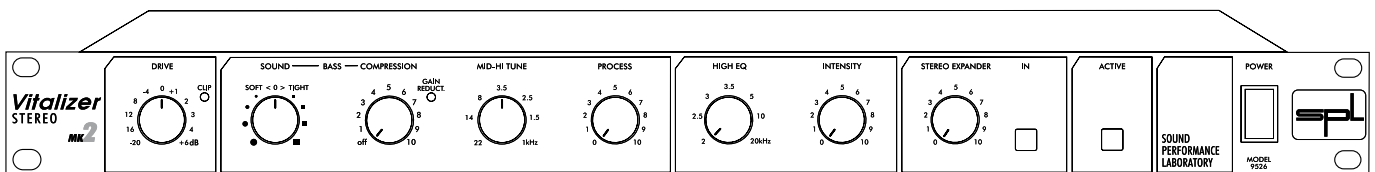




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# SPL

# Manual



# Vitalizer<sup>®</sup>

## STEREO

# MK2

Modell 9526

Dual Channel Program EQ

# Manual

by Hermann Gier, Paul White

Version 2.2 – 05/1999

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### **SPL electronics GmbH**

P.O. Box 12 27

D- 41368 Niederkruechten, Germany

Tel + 49-2163-983 40

Fax + 49-2163-98 34 20

e-Mail [info@soundperformancelab.com](mailto:info@soundperformancelab.com)



[soundperformancelab.com](http://soundperformancelab.com)

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## Foreword

Dear customer,

Thank you for the confidence you have shown towards SPL electronics GmbH by purchasing the SPL Stereo Vitalizer MK2. 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 music productions, live sound applications and pre-masterings.

As a typical SPL unit the Stereo Vitalizer MK2 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.

We wish you every success with your new Stereo Vitalizer MK2.

*Your Sound Performance Lab-Team*

## Thanks

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*

# Introduction

Vitalizer Awards:



In 1993 the "Golden Ear Award" was presented to SPL by Europe's biggest HiFi-magazine "Audio" for the Vitalizer in HiFi-Version.



In 1994 the "Stage Design Award" was presented to SPL by the "Artist" magazine for the exceptionally performance of the Stereo Vitalizer on stage.

The Stereo Vitalizer MK2 is an equalizer concept which makes use of scientific psychoacoustic technology to process audio signals. The unique combination of dynamic equalizers, amplitude-controlled phase correction, harmonic filtering and stereo expanding opens up a whole new listening dimension by adapting the sound pattern to the non-linearities of the human ear.

The Stereo Vitalizer MK2 gives the mid frequencies accurate transparency with a soft, unobtrusive sound. The treble range is reworked with broadband shelving filters, which focus on achieving a smooth, silky sound pattern. High frequencies are livened up without them sounding hard or aggressive. The Stereo Vitalizer MK2 uses a newly developed filter network to process the low frequency range. The bass is accentuated without any risk of emphasizing the lower mid frequencies unnaturally. You can choose between a dry, percussive bass (Tight) or a punchy, soft and very deep sound character (Soft). An easy to use compressor complements the bass section allowing the correction of level change due to bass processing. The result is a pleasanter and livelier sound pattern with an unrivalled wealth of detail.

The Stereo Vitalizer MK2 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 will perform the same task as those esoteric and costly equalizers often used for audio sweetening but with far greater tonal flexibility and at a much lower cost. You will be amazed by how transparent and powerful almost every audio signal sounds after it has been processed with the Stereo Vitalizer MK2!

## Operation safety



*Important security advices*

The housing of the Stereo Vitalizer MK2 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 should not be installed near units which produce strong magnetic fields or extreme heat. Do not install the Stereo Vitalizer MK2 directly above or below power amplifiers.

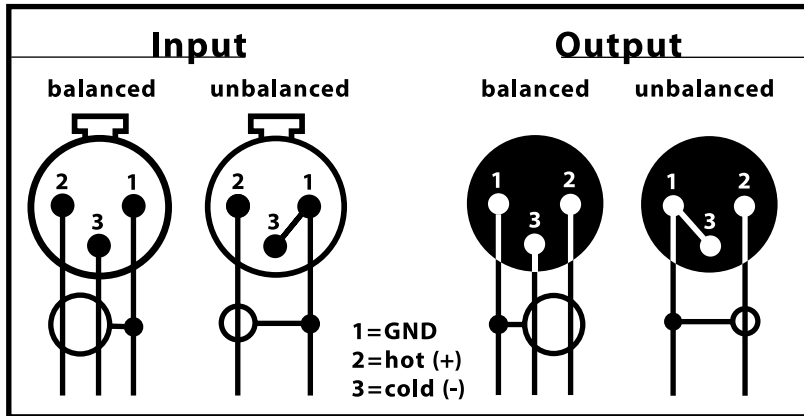
Check that the voltage details quoted on the back panel are the same as your local mains electricity supply. Use a minus (-) screwdriver to set the voltage selector to the voltage for the area in which the unit will be used.

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 with a soft, lint-free cloth.

The Stereo Vitalizer MK2 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.

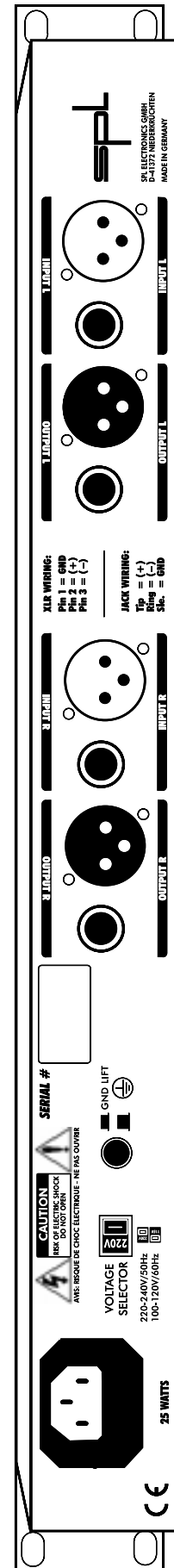
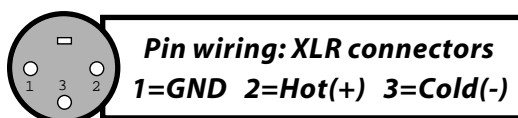
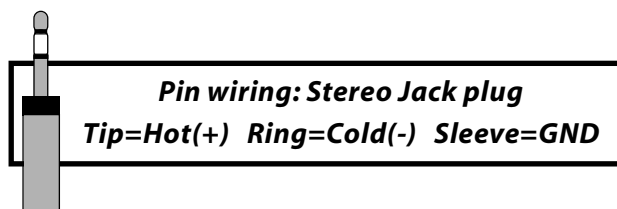
Should the need arise to use the XLR connectors in an unbalanced system, pin 3 of the XLRs should be grounded. Inserting a mono jack also unbalances the XLRs.



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 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 an exceptionally high CCMR (common mode rejection); 100 dB at 1kHz and 80 dB at 10 kHz.

As a precaution, before connecting the Stereo Vitalizer MK2 switch off the power to the unit and to all connected units.



# Applications

## Recording Studio

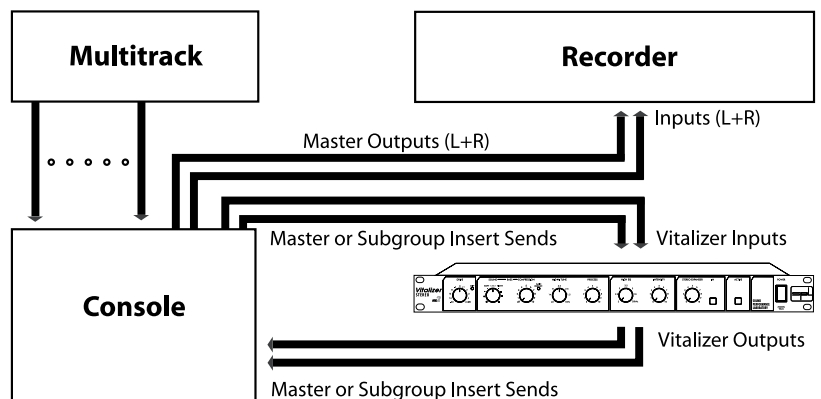
1. The most obvious application of the Stereo Vitalizer MK2 is to process a final mix, either while mixing or during post-production prior to cutting. Insert your Stereo Vitalizer MK2 into the master-inserts of your console or right in between a playback and a recording unit. Although inserting the Stereo Vitalizer MK2 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 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. 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 between master-outputs and amplifier. The major disadvantage of this connection is the varying input sensitivity with each fader movement.

### Application 1:

*The Stereo Vitalizer MK2 inserted into the master-inserts of the console*

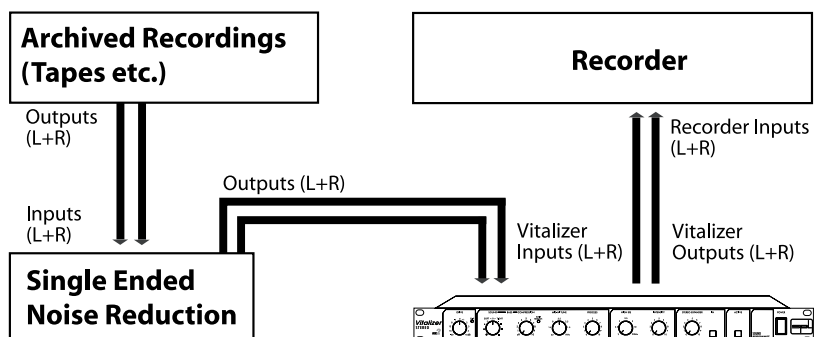


2. Another popular stereo application is the processing of existing master tapes during post-production such as when reprocessing archive material for CD release.

If a single-ended noise reduction system is used to clean up the original, the Stereo Vitalizer MK2 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.

### Application 2:

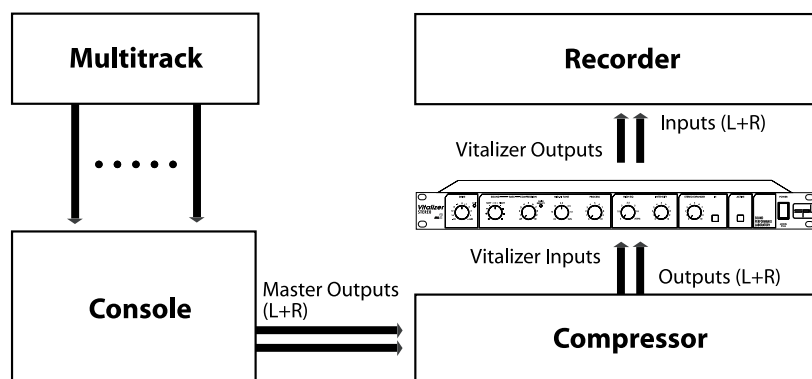
*The Stereo Vitalizer mk2 inserted between noise-reduction and recorder to improve archived recordings*



# Applications

3. In electronic music, the Stereo Vitalizer MK2 can be used to add new range and depth to samplers and synthesizers and also to further 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 after the compressor. You can then be sure that the Stereo Vitalizer MK2 will receive a level-corrected signal which helps to operate even more precise. If you use the Stereo Vitalizer MK2 before the compressor negative side-effects such as pumping could be more audible.



## **Application 3:**

*The Stereo Vitalizer MK2 inserted between compressor und recorder.*

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

## **Tape duplication**

The Stereo Vitalizer MK2 is perfectly suited to the production of 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 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.

## **Broadcast**

# Applications

## ***Sound reinforcement***

In live performance or in club installations, the Stereo Vitalizer MK2 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 helps produce a detailed, tight sound, even from indifferent speaker systems giving an improvement in perceived audio quality.

The Stereo Vitalizer MK2 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 in the master inserts.

## ***Video & film post production***

As in other areas, the Stereo Vitalizer MK2 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 is so quick to set up can save a lot of wasted time spent tuning multi-band equalizers.

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" movie 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 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.

## Set-up positions (see front panel picture):

- Drive to zero (center position)
- Bass Sound to zero (center position)
- Bass Compression to Off (counter clockwise)
- Mid-Hi Tune to 3.5 kHz (center position)
- Process to zero (counter clockwise)
- High EQ to 2 kHz (counter clockwise)
- Intensity to zero (counter clockwise)
- Stereo Expander to zero (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 3.5 kHz (initial setting Mid-Hi Tune) are becoming more intense. Frequencies below this point are diminished. First set the Process control at 1 o'clock.

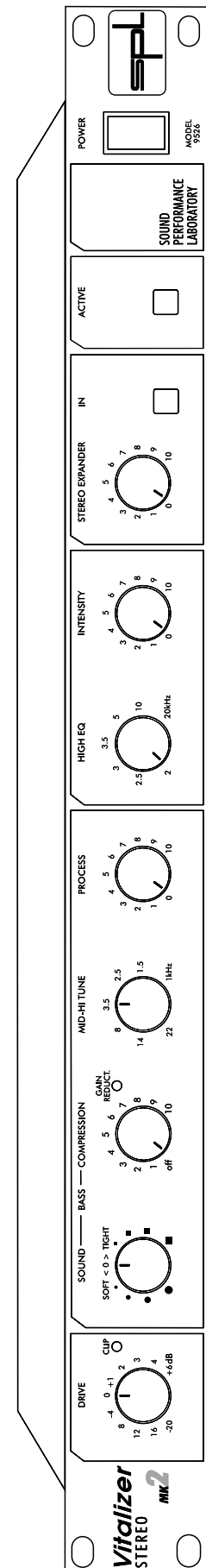
**3.** The next step is to shift the Bass control from the zero position to both sides. Turn to the right: The bass sounds tight and dry. Turn to the left: The bass sounds soft and round. Decide on a bass sound of the desired amplitude.

**4.** Now start varying Mid-Hi Tune. The original setting is 3.5 kHz. Turn to the right: The programme material sounds brighter and gets more mids from about 1.5 kHz. 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.

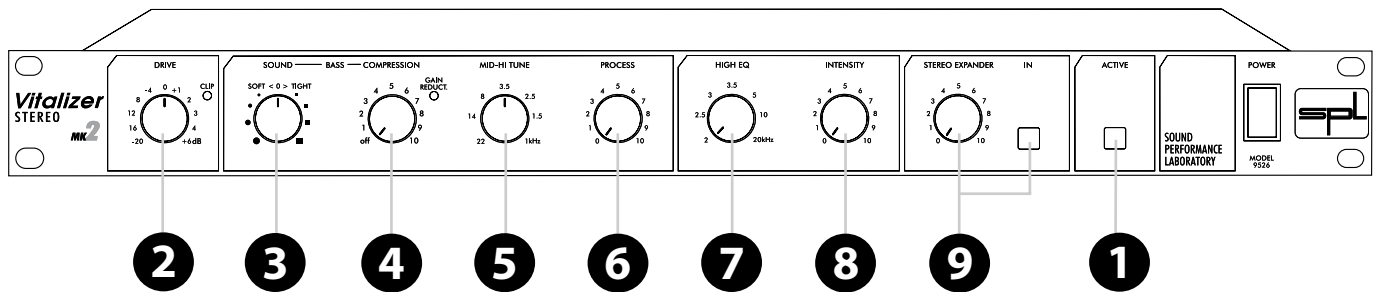
Turning the control to the left shifts the starting frequency from 3.5 kHz to higher frequencies. The programme material then sounds increasingly dull, because fewer and fewer frequencies are being included in the process, the higher the frequencies become. The setting you choose is a matter of personal taste.

**5.** The High EQ is variable in frequency and amplitude. This section helps you to give voices or other instruments in improved presence. Leave the High 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, activate the Stereo Expander section by depressing the In switch and turn the 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*

**1**

The Active function switches the Stereo Vitalizer MK2 on or off. The illuminated switch indicates that the Stereo Vitalizer MK2 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 is automatically switched to hard-bypass (power failure safety).

## Drive

*Sets the operating level of the Vitalizer filter network*

**2**

The Stereo Vitalizer MK2 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 center 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 center 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

*Clip LED illuminates 3 dB before a potential overload*

**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 symbolize the contoured Tight bass sound.

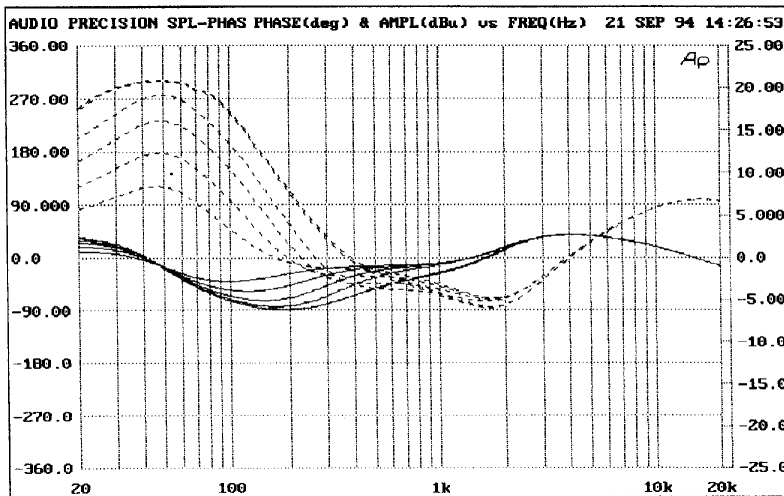
# Control Elements

If the Bass Sound control is moved from the center position (0) to the left, the sound becomes very deep, soft, and warm. This sound is known as Soft. This is symbolized 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 center 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 center position.

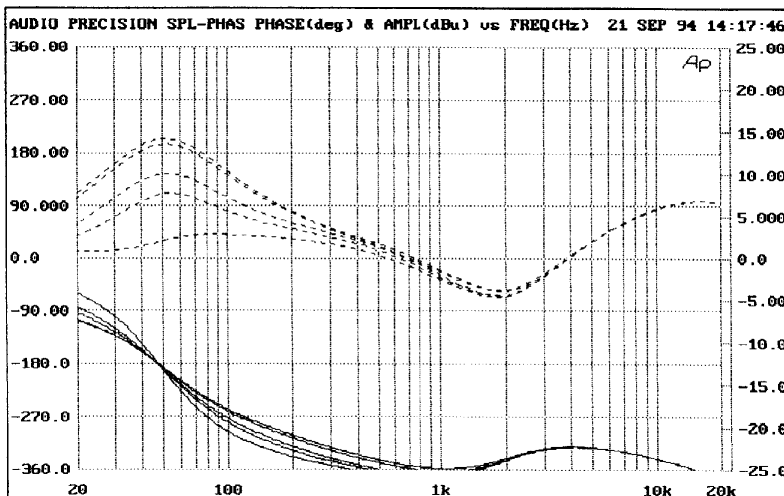
The Process control (6) determines the processing ratio between the set Bass Sound and the original signal. This results in varying sound structures: if you combine high bass amplification on the Bass Sound control with a lower Process value, you get a different bass structure than with a lower Bass 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.



**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  $-180^\circ$  at 50 Hz, but otherwise also drifts only by a few degrees at increasing amplitudes.

# Control Elements

## Bass Compression 4

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

*The Gain Reduction LED indicates compressor operation.*

The Stereo Vitalizer MK2 features an integrated Bass Compressor, which only works where it is useful: in the bass range. When recording on digital equipment it is essential not to overload the inputs of such systems which results 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 shelving filter to adapt the frequency range to the hearing sensation.*

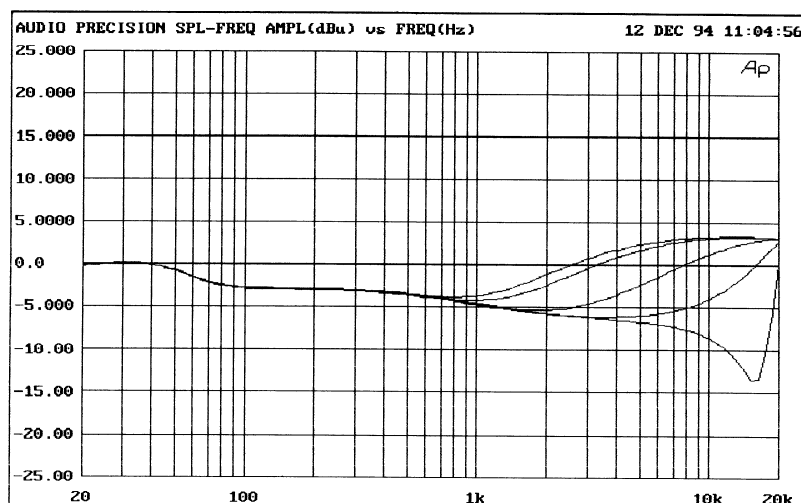
*No comb-filtering effect as with graphic EQs.*

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 of the Mid-Hi Tune control is between 1kHz (extreme right) and 20kHz (extreme left). In practice, common settings vary between 3.5kHz and 8kHz (12h to 10h positions). As the human ear perceives the range between 1kHz and 3kHz particularly clearly, at all volumes between 0 and 120 phon it makes sense to adapt this frequency range. You might feel inclined to say 'Yes, but I do that with my graphic EQ as well'. The main difference is that the graphic EQ really reduces the effective loudness of the frequency, i.e. cuts out the appropriate frequencies, thus changing the spectral content of the original signal. The Stereo Vitalizer MK2, however, relies on a more subtle method of amplitude-depending phase shifting. This does not involve altering the spectral composition of the signal but it does maintain the subjective impression of loudness. Moreover, graphic equalizers produce comb-filter effects because of the interaction between adjacent filters, when broad-band frequencies are raised.

**Fig. 3:**

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

- 1: 1 kHz / 2: 2 kHz / 3: 3,5 kHz /
- 4: 8 kHz / 5: 20 kHz



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 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 5kHz and 10kHz. The Mid-Hi Tune filter works with a wide bandwidth and always sounds musical, never 'bell-like'. Gradually go down from 20kHz (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 10kHz or higher, and setting the Process control on Max. Seeing as the Process control is also responsible for deleting 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.

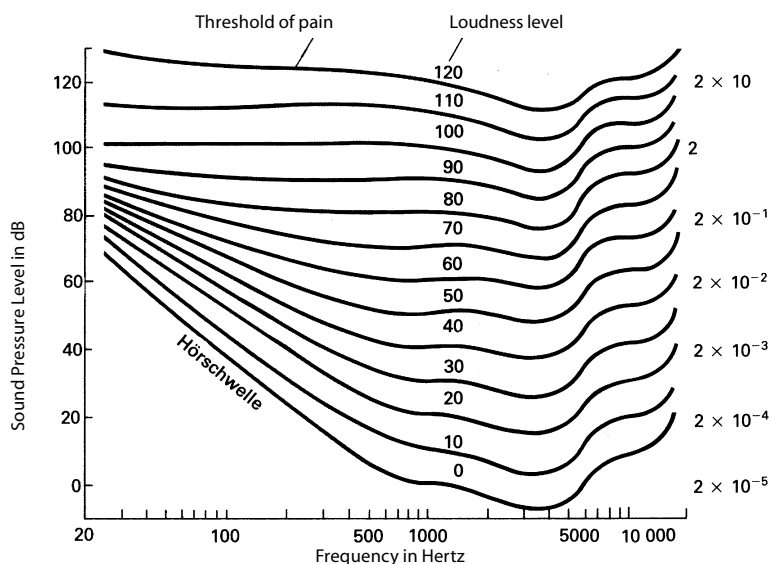
The Process control determines the ratio between Bass and Mid-Hi Tune to the original signal. The Process control also determines the damping intensity of dominant mid frequencies. This allows rapid adaptation to the loudness curves (Fletcher-Munson curves, "curves of equal loudness").

6

## Process

**Fig. 4:**

The Fletcher-Munson curve; "Curves of equal loudness"

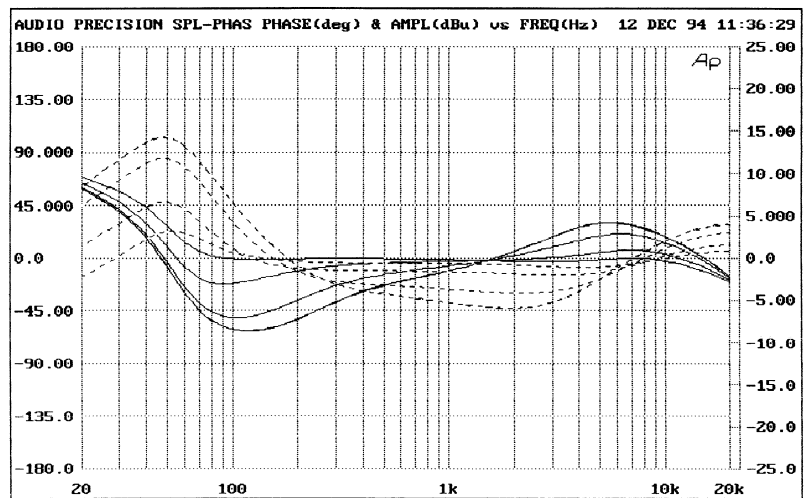


The human ear perceives the audio frequency spectrum at varying sound pressure levels very differently. Perception is by no means 'linear'. The Stereo Vitalizer MK2 alters the frequency spectrum in such a way that the balance is maintained between all frequency ranges even at varying monitor volumes. For the human ear, the sound is more pleasant and easier to perceive than the original. In other words, increasing the Process value also increases the intensity of the Mid-Hi Tune filter and the Bass filter, whilst dominant mid frequencies are damped by amplitude-controlled phase shiftings. This improves the perception of loudness, clarity and the bass punch, i.e. the strength and fullness of the audio signal.

# Control Elements

**Fig. 5:**

*Dotted line: Frequency responses for a Soft Bass Sound at varying Process levels and Mid-Hi Tune set to 3.5 kHz. Solid line: phase responses (drift slightly as the Process intensity increases) The diagram also shows the mid range attenuation according to the increasing Process levels.*



## High EQ

7

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

The Stereo Vitalizer MK2 works with steep filters and controlled changes of the phase relationships of the high frequencies and harmonics.

We consciously did without the generator principle of 'Exciters'. The Stereo Vitalizer MK2's High EQ filter does not add any distortions to the original signal, unlike with the generator principle. It extracts all the information it needs from the original signal. This significantly reduces the hearing fatigue effect on the listener. By influencing the phase relationship in an intelligent fashion, the filtering emphasizes 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 High EQ being added to the signal.*

The Intensity control sets the amount of High EQ being added to the signal. If you close the Process control (extreme left), the Bass and Mid-Hi Tune controls do not function any more. You can then listen to the High EQ control separately.

The Mid-Hi Tune and the High EQ filter complement each other in an ideal fashion. While the Mid-Hi Tune sets the frequency above which the program material is lifted and below which the damping takes place, the High 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 High EQ to catch the voice and the Intensity control to bring it back up front.

## Control Elements

### 9 Stereo Expander

The In switch switches the Stereo Expander on or off. The status-LED indicates, that the Stereo Expander is activated. The In switch only illuminates when the Active switch is depressed.

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

The Stereo Expander potentiometer controls the width of the stereo image. Working on established inter-channel phase principles, the Stereo Expander control is be 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. Very interesting is the spreading of the stereo image of overhead mics of drum-sets or choruses or horn sections.

Special care has gone into the design of the power supply of the Stereo Vitalizer MK2 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 15VA torroidal transformer and is designed to minimize induced hum and noise due to the lack of an air-gap.

The primary voltage may be selected between 230V/50Hz and 115V/60Hz 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 315mA 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 2000microF 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.

## Power supply

*Torroidal transformer*

*Voltage selector*

*Ground-lift switch*

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

*FUSE (primary voltages): 315 mA*

*Positive and negative voltage paths are smoothed with 2000 mF capacitors*

# Specifications

## Input & Output

Instrumentation amplifier, electronically balanced  
(differential), transformerless

Nominal input level ..... +6 dB

Input impedance ..... = 22 kOhms

Output impedance ..... < 600 Ohms

Max. input level ..... +24 dBu

Max. output level ..... +22,4 dBu

Minimum load ohms ..... 600 Ohms

Relay Hard Bypass ..... yes

Power Fail Safety ..... yes

## Measurements

Frequency response ..... 10 Hz-100 kHz  
(100 kHz = -3 dB)

EQ frequency range ..... 15 Hz - 22 kHz

CCMR (common mode rejection) ..... >-86 dBu @ 1 kHz

THD & N ..... 0,002% @ 1kHz

S/N CCIR 468-3 ..... -89 dBu

S/N A-weightened ..... -105 dBu

## Power Supply

Torroidal transformer ..... 15 VA

Fuse ..... 315 mA

Ground-Lift switch, Voltage selector

## Dimensions

Housing ..... Standard EIA 19"/1U,  
... 482 x 44 x 237mm

Weight ..... 3,4 kg

*Note: 0 dBu = 0.775 V*  
*Subject to change without notice.*



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.

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SPL electronics GmbH  
D-41372 Niederkruechten, Germany