Definition:  'Layer' means each DolbyA decoding step, usually 7.

Calibration of each layer, sequentially:
          NdB, N+10dB, N+20dB, N+30dB, N+40dB, N-10dB, NdB
          ('N' is the calibration offset, calculated from –coff=x)

Note:  all Eqs below are done with distortion cancellation.  EQ can be done more simply, but with 'special sauce' disabled.

ALL EQs assume 'special sauce' fully enabled.


There are potentially 4 phases of EQ and/or level manipulation:

**1**)  First step before anything else

**2**)  At the beginning of each **layer**: 0, 1, 2, 3, 4, 5, 6

**3**)  At the ending of each **layer**: 0, 1, 2, 3, 4, 5, 6

**4**)  FINAL EQ and 'special sauce' after **last layer**


FA decoding looks generally like this:

```
FIRST EQ(1) →
BEGIN EQ(2,0) → DA decode(0,N dB) → END EQ(3,0) →
BEGIN EQ(2,1) → DA decode(1,N+10 dB) → END EQ(3,1) →
BEGIN EQ(2,2) → DA decode(2,N+20 dB) → END EQ(3,2) →
BEGIN EQ(2,3) → DA decode(3,N+30 dB) → END EQ(3,3) →
BEGIN EQ(2,4) → DA decode(4,N+40 dB) → END EQ(3,4) →
BEGIN EQ(2,5) → DA decode(5,N-10 dB) → END EQ(3,5) →
BEGIN EQ(2,6) → DA decode(6,N dB) → END EQ(3,6) →
FINAL EQ(4)
```


First step(1) before anything else:

*  Any needed CD EQ

At the beginning of each layer (2)
                                ALL 1st order

Each EQ below is an HF shelf.

(LF side of the 1kHz→ 3kHz band)
MFLFbasefreq = 1000Hz
MFLFoffset = 250Hz
MFLFadoffset = 25Hz


-3dB shelf at (MFLFbasefreq - MFLFoffset) - MFLFadoffset
-3dB shelf at (MFLFbasefreq - MFLFoffset)
-3dB shelf at (MFLFbasefreq - MFLFoffset) + MFLFadoffset

+3dB shelf at (MFLFbasefreq) - MFLFadoffset
+3dB shelf at (MFLFbasefreq)
+3dB shelf at (MFLFbasefreq) + MFLFadoffset

-3dB shelf at (MFLFbasefreq + MFLFoffset) - MFLFadoffset
-3dB shelf at (MFLFbasefreq + MFLFoffset)
-3dB shelf at (MFLFbasefreq + MFLFoffset) - MFLFadoffset


(HF side of the 1kHz→3kHz band)
MFHFbasefreq = 3000Hz
MFHFoffset = 250Hz
MFHFadoffset = 50Hz

+3dB shelf at (MFHFbasefreq - MFHFoffset) - MFHFadoffset
+3dB shelf at (MFHFbasefreq - MFHFoffset)
+3dB shelf at (MFHFbasefreq - MFHFoffset) + MFHFadoffset

-3dB shelf at (MFHFbasefreq) - MFHFadoffset
-3dB shelf at (MFHFbasefreq)
-3dB shelf at (MFHFbasefreq) + MFHFadoffset

+3dB shelf at (MFHFbasefreq + MFHFoffset) - MFHFadoffset
+3dB shelf at (MFHFbasefreq + MFHFoffset)
+3dB shelf at (MFHFbasefreq + MFHFoffset) - MFHFadoffset


                        At the end of each layer(3):

gain +3dB

After the end of dynamics processing part of decoding (4)

                          LF band EQ for between 1kHz → DC.

This example is based on NORMAL recordings.  Modified for some recordings


LFbasemultfreq = 50
LFoffset = 20


1kHz, -1.5dB:

-1.5dB shelf at (LFbasemultfreq * 40) + LFoffset
1.5dB shelf at (LFbasemultfreq * 40)
-1.5dB shelf at (LFbasemultfreq * 40) - LFoffset


750Hz, -1.5dB:

-1.5dB shelf at (LFbasemultfreq * 30) + LFoffset
1.5dB shelf at (LFbasemultfreq * 30)
-1.5dB shelf at (LFbasemultfreq * 30) - LFoffset



500Hz, -6.0dB:

-6.0dB shelf at (LFbasemultfreq * 20) + LFoffset
6.0dB shelf at (LFbasemultfreq * 20)
-6.0dB shelf at (LFbasemultfreq * 20) - LFoffset


250Hz, -6.0dB:

-6.0dB shelf at (LFbasemultfreq * 10) + LFoffset
6.0dB shelf at (LFbasemultfreq * 10)
-6.0dB shelf at (LFbasemultfreq * 10) - LFoffset


200Hz, -6.0dB:

-6.0dB shelf at (LFbasemultfreq * 8) + LFoffset
6.0dB shelf at (LFbasemultfreq * 8)
-6.0dB shelf at (LFbasemultfreq * 8) - LFoffset


100Hz, -6.0dB:

-6.0dB shelf at (LFbasemultfreq * 4) + LFoffset
6.0dB shelf at (LFbasemultfreq * 4)
-6.0dB shelf at (LFbasemultfreq * 4) - LFoffset



50Hz, -6.0dB:

-6.0dB shelf at (LFbasemultfreq * 2) + LFoffset
6.0dB shelf at (LFbasemultfreq * 2)
-6.0dB shelf at (LFbasemultfreq * 2) - LFoffset


25Hz, -6.0dB:

-6.0dB shelf at (LFbasemultfreq * 1) + LFoffset
6.0dB shelf at (LFbasemultfreq * 1)
-6.0dB shelf at (LFbasemultfreq * 1) - LFoffset

```
-6dB shelf at 20Hz
-6dB shelf at LFbasemultfreq * 0.50
-6dB shelf at 10Hz

4 (four) EA of:
2nd order 0.75dB LF shelf at 80Hz/Q=1.0
```

```
                      HF side of required EQ (9kHz→21kHz)


HFhighbase = 21kHz
HFlowbase = 9kHz
HFoffset0 = 1.5kHz
HFoffset1 = 500Hz


Final rolloff:
All are 1st order, defined by begin/end freq.


Need three EACH of the following group delimited by "+" (sequentially):

++++++++++++++++++++++++++++++++++++++++++++++++

HF downward shelf between:    (HFlowbase - HFoffset0) - HFoffset1 -> (HFhighbase -
HFoffset0) - HFoffset1
HF upward shelf between:      (HFlowbase - HFoffset0) -> (HFhighbase - HFoffset0)
HF downward shelf between:    (HFlowbase - HFoffset0) + HFoffset1 -> (HFhighbase -
HFoffset0) + HFoffset1

HF upward shelf between:      HFlowbase - HFoffset1 -> HFhighbase - HFoffset1
HF downward shelf between:    HFlowbase -> HFhighbase
HF upward shelf between:      HFlowbase + HFoffset1 -> HFhighbase + HFoffset1

HF downward shelf between:    (HFlowbase + HFoffset0) - HFoffset1 -> (HFhighbase +
HFoffset0) - HFoffset1
HF upward shelf between:      (HFlowbase + HFoffset0) -> (HFhighbase - HFoffset0)
HF downward shelf between     (HFlowbase + HFoffset0) + HFoffset1 -> (HFhighbase +
HFoffset0) + HFoffset1


++++++++++++++++++++++++++++++++++++++++++++++++
```

**This below is a semi optional layer**, enabled only during 'special sauce' to get rid of lingering modulation of the signal.  Helps to purify sibilance.

The list of "offset frequencies" are, as follows, relative to 18kHz:
All numbers in Hz!!!  (read carefully, some calculations in there – lazy as I didn't do the calculations myself).

> 11.71875, 23.4375, 46.875, 93.75, 187.5, 375, 750, 1500, 3000, 6000, 9000, 12000, 15000, -11.71875, -23.4375, -46.875, -93.75, -187.5, -375, -750, -1500, -2250, -2625, -2625 - 187.5, -2625 - (187.5 + 93.75), -2625 - (187.5 + 93.75 + 46.875), -2625 - (187.5 + 93.75 + 46.785 + 23.4375), -2625 - (187.5 + 93.75 + 46.785 + 23.4375 + 11.71875)

For **each** of the above frequencies -- do the following variable set-up:

> Variable "offset" used below is EACH of the above frequencies in the list.

> Variable fbase = 18kHz - offset
> Variable fbm = fbase - HFoffset1
> Variable fbp = fbase + HFoffset1
> Variable hfm = HFhighbase - HFoffset1
> Variable hfp = HFhighbase + HFoffset1
> Variable r0m = fbm / hfm;
> Variable r0p = fbp / hfp;
> Variable ror = HFhighbase / fbase;
> Variable correction = 1.0 / sqrt(r0m * r0p * r0r * ror);

Here are the EQ filters FOR EACH 'offset frequency' above:
(this produces A LOT of cancellation EQ, but work super well to add on to the anti-MD and anti-IMD in the DA portion of the decoder).

+++++++++++++++++++++++++++++++++++++++++++++++
HF downward shelf frequencies from fbm to hfm
HF downward shelf frequencies from fbp to hfp
HF upward shelf frequencies from fbase to fbase * ror * correction
HF upward shelf frequencies from fbase to fbase * ror * correction

+++++++++++++++++++++++++++++++++++++++++++++++