounded clearer, and better able to handle the heaviness of the Deluxe. We ran the Deluxe with other speakers, and the brighter Jensen just seemed best suited for this amp. We even compared the Fender to a Victoria and Clark 5E3. The Fender definitely sounded considerably woolier than both, with a deeper bass response that left the E and A strings sustaining over all the others when we hit a full 6-string cord and listened to the decay. The only exception occurred with a Stratocaster, which sounded the brightest of all the guitars we used to evaluate the Deluxe. Is this “better”? Depends. We wonder if the Deluxe will please players using humbucking pickups. There seems to be a bit too much woof in the dog with them for our taste, but for Fender-style single coils and snappy P90s, the vibe is heavy and good.

We *suspect* that a lot of what we’re hearing with the low end push in the Deluxe is due to the output transformer, having acquired some fairly deep experience with *Mercury*

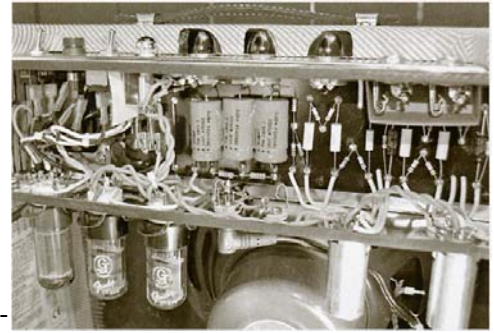
Magnetics transformers ourselves, and their trademark sound, which is generally thick, smooth, sweet on the top, and loaded with harmonic detail that seems diminished in most off-the-shelf transformers. But the 5E3 Deluxe also features a primitive tone circuit that offers no control over bass and midrange—only treble. The original 5E3 Deluxe circuit when followed faithfully also does not produce



much clean headroom... 12 watts is plenty loud enough for many small rooms in the absence of a hard-hitting drummer and a big bass rig, but the Deluxe spills into the distortion zone rather quickly—from about “4” on the Volume control and up, depending on whether you’re playing a guitar with cleaner, weaker single coils or heavier

P90s, for example. The slightly softer, toned-down Mic input will probably be ignored by most players, but the #2 input in the Instrument Channel is very useful for its slightly cleaner and less gainy sound. Of course, the #1 Instrument input is the ultimate sourced for maximum grease and grind, and they are abundant in the Deluxe. This amp also possesses plenty of treble bite with single coils, managed by the single tone control, but extremely high set-

tings produce some discernable, trashy distortion artifacts at very high volume settings.



As is so often the case with the sheer quantity of new

gear available to us today, on one level we’ve never had it so good, but this abundance of riches also makes the task of sorting through so many choices daunting, at best. We’ve played all the usual suspects in the handwired 5E3 realm—all respectable in their own way—good, yet different. And that’s a good thing. Aside from the nameplate, the \$1799 Fender Deluxe stands out in its ability to produce a remarkably thick and rich tone that other 5E3s seem to lack by degrees, leading us to conclude that the design team at Fender have accomplished precisely what they set out to do, resurrecting a modern rendition of the 5E3 Deluxe as a true heavyweight for its size.

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