27 The design of the VT-5 Equalizer

I'm Doug Fearn and this is My Take On Music Recording

The concept of equalization goes back to the 1920s and the telephone system. Radio networks needed a way to distribute their programs in real time, across the entire U.S., to hundreds of radio stations. This distribution was done via ordinary telephone wires, which normally are bandwidth-limited to the voice range of 300 to 3000 Hz.

The longer the line, the more high-frequency roll-off occurs. In order to put broadcast-quality audio through thousands of miles of telephone wire, the signal had to be amplified and frequency corrected at fairly short intervals of 10 miles or so.

The brilliant engineers at Bell Labs designed high-quality amplifiers that were flat from 50Hz to at least 15kHz, which exceeded the capability of most broadcast facilities and home radio receivers.

They also needed to compensate for the loss of frequency response over long wire lines.

The term "equalization" was applied to the process of making all the frequencies equal in level, or, as we would call it today, flat response.

The devices used to achieve this were called "equalizers." These were high-quality circuits and components that not only corrected the frequency response, but also minimized the phase shift inherent in any system where the frequency response is not flat. An excessive phase shift tends to smear the audio, usually subtly, but it still does not sound exactly right.

All devices originally designed to solve a particular problem end up being used as a creative tool by inspired people who see an expanded application for the technology. This happened with equalizers as well as limiters, two fundamental tools used in music recording.

The early equalizers used in recording and broadcast were simple, often with just a low boost and cut and a high boost and cut – much like the tone controls found on consumer equipment. The curves were usually shelving curves, which means that the response through the equalizer is flat up to a certain frequency and then makes a gradual increase, or decrease, to a certain amount of boost or cut. And then the frequency response remains elevated at that level for several octaves. This is a very simple type of equalizer, which can be implemented with just a couple of components, usually just a resistor and capacitor.

The elevated response continues until the circuit frequency limitations start to diminish the amount of boost, which will gradually roll off to no response at all. The same principle applies to highs and lows, and to boosts or cuts.

There are more complex ways to change the frequency response, which provide a different kind of curve. You can boost a particular frequency in a very narrow range, or in a much broader range. This can be done at any frequency in the audio range. A sharp peak singles out a very narrow range of frequencies and gives the sound a feeling of resonance, like you might encounter when speaking over the end of bottle.

On the other hand, a broad peak lifts a wider range of frequencies and does not have that single-frequency resonance effect of the bottle.

A sharp peak is called a high-Q equalizer. Q is a general electronic term that stands for “quality.” Originally, a high-Q circuit was desirable at radio frequencies, so that in a radio receiver, for example, you could tune in one station and eliminate others nearby in frequencies. That is definitely a positive attribute, but in recording, we rarely have a need to isolate one particular frequency and exclude all others. An exception might be to eliminate a troublesome room resonance, or an intruding sound of a specific frequency.

My first exposure to equalization, besides tone controls on a home radio, was with the Pultec EQP-1 equalizers that were in a production studio at WPEN in Philadelphia where I worked while in high school. This was a revelation to me, because you could manipulate the sound in ways I had never encountered before. Interestingly, this early 1950s design was developed by Western Electric, the manufacturing arm of the Bell Telephone company. Surely the original design concept originated in Bell Labs, where they solved the long-telephone line problem, and the source of almost all audio innovation and discovery for nearly 100 years.

When I built my first studio, I was able to find a couple of Langevin equalizers, which were limited in what they could do, but still useful.

Later I had a console with equalizers on each input. Some of the consoles I owned had terrible equalizers, which I never found useful and rarely used. Other consoles had decent equalizers, but nothing too terribly great, in my estimation.

And then, around 1976, I did a session in a studio with a Neve 1073 console. My first reaction to the 1073 equalizer was, “where have you been all my life?” I was astounded by the way the 1073 could shape the sound. And it was difficult to make it sound really ugly.

A couple years after that, I had a periodic visit to my studio by a young guy who was the U.S. rep for Trident Audio. He had family nearby and stopped by whenever he was visiting. One day, he dropped off a prototype of a parametric equalizer that Trident was about to release.

That was another revelation to me. This was a solid-state device, using discrete transistors and an interesting circuit that allowed you to adjust the frequency, the amount of boost or cut, and the Q of the circuit, in each of four bands, plus high- and low-cut filters.

I immediately starting using this equalizer on all key tracks I was cutting or mixing. It sounded really good and did just about exactly what I wanted.

I bought the prototype and a production unit, and that pair ended up on my mixing buss from that day forward.

A few years after that, I started a design of a better mic preamp for myself. I was not happy with any of the console preamps and wanted to re-capture the sound of the vacuum tube mic preamps I used earlier in my career. That project took a couple of years and resulted in the VT-1 Vacuum Tube Microphone Preamplifier that we still make today. That was followed by the VT-2 2-channel version, and eventually with the VT-24 4-channel model.

The VT-1 sold well and I was encouraged to tackle the next piece of gear that I wanted for myself – a good equalizer. I researched equalizers for about six months, which was not as easy back then in the pre-internet age. I built several different eqs, using several different classic design approaches.

The typical eq of that time, and still today, uses solid-state op amps in a highly-versatile circuit that can be configured to provide a limitless number of equalizer responses. Impressive, but I didn’t like the way any of them sounded.

I pretty much knew that I want an inductor-capacitor equalizer, but I wanted to explore all the possibilities to make sure I wasn’t missing anything. I concluded that my instincts were correct, and the inductor-capacitor design was what sounded best to me. There really was nothing else that I liked.

Incidentally, the electrical terms for a capacitor is C and for an inductor it’s L. That’s why this type of equalizer is sometimes called an “LC” equalizer.

Since vacuum tubes always sound better to me than solid-state, I knew that the active circuitry would be tube.

Also, I preferred the sound of a passive equalizer circuit. That is, the inductors and capacitors provide the frequency shaping independent of any amplifiers. The passive circuit could even be used all by itself, with an external amplifier to make up for the loss through the equalization circuit.

Passive equalizers are all really “cut” equalizers at their heart. In other words, for a boost circuit, you start with a cut and reduce the amount of cut as you push up the boost. That means that the loss through the equalizer is equivalent to the maximum amount of boost you want.

With multiple bands, it becomes a bit more complicated than that, but the bottom line is that most passive equalizer circuits have an intrinsic loss of about 20dB. This loss is made up by an amplifier circuit after the passive components.

Another factor in the sound of the passive equalizer is the impedance of the source feeding the equalizing components. In other words, the designer’s goal is only achieved if the passive eq circuit is fed with a constant and optimum impedance source.

Since the source impedance of pro audio gear is all over the place, ranging from fractions of an ohm to 600 ohms or more, the performance of the equalizer will vary depending on what is driving it. This was not a problem back in the days when passive equalizers like the Pultec were designed, because everything in a studio was standardized at 600 ohms. This was a carryover from the telephone system, which required exact 600-ohm matching to achieve proper operation.

That impedance matching makes sense with the telephone system, but it was wasteful and it limited the potential performance in the recording studio. Since the 1960s, virtually all studio gear has been designed to have a low source impedance, usually far below 600 ohms. And the line level inputs have a high impedance, usually 20,000 ohms or more. This works much better for the studio environment.

Because of that standard, the sound of a passive equalizer was unpredictable in the modern studio.

That's why I designed the VT-4, the original mono version of our equalizer, with a vacuum tube input amplifier that provided a solid and optimum impedance to the passive eq circuit. Consequently, you can feed the VT-4, or the VT-5 stereo version, from any source and it will always sound and perform the same.

That adds complexity and cost to the design, but I won't compromise on performance, so it was a no-brainer to build the VT-4 that way.

The question became, what frequencies do I want to incorporate, and what type of curve?

I had a pretty good idea of what frequencies and curves I liked, based on my experience with my favorite equalizers. Those frequencies became my starting point in the design.

It's possible to design an LC equalizer with practically an infinite number of possible inductor and capacitor values. As long as the two components give you the same center frequency, you could use a large capacitor value and a small inductor value, of vice versa, and achieve the same effect.

Since inductors are much more expensive that capacitors, the designer tasked with keeping costs down will use a small inductor and a large capacitor.

But is that optimum? How extreme can you go before the sound of the eq changes?

That was a big question for me, and I found some useful guidance in an old publication by Bell Labs from the 1930s. You see, the telephone company was a regulated monopoly up until around 1980, and much of the research at Bell Labs was public domain. They did an awesome amount of basic research at Bell Labs, much of which could be licensed and used in other products

In this article in the Bell Labs Journal was a table of suggested inductor and capacitor values for quality equalizer design. This was just what I needed.

I used their values to get started, and experimented with deviating from their recommendations to see what would happen. Sure enough, they were right. Except in a few cases, I used their values and the equalizer sounded great.

But I still needed to zero in on the frequencies that sounded the best and were the most useful.

Measurements cease to be of much use at that point. I depended entirely on what my ears were telling me. And that meant a lot of listening, to a wide variety of music. I had the VT-4 prototype on my workbench in my shop and had music going through it all day long. The shop had UREI 811B speakers, fed with a homemade vacuum tube amplifier, since this was what I was used to listening to in the studio.

To change the frequencies, I had to change either the capacitor value or the inductor value, ideally both at the same time. I wound the inductors myself, and could wind a new one for each change I wanted to try. Capacitor changes were much easier, since I had an extensive collection of high-quality caps that I could quickly change with a pair of clip leads.

Over the next year, I zeroed in on the frequencies and curves that sounded best to me. Soon I built a second prototype, so I could listen in stereo and use them on the mix buss in the studio.

It still surprises me when I realize that throughout this entire process, I never measured the frequencies or the curves. This was purely a design-by-ear project. To date, I do not know the exact curves, although I do know the frequencies because that detail is necessary during check out of the production units, to make sure that all of them match precisely.

It was not feasible for my company to hand-wind each inductor individually. And besides, hand-winding had too many variables. Fortunately, the good folks at Jensen Transformers agreed to make the inductors I needed, and boy are they precise. I joke that they could be used as calibration standards, and that is actually true. They are really that good. Jensen hand-tunes each one to make sure it is precise.

In my final design, the low and high frequencies had individual controls, allowing the boost and cut to be used simultaneously, at the same or different frequencies. This is a concept that is foreign to many engineers, and not using the controls in this way means they miss out on a lot of the capability of the VT-4 and VT-5.

The vacuum tube circuitry was largely derived from the VT-1 mic preamp, adapted for a line-level device. In fact, all my products use some version of that circuit. That gives the family of products a consistent sound.

All the transformers and inductors used in the VT-4 and VT-5 are made by Jensen. The input transformer is one of their stock designs, but the output transformer and the inductors are custom-made for us.

One thing the Trident parametric equalizer had that I found very useful was a mid-range control. I found that for many projects, a slight dip in the mids, around 300 or 400 Hz opened up the sound very nicely. I never found the boost useful at those frequencies, so I designed my equalizer to have only a mid-range cut.

This surprised some of the engineers, mixers, and mastering engineers who evaluated the early prototypes. It was then that I realized that I was not interested in making an equalizer to correct problems. What I wanted for myself was an equalizer that would take an already good-sounding track or mix and add the final bit of polish. The kind of polish that makes you smile.

If people needed to correct a problem in the sound, there are many other equalizers that are better at doing that.

But surprisingly, there were some problem tracks I encountered when mixing other people's projects, and the VT-4 was actually pretty good at making corrections. But, that is not its primary mission. It's designed to make a good track sound great.

The VT-4 was introduced in 2000, and we immediately were inundated with orders. That was the only time in our history that we had a backorder situation of as much as a couple of months.

The other surprise was that most people were ordering VT-4s in pairs, for mixing or mastering. Some mastering facilities asked if I could make a stereo version, since they would always be using the equalizer on both channels, and they would never need to have different eq on the left and right.

That resulted in the VT-5, the stereo version, which is the best-selling version of the eq. It is a true stereo unit, with one set of controls adjusting the two channels simultaneously and with great precision.

From the beginning, the VT-4s were all perfectly matched so that we did not even have to make matched pairs. A VT-4 from 2000 will match a VT-4 you buy today, within about 0.1dB.

Same with the tracking of the two channels of the VT-5.

One advantage of a pair of VT-4s over a VT-5 is that you can use the VT-4s independently while tracking, or on individual tracks during a mix. When used on the mix bus, the pair of VT-4s will have to be individually set the same, but otherwise they sound the same as a VT-5.

Originally, I was tempted to label the frequencies as A, B, C, D, etc., and the boost or cut with simple 1-10 markings. I wanted people to use their ears when setting the eq, and not be influenced by the panel markings, which are often quite different from what most engineers are used to.

In the end, I decided to mark the frequencies and the boost and cut in dB. Defining the frequencies of the Mid-cut and High-boost was simple. I just measured the frequency of maximum boost or cut and rounded that number off to the nearest logical number.

But the low-cut, low boost, and high cut are different, since they are shelving curves. I used the engineering convention of the 3dB point to define the panel markings. Using the 100Hz boost as an example, 100Hz is where the response is increased by 3dB. But the 100Hz boost starts well below 100Hz. In fact, the boost goes down to the lower frequency response limit of the equalizer, which is around 5Hz.

Similarly, the boost doesn’t stop at 100Hz. It extends quite a way above that, with diminishing boost, up to several hundred Hz.

You can see why I wanted to label the frequencies as A, B, C. The 100Hz label only tells a small part of the story about what that boost is doing.

The same applies to the all the low boost frequencies, and it also applies to the low and high cut.

Since you can use all these controls independently and simultaneous, the range of effects is multiplied. You can boost at 140Hz and simultaneously cut at 100Hz to create an interesting asymmetrical boost. That can be extremely useful, especially if you are trying to carve out space for individual instruments in a mix. To further refine this low boost, you can also cut at, say, 300Hz, perhaps to avoid a conflict with a mid-range instrument in the mix.

On the high end, you might boost a vocal at 10kHz to add sparkle. But perhaps doing so also makes the vocal too sibilant. Use the high cut to fix that, perhaps cutting at 10kHz.

Wait, boost and cut at the same frequency? Well, with conventional equalizers this would most likely just cancel out. But the VT-4 high boost and high cut have different curves, so the result may do something you didn’t know was possible.

Using the controls in combination is one of most useful features of the VT-4 and VT-5.

And what about the high frequency Q control? It adjusts the Q, or sharpness of the high frequency boost. For me, 90% of the time, I will use the 0.6 position. That's the broadest curve, and that's the one that sounds best to me on a mix or for mastering. The sharper settings are good at the lower range of the high boost frequencies, especially if you need an instrument like an electric guitar to cut through.

Throughout its first 20 years of production, the VT-4 and VT-5 used very expensive rotary switches to select the frequencies and adjust the amount of boost and cut. These were excellent switches that were totally quiet in operation – quiet enough to change during a mix, for example, should that be necessary. They were made by a small, family-owned company in the U.S. But the switches we needed were not their main products. I think D.W. Fearn was the only company that used them. It could take months to get a new order of switches. And the prices went up rapidly. A switch we paid $12 for in 2000 was about $50 in 2020. When we couldn't get switches in a timely manner, production of the equalizers ground to a halt for an indefinite period of time while we waited.

No other manufacturer made a comparable switch that met our specs.

So, in 2020 we decided to take a different approach. We changed the switches to the same quality switches we use in our preamps and VT-7 compressor, which were always available. And we never had a switch failure with those over the past 25 plus years.

But that switch would do the complex switching we needed.

The answer was to use relays to do the switching, instead of running the audio through the switches. Make the change had zero impact on the sound or reliability – we've used tens of thousands of that model relay without a single failure.

All VT-5s made after August 2020 use this system. We think it is an improvement in the design, and it insures that we can meet the demand for VT-5s.

While we were making that change, it seemed like an opportune time to revisit the heat issue in the VT-5. The VT-5 has always had a small fan on the back panel, which runs at reduced speed, to keep the internal components cool. A lot of manufacturers would not have bothered, but I design for a 50-year minimum life span, and keeping a device cool will extend its life.

I was never happy having a fan in the VT-5, so the switch change was an opportunity to address that as well. By the way, the VT-4 never needed a fan.

The first prototypes of the VT-4 used the same tubes that we use in the mic preamps, a 6072A. It's a great-sounding tube, originally designed by RCA in the 1950s specifically for professional mic preamps.

But the supply of 6072s in 2000 was not good. We were rejecting up to 90% of the tubes because they did not meet our specs.

We age all our tubes for at least two weeks, and then grade them for minimal noise, distortion, and other characteristics.

Another tube I had experimented with back then is the 6N1P, which also sounded excellent. I had an Amateur Radio friend who was the U.S. distributor for Russian Svetlana tubes, and he gave me some 6N1Ps to try out. It is not a direct replacement for the 6072 in any way, but it had similar characteristics and worked perfectly in our line-level products.

The problem with the 6N1P is that it ran very hot. About four times hotter than the 6072. But the supply of them was solid and the Russian tubes we used were rarely rejected in our testing procedure. There were fewer than 1 percent of the tubes that failed to meet our specs. The tradeoff for the excess heat seemed like a good idea.

Today, we have a reliable source for high-quality 6072s, and that presented an opportunity. I could re-design the VT-5 to use 6072s, just like the original design used. So, at the same time as we introduced the improved approach to switching, we also changed over to the 6072 tubes.

I spent a lot of time making sure that the change did not affect the sound. And it doesn't. The VT-5 with the new tubes sounds exactly like the older version. And making the change meant we could eliminate the fan.

By the way, we did the same thing with the VT-7 Compressor, and eliminated its fan, too.

Those of you who have an older VT-5 may be wondering if your unit could be converted to the new, no-fan version. Well, it could be done, but the cost would probably make it economically impractical. Almost every component in the amplifiers would have to be changed, and the easiest way to do that would be to gut the VT-5 and rebuild it from scratch. And that would take a lot of hours – more than the 40 hours it currently takes to hand-built every VT-5.

And if you have a VT-5 with the original switches, rest assured that you have equivalent performance with those quality switches. If we could, we would continue to make the VT-5s with those switches.

For the user, there is no difference between the operation or the sound of the older and newer products. The only time the fan became an issue was for those users who had their VT-5 mounted very close to a mic, which may have picked up a hint of fan noise.

Since 2000, I have never done a session without my VT-4s and VT-5s. In my control room, I have two VT-4s, a production VT-5, and the prototype for the VT-5, which is slightly different from the production units.

These are the only eqs I have. Well, I do have a few plug-in eqs that I sometimes try. Occasionally a plug-in solves a problem for me, but usually I try it and then take it out.

Just to give you some ideas of how to use the VT-5, I'll explain what I do and why I do it. But I don't want to tell you what to do. We all have our own style, or at least we should, and what works for me may not fit your style at all. But here's what I do.

First, I should point out that I am in the wonderful position of only working on recording projects that I want to do. And that means working with top musicians and good material. And most of my recording is acoustic-based, usually with either acoustic piano or acoustic guitar as the foundation of the song. Sure, there are electric guitar overdubs on most of these projects, but it is the sound of real acoustic instruments that are my first love.

Also, I normally use a very minimal mic'ing approach on my sessions. I even do some with just one stereo mic. And unless it is absolutely necessary, I never use more than one stereo mic on a drum kit.

I am fortunate to have a wonderful collection of mics, but mostly I use ribbon mics for everything. The sound of ribbon mics just fits my style very well.

I almost never use any eq while cutting a track, nor when mixing. If I'm not happy with the sound I am getting, I try to fix it in the studio with mic position, or, if that doesn't work, by changing the mic. Consequently, most of my tracks do not need any eq at all.

When it comes time to mix, I have a VT-7 Compressor on the mix buss, followed by a VT-5. I'll talk about the VT-7 in a future episode.

Here are my typical settings on the VT-5:

First, I almost always boost 2 or 4dB at 10kHz with the broadest curve. Rarely any more than 4dB. This is especially effective with projects that use ribbon mics for everything. Good ribbon mics have very flat response up to about 10kHz, and then they very gradually roll off. But they still have some response well above the range of our hearing. The 10kHz boost seems to open up the sound and give it a special quality with the VT-5.

Almost all condenser mics have a "presence boost," a broad peak of a few dB in the range from about 3 to 10kHz. That's a great sound for a lot of music, but I wonder if that design decision was originally to compensate for high-frequency losses in the recording chain of the 1940s and 50s. But by the time the other equipment solved those roll-off problems, the "condenser sound" was established as a standard. Anyway, more on that in a future episode.

Since the standard is now for that broad peak in the highs, any recording without it seems dull by comparison. By adding that 10k boost on the VT-5, the mix sounds more like a recording made with condenser mics. And, I have to admit, I like that little boost anyway. It even seems appropriate with a recording made with condenser mics.

That is part of the magic of the VT-5. I thought it was just me, but I hear it over and over from users. The VT-5 does something to the mix that is difficult to describe, but everyone loves what it does. Believe me, I am as surprised as anyone that this is a universal reaction.

Most directional mics, and especially ribbon mics, exhibit a lot of proximity effect. That means that the bass response goes up rapidly the closer the mic is to the sound source. Sometimes this is exactly what you want – some low end eq right at the mic. But with vocals, that usually does not sound good if the singer is less than a couple of feet from the ribbon mic.

Rolling off the bottom end about 2-6dB at 40Hz on the VT-5 is perfect to compensate for this. Remember, the low cut extends somewhat above the marked frequency, to a diminishing degree until you get up to about 300Hz, in the case of the 40Hz rolloff.

If the only problem is the vocal, I might decide to put that track through a VT-4 and do the roll-off only on the singer. For me, that is uncommon, but sometimes necessary.

For this podcast, I use an AEA R44 ribbon mic about 90% of the time. And for this recording, and all the other episodes with the 44, I roll off 4dB at 40Hz on the VT-5. It seems to be the perfect antidote to the proximity effect. And I work the mic from about 20 inches away. Any closer and I find the proximity effect on my voice is beyond what I can correct with any eq.

There’s another advantage to rolling off that very low end for many types of music: you clean up the bottom end, which allows more energy to be concentrated in the rest of the audio spectrum, and you greatly improve the reproduction on small speakers. Laptop speakers, standalone computer speakers, and phone speakers all benefit from removing the extreme lows. For one thing, most of those consumer devices do not have much headroom in their amplifiers, so they are very easy to overload. And that makes the whole song sound lousy. Your listeners won’t continue with the song if it sounds that bad.

Of course, if you are doing dance music, that is a different situation.

The VT-5 gives you lots of options for low-end roll-off, so forget what the labels make you think it will sound like and just use your ears. I have used a 400Hz roll-off very effectively on some mixes.

And always experiment with a combination of low cut and low boost. You can cut out the extreme lows and then boost higher up and maintain your nice bottom end without wasting energy on frequencies the consumer will not hear, and that could totally mess up the sound on their small devices.

And then, sometimes, a boost at 100Hz, which is often my favorite frequency, might cause some mid-range muddle, because the effect extends upwards quite a bit. That’s where the mid-range cut comes in. Use it to clean up that range.

There’s another thing I often use the mid-range cut for, and that is to clean up low-sample rate PCM recordings. By low rate, I mean anything below 96kHz. I’m still not sure of the exact mechanism, but digital recordings made at 44.1 or 48kHz tend to have a lot of problems in the mid-range, typically around 400Hz. Just a little cut can make a world of difference.

I should point out that after the VT-4 and VT-5 front panel graphics were finalized, I realized that 2dB steps in the mid-range were often too coarse for perfect control. So, starting around 2005, I changed the first four steps to 1dB instead of 2dB. We never did change the panel printing, since the exact number of dB is rather arbitrary anyway. But this change gave users better control of that range.

And speaking of steps, all the controls are marked in 2dB steps, which horrifies some users who insist they need half dB steps. I suggest they try it and see if it is a problem for them. Rarely has anyone said that the steps were too coarse.

The reason for this is that the curves on the VT-5 are quite different from most equalizers, and a 2dB step on the VT-5 is about as fine as a 1dB step on most equalizers. Another reason why I considered just marking the control steps as 1 through 10.

Moving on to the High cut control, I often leave this set to flat. But there are times when there is an annoying cymbal or vocal sibilance, and the 10k roll-off may help that. I usually only use 2 or 4dB, and doing so may mean that I need to bump up the high boost another notch. But using those controls together often solves the problem.

Of course, ideally, I would have solved that problem in the studio. But sometimes you have to fix it later, and the VT-5 can certainly help.

And that brings us to the highest frequency cut, 28kHz. What good is that, you might ask, it is above our hearing range. And that's true, especially if you are like most people over age 15 who cannot hear much above 10kHz anyway.

Well, I put that there to help clean up low sample rate PCM digital recordings. Although converters have pretty good filters that cut off all frequencies about 20kHz, there can still be aliasing frequencies generated. I won't go into the reason why this is a problem, but in my experience, those frequencies above our hearing range can cause problems in the audible range far below. Putting in some cut at 28kHz can make a difference in the overall clarity of the mix, on some recordings. Try it and see what you think. Don't listen to the highs, since you probably won't hear much change unless your hearing is exceptionally good up there. But you may hear an overall improvement in the mix, similar to what might happen with the mid-range cut, but better. Or use both techniques together if necessary.

Higher sample rates are unlikely to benefit from this, but you might want to give it a try anyway.

The last two controls deserve a few words. The Out/In switch bypasses the equalization circuitry entirely. The amplifiers remain in the audio path.

The Input Level control is there as a coarse adjustment of the overall level in the equalizer. You will probably use the center zero position most of the time, but if you have a track with a fairly extreme amount of boost or cut, you can bring the level back into the best range for the following piece of equipment.

Most studios leave their outboard gear on most of the time, and that's OK as long as there is adequate ventilation in the rack. That's another topic, but just remember that the cooler equipment runs, the longer it lasts.

What I do is turn on the master rack power at the start of a work day and leave it on until I am done for the day. That way everything is ready to go when I need it. I do not leave my gear on 24/7, but then I am the only one using the room and sometimes days go by when I am not working there.

And always use vented rack panels between your rack units. I know it takes up valuable space, but think about what you would lose in time and productivity if a critical piece fails because it ran too hot for too long.

We make a vented rack panel that matches our gear, but anything, even an open space, is better than packing all your expensive gear close together.

Over the years, I have been approached by plug-in designers, asking about making a plug-in version of the VT-5. There are a lot of good designers out there, but the folks at Acustica Audio in Italy were the ones that seemed to understand the quality level I would require, and had the advanced technical experience to make a plug-in I was happy with.

The Acustica folks and I spent over two years working on a VT-5 plug-in. Twice they came over to my studio and spent a full day sampling my VT-5. And once they had a working version of the plug-in, they sent it to me for evaluation. I didn't keep track of the number, but we went through many iterations before I was satisfied.

The result is the Acustica Ruby 2 plug-in. It has been available since 2018 and sells very well. It is a good way to try out the VT-5 sound before you buy the hardware, or just as a very useful plug-in.

So, you're wondering how close the Ruby 2 plug-in is to the hardware VT-5? Well, it is not an exact replica, and I don't think any software could ever be. But it certainly captures the essence of the VT-5 sound very well. I can tell the difference, but the differences are minimal. The key thing is that it sounds very good and is entirely useful.

That's the VT-5 story. If you have any questions, just drop me an email about that or anything else, to dwfearn@dwfearn.com

This is My Take On Music Recording. I'm Doug Fearn. See you next time.