

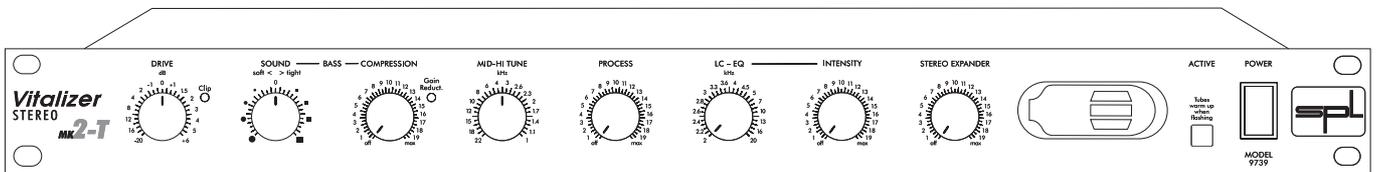


soundperformancelab.com



Manual

Model 9739



Vitalizer
STEREO
MK 2-T

Dual Channel Tube Program EQ

Manual

R & D: Wolfgang Neumann & Ruben Tilgner

Version 2.3 – 09/2000

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Dear customer,

Thank you for the confidence you have shown towards SPL electronics GmbH by purchasing the SPL STEREO VITALIZER MK2-T. You have decided to use a tool of high performance which sets you in the position to have faster success and a better sound quality in your music productions, live sound applications and pre-masterings.

As a typical SPL unit the STEREO VITALIZER MK2-T combines exemplary specifications and high manufacturing standard with excellent sound quality to provide you a precious component for recording purposes.

Please read this manual carefully to ensure you have all the information you need to use the STEREO VITALIZER MK2-T. We wish you every success with your STEREO VITALIZER MK2-T.

Your Sound Performance Lab-Team

I would like to start with my thanks to all our staff, who created what is to be described here. The importance of their exceptional qualification and talents cannot be overestimated.

Our products are often tested and compared in many publications and by our customers themselves and constantly valued with best results. I would like to pass on this broad appreciation to those, who deserve it – my excellent colleagues.

Hermann Gier

Foreword

Thanks

Introduction

The Stereo Vitalizer MK2-T is an equaliser concept which makes use of scientific psychoacoustic technology to process audio signals. The Vitalizer-technology has been constantly improved over the past nine years since its invention by SPL's Wolfgang Neumann and Hermann Gier.

The Stereo Vitalizer MK2-T is the tube version of the successful Stereo Vitalizer MK2. The 'MK2-T' utilises two Sovtek 12AX7-double triode tubes. One of them is used within the Mid-Hi Tune filter and gives the mid frequencies even more accurate transparency with a soft, unobtrusive sound. The second tube is used within the Stereo Expander. The stereo image not only gains more width but also more depth, transparency and clarity because of the pleasant tube harmonics. Great emphasis has been put into maintaining mono-compatibility. The treble range is reworked with new LC-filters, which focus on achieving a smooth, silky sound pattern. High frequencies are livened up extremely noiseless without them sounding hard or aggressive.

As with all Vitalizer models you can choose between a dry, percussive bass (Tight) or a punchy, soft and very deep sound character (Soft). The bass is accentuated without any risk of emphasising the lower mid frequencies unnaturally. An easy to use compressor complements the bass section allowing the correction of level change due to bass processing.

The Stereo Vitalizer MK2-T is especially designed to serve the needs in recording, mastering, cutting and post production work. Used on complete mixes or being inserted into the subgroups to treat specific parts of the mix, the Stereo Vitalizer MK2-T will perform the same task as those esoteric and costly equalisers often used for audio sweetening but with far greater tonal flexibility and at a much lower cost.

Operation Safety



Important security advices – please read them carefully!

The housing of the Stereo Vitalizer MK2-T has the standard 19"-EIA format and occupies 1U (44.45 mm) in your rack. When installing the unit in a 19"-rack, the rear side of the unit needs some support, especially in a touring case.

The Stereo Vitalizer MK2-T should not be installed near units which produce strong magnetic fields or extreme heat. Do not install the Stereo Vitalizer MK2-T directly above or below power amplifiers. Check that the voltage details quoted on the back panel are the same as your local mains electricity supply. Use a minus (-) screwdriver to set the voltage selector to the voltage for the area in which the unit will be used.

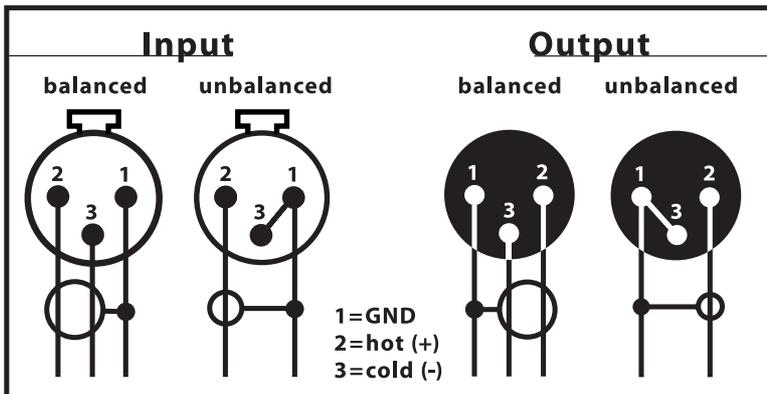
Never cover up the ventilation slots on the top of the unit. If, during operation, the sound is interrupted or indicators no longer illuminate, or if abnormal odor or smoke is detected, or if liquids are spilled on the unit, immediately disconnect the power cord plug and contact your dealer.

Only clean your Stereo Vitalizer MK2-T with a soft, lint-free cloth.

Before connecting the Stereo Vitalizer MK2-T switch the power off at all connected units.

The Stereo Vitalizer MK2-T is fitted with both XLR-connectors and TRS stereo jacks for balanced operation, though the jacks may be used with unbalanced connections simply by plugging in mono jack-plugs. The level difference that normally occurs when a balanced input or output is used unbalanced is automatically compensated for.

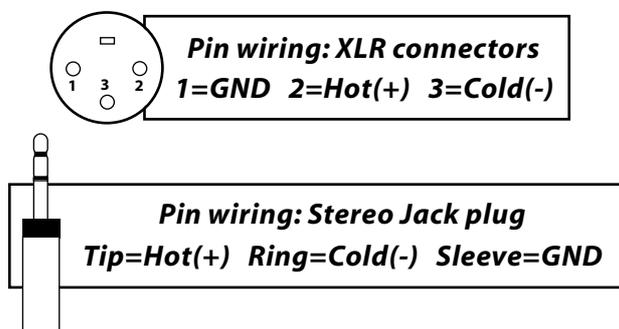
Should the need arise to use the XLR connectors in an unbalanced system, pin 3 of the XLRs should be grounded. The following illustration shows how to properly unbalance a balanced signal:



Tip: Inserting a mono jack also unbalances the XLRs.

Both output stages operate in parallel, so it is possible to connect two different destination units simultaneously, for example to record to two different media at the same time or split the output between a mixer and effects processor. However, only one type of input (jack or XLR) should be connected at a time – the Stereo Vitalizer MK2-T is not intended to be used as a mixer!

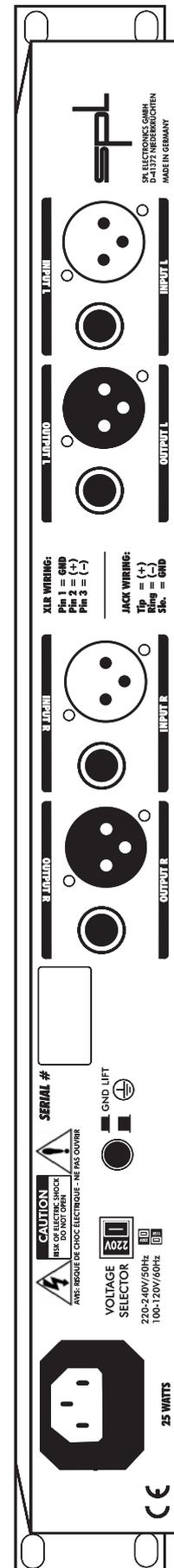
To ensure optimal signal quality, SPL has developed a new hybrid-component balanced input/output stage using all laser-trimmed resistors with a tolerance of 0.01%. This approach has resulted in high CCMR (common mode rejection) values better than -80dB at 1kHz.



Other rear panel connections and switches:

- Voltage selector: 220-240V/50Hz or 100-120V/60Hz
- CSA/UL/VDE approved 3-pole power plug
- GND-Lift switch

Connections



Applications

Recording Studio

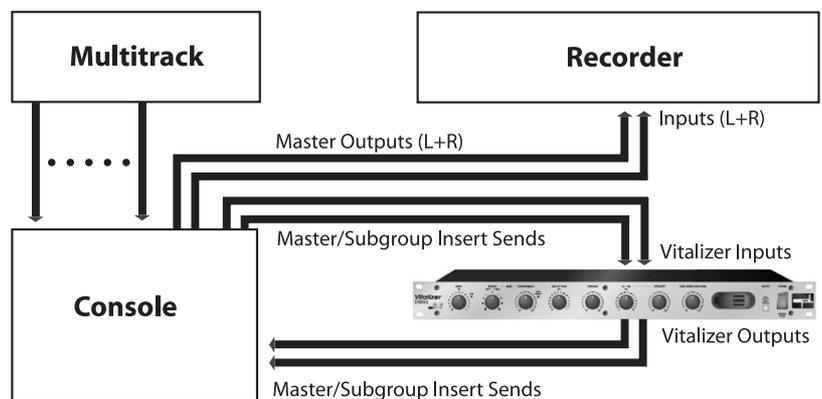
Application 1:

The Stereo Vitalizer MK2-T inserted into the master or subgroup inserts of the console.

1. In Recording Studios, the most popular application is to process a final mix, either while mixing or during post-production prior to cutting. Insert your Stereo Vitalizer MK2-T into the master-inserts of your console or right in between a playback and a recording unit. Although inserting the Stereo Vitalizer MK2-T into the master inserts is the most popular application, we advise to insert the unit into the sub-groups, so that specific elements of the mix are being treated with the Vitalizer process.

When patching the Stereo Vitalizer MK2-T into the sub-groups or master-breaks of the console, note if the master breaks are switched 'pre' or 'post' fader. They should best be switched 'pre' fader, so that a variation of the master fader does not affect the input level of the Stereo Vitalizer MK2-T. The effect level and the treated sound will then remain unchanged. It is important to use full-range monitors to assess the effect of any bass processing in and out of circuit in order to appreciate just how much processing has been added; the brain soon acclimates to changes in timbre and it is easy to overdo it! If in doubt, refer frequently to known recordings played through the same monitor system.

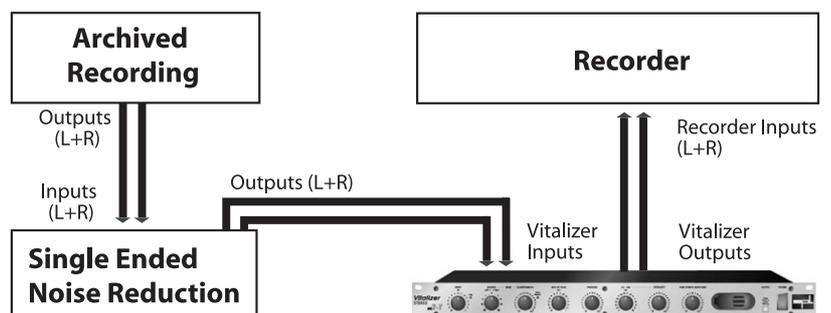
Do not connect the Stereo Vitalizer MK2-T between master-outputs and amplifier. The major disadvantage of this connection is the varying input sensitivity with each fader movement.



Application 2:

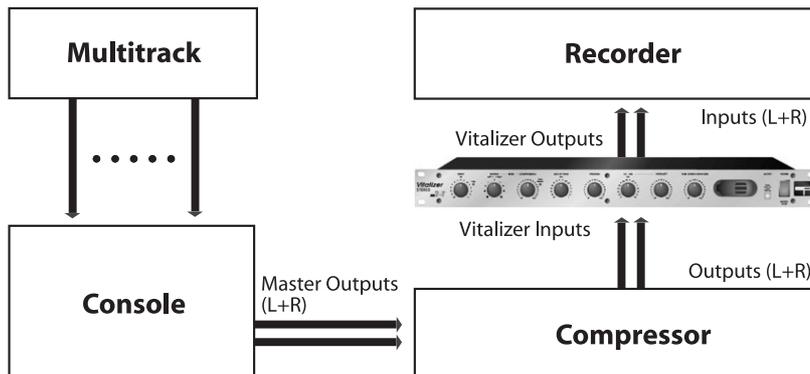
The Stereo Vitalizer MK2-T inserted between noise-reduction and recorder to improve archived recordings.

2. Processing of existing master tapes is another popular stereo application, both during post-production and when reprocessing archive material for CD release. If a single-ended noise reduction system is used to clean up the original, the Stereo Vitalizer MK2-T can make a significant contribution in restoring the high end detail that invariably suffers during such treatment. In many cases, the restored master can be made to sound appreciably better than the original.



3. In electronic music, the Stereo Vitalizer MK2-T can be used to add new range and depth to samplers and synthesizers and also to process existing effects such as delay and reverberation. Even budget instruments and processors with limited audio bandwidths can be made sound full-bodied and detailed.

If you want to use a compressor in the master chain after the console, use your Stereo Vitalizer MK2-T after the compressor. The Stereo Vitalizer MK2-T will receive a level-corrected signal which helps to operate even more precise. If you use the Stereo Vitalizer MK2-T before the compressor negative side-effects such as pumping could get more audible.



Application 3:

The Stereo Vitalizer MK2-T inserted between compressor und recorder.

Tape duplication is often made at high speed resulting in a deterioration of the high frequency spectrum of the copies. By processing the output from the source machine, additional brightness can be added to compensate for deficiencies in the copying system. It may also be necessary to modify the bass end as many high speed systems fail to reproduce the bass end of the spectrum faithfully.

In both areas, the Stereo Vitalizer MK2-T is both effective and simple to set up. Real-time duplication is getting more and more popular. In that application the Stereo Vitalizer MK2-T offers the same advantages as described under "Recording Studio" and "Video & Film Post Production".

The Stereo Vitalizer MK2-T is perfectly suited to produce radio jingles, commercials, and station idents. Because of the psychoacoustic nature of the processing, the treated signal will appear louder, closer, brighter and more intelligible than whatever was played beforehand, thus creating a powerful impact.

In commercial radio, the Stereo Vitalizer MK2-T can be used to process the entire on-air signal helping the radio station stand out from the competition. The integral surround processor can also be used to create a wider stereo spread which is important when most of the audience are listening on systems with a narrow speaker geometry such as is the case with in-car sound and portable stereo music systems.

Tape Duplication

Broadcast

Sound Reinforcement

During live performance or in club installations, the Stereo Vitalizer MK2-T is a powerful ally in maintaining speech intelligibility under difficult conditions. It is also of great benefit in systems designed to play recorded music because the illusion of loudness can be maintained at lower absolute SPLs. This could be particularly beneficial with the introduction of new noise level legislation. On the subjective side, the Stereo Vitalizer MK2-T helps produce a detailed, tight sound, even from indifferent speaker systems giving an improvement in perceived audio quality.

The Stereo Vitalizer MK2-T can be of great value when mixing under time-pressure. You can almost leave the onboard EQs flat and create the FOH sound with the Stereo Vitalizer MK2-T in the master inserts.

Video & Film Post Production

As in other areas, the Stereo Vitalizer MK2-T can be used to sharpen and enrich dialogue, even when the microphone placement is less than optimum as is often the case when filming due to the need to keep the mic out of shot. Music soundtracks benefit in the ways already described for audio-only applications and the fact that the Stereo Vitalizer MK2-T is so quick to set up can save a lot of wasted time spent tuning multi-band equalisers.

Time-compressed audio can also be treated to restore the lack of timbre so often caused by such intensive processing. This is particularly valid in the case of vocal narratives as even a relatively small amount of time-compression or expansion can dramatically compromise the sound quality.

On the post production work on Spike Lee's "Malcolm X" the voice of Denzel Washington playing Malcolm X was treated with the Vitalizer for dramatical reasons:

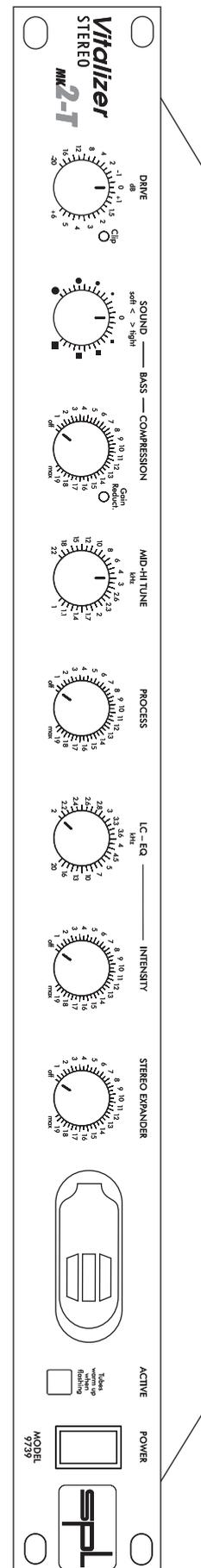
"We wanted to make sure that there was a dramatic quality difference between the voice-over and the sync dialog," Fleischman adds, offering a mixer's view. "You try to find a balance between two center mics then balance that with whatever you're using from left-right pair. We then treated it with the SPL Vitalizer, a psychoacoustic equalizer. It brings a lot more presence to the upper end of the spectrum and a very deep low end so that the voice sounds full." (Mix Magazine)

When setting up the Stereo Vitalizer MK2-T for the first time, it is wise to approach the controls in a specific order to avoid confusion and to achieve positive results right from the start. Use a CD as source.

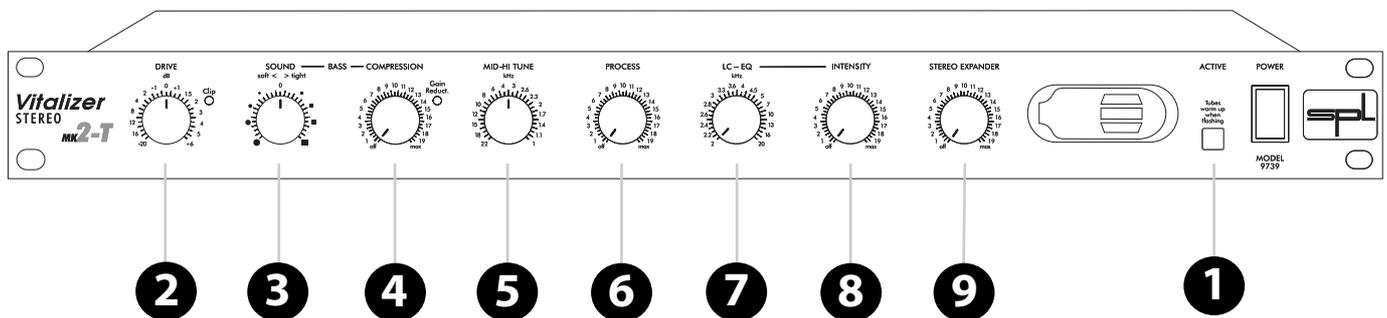
Starting set-up positions (see front panel picture):

- Drive to zero (centre position)
- Bass Sound to zero (centre position)
- Bass Compression to Off (counter clockwise)
- Mid-Hi Tune to 3.5kHz (centre position)
- Process to Off (counter clockwise)
- LC-EQ to 2kHz (counter clockwise)
- Intensity to Off (counter clockwise)
- Stereo Expander to Off (counter clockwise)

1. Press the Active switch. You will yet hear no audible change in the sound.
2. Slowly move the Process control in from the extreme left. You will find that starting from the 9 o'clock position all frequencies above 3.5kHz (initial setting Mid-Hi Tune) are becoming more intense. Frequencies below this point are diminished. First set the Process control at 1 o'clock.
3. The next step is to shift the Bass Sound control from the zero position to both sides. Turn to the right: The bass sounds tight and dry. Turn to the left: The bass sounds soft and round. Decide on a bass sound of the desired amplitude.
4. Now start varying Mid-Hi Tune. The original setting is 3.5kHz. Turn to the right: The programme material sounds brighter and gets more mids from about 1.5kHz. The Mid-Hi Tune control sets a starting frequency above which all frequencies are processed. If this starting frequency is lowered, the frequency spectrum included in processing increases. The programme material then sounds brighter and clearer. Turning the control to the left shifts the starting frequency from 3.5kHz to higher frequencies. The programme material then sounds increasingly dull, because fewer and fewer frequencies are being included in the process, the higher the frequencies become. The setting you choose is a matter of personal taste.
5. The LC-EQ is variable in frequency and amplitude. This section helps you to give voices or other instruments in improved presence. Leave the LC-EQ control in the set-up position (counter clockwise) and turn in the Intensity to around 12 o'clock. This makes the processed signal more natural with a soft, silky-sounding top-end.
6. Finally, turn the Stereo Expander control to the 12h-position. Note the soft spreading stereo image.



Control Elements



Active

ACTIVE switches a relay hard-bypass circuitry for XLR and jack operation.

ACTIVE Status LED flashes while tubes warm up.

1

The Active function switches the Stereo Vitalizer MK2-T on or off. The illuminated switch indicates that the Stereo Vitalizer MK2-T has been activated. The Active function is a relay hard-bypass function that works on both XLR and jack connections. In the event of a power failure the Stereo Vitalizer MK2-T is automatically switched to hard-bypass (power failure safety).

The Active status-LED flashes after switching on Power indicating that the two Sovtek 12AX7 tubes are warming up. After the tubes have reached their operational temperature the relays switch audio to the outputs. When activating the MK2-T you will notice a little change in sound which is caused by the tubes and their typical sound characteristics.

Drive

Setting the operating level of the Vitalizer® filter network.

CLIP LED illuminates 3 dB before a potential overload.

2

The Stereo Vitalizer MK2-T features a Drive control that enables you to set the level at which the Vitalizer filter network operates. The level can be changed between -20 dB and +6 dB.

To run the unit hotter set the level between the centre position (0 dB) and the clockwise position (+6 dB) with the proviso that the Clip LED on the front panel is not regularly flashing. This will achieve processing at a lower input sensitivity and will result in a more intensely processed sound. Conversely, in order to achieve milder processing, set the level between the centre position (0 dB) and the counter clockwise position (-20 dB). The Clip LED lights up around 3 dB before the effect signal path is potentially overdriven. Make sure that the Clip LED only lights up briefly, if at all. It is essential to avoid the Clip LED being lit up for any length of time.

Bass Sound

3

The Bass Sound control is responsible for the 'colour' or timbre. If you move the Bass Sound control to the right, you get a drier, percussive bass sound, known as Tight. As a result of this, on the right-hand side of the scaling points, there are squares which increase in size, in line with increased intensity. They symbolise the contoured Tight bass sound.

If the Bass Sound control is moved from the centre position (0) to the left, the sound becomes very deep, soft, and warm. This sound is known as Soft. This is symbolised with round scaling points which also increase in size as the intensity increases.

The further the Bass Sound control is shifted to the right or left of the centre position, the more intensive the bass in question. However, Process must be positioned to the right of the 9 o'clock setting for the bass to be audible.

You can always hear the original (dry) bass if the Bass Sound control is in a centre position.

The Process control (6) determines the processing ratio between the set bass sound and the original signal. This results in varying sound structures: if you combine high bass amplification on the Bass Sound control with a lower Process value, you get a different bass structure than with a lower Bass Sound amplification combined with a higher Process value. Choosing the best solution is a matter of personal taste and also depends on the type of original signal involved.

Tight bass sound to the right side of the 0 detented control and Soft bass sound to the left side.

Set the Process control above the 9 o'clock position to hear the selected bass sound.

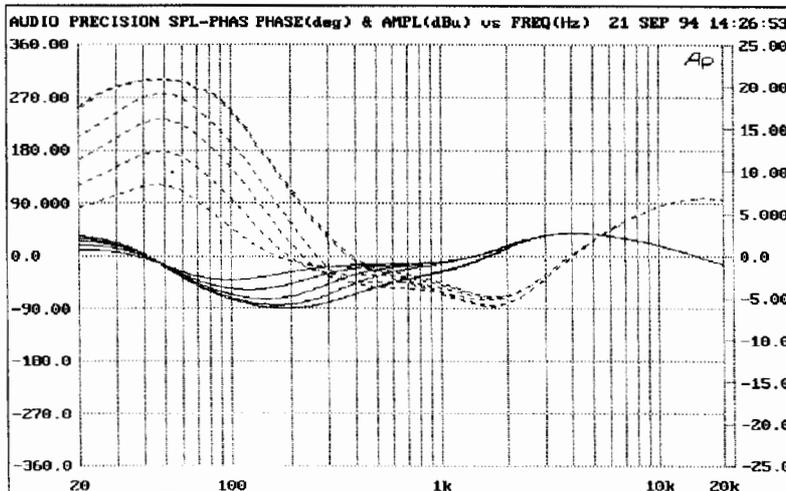


Fig. 1:

The dotted line shows frequency responses for a Soft Bass Sound at maximum Process and Mid-Hi Tune set at 3.5 kHz. The solid line shows the phase response, which always drifts only a few degrees if the amplitude is increased.

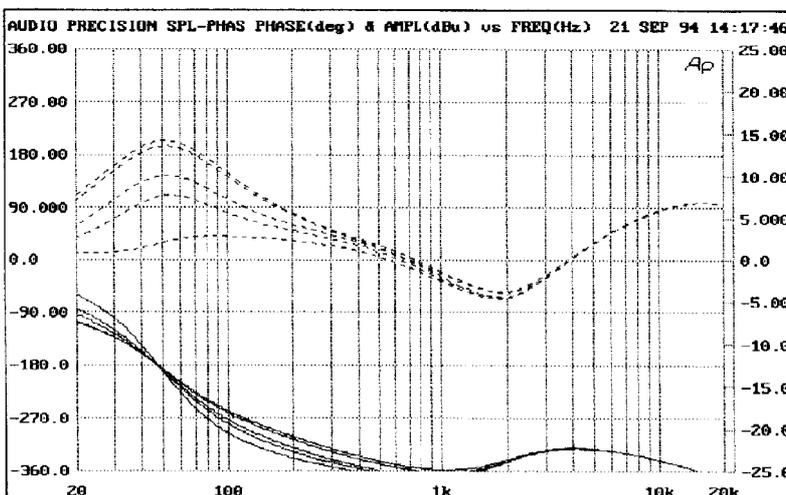


Fig. 2:

The dotted line shows frequency responses for a Tight bass sound at maximum Process and Mid-Hi Tune set at 3.5 kHz. The solid line shows the phase response which has a phase relation of -180° at 50 Hz, but otherwise also drifts only by a few degrees at increasing amplitudes.

Bass Compression

4

This easy-to-use compressor works exclusively on the bass and helps you to control the bass amplitude when recording on digital media.

The illuminating Gain Reduction LED indicates that the compressor is operating.

The Stereo Vitalizer MK2-T features an integrated Bass Compressor, which only works in the bass that the Vitalizer circuitry produces. When recording on digital equipment it is essential not to overload the inputs which would result in invalid samples sounding like digital peaks. As the bass frequencies carry most of the level it makes sense to integrate a compressor into the bass-path. This Bass Compressor does not effect the high-end! So your recording does not get duller when extensive compression is used. We designed the Bass Compressor as a 'one-knob' solution to make it easy to operate. The threshold, attack and release are automatically adjusted. The Bass Compressor control sets the ratio.

The blue Gain Reduction LED indicates the point at which the Bass Compressor starts to operate. When you turn the Bass Compressor control fully clockwise the entire bass processing of the Bass Sound control is nullified.

Mid-Hi Tune

5

Setting the starting frequency for the filtering to adapt the frequency range to the hearing sensation.

The Mid-Hi Tune control is used to set the starting frequency of a broad-band shelving filter. In line with the setting of Process control, all frequencies above this value right through to the end of the audio range are processed. The control range is between 1kHz (extreme right) and 22 kHz (extreme left). In practice, common settings vary between 2 kHz and 8 kHz (10 to 3 o'clock positions).

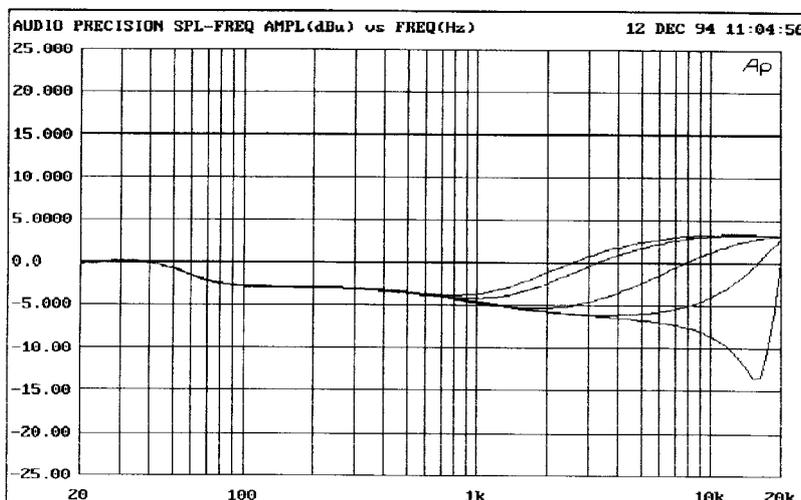
One of the Sovtek 12AX7 double triode tubes is used within the Mid-Hi Tune filter and gives the mid frequencies even more accurate transparency with a soft and silky sound pattern.

As the human ear perceives the range between 1 kHz and 3 kHz particularly clearly, at all volumes between 0 and 120 phon it makes sense to adapt this frequency range. In comparison to graphic EQs, which really reduce effective loudness of frequencies, i.e. cutting out the appropriate frequencies, thus changing the spectral content of the original signal, the Stereo Vitalizer MK2-T relies on a more subtle method of amplitude-dependent phase shifting. This does not involve altering the spectral composition but it does maintain the subjective impression of loudness.

No comb-filtering effect as with graphic EQs.

Fig. 3:

Five frequency responses are shown for the Mid-Hi Tune filter at max. Process value and Bass Sound at 0.



Moreover, graphic equalisers produce comb-filter effects because of the interaction between adjacent filters, when broad-band frequencies are raised. The Mid-Hi Tune filter can raise the broad-band spectrum with a very linear frequency response, without colouring the signal.

Above the Mid-Hi Tune value set, the Stereo Vitalizer MK2-T filters create a linear increase, i.e. one that is adapted to the human ear. This compensates any inability of our hearing as regards perceiving frequencies ranging between 5 kHz and 10 kHz. The Mid-Hi Tune filter works with a wide bandwidth and always sounds musical, never 'bell-like'. Gradually go down from 20 kHz (extreme left) to lower frequencies. The further down you go, the brighter the sound image becomes, as an increasing number of frequencies are included in the process.

The Mid-Hi Tune control can also be used to tone down excessively sharp-sounding material, by setting frequencies of 10 kHz or higher, and setting the Process control on Max. As the Process control is also responsible for damping dominant mid frequencies, all frequencies are gradually reduced down to the application frequency, in conjunction with high starting frequencies of the Mid-Hi Tune control.

Use the Mid-Hi Tune filter to smoothen sharp-sounding material.

The Process control determines the ratio between Bass Sound and Mid-Hi Tune to the original signal. The Process control also determines the damping intensity of dominant mid frequencies. This allows rapid adaptation to the loudness curves (Fletcher-Munson curves, "curves of equal loudness").

The human ear perceives the audio frequency spectrum at varying sound pressure levels very differently. Perception is by no means 'linear'. The Stereo Vitalizer MK2-T alters the frequency spectrum in such a way that the balance is maintained between all frequency ranges even at varying monitor volumes. For the human ear, the sound is more pleasant and easier to perceive than the original.

6

Process

The Process control determines the ratio between Bass Sound and Mid-Hi Tune to the original signal.

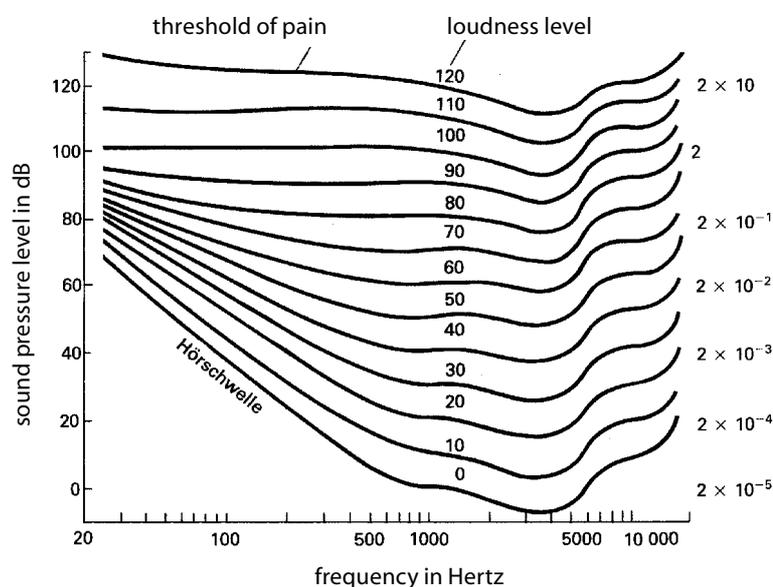


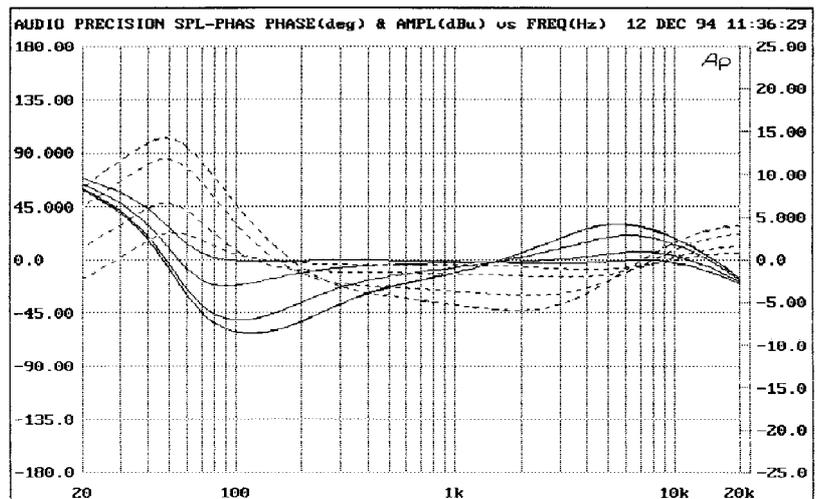
Fig. 4:

The Fletcher-Munson curve – "curves of equal loudness".

In other words, increasing the Process value also increases the intensity of the Mid-Hi Tune filter and the Bass SOUND filter, whilst dominant mid frequencies are damped by amplitude-correlated phase shiftings. This improves the perception of loudness, clarity and the bass punch, i.e. the strength and fullness of the audio signal.

Fig. 5:

The dotted line shows the frequency responses for a soft bass sound at varying Process levels and Mid-Hi Tune set to 3.5 kHz. The solid line shows the phase responses, which drift slightly as the Process intensity increases. The diagram also shows the mid range attenuation according to the increasing Process levels.



LC-EQ

7

Improved high and harmonic frequencies result in a silky top-end with better separation and intelligibility.

The Stereo Vitalizer MK2-T is equipped with LC filters which have been used in filter designs from the 60s and 70s. The filter-network processes the high end with a passive coil/condenser filter.

Coils are known for their pleasant 'retro' sound. When getting saturated they produce a special harmonical structure giving a certain punchy sound that we know from old filter designs. The sound gets more mid-range and presence. At the same time a certain amount of roughness is introduced. This is especially beneficial to vocals and helps them to stand out in the mix without altering level.

By influencing the phase relationship in an intelligent fashion, the filtering emphasises the perception of high and harmonical frequencies. The effect significantly improves the speech intelligibility and the transparency. Old archived recordings sound fresh and silky again. The brilliance of any audio signal can be improved without it sounding sharp.

The control range is 2 kHz to 20 kHz.

Intensity

8

Sets the amount of LC-EQ being added to the signal.

The Intensity control sets the amount of LC-EQ being added to the signal.

You can then listen to the LC-EQ control separately, when you close the Process control (extreme left). The Bass Sound and Mid-Hi Tune controls do not function any more.

The Mid-Hi Tune and the LC-EQ filter complement each other in an ideal fashion. While the Mid-Hi Tune sets the frequency above which the programme material is lifted and below which the damping takes place, the LC-EQ and Intensity controls come in place to extract certain frequencies from this process. This is very helpful, when you are processing material with lead vocals: Using the Mid-Hi Tune will generally damp some speech frequencies and the voice moves into the mix losing a bit of its presence. Use the LC-EQ to catch the voice and the Intensity control to bring it back up front. It especially improves the presence on vocals.

The Stereo Expander potentiometer controls the width of the stereo image. Working on established inter-channel phase principles, the Stereo Expander control is used to increase the subjective soundstage width of any stereo source. The off-center signals of the stereo source are detected and fed back to the opposite channel phase inverted. This effect can be applied to overall mixes as well as to single instruments which have been recorded in stereo. Very interesting is the spreading of the stereo image of overhead mics of drum-sets or choruses or horn sections.

The second Sovtek 12AX7 tube is used in the Stereo Expander which gives the stereo sound pleasant depth and reduces sharpness of the off-centre sounds. Centre-sounds of the stereo image are usually reduced in this process. However, the tube characteristics helps centre-sounds to maintain their position in the mix and to add a bit of clarity and separation.

Even when using the Stereo Expander to the max the stereo image will remain mono-compatible.

In case you want to monitor the Stereo Expander in isolation, switch Active on and set the Process and Intensity controls fully counter clockwise.

9

Stereo Expander

Power Supply

Internal power supply based around a torroidal transformer.

Voltage selector

Ground-lift switch

Transformer, power cord and mains connector with VDE, UL and CSA approvals.

FUSE: 315 mA

Positive and negative voltage paths are smoothed with 4000microF capacitors.

High voltage regulated tube power supply.

Special care has gone into the design of the power supply of the Stereo Vitalizer MK2-T because the power supply is the heart of any electronic system, and the better it is, the better the whole system works. In an audio system, this translates into better sound quality, lower noise and lower distortion.

The power supply is based around a 15 VA torroidal transformer and is designed to minimise induced hum and noise due to the lack of an air-gap.

The primary voltage may be selected between 230 V / 50 Hz and 115 V / 60 Hz by means of a recessed slide switch on the rear panel and a rear-panel ground-lift switch is fitted for use where ground loops are causing hum problems. When the Gnd Lift switch is set to off, the circuit ground is isolated from the chassis ground.

The detachable power cord is a standard 3-wire type fitted with an IEC mains connector; the transformer, power cord and mains connector have VDE, UL and CSA approvals.

The fuse has a value of 315 mA for the primary voltage.

On the secondary side of the power supply, an RC combination is used to filter out noise and hum voltages. Both half-waves are smoothed with 4000 microF capacitors in the positive and negative supply path, and both lines use precision voltage regulators for optimum stability. Deviations of only a few millivolts can impair audio quality, introducing artifacts such as loss of stereo imaging or a diffuse sound character.

The operational voltage of the tubes (225 V) is heavily smoothed and electronically regulated. Both inputs and outputs of the tubes are smoothed with condensers of high voltage and condenser values (300 microF/400 V/5%) to minimise offset voltages. The tubes are de-coupling at about 10 Hz.

Input & Output

Instrumentation amplifier, electronically balanced

(differential), transformerless

Nominal input level	+6 dB
Input impedance	= 22 kOhms
Output impedance.....	< 600 Ohms
Max. input level	+20 dBu
Max. output level	+20 dBu
Minimum load ohms.....	600 Ohms
Relay Hard Bypass	yes
Power Fail Safety.....	yes

Measurements

Frequency response	20 Hz-100 kHz (100 kHz = -3 dB)
EQ frequency range.....	20 Hz-22 kHz
CCMR (common mode rejection)	>> -86 dBu @1 kHz
THD & N.....	0,01855% @ 1kHz
S/N CCIR 468-3	- 85 dBu
S/N A-weighted	- 99 dBu

Power Supply

Torroidal transformer	15 VA
Fuse	315 mA (slow blow)
Ground-Lift switch	yes
Voltage selector	yes

Dimensions

Housing	Standard EIA 19"/1U, 482 x 44 x 237 mm
Weight.....	3,4 kg

Note: 0 dBu = 0.775 V

Subject to change without notice.

Warranty

SPL electronics GmbH (hereafter called SPL) products are warranted only in the country where purchased, through the authorized SPL distributor in that country, against defects in material or workmanship. The specific period of this limited warranty shall be that which is described to the original retail purchaser by the authorized SPL dealer or distributor at the time of purchase.

SPL does not, however, warrant its products against any and all defects:

1) arising out of materials or workmanship not provided or furnished by SPL, or 2) resulting from abnormal use of the product or use in violation of instructions, or 3) in products repaired or serviced by other than authorized SPL repair facilities, or 4) in products with removed or defaced serial numbers, or 5) in components or parts or products expressly warranted by another manufacturer.

SPL agrees, through the applicable authorized distributor, to repair or replace defects covered by this limited warranty with parts or products of original or improved design, at its option in each respect, if the defective product is shipped prior to the end of the warranty period to the designated authorized SPL warranty repair facility in the country where purchased, or to the SPL factory in Germany, in the original packaging or a replacement supplied by SPL, with all transportation costs and full insurance paid each way by the purchaser or owner.

All remedies and the measure of damages are limited to the above services. It is possible that economic loss or injury to person or property may result from the failure of the product; however, even if SPL has been advised of this possibility, this limited warranty does not cover any such consequential or incidental damages. Some states or countries do not allow the limitations or exclusion of incidental or consequential damages, so the above limitation may not apply to you.

Any and all warranties, express or implied, arising by law, course of dealing, course of performance, usage of trade, or otherwise, including but not limited to implied warranties of merchantability and fitness for particular, are limited to a period of 1 (one) year from either the date of manufacture. Some states or countries do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you.

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