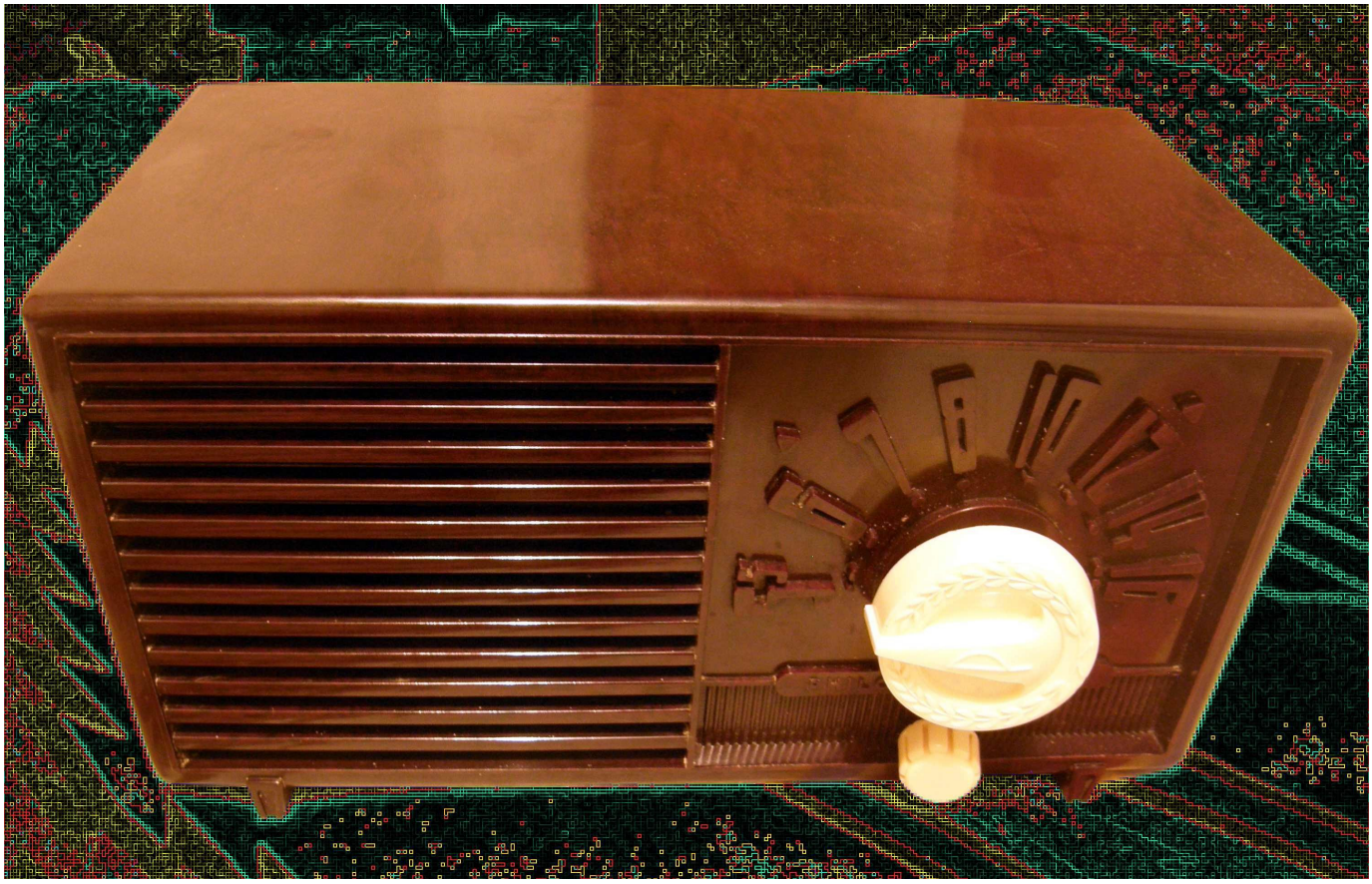
Tube FM 4 - Compression/Distortion

effects made from tube radios
Cupwise Nebula programs



General Information

During the creation of Tube FM 1, I thought it would be great if I could capture some really distorted and compressed sounds from the radios. Nebula compression has come quite a way since then, and I've learned a lot more about the sampling process as well. It is my opinion (and I think you will agree) that this set breaks new ground regarding what can be done with Nebula.

Five of the six radios used in Tube FM1 were used again here, and are joined by a few new pieces of hardware. These include two old solid state PA amplifiers- a Bogen CT-60, and a University Sound 35 T. The best new addition has to be the Philco tube amplifier which was pulled from a phonograph/radio console (models 1708, 1608, 1808 used this amp). These three amps were used to over-drive the radios. The Philco tube amp was also the focus of its own effects, being itself over-driven by the two solid-state amps.

One new idea behind this set is that the NAT sampling process was handled as if hardware compressors were being sampled (in most cases). This really makes a night and day difference in the end results- the distortion and compression is much more apparent. Also, the radios' real attack and release behavior was captured, along with exaggerated behaviors. The resulting programs offer more direct control, with a wide range of sounds possible from each effect.

Effect Types

OD Each radio (and the Philco amp) was over-driven to produce at least two programs. This was done by sending a really hot signal directly into them, not transmitted via FM, but directly injected into the circuitry (I call this 'DI' or 'direct input'- as explained in my Tube FM 1 manual, the radios had to be taken apart to do this). The radios (and their tubes) then compress and distort the signal, and also add some tone shaping. For most of these, the signal was taken from the radio directly. The tuners have RCA output jacks which were used, but the table top radios used the 'DO' or 'direct output' method I've used in my other tube radio effects (again, radios had to be taken apart to do this). Some of the over-drive effects used a microphone instead, and these will say 'Mic' in the program name. This was only done for 2 of the table top radios.

Dist+ The radios weren't over-driven as much in these setups. Most of the distortion comes from other sources, which were usually placed before the radios in the signal chain. Different pieces of hardware were used to distort the signal, which then went to the radios, which further shaped the tone.

Torn These were made by sampling 2 of the table top radios with ripped/torn speakers and a microphone. The end results don't really sound as messed up as the real deal does, but they are slightly different from the 'OD Mic' effects.

Detuned These were sampled using FM transmitters to get the signal into the radio, then the FM station dial on the radio was adjusted to be just slightly off of the signal. I had noticed when first dealing with these radios, that detuning the receiver dial to just the right position produces a crazy sounding distorted modulation type of effect. It is VERY unfortunate (in my opinion) that the modulation aspect of the sound cannot be recreated by Nebula, but the end results are still unique. Some are very destructive, others are not too unlike the OD effects.

Robotic The first of these I made was the result of a mistake I made when using NAT to render an effect. I had some settings wrong, and the result came out completely wrong. I liked it. I made more. They are made from other effects (as I just explained), so they share most of their name with the effects they are made from, then have 'Robotic' at the end. The end sound is clearly the result of some digital mischief, but the tube radio tone still governs much of what you hear. These were made as 'preamp style' programs, so they don't have the sampled attack/release behaviors, or side-chain versions, but do have 'trim' versions. The word 'robotic' is used to represent the digital side of the creation process, using the workings of Nebula as an effect itself.

Bionic OD Over-drive setups were used, but the tones used in the sampling process were basically played through the hardware at double speed. The sample rate is 'adjusted' to do this- NO re-sampling is done. The recording is then adjusted back to 96khz. The end result is that the response is shifted down an octave. For example, if a hi-pass filter at 1khz is sampled this way, the result would be a hi-pass at 500hz. The word 'bionic' represents the fact that digital trickery was used in the creation of these, but in a way that augments the analog side of the hardware. As cool as 'bionic over-drive' sounds, the end results really aren't much different from regular OD effects, just leaning more towards the bass end.

Installation

Just copy the .n2p files to your Nebula 'Programs' folder, and the .n2v files to the 'Vectors' folder.

Usage

- Programs are in the 'RAD' category, then the 'TBFM4' sub-category.
- 44Khz versions have '(44k)' suffixed to the program names.
- Try 1k options for 'clean' (no distortion) compression/tone shaping.
- For larger kernel options (usually 10k), most effects come in two flavors:
    - standard- best compression behavior
    - alt- may be better for thick, smooth distortion in some cases
        - The differences between the two are subtle. One thing you may notice is 'snappier' attacks with the the standard versions, and more rounded attacks with alt programs. The only settings that are different are the kernel lengths, which can be changed in the 'kern' page. Standard versions have 10ms lengths, which is standard for compressor programs. Alt versions have 50ms lengths, which can throw off the compression behavior a bit, but might provide a thicker distortion tone.
- The 'Robotic' effects were not made as 'compressor style' programs, and were instead done as 'preamp style' effects. They do not have side-chain versions, but do have 'trim' versions.
- External side-chain versions are found in the 'Ext S' sub-category under 'TBFM4'. These require you to route another stereo signal into the 3rd and 4th input channels of Nebula, if your host allows that. Then you can set up a custom filter on the side-chain signal before it hits Nebula, using the EQ/filter plug-in of your choosing.
- Internal side-chain versions are found in the 'Int S' sub-category. These allow you to adjust Nebula's built-in Hi Pass filter, on an internal side-chain.
- Side-chains give you more control over what comes out, especially the external side-chain. You don't have to use them in every case, but in many cases you will need to use one. Bass-heavy signals can throw off Nebula, and cause 'crackling' in the output. This is a common case where the side-chain is needed. Things like drums usually work well without a side-chain.
- Trim versions of the 'Robotic' effects can be found in the 'Trim' sub-category. Some of the robotic effects react very differently at different input levels, so the trim versions can help you quickly 'scan' through the possible results. You lose the 'dist' control with these versions- this is a limitation of Nebula.

Program name scheme examples:

Bell Dist+2 10k
*Heathkit Det1 1k
Zenith OD2 1k
Zenith Torn1 alt 10k

Bell, Heathkit, Zenith= Name of the radio used. The Philco amp will say 'Philco amp' whereas 'Philco radio' will represent the radio. Philco amp will not be mentioned unless it is the primary piece of tube hardware in a particular setup (so not if I t is just being used to boost the signal going into a radio).
Dist+2, Det1, OD2, Torn1= Type of effect. The number tells you which one it is, in cases where there are more than one of that type for that radio.
10k, 1k= Number of kernels. More means you can have more distortion, but at the cost of more CPU. 1k programs have no distortion and can be used as clean compressors (this would be impossible with the actual radios).
alt= Used to label 'alt' versions of larger kernel options.
*= If you only have the 96khz version of the set you won't see this. It tells you that this is the 44khz version of the effect. If this isn't in the name, it's the 96khz version.

Almost all of the effects in this set will resemble compressor programs when loaded in Nebula (exception- the 'robotic' programs). Threshold, attack, release, and ahead controls are all present, and work as you would expect them to. There is no 'ratio' control. Dropping the threshold will give you more compression and a more distorted sound, unless you are using a clean (1k) program, or have the 'dist' control adjusted to a low level. The 'dist' control will increase the distortion, but remember that it is an artificial way of boosting the harmonics/distortion, so you should probably use the threshold control first to get close to the sound you want. Then if you need more, or LESS distortion, use dist. The dist control is the same as the 'drive' control you find in many other Nebula effects- it's just been renamed.

Every program (except for the 'robotic' ones) will load with the attack/release controls in a default position which provides the actual response of the hardware setup that was sampled to make that effect. This position is always represented by '1' on the control. If you adjust away from those positions, you are going into 'exaggerated' territory. These faster/slower than normal behaviors were sampled by running the tones (just the tones used to sample the attack/release envelopes) through the hardware at different speeds, to exaggerate the response. This usually came out 'as planned', and gives you a smooth transition from faster to slower behavior as you tweak. In a few cases, the results didn't come out 'as planned', and you get unpredictable results. My first thought was to 'fix' those programs, but I decided to keep them as they

are, because I think they provide different effects that aren't possible anywhere else in the set, and their 'bad' behavior goes along with the main concept of the set. You always have the default settings, which work fine- although Nebula currently can't accurately reproduce the instant attack/release times of these radios. No, the over-drive effects are not completely accurate to the real thing, but they are still useful tools and that's the whole point.

More usage tips are given towards the end of the manual.

Hardware used

- Three old (1950's) table-top tube radios: an unknown model Arvin, Philco B569, Zenith C724G
- Two tube tuners: Bell 2255, Heathkit AJ-63
- Two old solid state PA amps: Bogen CT-60 and University Sound 35 T
- Philco tube amplifier from old phono/radio console
- Three FM transmitters of various quality: a cheap battery powered Belkin, a HLLY TX-01S, and the (nice!) EDM TX LCD
- Three mics: an AT2020 condenser, an Akai ADM-6 dynamic, and an XM8500 (also dynamic).
- A modified VTB1 (opamps upgraded, better tubes used)
- Yamaha MU128 midi 'rompler', with external input and effects
- A-Station synth, external input through effects
- Paia Quadrafuzz
- cheap guitar distortion pedal
- other things...
- RME Hammerfall 96/32 for A/D, D/A

Program Specific Descriptions

The following section gives descriptions of the setups used to produce the effects. There are additional notes/comments given for some effects, concerning how they sound/behave, and how they might be useful. Each radio used 2 different tube sets, the descriptions note this by saying that either tube set A, or B was used for that setup.

Arvin Detuned:

Signal went out to EDM FM transmitter, picked up by Arvin which was tuned slightly off of the signal. The Arvin's volume knob was cranked which results in a little overdrive from the Arvin also. Tube set A.

Arvin Dist+1:
Signal went out to Paia Quadrafuzz, then to Arvin radio (direct in and out) and back to A/D. Tube set A.

Notes- This effect will act as a bandpass at a fairly high frequency, so it's a very bright, sizzling sound. The distortion and compression it gives, combined with the filtering, creates a unique effect. Try it with synths!

Arvin Dist+2:
First, a plug-in tape saturation plug-in was applied. The out D/A, to Arvin (DI) and out (DO) to A/D. Arvin's volume knob was cranked, so it added some overdrive There was also a bit of a feedback loop set up (some of the signal went back out the D/A). Tube set B.

Arvin OD1:
Signal out to University amplifier, then to Arvin, direct input. Direct out from Arvin through an old potentiometer I took from the dead Admiral radio (used in TubeFM1-3), then to A/D. Tube set A. One funny thing about this radio, is that if you look at the frequency responses it gave in the TubeFM1 set, there was much more filtering of lows and highs than there is here. I have no idea why it happens, but I found that if I send a lower level signal in and let the Arvin boost the signal/overdrive itself, I got a fuller response. Weird.

Notes- Can give a very crunchy/punchy compression to drums or other quick sounds. Distortion is fairly smooth even at higher levels.

Arvin OD2:
This is the only OD program in the set that went through FM. Signal went to the Philco amp first, then to the HLLY transmitter, picked up by Arvin. Arvin's volume knob cranked, providing most of the overdrive effect. Most of the other radios I have don't work this way, their volume controls seem to behave more like a trimmer pot after the tube stages, and won't boost in a way that adds compression/distortion, which is why I usually needed the other amplifiers to send a hot signal into them. The Arvin can actually overdrive itself though. So, in this case the Philco amp and FM was used just to add color. Tube set A.

Arvin Bionic OD (OD3):
The signal was first 'adjusted' (not converted!) to 192khz. This just means it plays back twice as fast, but every sample is still accounted for, and unaltered. Went out D/A, to Philco, then to Arvin (DI), and direct out to A/D. Tube set B. The end result of the 'Bionic' process here, is that the frequency spectrum characteristics are shifted down an octave.

Arvin Torn Speaker1:
Went to Arvin (DI), which was connected to a radio speaker I tore up a bit (taken from the Admiral radio used in previous sets). ADM-6 mic picked up signal from there. Mic plugged in University amp. Then to A/D. Signal was very compressed/overdriven. Tube set B.

Notes- Unfortunately Nebula can't recreate the complex behavior of the buzzy torn speaker, but you do get some of the character...

Arvin Torn Speaker2:
To Arvin (DI). Torn speaker, mic'd by AT2020 which went to VTB1 (no tube blend), then to A/D. Tube set B.

Arvin Torn Speaker2 Robotic:
Robotized.

Bell Detuned1:
Signal went to EDM FM transmitter, picked up by Bell. Station tuned slightly off of signal's strongest point, so that the sound coming out was modulated and distorted in a very strange way. Tube set B used in Bell.

Notes- One of my favorites. Awesome with drums.

Bell Detuned2:
This time the HLLY transmitter was used, and again the Bell's station was tuned slightly off center to get an odd result. Then, signal went to Philco amp, with its bass and treble controls tuned to (my) taste. Bell used tube set A.

Notes- This one isn't as obviously weird as Bell Detuned1, but I think the bass/mid area seems kind of strange, in an interesting way.

Bell Detuned 3:
Cheap Belkin battery operated FM transmitter used this time. Bell was detuned again and used tube set A.

Notes- Very filtered sound. Low bass is about all that's left, unless you crank the 'dist' control. This one also gives a very asymmetrical output, almost only positive signal comes out. As interesting as this is it can be a bad thing in some situations (it can eat up your headroom), and you may want to use a DC bias remover after this effect, but that's up to you.

Bell Dist+1:
Went to Tascam 122mk3 cassette tape deck first, which boosted the signal. Then to Bell tuner, which was over-driven. Then, to VTB1 preamp, with its 'tube

blend' knob cranked, and an old Mullard tube replacing the factory installed one. So, in this case plenty of distortion is coming from the Bell, and the VTB1 added more. Bell used tube set B.

Notes- Not too much unlike the OD programs for this radio. This one has the flattest frequency response of the bunch.

Bell Dist+2:

Out to Paia Quadrafuzz. Then to the EDM FM transmitter, picked up by Bell. Tube set A.

Notes- This was kind of an unusual setup- having an extra distortion source, then transmitting by FM.

Bell OD1

Signal went to Philco tube amp, then to Bell tuner. The amp sent a pretty hot signal into the tuner, which distorted and compressed the signal. Tube set B.

Bell OD2:

Went to the Bogen PA amp, which has a knob for introducing compression to the signal. This was used at a very small amount here, around '2' on the knob. The Bogen also has a 5 band eq and here a small amount of boost was added at 1khz. Hot signal went to Bell. Tube set B.

Bell OD3:

Signal went to University PA amp, which has 'bass' and 'treble' knobs. The bass was boosted a bit. Tube set A.

Notes- This one, I was very close to cutting from the set. You can see why right away. Certain ranges on the thresh control will produce really choppy results. I eventually tried it with some vocals though, and actually liked the choppy effect I got. I decided to keep it in, for a little bit more variety. Like the 'robotic' programs, this is an effect that results from a 'broken' Nebula process.

Heathkit Detuned1:

Signal went to Belkin FM transmitter, and was picked up by Heathkit, detuned. Tube set A.

Heathkit Detuned2:

Signal to EDM transmitter, picked up by Heathkit detuned, tube set A.

Heathkit Dist+1:

Into a cheap and simple guitar distortion pedal, then to Heathkit. Tube set A.

Notes- First of all, you can get a crazy effect by maxing out the release and lowering the attack, almost like a reverse/backwards sound (just the envelope acting weird). It's clearly not something I planned, but I like it and kept it. Very unusual, unpredictable, and 'wrong' behavior, but it can produce interesting results with just about anything you throw at it. Beware though, the action on that release control isn't smooth or very logical over the '1' position.

Heathkit Dist+2:

First, a bit of a nice tape-sat vst effect was applied to signal, small wet mix. Then out through D/A, and signal went to the MU128, where 3 different distortion effects were used. From there signal went to Heathkit. This effect was recorded/sampled together with Arvin Dist+2. After the Arvin effect's signal went through A/D, some of it was fed back out through D/A, into the Heathkit Dist+2 setup. Heathkit used tube set B.

Heathkit OD1:

Signal went to Bogen PA amp. Bass was boosted with Bogen's eq. Hot signal went to Heathkit tuner. Very nice sounding overdrive was result. Tube set A.

Notes- Can give a nice saggy OD effect. Side-chain may not even be needed.

Heathkit OD2:

University PA amp, with a little bass boost to counter the slight bass cut the Heathkit introduces (this also has the effect of driving/distorting the bass frequencies harder). Out hot to Heathkit, using tube set A.

Heathkit OD3:

Philco tube amp boosted signal. Then went to Heathkit. Tube set A.

Notes- More filtered sounding than the other two. Side-chain=helpful, just don't expect too much distortion from this one. Nice compression though.

Heathkit OD3 Robotic:

This one can almost sound normal if you drop the input level really low. Then you can bring it up slowly and the results keep getting more and more messed up. So, it's almost like you can mix in the perfect amount of craziness. No 1k version.

Philco Amp Dist+1:
Signal went into A-Station. Effects used there included: delay, reverb, resonant filter, filter overdrive, distortion, eq (treble cut), and some phasing. From there signal went to Philco amp, with it's treble knob jacked up to compensate for the A-Station's treble cut. The tubes in this amp are different types than any of the ones from any of my radios or the spares I have on hand, so I don't have any others to swap in, and all effects using it have the same tube set.

Notes- This is the only stereo effect in the set. Make sure to try the 6k alt version, because it adds a subtle delay effect in.

Philco Amp Dist+2:
First some vst plug-in saturation was applied, with an increasing amount of wet/dry ratio at higher dynamic levels. Then signal went out D/A, to Paia Quadrafuzz, then to Philco amp.

Philco Amp Dist+2 Robotic:

Notes- At this moment as I'm testing this, it's making an acoustic guitar (strummed chords) sound almost like a kid's toy xylophone, some wind-chimes, with a woodblock, and a weird rhythmic swishy noise on top of that. The only robotic effect with a 1k version, which produces less layers of sound than the 10k, but might be a bit clearer.

Philco Amp OD1:
To University amp, then Philco amp. University is overdriving the Philco.

Philco Amp OD2:
To Bogen amp, then to Philco.

Philco Radio Dist+:
Signal goes out to Mu128. Effects used there include: lofi/bit depth reduction, a 'radio' filter, some distortion, and an envelope following wah. From the Mu, signal went to Philco amp, then to Philco radio, then to A/D. Tube set B.

Philco Radio OD1:
To Bogen amp. Bogen's EQ was set to try to counter-act a bit of the heavy filtering of the Philco radio, but didn't seem to help much. Then to the radio, direct in and direct out to A/D. Tube set A.

Notes- You can get a really creamy, filtered sounding overdrive.

Philco Radio OD1 Robotic:

Notes- Choppy. 10K only.

Philco Radio Bionic OD (OD2):

Out to University amp, then to Philco radio, direct in. Direct out to A/D. Tones were first adjusted to 192khz, then the recordings were adjusted back to 96khz. The end result is an effect with the frequency response of the radio being shifted down an octave. Tube set A.

Zenith Detuned1:

EDM FM transmitter used, signal picked up by Zenith which was tuned off of the station slightly. Then to A/D, and some of the signal was sent back out through D/A creating a feedback loop (subtle). Tube set A.

Notes- 1k version can give some clangorous effects if the thresh is dropped. The 10k version will sound MONDO messed up if the thresh is dropped, but if you raise the thresh level and increase the 'dist' control you can get a nice overdrive sounding distortion too. The two versions are very different, but the 5k version is a little like both.

Zenith Detuned2:

HLLY transmitter used, Zenith tuned off of signal. Tube set A.

Zenith OD1:

To Bogen amp, then to Zenith hot, DI and DO out to A/D. Tube set A.

Zenith OD2:

University amp drove the Zenith (DI), then DO to A/D. Tube set B.

Zenith OD3:

Out to my Tascam 122 mk3 cassette deck, but not to tape- it was only used for some amplification (fairly clean amps). Then to Zenith, direct in, and direct out to Philco amp, then to A/D. Tube set B.

Zenith Bionic OD (OD4):

Same setup that was used for OD3, except recorded at double speed (at 192 khz), then re-adjusted to normal speed. Same effect as with other bionics, everything is shifted an octave down. Very small amount of feedback introduced also. Tube set A.

Zenith OD5 Mic'd:
To Philco amp, then to Zenith direct in, picked up by ADM-6 mic, to University amp then A/D. Tube set A.

Zenith OD6 Mic'd:
Same as OD5, but to AT2020 mic, then VTB1.

Zenith Torn Speaker1 Robotic A & B:
HLLY transmitter, picked up by Zenith with torn and taped up speaker. This speaker was a different one from the one used in any other torn speaker program. XM8500 mic picked up signal, to VTB1, bit of tube blend there.

Notes- I'm calling both of these 'robotic' because even though one of them *should* have come out correctly, they both sound as if they were 'rendered' incorrectly. I checked everything to make sure, and one of them does seem to be set up properly. I don't know why it sounds like this, and my head began hurting trying to figure it out so I just moved on. I've had version A on my hard drive for over a year now and have used it a few times to really destroy sounds. It helped inspire this set. Only 7k versions for each.

Zenith Torn Speaker2:
Out to Philco amp, then to Zenith direct in, torn speaker mic'd by ADM-6 into University amp.

Zenith Torn Speaker3:
Same as 2, but with AT2020 and VTB1 amp.

General Usage Tips/Ideas:

- Try experimenting with the external side-chain, and the signal's filtering. Instead of just applying a simple high-pass, try really sculpting the sound with a multi-band EQ. The shape of this signal will directly effect the distortion you get...
- The 1k versions can be used for a clean compression effect with some tone coloring. They take a very small amount of your resources compared to the 10k programs (especially the 'alt' versions). All effects have been optimized, but if you don't need distortion, it makes sense to use the 1k option.
- The 'dist' control can drastically change what you get with small adjustments. For distortion the obvious thing is to drop thresh and boost dist, but experiment. Try dropping the threshold level to get a crunchy sound with drums, then instead of increasing 'dist', try dropping it also. Try the opposite- increase thresh and then crank

dist. There are many possible combinations... Yes, the 'dist' control is an 'artificial' way of adjusting the distortion, but if you're a purist, you're in the wrong place!

- The internal/external side-chain versions also use stronger smoothing algorithms for the interpolation. Most of the standard versions of the programs use the 'parabolic' algorithm, which isn't quite as effective in many cases as the more exponential methods. So if you load a standard version of an effect and like the sound, but get crackling artifacts, you really should load one of the side-chain versions.
- A limiter after Nebula is always a good idea.
- If distortion is what you are after, make sure to try the regular and 'alt' versions. You might try cranking the 'dist' control to a high level in both versions, then switching between the two to see if there is a significant difference. Then when you choose which to use, you can adjust 'dist' back to taste.
- Try cranking the 'dist' while adjusting the attack/release/thresh/input controls. This way you can hear exactly how the distortion content is being shaped. Then you can drop it back to a lower level- or keep it up!
- The robotic effects calculate that you have exactly a 34.45% chance of resisting the robotization process. When you aren't looking, they will attempt to robotize you, your loved ones, and your pets!
- Even though drums work well without a filtered side-chain, if you are going to process a drum mix including bass drums, you should probably go with a side-chain.
- The trim versions of the robotic effects really show off how differently those effects respond at different input levels (which is a result of how they are made). You lose separate control over the harmonics' level (no dist control), though.
- If you come up with any good tips, let me know! I'm out of stuff to say!

Thanks:

Giancarlo, Enrique – and everyone who has helped support Nebula.
www.acustica-audio.com

Everyone who has supported my work!
Don't hesitate to contact me for support with the set! (check contact page at site)
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