~Sebatron~

Innovative Australian Audio

THORAX

Valve Pre/EQ/Comp Operating Manual

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1. Introduction

-Introduction to the THORAX

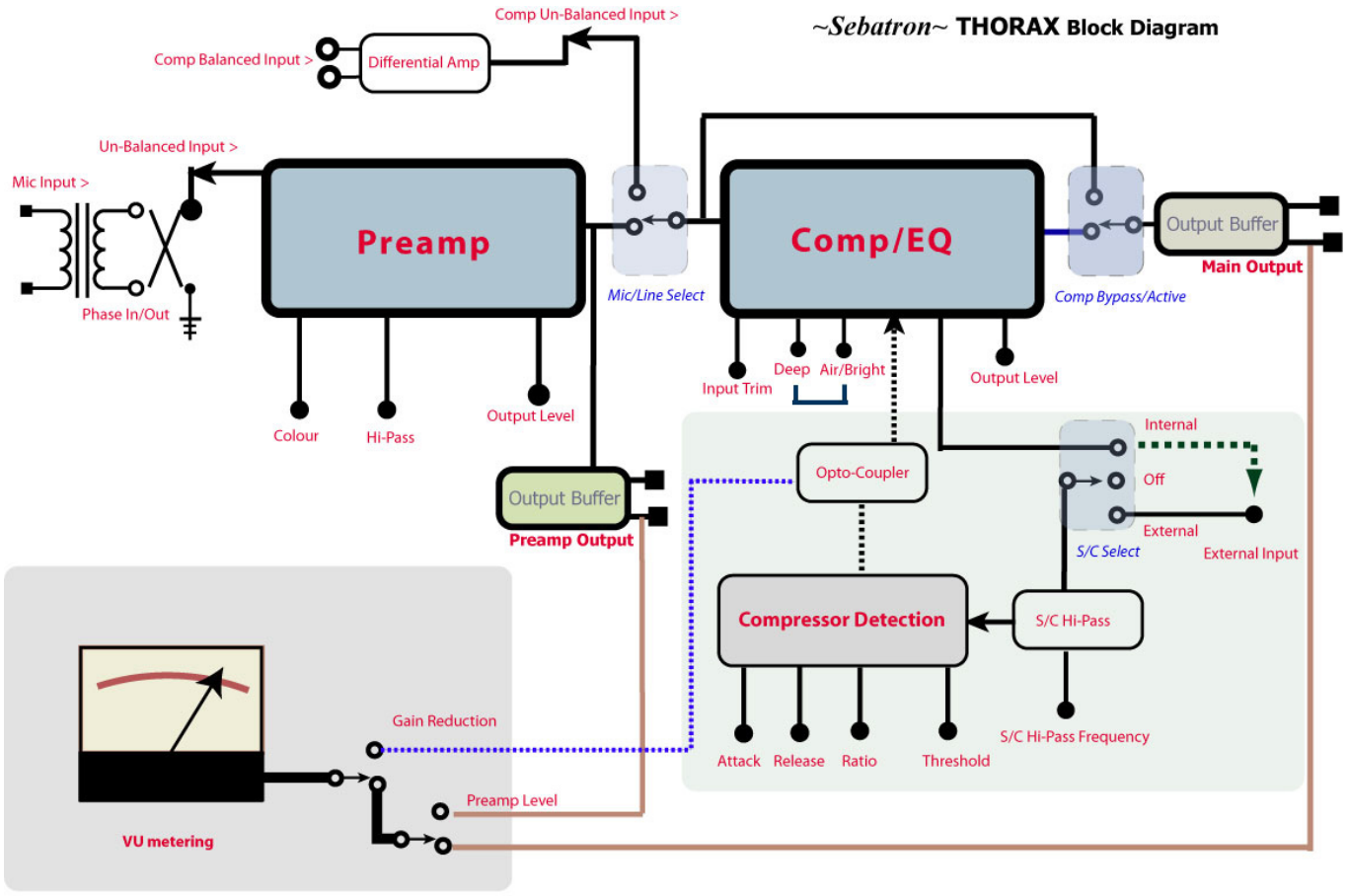
The new THORAX presents you with not only a practical and neutral audio amplifying device but one that can provide an enhancement and accurate dynamic control of the audio signal only achieved through equipment costing many thousands of dollars more.

THORAX has been designed to give the Professional and Home recording Engineer a High Quality Valve Microphone and Direct Input Preamplifier/Equalizer/Compressor at a reasonable cost. Great care has been taken in circuit layout and design to create not only an accurate and transperent sonic tool but one that can also overdrive with symmetry and subtly dynamically control or 'Compress' the input signal in a manner which is musical and close to the operation of the human ear.

As is common knowledge , Valves are distinctly different to Transistors and Intergrated Circuits in the sense that they have a unique operating region that does not terminate in an abrupt brick wall as Solid State Technology does.It is in this region that the valve expresses most of its harmonic qualities.Operating in a clean or transperent manner is also possible when the gain of the valve is dialed right back and degress of negative feedback are introduced to increase linearity and bandwidth. There are no chips in THORAX which means , above all else , the unit is very difficult to damage with an incorrect interface. Chips , or intergrated circuits , are often a weak point in consumer-level hybrid valve designs because they fail easily when overloaded.This is not the case with the THORAX channelstrip , being a High Tension valve design , it is free of such failings and is ruggedly dependable.

The Optical Compressor is a feedback design and has been configured for maximum flexibility and the widest possible adjustmant range.The Compressor Detection circuitry has been optimized for fast , tight charactersics but also has significant flexibility to mimic some classic slower time curves of the past. The fully variable attack/release controls allow the user to easily fine tune the compression envelope and the Ratio control is invaluable for providing the gateway into compression that is neither heard nor unheard. At the far left setting , the ratio control operates at the minimum and careful alignement with the envelope can provide a compression characteristic similar to analoge tape.Particular attention has been made to compression depth so signals can be subtley compressed or heavily slammed.
Gain makeup is all valve and the interplay between the input trim control and output level control can create some interesting and organic textures to signals.The compressor stage features balanced and unbalanced inputs/outputs that can handle a wide range of levels from cold to hot.Two of these stages can be linked up via the side chain input on the back to form an accurate stereo buss compressor.Mixes can be processed in an organic manner when run through the THORAX circuitry even with no EQ or compression acvtivated.

All circuitry is fully bypassable so the signal can be compared or A/B'd easily with the unprocessed original signal.


~Sebatron~ THORAX Block Diagram
Comp Un-Balanced Input >
Comp Balanced Input >
Differential Amp
Un-Balanced Input >
Mic Input >
Phase In/Out
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Output Level
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S/C Hi-Pass Frequency
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Ratio
Threshold
Gain Reduction
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1. Introduction

The ~*Sebatron*~ THORAX is comprised of two main sections, the THOAX/AXIS preamp and the THORAX Valve Equalizer and Optical Compressor :

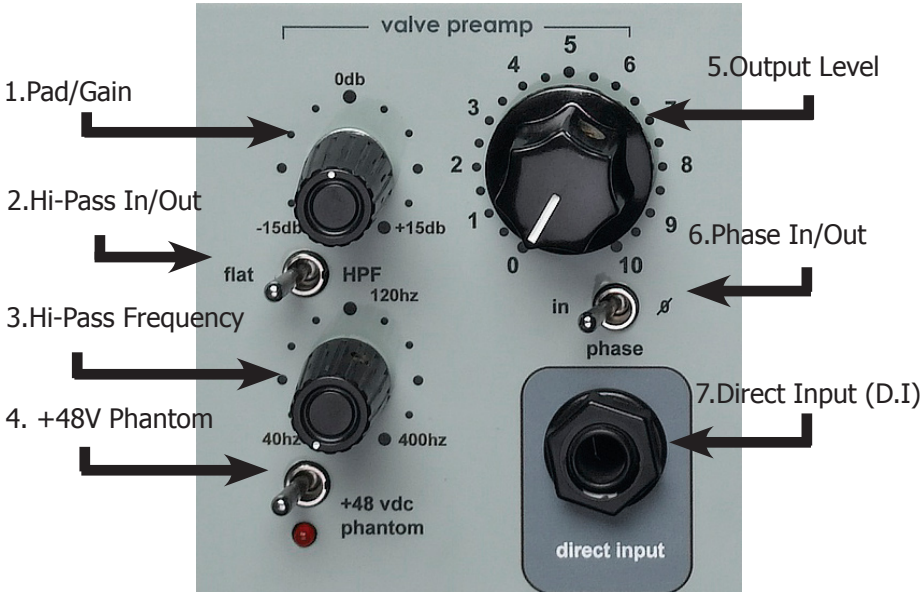
-THORAX (AXIS) Preamp features :

- Fully balanced Transformer coupled XLR microphone input
- High Impedence unbalanced ' Direct Input ' for Guitar , Bass , Keyboards or line level signals etc.
- Fully balanced and unbalanced XLR and phono inputs and outputs
- A variable ' pad/gain ' control that changes the colour of the signal as well as acting as a pad or gain control increasing overall sonic flexibility
- Quality 12AT7/ecc81 Valve running on a High Voltage rail providing steller musical signal amplification and enhancement
- A gentle 40Hz to 400Hz variable High Pass Filter for removal of unwanted lower frequencies without signal annomalies
- 180 degree mic input phase reversal switch
- +48VDC Phantom power for condenser microphones
- Output level control for transperent control of the final output signal
- Wide swing and internally calibrated accurate VU metering
- Wide Bandwidth and Low Noise quality Class A circuitry
- Quality switches , potentiometers and components used throughout

-THORAX Valve Equalizer and Optical Compressor features:

- Fully balanced and unbalanced phono and XLR inputs and outputs.
- Switchable mic/line input
- Variable input trim control so signals can be driven into Valve Colour..
- Fully variable and switchable Two band Boost Equalizer.
- Fully variable Threshold,Ratio,Attack,Release.
- Tight/Smooth switch similar to Peak/RMS.
- Switchable Side-chain insert for external EQ or 'Ducking'.
- Variable High Pass Filter for compressor side-chain control.
- Transperent Output Level/Gain Makeup
- Switchable Pre/Post/GainReduction Metering

2. Controls



-1.Pad/Gain

The Pad/Gain control is a dual feature parameter that acts as a pad for dealing with heavy mic/line signals and also acts as a gain boost when turned towards the right.This is done by varying the amount of interstage coupling and negative feedback through a double ganged potentiometer. Everything from close miced drums to gentle acoustic overheads can be directed and controlled through the useage of the variable pad/gain control.

In addition to mic preamp work , this control allows enough range for the user to directly inject heavy line level signals for additional valve processing and gradually wind in some 'Harmonic Distortion' or colour subtlely into the signal for enhancement or creative purposes. The pad/gain control provides just over 30db swing that allows the user to comfortablely deal with heavy audio signals (up to +10db)with a very transperent reponse but also able to drive a signal into mild to heavy distortion if required.

2. Controls (cont.)

-2.Hi-Pass In/Out

Activates variable Hi-Pass Filter for frequencies 40hz to 400hz.
The HighPass filter is smooth and organic with a very gradual slope.

-3.Hi-Pass Frequency

Adjusts frequency as to when High Pass Filter becomes effective.
This filter is useful on many sources particularly voice or guitar to eliminate very low frequencies that will subsequently eat into the dynamic range of the signal yet offer little or no real musical value.

Easy to put back in at mix time if needed , but better eliminated earlier on in the tracking phase rather than latter. By switching this feature into the signal path , there is no added noise , distortion or colouration.

-4. +48V Phantom Power

Provides +48VDC to drive condenser microphones.

-5.Output Level Control

The Output level control provides up to another 30db of gain , however control is clean and transperent through the whole scale.

From mic input to final output , the preamp stage can provide up 70db of gain with an infinite range of tonal and sonic textures available inbetween.

-6.Phase In/Out

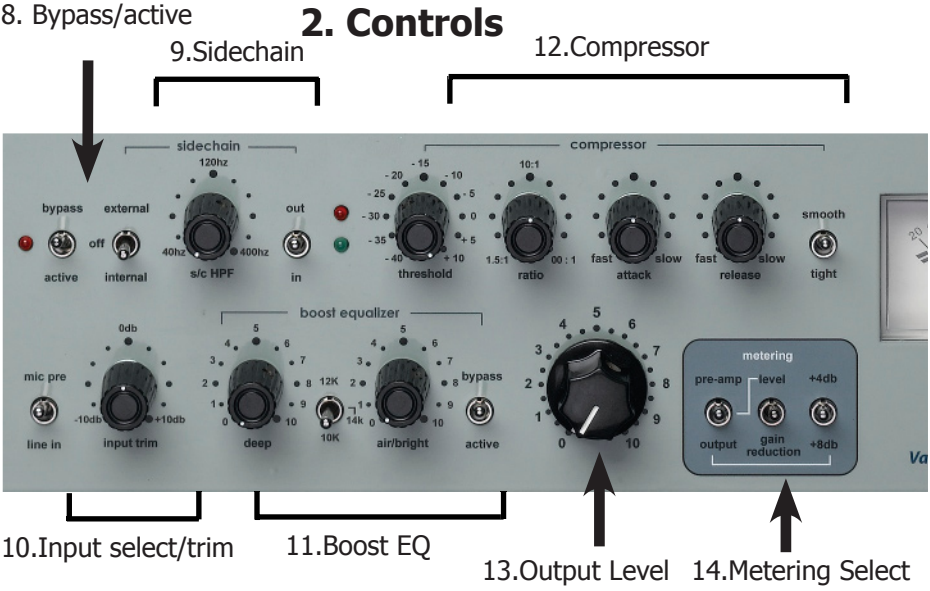
Adjusts the polarity of the audio signal by shifting phase of the signal by 180 degrees. Used to correct phase errors in multiple micing networks.

-7.Direct Input (D.I)

Unbalanced input for Bass , Guitar , Keyboards or line level signals.
This is a High Impedance input that can handle a wide range of signals and strengths and is another highlight of the preamp.

Something plugged into this socket will automatically turn off the microphone XLR input this is done to minimize noise.

2. Controls



-8.Bypass/active

Selects whether complete compressor/EQ stage is active or inactive. This includes the whole signal path right up to the Output Level control.

-9.Sidechain

Selects between internal , no sidechain (middle spot) or external sidechain input.

Internal is for normal compression use where the signal being compressed is dynamically controlled by itself.

When the middle spot of this selector switch is selected , the sidechain for the compressor is turned off.This is the same as turning the compressor off but not bypassing the Audio Path. This is handy if you are using the Compressor section purely for its valve tonal or its sonic qualities (for example processing a mix using just EQ).

If External input is selected the THORAX can be used for ducking by using a completely seperate signal from the one being used from the input.This is possible by inject a signal into the unbalanced S/C input on the back .It will act as the 'control' for the compressor while the normal audio is modulated by this.

If no plug is inserted into the S/C input on the back , it automatically reverts to internal S/C select.

-10.Input select/trim

The input select switch selects between the preamp output or the balanced/ unbalanced line inout on the back.

If no signal is present in either preamp or line input , it can be confusing when this is set to the wrong position as no output will be present.

The input trim control allows the user to comfortably drive the signal into the compressor section for more colour control.

2. Controls

-11.Boost EQ

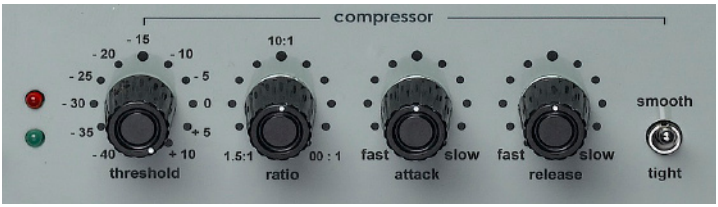
The Boost EQ is two band with a switchable top end frequency.The EQ stage also features a complete bypass switch which removes it completely from the signal path.

High Frequencies were deliberately chosen for the 'Air/Bright' band so as to provide the user with the benefit of processing this part of the spectrum in an organic manner using the open ended gain provided by the Valves.

The 'Deep' EQ band is similar to the VMP switch 'Deep' but this time presented in fully variable form.

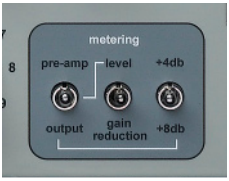
-12.Compressor

The Optical Compressor Cell is the Dynamic control instrument of the THORAX.
This is adjusted by the standard set of Parameters that are found on many ompressors.



Attack , Release and Ratio are fully variable and invaluable when tailoring the envelope of the required compression.

The compression 'mode' is setup by the 'tight/smooth' control toggle.This is similar to Peak/RMS switching but a little more extreme.Set the desird position by taste , but generally speaking the 'Tight' position is more suited to fast transient signals like drums whereas the 'Smooth' may be more applicable to vocals and Bass.



-13.Output Level

Provides transperent gain makeup post compression. Another 40db of pure Valve based gain to offset the gain reduction of the compressor or to simply use as Signal Gain.

-14.Metering Select

The Metering select section allows the user to monitor signals from either the preamp , the main output or the amount of gain reduction in db that the compressor is doing.

By carefully monitoring these levels it is possible to accurately calibrate the THORAX into many recording situations that may vary in signal and or compression levels.

3. Operation

-Microphone Recording :

1. Plug microphone into back XLR mic input of THORAX.
If microphone is of a condenser type , then activate the +48v phantom power switch.
2. Plug output of AXIS preamp (using balanced or unbalanced output and cables) into soundcard etc.
3. Start with pad/gain control fully left and slowly bring up the output level control until the desired recording level is attained.
4.If more colour is required , then slowly rotate the pad/gain control to the right to bring the level up while at the same time keeping an eye on the final output level so as to not clip the next piece of equipment connected to the THORAX.
Adjust the output level control to suit requirements.

-Direct Input (D.I.) Recording :

1. Plug Bass , Guitar , Keyboard or any other unbalanced output electronic instrument into the Direct Input socket on the front panel.
2. Plug output of THORAX preamp (using balanced or unbalanced output and cables) into soundcard etc.
3. Start with pad/gain control fully left and slowly bring up the output level control until the desired recording level is attained.
4.If more colou is required , then slowly rotate the pad/gain control to the right to bring the level up while at the same time keeping an eye on the final output level so as to not clip the next piece of equipment connected to the THORAX.
Adjust the output level control to suit requirements.

-Processing Line Levels :

THORAX is capable of handling relatively strong line level signals.By carefully running line level signals into the preamp it is possible to wam up your mixes and give them that special sonic texture that they may require.
1. There are two inputs to choose from when running line level signals into the THORAX preamplifier.You can either use the XLR balanced line signals on the back or the Direct Input signals on the front.Neither has any special sonic advantages , the bulk of the colouration is obtained from the valve.Generaly speaking though , we recommend the Direct Input on the front panel as this is a direct path to the grid of the valve.
2. Plug output of THORAX (using balanced or unbalanced output and cables) into soundcard etc.
3. Start with pad/gain control fully left and slowly bring up the output level control until the desired recording level is attained.
4.If more colour is required , then slowly rotate the pad/gain control to the right to bring the level up while at the same time keeping an eye on the final output level so as to not clip the next piece of equipment connected to the AXIS preamp.Adjust the output level control to suit requirements.

3. Operation

-Using Compression :

There are two different ways to input a signal through the compressor. One is through the preamp and then by selecting the preamp input on the select switch of the compressor. This is fine for processing Mic or Instrument level signals and to a certain extent fine if you want to process line level signals through the preamp and drive the relevent stages slightly for some colour. However , should you want to transparently compress a line level signal it is recommended that you use the Balanced/Unbalanced line input on the back and select the appropriate position on the input select switch.Make sure your line level is adjusted to an optimum range by adjusting input trim and keeping an eye on the output metering.

After doing this simply adjust the Threshold and Ratio controls for the desired level of gain reduction.This will vary according to instrument and musical enviroment and of course your own personal tastes.Carefully train your ear and use the training to aid your adjustment of all the Compressor parameters.

As a rough guide , compressing instruments or voices anywhere from 1db to 6db is usually an average with higher levels of gain reduction like 8db and over reserved for drum transients etc.

-Using no Compression :

As mentioned , THORAX can also be used as a signal processor even without any compression activated.By carefully adjusting the 'Input Trim' control , a degree of Colour can be introduced into the signal and that may be all that is required for the mastering of a piece of Music or Sub Mix.This Colour is organically obtained from the valve and as mentioned can act as a subtle compressor when aligned correctly.

Additionally , with some EQ added , compression may be a non-requirement of the signal you wish to process. The High Frequency bands of the EQ can open up and otherwise dull and lifeless mix and the deep band adds warmth presence and depth. These features are also extremely useful for processing loops and samples etc.

-Getting some distortion :

Although not designed as a 'dedicated distortion unit ' , it is possible to utilize THORAX as an effective tool just for its ability to crunch signals into saturation.This is best done through the preamp input as there is more gain and control.

Turn the pad/gain control right up to the max and turn down the output level to get workable signal levels.Work the input trim and compressor output levels to get the desired texture.There are no rules , use the THORAX to electronically sculpt signals so they will sit better in a mix. Sometimes just crunching signals to semi-clean can yeild great results.

4. Servicing and Maintenance

-Replacing Valves :

Valve Type: 12AT7 (equivilants : ECC81 , CV4024)

The THORAX channelstrip comes stocked with brand new J.J valves.We use J.J valves because of low microphony , consistency and of course the sound which is generally regarded as neutral.Valve life varies from valve to valve but is generally three to five years with average useage and up to ten years if used sporadically and kept in a good enviroment. As valves approach the end of their lifespan there usually is a rise in noisefloor (hiss-noise) and a narrowing of the sonic bandwidth , or in other words , Bass and Treble response start to drop off.Irronically , this can somtimes work in ones favour as the sound becomes a little more focussed and may sit in a mix easier. However , usually the difference is negligable and it won't be apparent until new fresh valves are installed.If useage is minimal and within 10 hours a week on average , then we would recommend valve replacement around the four to five year mark.Heavier useage , twenty hours a week and upwards for example , we would recommend valve replacement within three years.

In all cases , useage is simply having the unit on , not necessarily passing signals. Even in an idle state with no signals there are still transformers and valves operating and it is recommended that for general useage that the unit be left on for periods of no longer than eight hours at a time . If longer periods are required it is recommended that the unit be switched off for at least half an hour for some cooling to occur before proceeding with the next shift.

-Mains Voltage Selector :

On the back of the unit near the mains power input you will see a small rectangle cut into the chassis so that access can be gained to the Mains Power Switch. This switch should be set to your mains power voltage.
This switch is usually set in the factory for the appropriate voltage that the unit is destined for , however , in cases of re-sale etc. it is always recommended to check this switch before initial power up.

There are two scenarios if the switch is incorrectly set.
One of the scenarios may be fatal to your unit (causing internal damage) . This would be where local power is 220/240VAC and the unit is set to 110/120 VAC. If the unit is powed up in this mode , damage starts to occur within seconds.If caught in time there may be no damage at all.Just for the record , the first components to perish in this way would be the smoothing capacitors in the power supply.

5. Specifications

Frequency Response : 20Hz - 90 KHz +/- 2db
Maximum Input level (mic) : +4db
Maximum Input Level (D.I) : +10db
Maximum Output Level : > +30dbm balanced
Total Gain of preamp section: <68 db
Additional Compression makeup gain: <40db
Input Impedance (mic) : 1K ohm
Input Impedance (D.I) : 100K ohm
Output Impedance : Less than 600 ohm
Min Compression Attack Time: 1ms
Max Attack Time: 25ms-tight 1sec-smooth
Min Release Time: 4ms
Max Release Time: 5 sec-tight 6 sec-smooth

Power:
Externally switchable 110/120/220/240 VAC for global useage.
Build:
Chassis is 1.2mm mild steel powder coated 'Tectured Black'.
Front Panel is 3mm mild steel powder coated 'Transformer Grey'.
Single sided printed circuit boards.
Modular P.C.B preamp for easy servicing and modifications.
Topology:
Topology is all discrete and Class A Valve and Solid State signal path running on +300V and +60V rails respectively.
Circuitry:
Class A Discrete and low noise.
Two Dual Triode 12AT7/ecc81 and High Voltage Silicon Transistors.