

## Usage guide for V1.6.0A-D DA/FA decoder

(Preliminary before complete docs are prepared.)

New features:

- \* Multi layer FA/DA decoding with enhanced speed.
- \* Much higher quality, even at --normal mode.
- \* Most of the time, --fx and --fz modes not needed, but still desirable. Diminishing returns beyond '--fx'
- \* Simplified (up-to-9) multi-layer usage.
- \* Simplified optimal calibration level setting.
- \* Only --fcd, --fa, --fcd=G, --fa=G, --fcd initiator are needed. (maybe --fce, not sure.)
- \* No worries about dynamics or levels/clipping between layers.

Not fully tested on this release:

Timing line-up of input/output files. There might be some timing drift. The timing code is entirely new, and not fully adjusted yet.

Most FA material IS encoded multi-layer, and the sound quality of decoding results is substantially improved when doing an accurate multi-layer decode.

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## USAGE

The general command syntax is *exactly* the same as before, but there are new features. Most of the older features & FA initiators are not needed, and some features will be deprecated as the documentation is updated. Some of the older features (the --pe switches, and the A-K modifiers) still have significant value. A few of the legacy initiators are still potentially helpful.

The most important thing to understand is the general command syntax. This 'general' example does not include any extra features and only enables FA decoding. Refer to the *single layer* example below:

(this command does a very simple single layer decode, simple 'dot' progress)

**da-avx --input=infile.wav --overwrite --output=outfile.wav --info=1 --fcd --tone=-13+N**

The above command might not sound optimal for multi-layer material, and might need '--fcd=G' or '--fa' or '--fa=G' instead because of the layering mismatch. However, a single layer decode often can be an improvement. Sometimes also, the tone value might best be --tone=-19+N instead. When decoding multi-layer material as single layer, sometimes adjusting the '--tone=' value will produce better results.

(this command does a very simple three layer decode, simple 'dot' progress)

**da-avx --input=infile.wav --overwrite --output=outfile.wav --info=1 --fcd --tone=-39+N --next --fcd --next --fcd**

The above 3 layer command needs some explanation:

The multi layer control groupings are separated by the '--next' switch. The '--next' switch starts a new layer/grouping. The first grouping starts by default. The second grouping starts after the first --next switch and the third group starts after the 2nd --next switch.

Each grouping uses the same defaults from the previous grouping. Since the first grouping starts with an '--fcd' initiator, then unless another initiator is used in the second grouping, then the '--fcd' will be the default. Notice that the 2nd and third '--fcd' aren't actually needed, because the defaults are inherited from the previous grouping. The 2nd grouping inherits the '--fcd' initiator from the first grouping, and the 3rd grouping inherits the '--fcd' from the 2nd grouping.

Also, the --tone values are inherited, but instead of a direct inheritance, the --tone value is incremented by 10dB for every step. For example, the first grouping starts with  $-33+N$ dB, then the second grouping inherits  $-23+N$ dB and the third grouping inherits  $-13+N$ dB.

Notice the use of '+N' in the --tone values. There is a default value that appears to be exactly correct for most FA decodes, and that value is based on '-13.55365' or '-19.55365'. So, the '+N' is a command line shorthand for the '-0.55365' value. The '+N' makes it easier to avoid memorizing or typing the extra '0.55365'.

(Exact equivalent command for the three layer decode above, but taking more advantage of inheritance)

**da-avx --input=infile.wav --overwrite --output=outfile.wav --info=1 --fcd --tone=-39+N --next --next**

Since each --next/layer inherits from the previous, the first --next creates another decoding layer, and uses '--fcd --tone=-29+N' as defaults. Likewise, the last '-next' creates the third/final decoding layer with '--fcd --tone=-19+N' as the default. You can change these values simply by specifying them right after the '--next' switch. IF you specify the '--fa/--fcd' initiator, then any '--tone' value should be specified after that initiator.

## Understanding the new FA initiator scheme

The new initiator scheme is very simple and logical. The `--fcd`, `--fcd=G` initiators are the most often used. However, certain recordings will require `--fa`, `--fa=G`. There is a variant of `--fcd=G`, which is `--fcf`. `--fcf` allows more highs around 9kHz through, and might be helpful for precision or enhancement reasons. There is also an `--fce` that allows more of the highest highs through. It is best to ignore `--fce`. The other FA initiators have been removed, and are ONLY a source of confusion.

There is a pattern for the sound of each initiator. Most of the time, you'll have to choose the initiator by listening for the correct sound. Here are the hints – each progressive initiator allows LESS highs through. So, the first one will allow the most highs through, that is, do less HF shelving cut. The most common initiators are in bold. The semi-common initiators are in 'italics'. The others are best ignored unless desperate.

Most to least highs:

<i>--fa</i>	<i>Sometimes used on classical or FA recordings that sound very dull</i>
<i>--fa=G</i>	<i>Similar to '--fa', except used a little more often.</i>
<b>--fcd</b>	<b>Except for --fcd=G, this is the most common initiator, used most often for the first layers</b>
<i>--fce</i>	<i>Seldom used, perhaps to boost the super highs in lieu of --fcd=G</i>
<i>--fcf</i>	<i>Seldom used, perhaps to mildly boost the 9kHz range in lieu of --fcd=G</i>
<b>--fcd=G</b>	<b>Most likely used initiator, except for the first (lowest) layer</b>
<i>--fcf=G</i>	<i>Very seldom used, but have encountered it from time to time.</i>

The most common FA initiator sequences (from -39+N to -29+N to -19+N):

`--fcd --fcd=G --fcd=G`  
or  
`--fcd=G --fcd=G --fcd=G`  
or  
`--fcd --fcd --fcd=G`  
or  
`--fcd --fcd --fcd`  
or  
`--fa=G --fcd=G --fcd=G`  
or  
`--fa --fcd=G --fcd=G`

If you allow a wrap-around (create 4 layers, either restarting at -49+N or -39+N), then the first initiator for the wrap around will most likely be the same as the first in the entire sequence. So, the sequence for 4 layers based upon the first 3 layer example above would be:

`--fcd --fcd=G --fcd=G`, and then `--fcd` again.

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## Simple, Generic Decoding Commands

These examples are reasonable 'starter' multi-layer decoding commands. These generally gives improved results on perhaps 2/3s (or even more) of FA material.

There are two general command-types that could be deemed 'generic' decode commands. The major variant beyond the two commands is the choice of -33+N or -39+N for the tone value:

(Generic command #1)

**da-avx --input=infile.wav --overwrite --output=outfile.wav --info=1 --fcd --tone=-33+N --next --fcd --next --fcd**

(Generic command #2)

**da-avx --input=infile.wav --overwrite --output=outfile.wav --info=1 --fa=G --tone=-33+N --next --fcd=G --next --fcd**

The above commands are great for a 1st level decode attempt on older recordings. The best first choice would be 'Generic command #1) because it does the least manipulation and gives baseline results. The most common variation is that the --tone= value might better be -39+N on some recordings. If these commands don't make some kind of improvement, and there is 'gating' in the sound, then it is possible that the recording is single level only (very unlikely) or isn't FA. If the results have too many highs instead of too weak, then try using --fcd=G in the first and/or second layers on command #1. So, you might try the following if 'Generic command #1' has too much HF: (First three are most likely, and the choice in the order below):

**da-avx --input=infile.wav --overwrite --output=outfile.wav --info=1 --fcd=G --tone=-33+N --next --fcd --next --fcd**

or

**da-avx --input=infile.wav --overwrite --output=outfile.wav --info=1 --fcd --tone=-33+N --next --fcd=G --next --fcd**

or

**da-avx --input=infile.wav --overwrite --output=outfile.wav --info=1 --fcd=G --tone=-33+N --next --fcd=G --next --fcd**

or even

**da-avx --input=infile.wav --overwrite --output=outfile.wav --info=1 --fcd=G --tone=-33+N --next --fcd=G --next --fcd=G**

The above generic commands also have the '--info=1' switch specified, where it gives the 'dot' progress indicator. Much greater detail can be had by using the '--info=2' switch instead.

Using the generic 3 layer commands on fast machines, the --final or possibly even '--fx' on the fastest >4 core machines might support real-time play. These higher quality modes make only minor improvements (slightly less grain on transients and a little less fog.)

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## Helpful Suggestion

The decoder actually has a slight tilt downwards vs frequency, but still sometimes sounds 'hot' on the high end. I suggest that sometimes the fadditional EQ switches at the end of all over switches might be helpful: **--pe6k=K,-0.375 --pe7p5k=K,-0.375 --pe9k=K,-0.375 --pe10p5k=K,-0.375 --pe12k=K,-0.375**. You can pick and choose which switches and you can use other gain values.

IMPORTANT HINT: (allowing more highs with `--fcd` at the first, lower initiators).

Very often, the proper initiator sequence doesn't use the same initiator for every level. The usual sequence is either the same initiator (e.g. always using `--fcd` or `--fcd=G`), or starting with `--fcd` at the lower (first) levels of decoding, and then `--fcd=G` for the higher levels. When/if you allow a wrap-around, like from 19+N back to 49+N, and if the first (lowest) initiator was something like `--fcd`, then the first wrap-around initiator would also be `--fcd`... Here is an example of this:

```
da-avx --input=infile.wav --output=outfile.wav --fcd --tone=-39+N --next --fcd=G --tone=-29+N --next --fcd=G --tone=-19+N --next --fcd --tone=-49+N
```

Note the above, where the first, -39+N layer is `--fcd`, the next two -29+N, 19+N layers are `--fcd=G`... The last, wraparound layer at -49+N is `--fcd` again. So, the sequence is: `--fcd (-39)`, `--fcd=G(-29)`, `--fcd=G(-19)` and then at wrap around `--fcd(-49)`... That is, wrap around is defined as the calibration (tone=) level going from a higher (-19dB) level back to a lower (-49dB) level.

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## About 'Higher Quality' modes

About higher quality modes. More than likely, they aren't needed. Most recordings have already been damaged by NR encoding/decoding, and the normal higher quality modes only help a little. On pristine material, the improvement is tremendous. Simply add the `'--fx'`, or `'--fz'` switches for slightly improved quality at the cost of a LOT of CPU. The amount of CPU usage is dependent on the number of layers, and can be very very slow when using especially `'--fz'`. Frankly, I am not patient enough to use `'--fz'` unless for testing purposes.

## Switches that you'll likely need

For this document, other than the simple examples above, we need to depend on the older, broken documentation. That IS bad, and I am planning an update soon. However, in the interim, I am listing in a simple form, the switches that you'll need. This is admittedly VERY primitive – I haven't even updated the man page yet, because I haven't chosen the commands to add and remove.

**These are the switches that I normally use, and I have been working on the most difficult material for testing reasons!!!**

Input/Output switches:

**--input=<infile.wav>**

Specifies audio file to read/decode.

**--overwrite --output=<outfile.wav>**

Switch combination that writes the output file.

**--info=1** or **--info=2**

Gives real-time display of program activity. I STRONGLY suggest using one of these switches.

**--outgain=<xxdB>**

Since the output level can be higher than the input level, it might be necessary to use less than 0dB gain on output. This switch gives that capability.

**--floatout**

For greater dynamic range, the decoder can produce floating point .wav files. Some consumer programs choke on FP files though.

Mode/Tuning switches:

**--fcd** or **--fa** or **--fcd=G** or **--fa=G** or **--fcf**

These are the EQ modes, that describe the kind of FA EQ curve being used on the current decoding layer. The modifier 'classical' is also needed for many classical recordings. To specify 'classical' and 'G', then use something like '**--fcd=classical,G**'. Even though '**--fcf**' is very similar to **--fcd=G**, it is just different enough to be needed from time to time. Most often, it appears that **--fcf** is sometimes best instead of **--fcd=G** on the 'first' of the decoding sequence, that is with the lowest '**--tone=**' levels.

**--tone=<calibration level>**

This specifies the calibration level used, and is almost standardized. The calibration is almost always -13.55365 or a multiple of 10dB lower. The calibration could be -19.55365 or multiple of 10dB lower instead. To make typing easier, instead of -13.55365, one can type -13+N, or -19+N, where 'N' fills in the .55365. This '+N' form also applies to the 10dB offsets also, so you can specify -33+N just as easily.

**--next**

This opens up a new decoding layer, just like doing another decode in sequence. The decoding modes default from the previous decoding modes, except the new '**--tone=**' value is incremented by 10dB. Normally, you should start with the lowest decoding calibration '**--tone=**' value first, and then let the program auto-increment the values to either 19+N or 13+N. After that, then the program automatically resets the increments back to the previous starting value for '**--tone=**' and cycles through again. It is probably best to specify all of the parameters unless you understand the defaulting and auto-increment mechanism.

**--nextda**

This opens up a true DA decoder instead of FA. No details yet, but follows the same rules, except the default calibration is always '**--tone=-**'

13.55365'. This can be overridden.

Mode/Tuning switches (cont'd):

**--final, --fx, --fz**

These are the anti-MD mode specifiers. The old specifiers are still available and theoretically provide higher quality at GREAT cost of CPU. I suggest that if you want to use an anti-MD mode, then '--final' gives good first order improvements, and '--fx' is probably all that you really need. '--fz' is really good, and really does ferret out distortions, but is VERY VERY CPU expensive, esp when running multiple layers.

Very useful information switch:

**--df**

This switch means 'dump filters'. This is very important because it also shows the calibration levels (--tone= values) for each layer. It can help if loosing track of what the tone= values are...

Stereo image switches:

**--wia=<Iratio>**

**--woa=<Oratio>**

**--wof=<Eratio>**

These switches override the default 'Iratio=2.0', 'Oratio=0.50' and 'Eratio=1.0'. Normally, Oratio is 1/Iratio. Usually Iratio is either 2.0 or 1.414. If the stereo image needs to be modified after the decoding, then Eratio can modify the stereo width. Numbers like 1.414, 1.19, 0.8409, 0.707 might be needed. Note that relations to sqrt 2 are most commonly used.

When 'classical' mode is operative, then Iratio=1.0 and Oratio=1.0.