Electric Signal

MMXV AD

User manual

Delta Transconductance band Compressor

Electric Signal 2016 - Revision Alpha

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Serial number	a priori Line voltage

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I.1 Thank You

For choosing the Electric Signal Delta Transconductance band Compressor and trust in us.

Eletric Signal has the mission to ensure the professional audio engineer has reliable, high quality equipment.

By knowing the status quo, annihilating the dogma's and standing on a many shoulders, Electric Signal is always innovating. Pushing the envelope further and tries to leave the real decisions for the engineer. By knowing we are only a switch in the chain we try to achieve to give the engineer the maximum potential by providing him the relevant choices.

It is tough to vocolise, however Arthur Shoppenhauwer writes in 'the world as will and reprentation'

"The effect of music is so very much more powerful and penetrating than is that of the other arts, for these others speak only of the shadow, but music of the essence."

I.2 Introduction

The Delta Transconductance band compressor is a vacuum tube based three band compressor and is essentially three stereo compressors, a three band passive crossover filter and a tube based mixer

For the compression, the delta mu technology is used. The 6386 tiode, used in many classic compressors is ideal for this task, nowadays difficult to obtain. Therefore the Delta Transconductance band Compressor uses the 6ba6/5749 penthode in triode configuration and has the same characteristics as the 6386 triode.

Like all delta mu compressors, balance needs to be (re)calibrate to cancel out 2nd order harmonics. Therefore these calibration settings are on the front panel. To make proper settings there are sockets on the front panel to measure the (in)balance.

Furthermore, solid state components are used in the power supply and the side chain. There are no integrated circuit's, electrolytes or transistors in the audio chain. The input and output are transformer balanced.
The controls on the front panel are toggle switches or rotary switches, so recall is possible. These switches control relay based attenuators, never touch the audio signal directly and make a short as possible audio chain.

I.3 Warning

For personal safety, please read this user manual and warning thoroughly before using the equipment. To reduce the risk of electric shock, it is essential that the unit is disconnected from the mains supply before removing the cover. The Delta Transconductance band Compressor uses thermionic vacuum electron tubes and works on a lethal voltage up to 300 volts. Even after a long period of disconnection, components can still be charged.

Use and store the Delta Transconductance band Compressor only in studio conditions. Do NOT operate the Delta Transconductance band Compressor in a hazardous area, near water or moisture.

Due the amount of tubes, the Delta Transconductance band Compressor

generates heat.
However the unit should never run this hot so that it makes it untouchable. Ensure that adequate ventilation is provided(see II.2).

In the event that this unit has been suffered an impact, an electrical safety test must be carried out before reconnection to the mains supply.

Refer servicing of the unit to qualified personnel only.

II.1 Getting Started

The package contains:

-this manual
-the Delta Transconductance band Compressor
-a power inlet cable

If you're not sure, control the operating voltage is the correct one(II.3) While doing so check for compromised vacuum and broken glass.

Use short XLR cables for input/output where:

pin 1: ground, shield
pin 2: positive phase, hot
pin 3: negative phase,cold

Use the power inlet cable to connect the equipment with a earthed power source.

Make sure the unit is installed in a rack, with sufficient ventilation(see II.2) or on a stable flat surface.

II.2 Heat and ventilation

Due to the amount of tubes the Delta Transconductance band Compressor uses more energy than a laptop and therefore generates significantly amount of heat.

The machine is equipped with a very low noise noctus fan and had a operation time of 100000 hour. Installed in a rack the unit should be inaudible. It is recomended to have 1U of space between the unit and other equipment. Make sure that the ventilation slots are not obstructed. When rack mounting this equipment, an external fan may be required to provide sufficient airflow.

II.3 Operation voltage

The Delta transconductance band compressor can operate from 240 vac 50 Hz or 120 vac 60 Hz. The line voltage is set at the factory based on the buyers request at time of the order. To change the line voltage, padlock the machine from mains. The line voltage switches are located at the back of the machin. Switch it in the correct position. Do NOT operate the equipment with the line voltage switch in the wrong position.

III Powering up the Machine

Now that the Delta transconductance band Compressor is installed and all connections are made, it is ready to operate

III.1 Power

Push the power button:  Power

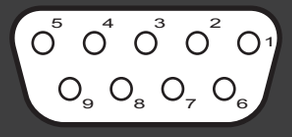
Now the light in the power button will illuminate, and the machine generate sa few clicks from the relays. Now the tubes heat up, inside them a physical process occures named 'the Edison effect' and electrons will flow into the micro universe of the tube. The gain reduction meters measure the current trough the tubes responsible for the compression and the leds of the meters will lit up. After 30 to 60 seconds the machine is ready for operation.

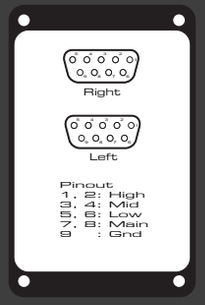
III.2 Balance measurement

The machine is calibrated in our factory, however the procedure is as follows. The tubes can drift directly after the warm up so it is recommended to leave the unit on for half an hour, before calibration /measurement. For this procedure is needed:

-a flat screwdriver
-a (digital) multimeter

Remove the the measurement panel. Behind the measurement panel there are two 9pins d-sub sockets, with the numbering of pins:

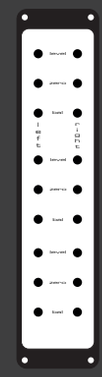




Set the multimeter to mV and connect the wires of the meter to pin 1 and pin 2 of the right D sub socket, If the multimeter measures anthing other than 0 volts the balance of this stage is not calibrated properly. See next chapter for balance calibration (III.3).

III.3 Balance calibration

If an unbalance is measured, second order harmonics occure. To rebalance the stage, apply the multimeter to the correct stage (see III.2) and use the flat screw driver to adjust the balance trim-pot until the multimeter indicates 0 volts.



bal

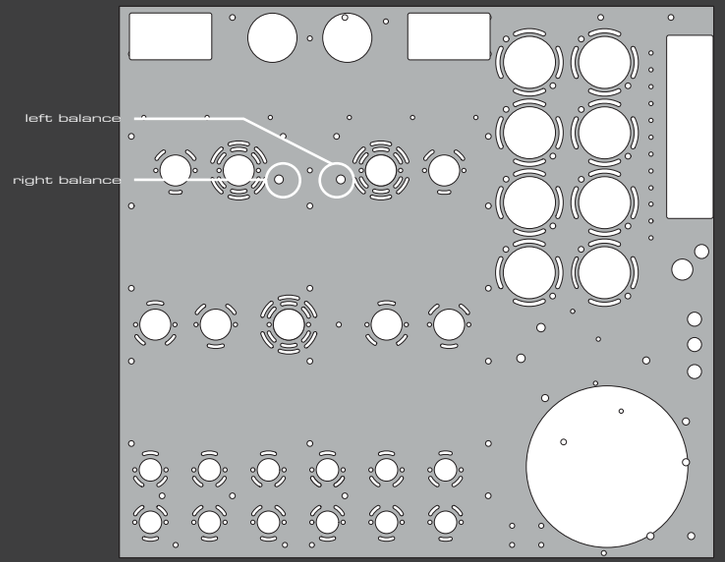
III.4 Meter zero/bias

While tubes age, their conductance decrease and therefore the gain reduction meters will indicate compression. Although this is not immediately a problem, there is a way to recalibrate the idle current of the tubes. Use a flat screwdriver to adjust the zero pot-meter of the desired channel (mid, high, low, and left or right) and set the meter to 0 dB. If thie problem is not solved, a tube replacement may be necessary. After altering the bias, it is recommended to re balance the stage.

zero

III.5 Output stage balance/ measurement

This procedure is equal to the delta mu gain stages; if an inbalance is measured at pin 7 and 8, the balance needs to be recalibrated. The balance pots are next to the 6h30 tubes. (see visual below)



III.6 Level

There is a possibility that an imbalance may exist between the levels low/mid/high and left/right. These imperfections can be set properly by adjusting the level trim-pots. They can atttenuate 2.5dB.

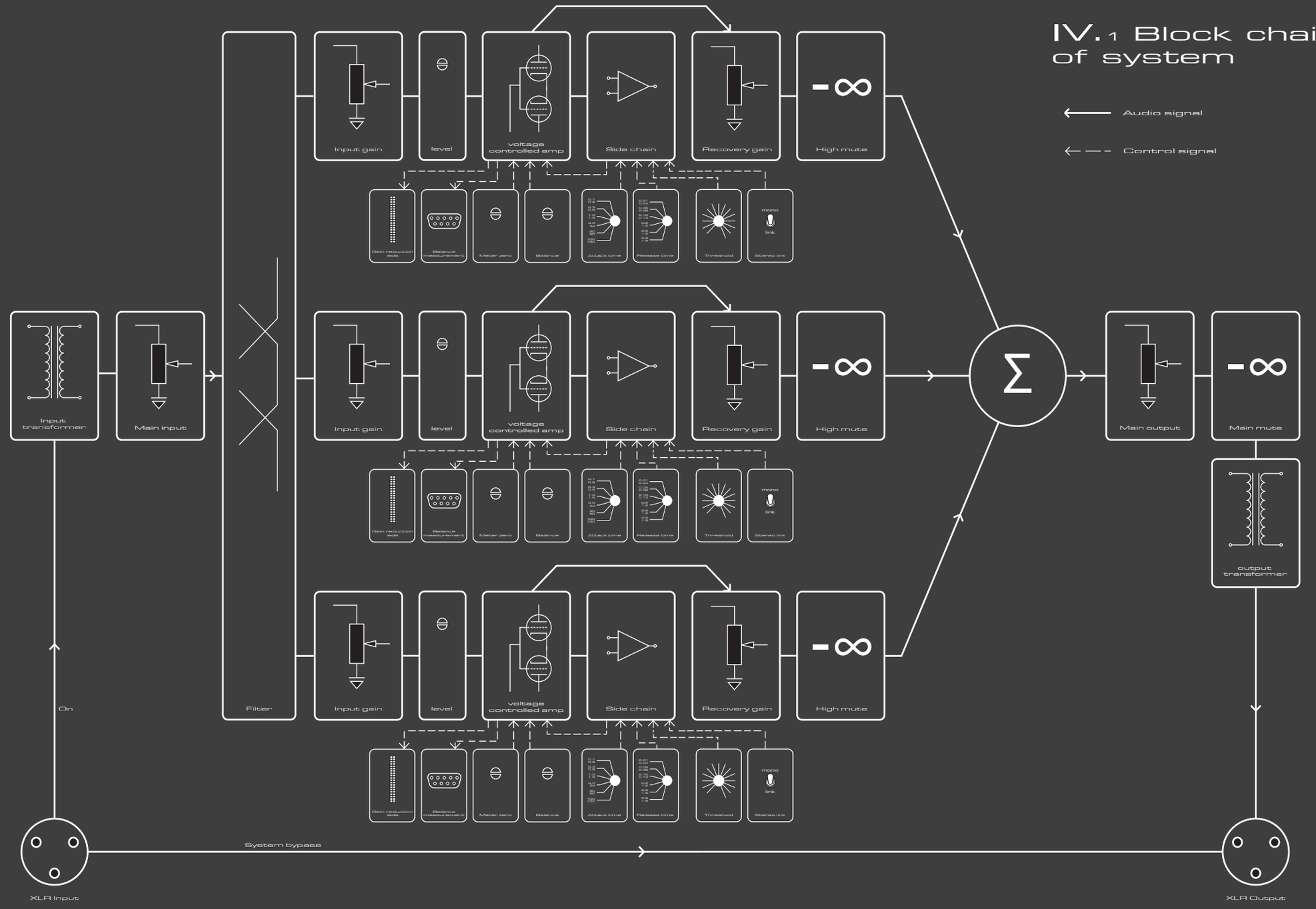
level

IV Using the system

The next chapters describe how the machine can be used. Due to the high amount of controls, compared to other compressors, the front panel may be a bit overwhelming, but is actually simple if familiar. Remember there are three elements: Main, filter and compressors. The controls for the compressors are arranged in a matrix. This matrix is present in the whole front panel design exept for the filter and main section. The controls for the filters are divided in two sections, because there are two crossover frequency's. Furthermore all secondary functions are engraved in red and all controls (besides the calibration trim-pots) operates the left and the right channel. As mentioned before, due to the relative large number of operations and the axiom; 'a shorter signal pad is in most cases better' the Delta Transconductance band Compressor uses more than 100 signal relays and they may give a light 'clicking' sound if a control is used.

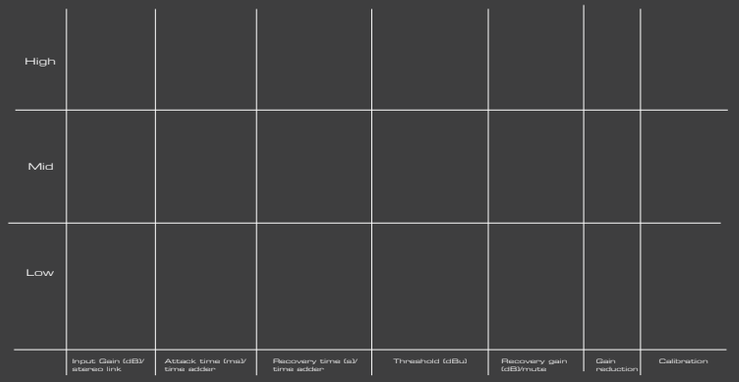
On the next page there is a visual of the block chain of the machine. In the manual and on the front panel, the three compressors of the machine will be defined by high, mid and low channel. Once the filter is bypassed this definition (high, mid, low) it may partially loose it's meaning, so for example; bypassing the low pass filter of the high to mid section resulting in the 'high' compressor working over the whole (20hz-20kHz) frequency range.

IV.1 Block chain of system

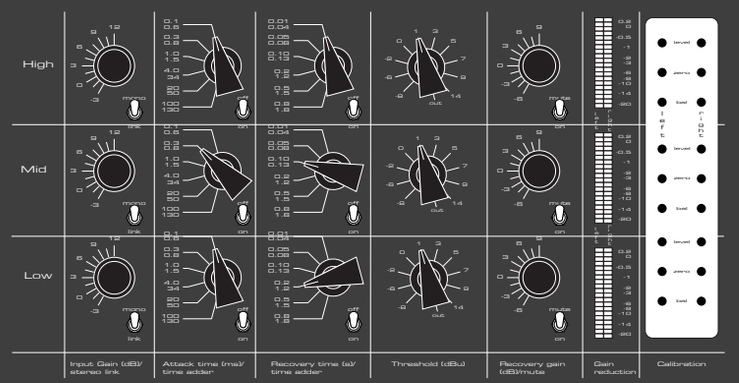


IV.2 Control Matrix

Behold the following visual: This is a manipulated image from the front panel; the control, main and the filter section are edited out. What is left is an empty matrix.



The controls are arranged in that matrix:



IV.2.1 Input Gain

This Control is an 11 position rotary switch, and controls a relay based attenuater with a resolution of 1.5dB per step. Together with the Threshold control this defines the slope and the threshold of the compression curve.

IV.2.2 Attack time

The attack control determines the speed with which the compressor attacks a level above the threshold point. It also determines the ratio of action the compressor will have on short duration spikes and transients.

IV.2.3 Release time

It determines the time-rate of compression holding action. Increasing the control clockwise lengthens the holding time.

IV.2.4 Threshold

The threshold control is used to adjust the amount of compression in conjunction with the input gain. With the control in the full clockwise position (out), there will be no compression. Turning the control anti-clockwise increases the amount of compression.

IV.2.5 Recovery gain

This Control is an 11 position rotary switch and controls a relay based attenuater with a resolution of 1.5dB per step. Besides amplefying the signal after compression, this control can be used to mix the low, mid and high band together.

IV.2.6 Stereo link

When switched to “mono”, the amount of compression of the right channel is independent of the left channel. When switched to “link” the control voltage is combined, left and right channel are reduced in gain by the same number of dB.

IV.2.7 Mute

Mutes the channel.

IV.3 Gain reduction meters

Six meters, mid, high, low and left.right measure the current trough the remote cutoff valves responsible for the gain reduction/compression and therefore measures the gain reduction. Over time while the tubes age and the conductance of them lowers, the meters may drop. However the bias can be recalibrated if this occurs (see III.3)

IV.4 Main output

24 position rotary switch, controls the output gain, with a resolution of 1 dB per step.

IV.4.1 Main Mute

If the main output rotary switch is turned completelyanti clockwise to the - the output is muted.

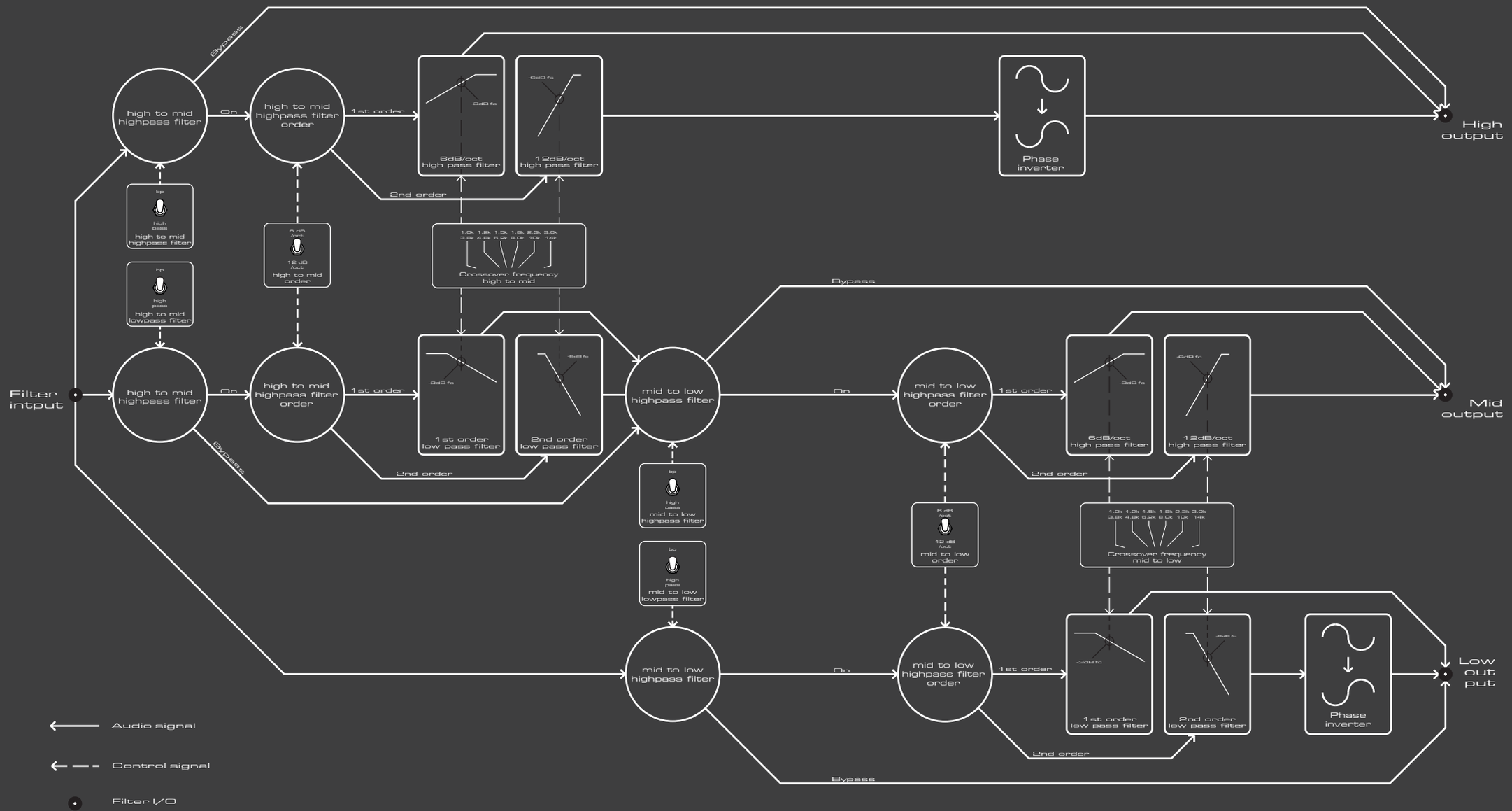
IV.4.2 Main system bypass

Removes all the electronics from the signal chain and links the input to the output, see the block chain IV.1.

IV.4.3 Main input

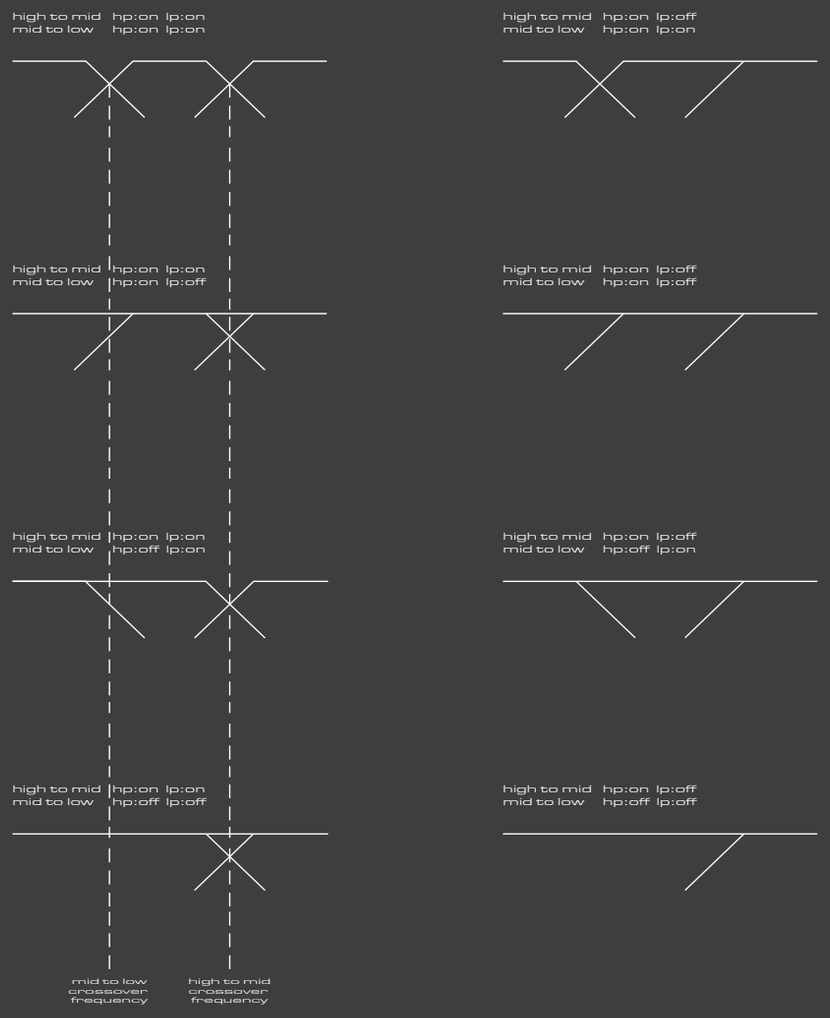
11 position rotary switch, controls the output gain, with a resolution of 1dB per step, Notify that this control can effect every compressor in the unit. In combination with the input gain 121 gain combinations are possible

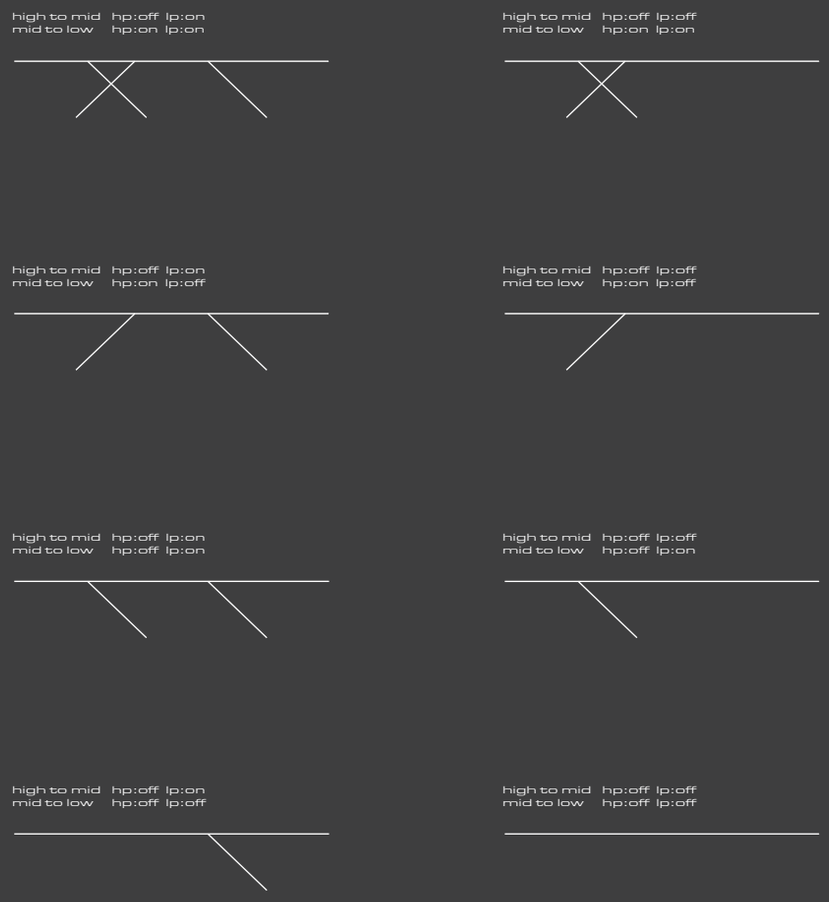
V.1 Filter
Block chain



V.2.1 Bode plot's of filter setting -

high to mid 6dB/oct - mid to low 6dB/oct





V.2.2 Bode plot's of filter setting -
high to mid 12 dB/oct - mid to low 12 dB/oct

high to mid hp:on lp:on
mid to low hp:on lp:on

high to mid hp:on lp:off
mid to low hp:on lp:on

high to mid hp:on lp:on
mid to low hp:on lp:off

high to mid hp:on lp:off
mid to low hp:on lp:off

high to mid hp:on lp:on
mid to low hp:off lp:on

high to mid hp:on lp:off
mid to low hp:off lp:on

high to mid hp:on lp:on
mid to low hp:off lp:off

high to mid hp:on lp:off
mid to low hp:off lp:off

high to mid hp:off lp:on
mid to low hp:on lp:on

high to mid hp:off lp:off
mid to low hp:on lp:on

high to mid hp:off lp:on
mid to low hp:on lp:off

high to mid hp:off lp:off
mid to low hp:on lp:off

high to mid hp:off lp:on
mid to low hp:off lp:on

high to mid hp:off lp:off
mid to low hp:off lp:on

high to mid hp:off lp:on
mid to low hp:off lp:off

high to mid hp:off lp:off
mid to low hp:off lp:off

V.2.3 Bode plot's of filter setting -

high to mid 6 dB/oct - mid to low 12 dB/oct

high to mid hp:on lp:on
mid to low hp:on lp:on

high to mid hp:on lp:off
mid to low hp:on lp:on

high to mid hp:on lp:on
mid to low hp:on lp:off

high to mid hp:on lp:off
mid to low hp:on lp:off

high to mid hp:on lp:on
mid to low hp:off lp:on

high to mid hp:on lp:off
mid to low hp:off lp:on

high to mid hp:on lp:on
mid to low hp:off lp:off

high to mid hp:on lp:off
mid to low hp:off lp:off

high to mid hp:off lp:on
mid to low hp:on lp:on

high to mid hp:off lp:off
mid to low hp:on lp:on

high to mid hp:off lp:on
mid to low hp:on lp:off

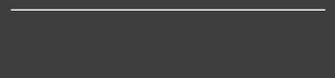
high to mid hp:off lp:off
mid to low hp:on lp:off

high to mid hp:off lp:on
mid to low hp:off lp:on

high to mid hp:off lp:off
mid to low hp:off lp:on

high to mid hp:off lp:on
mid to low hp:off lp:off

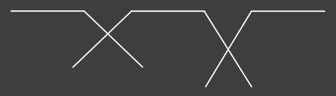
high to mid hp:off lp:off
mid to low hp:off lp:off



V.2.4 Bode plot's of filter setting -

high to mid 12dB/oct - mid to low 6dB/oct

high to mid hp:on lp:on
mid to low hp:on lp:on



high to mid hp:on lp:off
mid to low hp:on lp:on

high to mid hp:on lp:on
mid to low hp:on lp:off

high to mid hp:on lp:off
mid to low hp:on lp:off

high to mid hp:on lp:on
mid to low hp:off lp:on

high to mid hp:on lp:off
mid to low hp:off lp:on

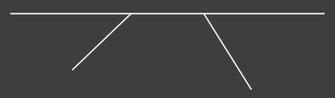
high to mid hp:on lp:on
mid to low hp:off lp:off

high to mid hp:on lp:off
mid to low hp:off lp:off

high to mid hp:off lp:on
mid to low hp:on lp:on

high to mid hp:off lp:off
mid to low hp:on lp:on

high to mid hp:off lp:on
mid to low hp:on lp:off



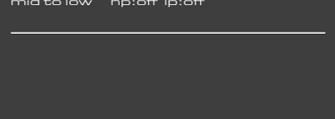
high to mid hp:off lp:off
mid to low hp:on lp:off

high to mid hp:off lp:on
mid to low hp:off lp:on

high to mid hp:off lp:off
mid to low hp:off lp:on

high to mid hp:off lp:on
mid to low hp:off lp:off

high to mid hp:off lp:off
mid to low hp:off lp:off



V.3 Filter

In general, the filter splits the signal in a low, mid a high band. furthermore the filter settings enables the user to enables/bypass filters and sets the order or bypass all the filters to enable paralell compression. The next subjects besides cross over frequency discribes one of the two filter sections but they work equally.

V.3.1 Paralell compression

New York compression, mowtown compression or parralell compression is one or more compressors working paralell on the same material and later mixed together. Often, a heavy compressed signal is combined with an ligtly or uncompressed signal. The filter bypass function makes it possible to change from a band compressor to a set of three stereo compressors configured in paralell, wich enables paralell compression.

The bode plot's in the prevous chapters indicates that if the machine is set as three paralell compressors, the order and filter crossover frequency cotrol has no function, see for example the right bottom bode plot (V.2.1-V.2.1)

V.3.1 Crossover frequency

See V.2.1 and V.1, Controls the crossover frequency of the low passfilter and the highpass filter. Notify the frequency multiplier switch(1x white or 4x red) so Twelve cross over frequency values can be set,

V.3.2 Lp bypass

Activates or bypasses the lowpass filter, see V.2.1 to V.2.4

V.3.3 Hp bypass

Activates or bypasses the highpass filter. see V.2.1 to V.2.4

V.3.4 Order

This cotrol defines the rollof slope, choose beteween first order(6dB/oct) of second order (12dB/oct). The first order filter crossoverpoint is at -3dB. And the second order filter is -6dB.

VI.1 Tube complement

Tubes for replacement can be obtained from our factory.
The Delta Transconductance band compressor uses the following thermionic tubes:

12X	6ba6/5749/6k4p	Compression
3X	6H30	Input/output
2X	6H2p(-ev/-er)	Mixing
4X	12AT7/ECC83	PI/tonecontrol

Notify that the remote cutoff tubes, responsible for the compression(6ba6/5749/6k4p) need to be matched pairs. The 5749W (wich comes with the compressor) is an joint Army Navy electron tube from General Elecric.

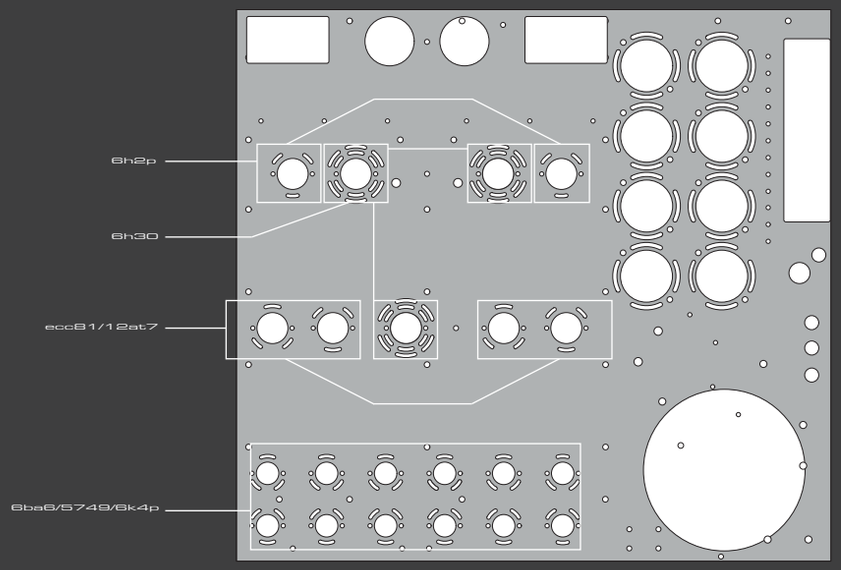
The two 6h30 for the output need to be matched triodes.

The Delta Transconductance band compressor comes with two russian milspec 6h2p-er, responsible for mixing, if desired to use an european ecc81 or an nowadays 12ax7 make use of a ecc to 6h2p socket (contact electric signal for more information)

Not every ECC83 is usable due to the maximum rating specifications, contact electric signal for more information.

See next subject for tube replacement.

VI.2 Replacing the tubes



To remove a tube, press the screening can down and twist anti-clockwise, when it will spring out. Then remove the tube by pulling upwards, possibly using a cloth if it's still hot. Take care not to bend the pins when putting back in.

VII.1 Disclaimer

Electric Signal reserves the right to alter specifications without prior notice. Electric Signal cannot be held responsible for any damage resulting in using the Delta Transconductace band Compressor.

VII.2 Warrenty

The unit comes with a 24 month warranty covering parts and labor, It is essential that it is returned to our factory or to the dealer from which it was purchased for repairs to be carried out otherwise the warranty is invalidated. Contact Electric Signal how to send it to us.

VII Specifications

Input impedance	15k
Output impedance	600
Signal to noise	>80dB
Power consumption	200Watt max
Weight	12kg
Operating voltage	240vac/130vac
THD	0,1%
Frequency responce	-1dB 12Hz-30KHz
Attack time	0,1-130ms
Release time	10ms-1s

IX Edison Effect

Edison Effect or Thermionic emission:

Thermionic emission is the thermally induced flow of charge carriers from a surface or over a potential-energy barrier. This occurs because the thermal energy given to the carrier overcomes the work function of the material. The charge carriers can be electrons or ions, and in older literature are sometimes referred to as "thermions". After emission, a charge that is equal in magnitude and opposite in sign to the total charge emitted is initially left behind in the emitting region. But if the emitter is connected to a battery, the charge left behind is neutralized by charge supplied by the battery as the emitted charge carriers move away from the emitter, and finally the emitter will be in the same state as it was before emission.

The classical example of thermionic emission is the emission of electrons from a hot cathode into a vacuum (also known as thermal electron emission or the Edison effect) in a vacuum tube. The hot cathode can be a metal filament, a coated metal filament, or a separate structure of metal or carbides or borides of transition metals. Vacuum emission from metals tends to become significant only for temperatures over 1,000 Kelvin The science dealing with this phenomenon has been known as "thermionics", but this name seems to be gradually falling into disuse.

X Declaration of Confirmity

The Delta Transconductance band Compressor complies with the requirements of Conformité Européenne.

CE

XI Contact details

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XII Recall sheet