Tube Radios Direct Revamped

General Information

This is the classic sound of tube radios, captured with direct electrical connections (as opposed to miking the speakers); and now, 13 years after the original release, I've revamped this collection entirely. You can still use the 34 different effects (from six radios) to get some 'vintage' tone with subtle to not-so-subtle filtering and some slight harmonic enhancement, with the newly added option of bypassing the filtering altogether leaving only the harmonic sweetening. Beyond that, you can now crank them into overdrive, and each one offers a wide variety of distortions you can use as a tool in your mixes!

There are three elements to these effects-
1) The frequency response of the fundamental part of the output. Each radio effect filters the audio in different ways and this contributes a lot to the overall 'old radio sound'. It reacts dynamically- the response often becomes fuller at higher input levels, and more filtered at lower levels.
2) Harmonic distortion, which also reacts to the input dynamically. Higher input means more tube harmonics. The harmonics also have their own frequency response, further contributing to the variety in these effects.
3) Compression. Higher input means more tube overdrive compression.

The first and second of those elements are combined into tone programs for each sampled effect, including a normal and 'hot' version (where you get the overdrive distortion). The compression is contained in a separate program. This means that to get the full sampled effect you need two Nebula instances, one tone and one compression instance. But this also also means you can use the compression separately if you'd like a little tube overdrive style soft-knee compression without any filtering or distortion. I've also added attack and release controls to those programs, allowing you to use them more like a typical compressor, opening up a huge range of possibility. They load with default settings to provide the type of instant compression/limiting you'd expect from tube overdrive.

All tone programs allow you to bypass the radio filtering part of the effect, and you can also turn off the harmonics for a cleaner sound, so you can use any of the three elements separately if you choose to do so! This also really opens up a lot of possibility! These programs can be made to provide distortion ranging from subtle fattening to growling or sizzling.

There are also some great skins by Max, which allow quick switching between all programs, for both N3 and N4!!!

Background

For every program, the signal was taken from the radios through a <u>direct electrical connection</u> (no microphones were used). I used six tube radios, mostly from the 1950s. 'Tabletop' radios with built-in speakers usually have no output jack, so to get a direct signal out of those a simple hack was used. Basically, the speaker leads were tapped for the signal (**not safe** unless an isolation transformer is also used).

Two of the radios were 'tuners', designed to be used with external speakers as part of a larger setup. They had RCA output jacks, making them much easier to sample. Tuners were aimed at providing a more hi-fi experience, and usually have better sound specs, particularly with their frequency response.

Two FM transmitters, the (not very good) HLLY TX-01S and the (very high quality) EDM TX LCD, were used to get the signal into the radios. This means that the signal going through the airwaves was part of the sampled chain! Another method used a simple hack where the signal was injected directly into the radio's wiring, bypassing the transmitter, airwaves, and demodulation by the radio, and providing a cleaner signal and an extended high frequency response that wouldn't normally be possible with the radio. Both methods were used when possible, to provide different results for each radio.

At least four samples were taken from each radio, except for the Philco which is AM only, so I could only use the 'direct in' method with it. Radio tubes were swapped out for alternate sets to provide different results between the various samples. There are also special '+' (plus) programs where I used either pre-emphasis EQ during sampling, or post processing of the samples, to get a fuller (less filtered) frequency response. Sometimes this post-processing was done in a very transparent way- applying amplitude envelopes directly to the recorded tone sweeps to accomplish the "equalizing". In other cases I simply EQ'd the impulses produced from the tone sweeps.

The stereo programs (except for Stereo 6+) were made by pairing combinations of the other effects. Keep in mind that the other programs don't convert your stereo signal to a mono one. They just apply the same effect to both channels, whereas the stereo programs apply a separate effect to each.

Installation

There are two main steps to the installation-

1) Install the programs/vectors. Just copy the .n2p files to your Nebula 'Programs' folder, and the .n2v files to the 'Vectors' folder. Before moving on to the skin install, check to see that the programs do load properly in default Nebula, by going into Nebula's program finder list and loading them from there. You'll find the programs in the 'RAD' category, then either the 'TR4', 'TR5', 'TR8', or 'TR9' categories below that, depending on the sample rate(s) you've installed. 'TR5' is for the 48khz rate.

2) To install the skins, consult the skin installation manual, the section relating to either N3 or N4, depending on which you're using! After installing the skins you will be loading these programs as a unique plug-in, not by using the Nebula program finder/list to select them! So don't ever load them that way again (it breaks the buttons in the skins)!

General Use

- If you just want a **classic tube radio sound**, try out the normal programs. Each one filters the sound differently, and gives some harmonic saturation, which you can adjust with the 'Input Trim' and 'THD Level' controls. You can also add a compressor instance if you like.

- If you want some **subtle harmonic saturation without any filtering**, load a normal program and set the '*f* mode' knob to the '2' setting, which bypasses the radio filtering. This really opens the doors for using these programs as subtle saturation tools, and wasn't possible before the 'Revamped' update. You might find that certain programs produce harmonics that work really well for this purpose- try to remember them. Again you should use the Trim/THD Level controls to perfectly dial it in.

- If you want **overdrive harmonic distortion**, first add a compressor instance before the main tone instance, dial in some compression with 'Input Trim' (applying makeup gain as needed), then load a 'hot' program in the tone instance. They all sound different, so try several, and after loading them adjust the 'THD Mode' control through all possible settings (2-5). These produce different sounding distortions. Once you've found a combo you like, you can further refine the sound by adjusting Trim/THD levels (don't go over 0dBFS on the peak hold display), or by using the '*f* Mode' control to turn off the radio filtering ('2') or to remove the fundamental part of the signal completely ('0' setting).

- If you just want the **tube radio compression** part of the sound, load a compressor instance and play with the controls. Boosting 'Input Trim' gives more compression. Adjusting attack/release away from the default settings allows you to use these programs like a typical compressor.

Main GUI

1) Button Matrix - These buttons allow you to quickly select the various programs offered in this release. The gray buttons are for the normal programs, and the red ones are the 'hot' programs, which give you heavier distortion. The '+' signs indicate a plus program with an enhanced/fuller frequency response, and the 'LC' buttons load the only programs that use the Lo Cut (9) control. 'A' is the alt version of Admiral 4 that was added in the 'revamped' update.

2) Frequency Response Graph - This window shows you the response for the fundamental element of the effect you've chosen, without the distortion factored in. If you choose a hot program the distortion takes over and the graph becomes less useful. Clicking this bypasses the effect entirely.

3) Input Trim - An input drive control that compensates with the opposite amount of output adjustment. Boosting this will generate more harmonics.

4) THD Level – Unlike boosting the input, this doesn't cause more harmonics to be generated. It's adjusts the output level of the harmonics after they've been generated. Very useful for precise fine-tuning of exactly how much distortion, or subtle harmonic enhancement you want in your signal.

5) *f* Mode - Switches between three modes for the fundamental part of the effect. Default setting is '1' which gives you the sampled radio tone, usually with filtered low and high frequencies. '2' bypasses the radio filtering, outputting the dry input. Use this setting to get the subtle harmonics with the normal programs, or tube overdrive distortion from the 'hot' programs, but without the filtering. Setting this control to '0' can only be done in the 'hot' programs, and actually mutes the fundamental completely, allowing you to have only the distortion. If the distortion is really heavy you may not notice much difference in sound by switching to the different settings, but you usually do, and it can be interesting.

6) THD Mode - This one switches between various modes for the harmonic distortion content of the effect. Settings of '0' and '1' can only be used in the normal programs, while 2-5 can only be used in 'hot' programs. Normal programs default to '1' which gives you harmonics on the more subtle side, allowing slight enhancement/sweetening of the signal. Setting it to '0' turns the harmonics off completely, allowing you to get a clean output with only the radio filtering. 'THD mode' settings 2-5 are the overdrive modes. These modes give you overdrive distortion at high levels. Each setting sounds different, producing slightly or very different distortion profiles. Just load a 'hot' program and try them all out!

7) Release - Gives you some control over the dynamic behavior of the tone. It's not like the release on a compressor- it's affecting the tone, not the level. It's typically subtle and is set to provide a good result by default, so you can ignore it, but you may want to experiment with it when processing dynamic audio (like drums).

8) Feedback - In some cases it can give interesting results. Try it, but be careful (as with any feedback control)!

9) Lo Cut - Only works with the Admiral 3 program. Increasing this introduces a high pass filtering type of effect.

10) Output Gain - This is a simple output gain control. It can only boost by +6dB but lowers gain down to infinite (silence).

11) VU Input Meter - It's a VU style input meter. The separate little red LED above lights up if your output peak goes over 0dBFS.

12) Peak Hold - This readout shows your recent highest input level. Try to avoid going in over 0dBFS. The input trim control does affect this readout.

Compressor GUI

1) Button Matrix - Same as before. There aren't buttons representing every sampled effect for each radio, because not all of the captures had interesting dynamic responses. Some were almost perfectly linear. You don't even have to match the same radio if you're pairing one of these with a tone instance. You can mix and match as you please, or even use these without a tone instance.

2) Dynamic Response Graph - This window shows you the non-linear dynamic response you're going to get. We can also call it the compression knee. Clicking this window bypasses the effect.

3) Input Trim - An input drive control that compensates with the opposite amount of output adjustment. Boosting this will typically cause more compression (one of the programs, Heathkit 4, actually expands the input).

4) Makeup - Use this to boost the signal back up after compression. You can use the In and Out meters (9) to help you match the output with the input.

5) Attack - I added this control to allow these programs to be used as simple soft-knee compressors, in any situation, but it defaults to a fast setting giving instant gain reduction like you'd get with the radios.

6) Release - Defaults to fast setting but can be adjusted for more control.

7) Output - Can be used for up to 6dB of gain, or to lower the output.

8) Peak Hold - This readout shows your recent highest input level. Try to avoid going in over 0dB. The input trim control does affect this readout.

9) Peak Input/Output Meters - Here we have digital peak meters because I think that style is more useful in this case.

Sampling Details

This part isn't really important, it's just here to give some background on the creation of these effects- particularly how they were sampled. The term "DO" means "direct output", which in the case of the tuners means I took the output from the RCA jacks, but with the table-top radios I had to tap the speaker leads. "DI" means direct input, using another tap going into the electronics, or the Admiral's phono input.

Zenith 1 Chain: D/A > EDM transmitter > Zenith, DO > A/D

Zenith 1+ Sourced from the Zenith 1 samples, but I used a very transparent method of "equalizing" the samples to get a fuller sound. This is done without an actual equalizer, by simply applying custom amplitude envelopes to the recorded tone sweeps to attempt to make them flatter.

Zenith 2 This one also went through the Studio Projects VTB1 with a very slight amount of its 'tube blend'. Alternate tube set was used in the radio.
Chain: D/A > HLLY trans > Zenith, DO > VTB1 w/tube blend > A/D

Zenith 3 D/A > Zenith DI, DO > A/D

Zenith 4 The set up for this one had some inversion/phase cancellation or something, causing this response, which is very abnormal being mostly higher frequencies. So it doesn't really represent the radio but I kept it anyway. D/A > University PA amp > Zenith (DI), DO > A/D

Bell 1 Being a tuner, it has a nicer frequency response compared to the table-top radios.
Chain: D/A > EDM > Bell, DO > A/D

Bell 2 With Bell 1, the FM dial was tuned perfectly to pick up the transmitted signal. For this one the tuning was dialed intentionally off of the signal a little, which gives unusual results. The VTB1 was used here also. Chain: D/A > EDM > Bell, DO > VTB1 > A/D

Bell 3 The cheaper FM transmitter was used here, which is why it has more high end roll-off.
Chain: D/A > VTB1 w/tube blend > HLLY > Bell, DO > cheap mixer > A/D

Bell 4 This has a fairly flat frequency response except for the high-end boost. It can be good for some subtle enhancement. Chain: D/A > Bell DI, DO >A/D

Bell 5 This setup was similar to Bell 4, but came out even flatter. The only reason these have a frequency response up to and beyond 20khz is because the signal wasn't being transmitted via FM, and was instead directly injected into the electronics. Chain: D/A > Bell DI, DO >A/D

Arvin 1 This radio's character mostly falls in the mid to high frequency range, giving most of its programs a very hyped-up sound. Chain: D/A > EDM transmitter > Arvin radio, DO > A/D

Arvin 2 A different set of tubes and the inferior transmitter give this one a slightly different flavor from Arvin 1. Chain: D/A > HLLY transmitter >Arvin, DO > A/D

Arvin 3 Because no transmitter was used, the frequency response is a bit extended in the high end. D/A > Arvin direct in > VTB1 > A/D

Arvin 3+ Sourced from the Arvin 3 samples, which were enhanced with my transparent amplitude envelope method of "equalizing".

Arvin 4 This one included the Philco amplifier I used in my Philco Amp release, which helped produce a fuller frequency response. D/A > Philco amp > Arvin (DI), DO > A/D

Heathkit 1 The table top radios filter out much of the high frequency content, but the tuners don't, so with them you can actually hear the FM transmitter's own LP filter as part of the effect. Audio signals need to have everything above ~17khz filtered out before being modulated/transmitted via FM. The EDM does a great job of coming right up against that limit, with a smooth filter. D/A > EDM > Heathkit, DO > A/D

Heathkit 2   The HLLY transmitter begins rolling off the highs much earlier, and seems to emphasize lower frequencies a bit. This on also used alternate tubes. D/A > HLLY > Heathkit, DO > A/D

Heathkit 3   D/A > Heathkit DI, DO > A/D

Heathkit 4+ Same setup as with Heathkit 3, except there was a pre-emphasis eq curve applied to the tones before they went through the radio, to try to get a flatter result. After sampling, the tone sweeps were enhanced using amplitude envelopes. The result is a program with an almost totally flat frequency response. vst EQ > D/A > Heathkit DI, DO > A/D > enhanced

Philco 1   Because this radio is AM only, the only method used to get the signal into it was the direct input (DI) method. Try this effect for an instant lo-fi, very smooth, old-timey effect. Chain: D/A > Philco direct in, direct out > A/D

Philco 1+   Enhanced (amplitude envelope method) version of Philco 1. Retains the dynamic and harmonic characteristics of the original program, but has a much fuller frequency response.

Philco 2   The signal was injected at a different point in the radio than with Philco 1, and the radio's tubes were all swapped with a spare set. A cheap DJ mixer provided some level reduction to prevent clipping at A/D. This is the most filtered effect in the set. Chain: D/A > Philco direct in, direct out > cheap mixer > A/D

Philco 3   The signal was injected in yet another point in the radio's circuitry, giving a very different result. D/A > Philco DI, DO > A/D

Admiral 1   This radio has a bass/treble tone knob, and it was set close to center here. VTB1 was used, with a few clicks of tube-blend. D/A > EDM > Admiral, DO > VTB1 w/tube blend > A/D

Admiral 2+   This radio has a phono-in jack, which was used here with an EQ plugin for pre-emphasis before the radio to produce a flatter result. vst EQ > D/A > Admiral DI, DO > A/D

Admiral 3   This program has a Lo Cut control, which was sampled from the radio's tone knob. The control introduces a slight bass cut. This one did not use the radio's phono input jack because the tone knob does not influence anything sent in through it. Instead the signal was injected at another point in the circuit. Chain: D/A > Admiral DI, DO > A/D

Admiral 4   This one was sampled using a feedback loop. The loop included the entire signal path and caused a ripple to appear through the frequency response of the program, giving it a slight metallic flavor (which can be enhanced with the feedback control). Chain: D/A > HLLY > Admiral, DO > A/D (feedback to D/A)

Admiral 4 Alt   Same as Admiral 4 but I removed the feedback impulses, thusly removing the feedback itself. It gives a more normal frequency response and sound this way. I only did this for the fundamental part of the effect, meaning that the harmonics still have the quick feedback repeats and will still sound weird.

The stereo programs were made by pairing some of the previously described effects to others with similar frequency plots. Because of the differences between the channels, you may notice an increase in the stereo image of your input. There will also be phase differences so don't use these if that matters to you. Stereo DO6+ was not made the same way as the others (see its description), and stereo differences are much more subtle with it.

Stereo 1   Arvin 1 is used for the left channel, and Arvin 2 for the right.

Stereo 2   This one uses Zenith 1 for left, and Zenith 3 for right.

Stereo 3   Here, Bell 2 = left channel, and Admiral 1 = the right.

Stereo 4   Heathkit 1 left, Arvin 3 right.

Stereo 5   Bell 1 left, Bell 4 right.

Stereo 6+   I used the same setup that produced the Heathkit 4+ program, but in a tricky way, to create a subtle stereo result.

Tips/Ideas

- As mentioned elsewhere in this manual, setting '*f* mode' to 2 bypasses the radio filtering. Setting 'THD Mode' to 0 bypasses the harmonics. Bypassing both at the same time bypasses everything and gives you no effect, which would be pointless, so don't do that.
- The feedback control can be interesting, so don't forget to try it out.
- Looking at the knee for each compressor program should give you an idea of what you're getting. One of them expands the signal, rather than compressing it.
- The release control in the tone programs tends to be subtle, and is more noticeable in the main (not 'hot') programs, when processing something like drums with lots of dynamics. You can then sometimes notice an effect on the radio filtering aspect of the sound.
- Usually it's best to have the compressor instance before the 'hot' program, if you're trying to get overdrive distortion. It allows you to reduce the dynamic range a bit before going into the hot program, which means the distortion is more consistent. However, if your input is already compressed or isn't very dynamic to begin with, you can skip the compressor instance, or try putting it after the hot program. Sometimes it sounds better that way.

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