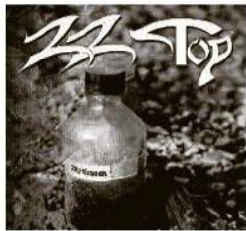




of the market for guitar gear. The barrier to entry for manufacturers is relatively low, and higher production = lower parts costs and incrementally higher profits. If there is a godfather of the modern pedal era it would be Mike Mathews, who started Electro-Harmonix in 1968 with \$1,000. Four decades later pedal effects remain hugely popular and affordable,

so naturally we have more choices than any one person could ever hope to digest and experience. Now, if you were considering a new overdrive or boost pedal, for example, how would



you sort through the hundreds of overdrive pedals being made today? You wouldn't. Most people hop online and read reviews and forum chatter until they are overcome by a compelling fantasy of rock & roll immortality, perhaps rendering unto the neighborhood Roky Erickson's "It's a Cold Night for Alligators." If you play in a party band you really should learn that one.

In the following pages you'll find that we are featuring more reviews of overdrive and boost pedals than we have ever presented before in a single issue. It has been a revealing and enlightening trip, but after many long mid-winter sessions dissecting the tones of so many pedals, we're happy to have concluded this project on your behalf. It's not the listening that is so difficult, but figuring out how to describe the sound of so many different pedals that are more or less intended to do the same thing. You should also know that there was some ruthless selectivity at work here – two overdrive effects we evaluated were rejected as not worthy of your time. Enjoy...



Effectrode



More distortion effects surely must have been built than all other guitar effects combined. Yes, guitarists go nuts for the grind, yet we have always wondered somewhat skeptically just how many ways there really are to create distortion with a pedal... The hundreds upon hundreds of distortion and overdrive pedals that exist can't possibly utilize significantly unique designs and components can they? After all, your overdrive pedal isn't distorting... your pedal is causing your amplifier to distort, right? How many ways could

there possibly be to do that? It has always seemed to us that the pedal bizness has turned on catchy names and a vaguely defined competition to acquire 'the best', the 'best' being a constantly moving target defined by an amorphous group of players who pride themselves on living on the bleeding edge. And to a great extent it's the comparatively low cost of entry that really drives the market for pedals. Risking \$100-\$300 is a lot easier than spending thousands on a guitar or amplifier... Like the custom pickup game, what we need is less hype and more clarity added to the conversation, and that's what you are about to get here...



Phil Taylor is a British audio design engineer and founder of Effectrode Audiophile Pedals in Staffordshire, Great Britain. We were originally introduced to Phil by one of our favorite guitarists and tone freaks, Adrian Legg, and for the sake of clarity, please let's not

confuse *this* Phil Taylor with another friend and tone freak in London, the Phil Taylor who has worked with David Gilmour for decades... In addition to designing a wide range of Effectrode pedals, Phil Taylor is a prolific writer, and his web site features many informative and interesting articles related to effects, audio design and tone. Following his bio we have included Phil's excellent explanation of Guitar Preamp Tone as it relates to our review of the Effectrode Blackbird Vacuum Tube Preamp. Enjoy...

TQR: How did you become interested in audio, tone and building effects, Phil?

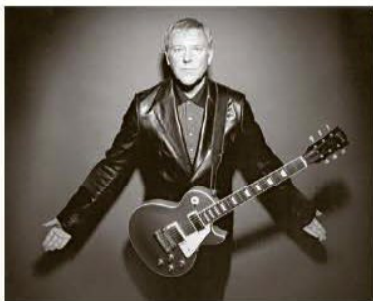


I'm privileged to have worked for several companies in audio electronic design, manufacturing engineering and as an acoustic consultant. During the early 1990s at BSS Audio as a production engineer who build and professional audio signal processing gear for studios and live venues all over

the world for artists such as RUSH and Peter Gabriel. I also have over six years experience acting as a consultant advising on acoustic treatments for reverberation control and sound insulation in theatres, halls and studios. My fascination for designing tube gear, especially the quest for the ultimate overdriven guitar sound culminated in the formation of Effectrode in 1996. My design philosophy is to create new designs that utilize vacuum tubes to create bigger and richer sounding effects with a vintage twist.

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I had to teach myself everything about the physics of vacuum tubes from dusty 1950s and '60s texts uncovered from the darkest recesses of backrooms in small, secondhand bookshops. I began repairing, modifying and 'hot-rodding' tube amps – Fender Twin Reverbs were a specialty and a pleasure to work on. I also recall a friend asked me to take a look at an old Rogers Cadet – the Cadet was an older push-pull, hi-fi amp – not exactly what you'd describe as an audiophile amplifier, but it did have a sweet and musical tone. Being a student of science and engineering, I was somewhat skeptical about claims for superior audio performance of electron tubes over relatively recent developments in solid-state Bi-Polar and MOSFET technology. I'd always accepted that technically there's no doubt that well designed solid-state amps measure well, however, to my ear they sounded either harsh or clinical in comparison to tube amplification. Other custom projects include rebuilding and modifying the original 'Copycat' tape echo units, tube based 16mm projectors and the design of tube RIAA phono preamp stages.



I first began repairing transistor hi-fi amps and building effects pedal kits at age 14. These amps were invariably used and abused by mates who played guitar through them and usually burnt out the output transistors. This helped me develop patience, deductive fault finding techniques and earn some extra cash. A year or so later I began to learn guitar as it was the cool thing to do at school, so long as you played heavy rock. My playing was and still is greatly inspired by Alex Lifeson, the powerful and textural guitarist from the Canadian power trio Rush. A friend from college coined the term 'wrecking' for jamming sessions, which was her way of expressing respect for the fantastic wall of sound that could be achieved with a guitar, amp and a handful of cheap Japanese stompboxes.



As a kid, I was fascinated by science and electronics. I can only blame my parents for this as they deliberately added fuel to the fire by giving me a chemistry set and electronics kit on my birthday. This rapidly escalated into a larger scale chemical production facility and construction of dozens of different types of storage batteries which bubbled merrily away in my bedroom. When I was twelve years old I was allowed my first soldering iron which

led to the construction of numerous crystal and transistor radios that never ever worked along with an evolving pattern of interesting burn marks on my bedroom carpet.**To**

Guitar Preamp Tone Explained



The 'Blackbird' is a real all-tube preamplifier in a pedal. It's designed to add multiple channels to vintage or boutique guitar amps giving access to a wide tonal palette ranging from warm and fat blues drive

sounds, to classic rock distortion and harmonically-saturated, savage metal tones. The drive channel is based on the same 4 stage tube clipping circuitry found in the Dumble, Boogie and Soldano amps. These types of amps are in a class of their own, being exceptionally expressive and touch sensitive giving the player access a wide tonal palette from mild blues breakup to harmonically rich, saturated drive tones just by simply digging in or easing off with the guitar pick. The clean channel is a replica of the classic 'Blackface' circuit by Leo Fender and is capable of creating jazz, country and beautifully warm, glassy tones. Additionally, this pedal packs a huge degree of flexibility with a host of unique features that allow the fundamental drive tone of the pedal to be altered by adjusting tube bias points and swapping out tubes. During the research and development of the Blackbird vacuum tube preamp I undertook a thorough investigation into tube preamp circuits in a quest to discover just what factors are important in creating great guitar tone. The following article is a result of those labours...



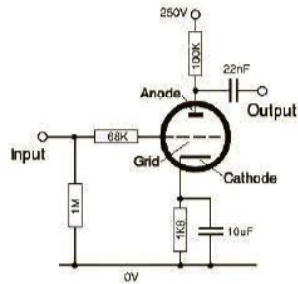
The interplay between your guitar, amp and playing technique are all fundamental to your tone. Your amp responds or reacts in a certain way to the signal from your guitar pickup, the pickup responds to the way you pick the strings and in turn you react to

the sound you hear coming from your amp. The whole system is a closed loop with the implication that your guitar and amp will influence your playing in a significant way – the right guitar and amp setup will let your playing soar whilst the wrong setup will hold you back, keeping you well and truly grounded. It's impossible to over-emphasise the importance of the relationship between gear and musician – it's certainly worth delving into the science a little and discovering what makes great tone. This article specifically explores

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tube guitar preamp circuitry – the aim is to demystify the tube sound, give a clear explanation of what’s happening within the preamp and gain, and an insight into how guitar legends created their wonderful, classic guitar sounds.

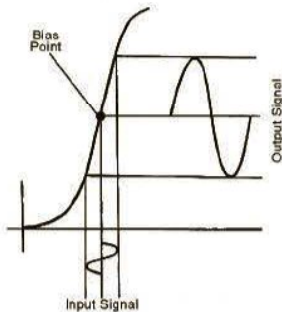
What’s Inside



Your tube amp is made up of a preamp section and power amp section, both of these contribute to the overall tone and feel of the amp. Figure 1 shows a typical tube preamp stage. This type of circuit is called a common cathode gain stage and is found in many

classic Fender amps, including the early Deluxe and Twin Reverb ‘Blackface’ and ‘Silverface’ amps. This circuit is a standard building block for amplifier circuits and is used by many other amp manufacturers including Soldano, Boogie, Marshall and Effectrode in their effects pedals. This circuit turns a small voltage into a large voltage – it’s a *voltage amplifier*. With a 12AX7 tube this circuit gives about 30dB of voltage gain, with a 12AU7 expect about 15dB of gain. In a typical vintage amp this gain stage is followed by passive tonestack and then a power stage drive section.

Tube Distortion



Distortion is low in this type of amplifier circuit as the 1K8 cathode resistor sets the bias point right in the middle of the tube’s linear region as shown in Figure 2. Figure 2 shows the ‘transfer function’ or ‘load line’ for this amplifier. The small input voltage (x-axis) controls anode current

(y-axis) flowing through the tube to give amplification. This centre biased amplifier section has the maximum threshold of clipping possible (highest headroom), that is where the grid can be fed with the largest possible signal before clipping. Another way of putting it, is to say the input sensitivity of the stage is at its lowest (input sensitivity describes the input voltage required to drive the stage into the non-linear region on the curve and cause clipping). Consequently, this is a very clean sounding amplifier and introduces relatively little distortion into the signal – early guitar amp manufacturers weren’t striving to generate huge amounts of overdrive and sustain with their circuits, just amplify the signal so the guitar could be heard above the drums.



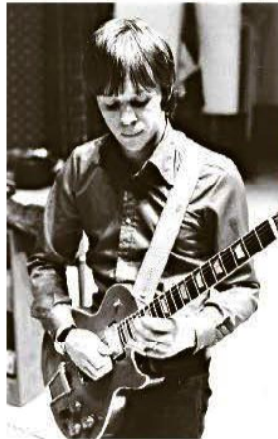
The non-linearity inherent in tubes means that there will always be small amounts of distortion introduced into the signal, even with a clean amp

such as the Fender Twin. This partly explains why a tube amp sounds warmer and has a more musical character than a solid-state amp. The sound of many great rock & roll players such as Ritchie Valens, Buddy Holly and Chuck Berry were defined by amps with cathode follower preamp stages. Although the preamp section of these amps is relatively clean sounding, the power amp section generates significantly more signal distortion, especially when the amp is cranked up. The distortion is the result of several factors including:

- The power amp tubes entering the clipping region
- The rectifier tube voltage sagging
- The transformer core becoming saturated
- The speaker cone resonances and/or break-up

This subject, however, is outside the scope of this article – so let’s get back to the preamp section.

Symmetrical Clipping

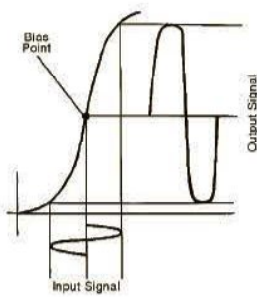


This preamp section can be made to distort (in a very pleasant way) if fed with a large enough signal and that’s exactly what guitarists did during the late ‘60s and early ‘70s. Players like Alex Lifeson, Jimmy Page and Robin Trower pushed their amps into distortion by placing a boost pedal before their rig (typically a wall of Hi-watt or Marshall tube heads feeding into 4 x 12 cabs!) Because the bias point

of the first amp section is roughly in the middle of the load line, the guitar signal is clipped roughly equally on both sides – symmetrical clipping as shown in Figure 3.

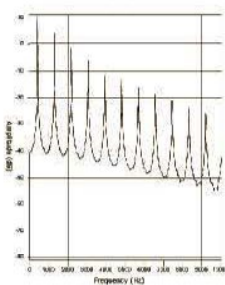
Symmetrical clipping produces a mixture of odd and even order harmonics creating the classic rock distortion tone. What you’re hearing when you use a boost pedal is actually your tube amp distorting – that is, a significant amount of

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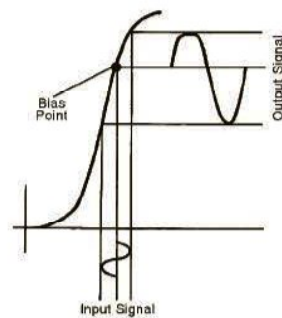
the tonal character of the overdrive tone is generated by the amp. Figure 4 shows a frequency analysis of a centre-biased 12AX7 being overdriven. The fundamental is a 440Hz sine wave ('A') and strong 3rd, 5th, 7th, etc. harmonics are clearly present in the output signal. Even

harmonics are also present, however at reduced amplitude in comparison to the odd harmonics. Although centre biased symmetric clipping distortion is beginning to approach a square wave, the rounded edges ensure that brittle-sounding high order harmonics are absent.



Incidentally, a true square-wave is made up of a series of only odd harmonics – this is the kind of distortion produced by hard-clipping diode circuits found in op-amp based stompboxes such as the Boss DS-1.

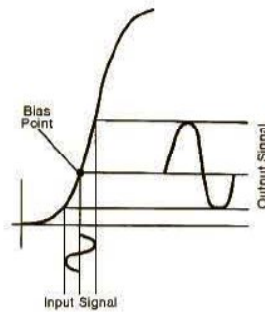
Asymmetrical Clipping



It wasn't long before designers began experimenting with multi-stage tube preamplifier circuits – pioneers of the art include Alexander Dumble, Randall Smith and Mike Soldano. Their amps contained several tube stages in series (typically four stages) to massively boost

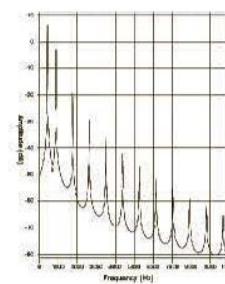
the input signal until it went outside the linear region of the tube. Additionally, by manipulating the bias point on the load line they could exercise a degree of control over the input sensitivity in each stage of the amp so that the signal clipped in a more controlled manner. Because the bias point is offset from the centre of the load line, the output signal clips to a greater extent on one half of the cycle than the other – this is *asymmetric* clipping. Reducing the value of the 1K8 cathode resistor causes more anode current to flow so that the tube runs physically hot. This shifts the bias point to the right-hand end of the load line and the output signal will be clipped on the positive cycle of the output signal – this is called grid current limiting and is shown in Figure 5. A moderate amount of hot biasing produces a smooth, warm and 'bluesy' drive, too much and the sound becomes more aggressive and 'fuzzy'

The bias point can also be shifted to the left-hand end of the



load line by increasing the value of the cathode resistor to reduce the current flowing in the anode – this is called cold biasing. This generates cut-off clipping on the negative cycle of the output signal producing a 'crunchier', 'harder-edged' distortion as shown in Figure

6. Cold biasing is used in many modern triode high gain tube amp designs as it adds rich, harmonic content giving a 'heavier' and 'crunchier' distortion tone.



Asymmetric clipping generates a signal rich in even and odd order harmonic overtones. The second harmonic is particularly strong, which is almost certainly one of the reasons tube amps sound so musical – the second harmonic is exactly one octave above the fundamental. Both symmetric and asymmetric clipping occur in a

multi-stage tube preamp and it will consequently produce a tone that is a complex mix of even and odd order harmonics. Designing an amp is an art and involves a substantial amount of experimentation in the quest to discover the ideal biasing point, interstage tone-shaping and gain for each stage. The biasing point of each tube stage affects how the stages interact to produce distortion, ultimately defining the core tone of the amp – whether it is glassy clean, warm and bluesy, classic rock or creamy and sustaining.

Blackbird Review



It isn't difficult to imagine how an effect designed

with vacuum tubes might deliver a warmer, more musical sound and feel than the typical overdrive or boost pedal, but the Blackbird goes well beyond the concept of an overdrive 'pedal'... Phil Taylor has designed a complete 2-channel preamp for the guitar that offers Clean and Overdrive channels with variable levels of drive and gain based on the type of tube utilized (12AX7, 5971, 12AY7 or 12AU7), plus a 3-way switch to select different bias points, and an internal trim pot. Granted, the bigger box will occupy more real estate on your pedal board, and the Blackbird requires a 12VDC power sup-

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ply (provided) rather than the standard 9 volt, but the rewards are evident as soon as you power up.



Despite the 2-channel layout, tube options and switchable bias points, the Blackbird is easy to dial in and adjust. Evaluating and considering the gain characteristics of different tube types

takes a little time, but hearing the variations between them and choosing your favorite tube adds a degree of flexibility that is entirely worth the effort. Like a miniature mixing desk, the interactive bass, midrange and treble tone controls are also very useful for tweaking EQ, and if you don't have a midrange control on your amp, you will now.

The Clean channel provides a moderate level of enhanced gain that works well for blues and rhythms when you want just a little extra hair on chords without distortion and sustain. "Clean boost" would be an accurate description, although you can turn the volume control up beyond 2 o'clock and get more grease. The Overdrive channel in Classic mode adds a Gain control and produces strong sustain rich in even order harmonics that is very touch-sensitive, dynamic and musical. If distortion can be described as 'beautiful' this is it. Flipping the toggle to 'Creamy' creates symmetrical clipping and gonzo levels of metal distortion and burn, but overall fidelity and clarity remain intact with no muddiness or treble fizz.



We tried several different tubes – a GE 12AY7, RCA 5971 and 12AX7. A 3-way bias toggle switch is used when changing the top/right tube from a 12AU7 (middle setting), 12AY7 (down) and 12AX7 (up). You can also further adjust bias voltage for the first tube stage with a trim pot inside the case. The 5971 sounded really good in the Clean channel for rockin' blues, the 12AY7 predictably softened gain with less intensity by degrees, but our overall favorite

was the RCA 12AX7. This tube is notoriously rich and sweet with a melodious character that just seemed to work perfectly in the Blackbird for cleaner tones with a little edge, smooth distortion in Creamy mode, and full out arc welding in the Classic setting. In all respects the Blackbird is, as the logo on the case says, the audiophile's tube tone engine. Additional features include an External Select jack that can be used with a Fender-type reverb and tremolo footswitch to switch between Classic and Creamy modes, and a Balanced Direct Out driven by a discrete Class AB amplifier circuit.

If you don't happen to hold a stash of classic American, British or Dutch preamp tubes, obvious choices are JJ, Electro-Harmonix and TAD. JJ 12AX7s are shipped in the Blackbird. **TQ**

www.effectrode.com

Tonequest Dumkudo



OK, we were mildly skeptical when Mark Johnson first showed us his Dumkudo overdrive. Mark hadn't owned his (bought on eBay) long enough to use it on stage, and we didn't get around to plugging it in that day since we just happened to be more focused on

guitars and amps. Whenever we see a Dumble reference used in association with something not made by Dumble, even if it's only half of the name – we become a little uncomfortable, and you know why. Still, we were intrigued given the fact that Robben Ford, Larry Carlton and our good friend and TQR board member Sonny Landreth have been associated with the Dumkudo. The Dumkudo is described as having been designed for single coil pickups, while the Zenkudo was designed for humbuckers. We sent an e-mail to designer and founder Toshihiko Tanabe from his web site inquiring about receiving a Dumkudo for review. No reply. A few weeks later we found a Dumkudo for sale on eBay and sniped it for \$305.00 with free shipping – about \$25 less than ordering direct with the silver case and knob upgrades on our pedal, and of course we didn't have to get in line and wait for a pedal to be built and shipped from Japan.

After the Dumkudo arrived we jumped back on the Tanabe web site and noted that he mentioned that e-mails should have something like 'Dumkudo order' in the title to avoid going into the spam folder. So we sent another e-mail, this time asking Mr. Tanabe if he would be willing to respond to a few questions, since we were going to be developing a review article. The next day we received a reply, complete with answers to our questions in halting English...

TQR: Please describe your background. How did you become interested in developing your own overdrive effects, and how did the process begin for you?

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