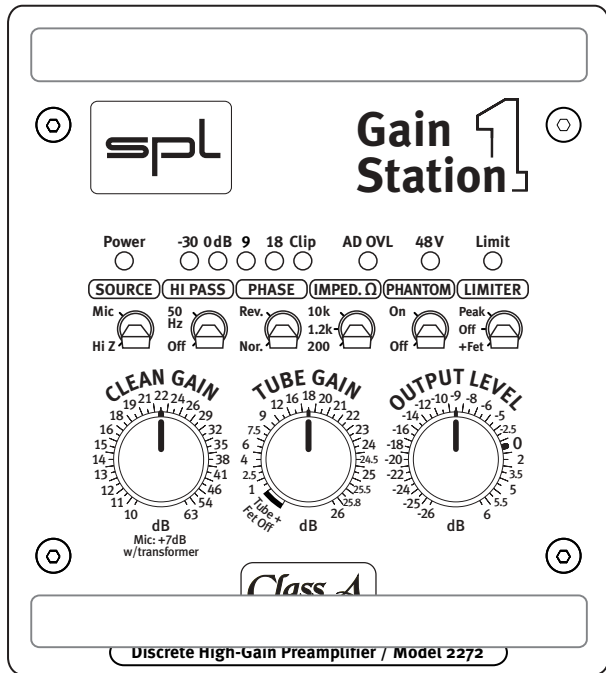




User's Guide



GainStation 1

Models 2272, 2273

Single channel microphone and instrument preamplifier

Version 1.0 – 6/2003

Designer: Ruben Tilgner

This user's guide contains a description of the product. It in no way represents a guarantee of particular characteristics or results of use. The information in this document has been carefully compiled and verified and, unless otherwise stated or agreed upon, correctly describes the product at the time of packaging with this document.

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Input makes all the difference.

Modern audio production relies increasingly on digital systems for recording and mixing processes (DAW's, digital consoles etc.). The advantages of digital audio are manifold and include affordable storage, comfortable editing, recall capabilities and automation. On the downside, digital systems still do not offer the same audio qualities and sound characteristics of high-end analog equipment. Especially digital equalizers and other aspects of the mixing domain cannot compete with the open, transparent sound of the best analog gear. So today more than ever, your input signal has to sound as good as possible—the quality of your original tracks will largely define the end result. Lifeless or dynamically lacking signals are often over-processed with EQ, compression and other effects in an attempt to compensate—often an extremely tedious process in the digital domain that doesn't always produce the desired results.

Attacking this problem on the preamplification front, with the goal of noticeably improving a signal and sending it along its path with a healthy foundation, requires a great deal of thought and engineering effort. To this end, the GainStation 1 employs technologies that not only satisfy test equipment, but also—and most importantly—the user. Components and circuits were carefully chosen and designed on the basis of extensive measurements and listening tests. In short, developing the GainStation 1 was a major undertaking that required immense amounts of time and experience.

Another important goal in designing the GainStation 1 was that the case itself should optimally adapt itself to modern production environments. It was to be as compact as possible, allowing easy transport and ergonomic placement in virtually any situation. A free-standing case which does not need to be rack-mounted has several advantages: not only are the inputs and outputs always easily accessible, but the unit can also easily be placed on top of an amp, outboard rack or even some keyboards, on your desk next to your laptop, or in direct proximity to a microphone to allow for maximum operational comfort and minimum cable lengths.

To accommodate portability, the optionally available SPL GainBag ensures safe transport of the GainStation 1 and offers additional storage for cables and an average-sized microphone.

For more permanent installations, up to four GainStation 1's can be rack-mounted in one optionally available 3-unit rack space mounting frame.

Main technical features of the GainStation 1

- Custom-designed and built, fully discrete, class A op-amps (no off-the-shelf stuff here). The GainStation's op-amps feature 60-Volt operating voltage—twice as high as most common op-amps—for an incredible dynamic range.
- An extremely high amplifier slew rate of 200 V/microsecond, ensuring clean transmission of high-frequency signal portions and rapid transients with virtually no cut-off.
- An almost entirely DC-coupled signal path, making signal-degenerating condensers unnecessary.
- An optimized layout guarantees the shortest possible signal paths, while generously proportioned grounding surfaces ensure low impedance and maximum shielding.
- All switching functions are handled by encapsulated relays with gold-plated contacts.
- All resistors are within 0.1% tolerance and were selected after extensive listening tests.
- A no-compromise power supply with extensive additional shielding and seven separately wound and regulated voltages. The power supply is of primary importance to audio quality; its importance should not be underestimated.
- A tube stage utilizing premium MKP foil condensers and a select 12 AX7 LPS tube for clear, dynamic audio.

Introduction

This cutting-edge technology ensures that signals recorded with the GainStation 1 have more presence and substance and will easily cut through a mix even at lower levels. Extremely low-frequency signals are tight and transparent with clear intonation. Percussive transients are interpreted more precisely, which leads to a clearer rhythmic content and in turn a more solid rhythmic performance and perception.

A bassist using the GainStation 1 as a preamp will immediately notice that he hears and feels what he is playing much better, which leads to improved playing and a better recording. The track will have more punch and dynamics, greatly improved presence and almost palpable detail. In short, the instrument sounds incredibly authentic and alive. Beta-tests with the GainStation 1 showed that all instrumentalists enjoyed playing more and in many cases were truly amazed at what their trusty instrument was capable of.

Given this improvement in the input signal, one is much less inclined to equalize and compress—in many cases you will probably find that you can do without additional processing, which not only saves an enormous amount of time and processor power, but also has an extremely positive effect on the final result.

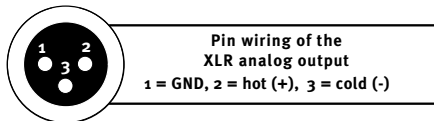
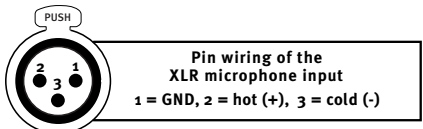
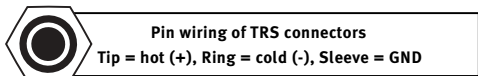
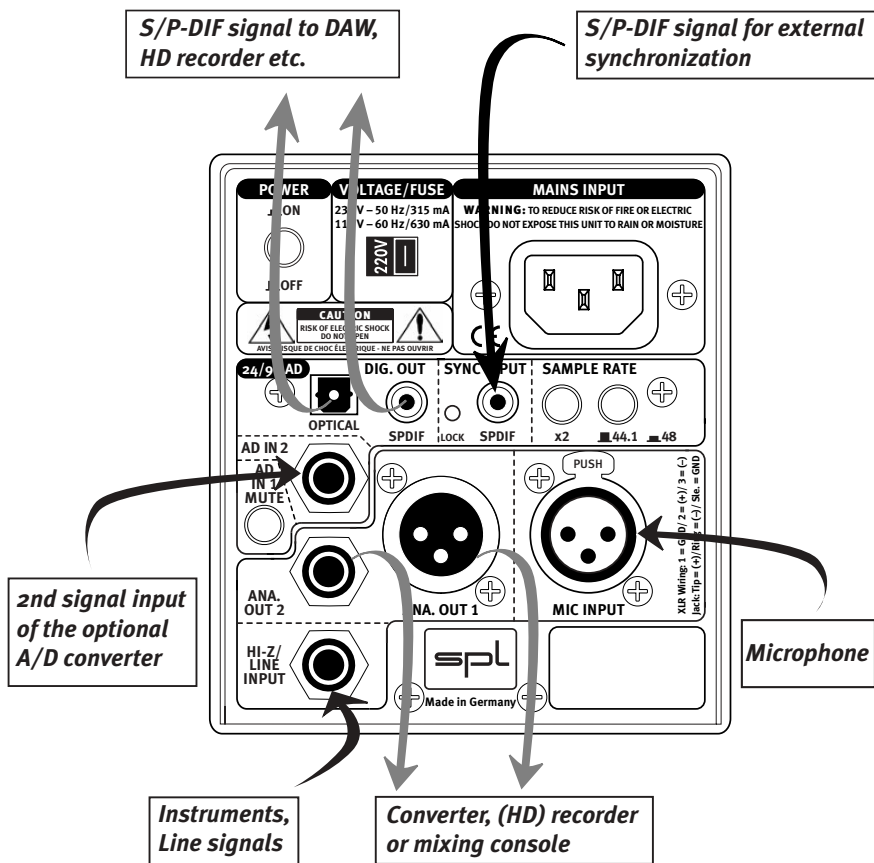
The GainStation 1 itself offers effective sound-shaping capabilities at recording, most notably via the tube stage, which can be completely bypassed or continuously added to the preamp circuit, allowing everything from extremely subtle „warmth“ to a very noticeable tube saturation effect. The integrated limiter can be used to protect an internal or external AD converter from clipping, or for example to add punch to drum tracks, which in turn reduces or in many cases even eliminates the need for subsequent compression. Put simply, the more tracks are recorded with the GainStation 1, the more solid and transparent—and easier to mix—the entire recording will be.

Before you begin

It makes good sense to think about where you place your GainStation1 before connecting it. It should be positioned so that you can easily reach it, but there are other considerations. Try not to place it near heat sources or in direct sunlight, and avoid exposure to excessive vibrations, dust, heat, cold or moisture. It should also be kept away from transformers, motors, power amplifiers and digital processors. In addition, please:

- Do not open the case. You may risk electric shock and damage to your equipment.
- Leave repairs and maintenance to a qualified service technician. Should foreign objects fall inside the case, contact your authorized dealer or support person.
- To avoid electric shock or fire hazards, do not expose your unit to rain or moisture.
- In case of lightning, unplug the unit.
- Always unplug the cable by pulling on the plug only; never pull on the cable.
- Never force a switch or knob.
- Use a soft, lint-free cloth to clean the case. Avoid cleaning agents as they may damage the unit.

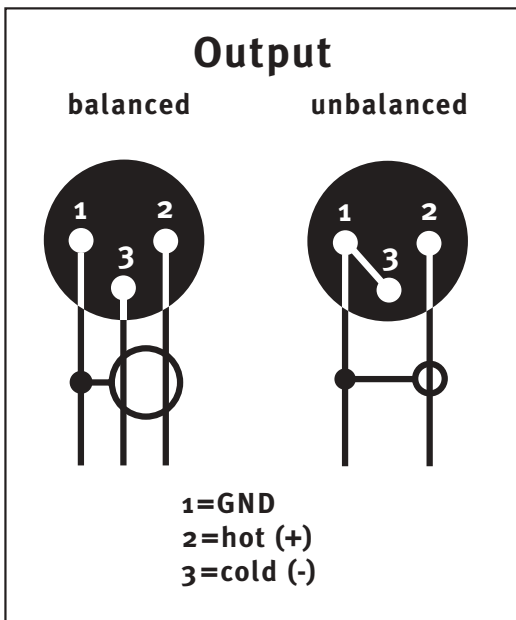
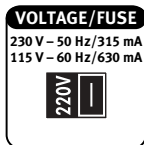




Again, while the GainStation 1's housing is EMV-proof and protects against HF-interference, placement of the unit is very important since it amplifies microphone signals as well as other unwanted signals. Before connecting the GainStation1 or any other equipment turn off all power.

IMPORTANT: Adjust the voltage setting on the back so that it corresponds with the power conditions.

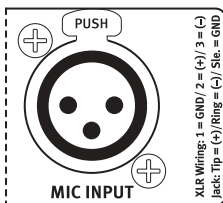
The following graph shows the correct wiring for connecting unbalanced signals to the balanced XLR connectors:



The HI-Z/Line Input connector is designed for unbalanced signals only.

The TRS output connector (see „Analog Outputs“, page 10) can be operated both with balanced and unbalanced wiring. Simply use a mono 1/4" plug for unbalanced operation.

Rear panel/connections



MIC INPUT

Dynamic, condenser or tube microphones can be connected to the MIC input. The 48V switch provides the phantom power necessary for some microphones (see also „Control elements/ Phantom“ on page 16).

The MIC input can also be used as a balanced connection for professional audio equipment with a maximum output level of +20 dBu.

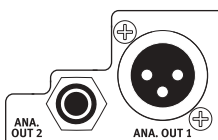


IMPORTANT NOTE: Always switch the phantom power (48 V) off before connecting anything other than phantom-powered condenser microphones.



HI-Z/LINE INPUT

The instrument input HI-Z/Line Input is for electric guitars and basses or other high-impedance, line-level signals such as keyboards, samplers, drum machines etc. with unbalanced outputs. If a balanced connector (TRS) is inserted, the ring of the plug is automatically connected to the ground to ensure proper unbalanced operation.



ANALOG OUTPUTS 1/2

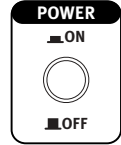
The preamplified output signal is fed to the balanced Analog Outputs. Since the XLR and 1/4" TRS connectors are wired in parallel, an unbalanced connection at one connector will cause the other connector to operate unbalanced, e.g. if a mono 1/4" plug is inserted into the 1/4" jack, the corresponding XLR socket will also operate unbalanced.



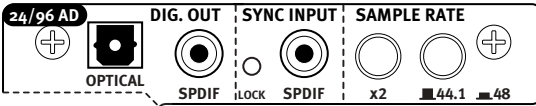
IMPORTANT NOTE: The output connectors can deliver an output level of up to +34 dBu. Please ensure that all other equipment can handle these levels to prevent possible damage.

POWER

The POWER switch turns the GainStation 1 on (indicated by the blue POWER LED on the front panel) or off.



24/96 AD Converter (optional)



The optional 24/96 Converter module (model 2376) provides a digital output for the GS1 in the form of an S/P-DIF output with RCA and optical connectors (in parallel). The converter transmits 24-bit signals.

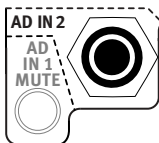
The module is based on a 24-bit converter by AKM® with a variable sample rate of up to 96 kHz. All common sample rates can be selected (see below). Highly accurate quartz oscillators ensure a clean, low-jitter master clock.

SAMPLE RATE

The 24/96 AD converter module allows you to select between the four most common sample rates: 44.1, 48, 88.2 and 96 kHz.

Using the 44.1/48 button, select one of the two basic sample rates (out: 44.1 kHz; in: 48 kHz). The x2 button doubles these sample rates to select 88.2 or 96 kHz respectively.

Rear panel/connections

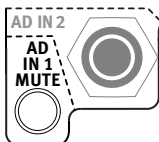


AD IN 2

If the optional 24/96 AD converter module is installed, this input can be used to convert an external analog signal. To avoid clipping, the input level should not exceed +12 dBu (+12 dBu corresponds to full digital gain of 0 dBfs). Excessive input levels are indicated by the AD OVL LED.

If no connection is made here, the output signal of the GS1 is routed to both channels of the converter.

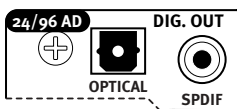
TIP: AD IN 2 can also be used as an insert for external pre-conversion processing. Connect the analog outputs of the GainStation 1 to the external processor's inputs and the processor's outputs to AD IN 2 on the Gain Station 1. One channel of the converter output will contain the dry or unprocessed signal, while the other channel will contain the processed signal.



AD IN 1 MUTE

Channel 1 of the converter is internally connected to the analog output, so that the AD OVL LED is always active. If the converter is not being used, this connection can be bypassed via the AD IN 1 MUTE switch so that the LED does not continuously blink or illuminate.

TIP: If no converter is installed, this switch should always be activated.



DIG. OUT

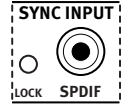
The converted S/P-DIF signal is routed in parallel to the RCA and optical outputs. The signal is in professional format with no sample rate data in the status block.

SYNC INPUT

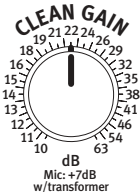
The SYNC input allows you to feed an external signal into the converter to control the sample rate. Connect an S/P-DIF output from your master source (e.g. sound card) to the SYNC input. The AD converter will automatically convert to the same sample rate that is received. The 2376 is not equipped to accept Word Clock for synchronization.

The yellow SYNC LOCK LED illuminates when a valid sync signal is present at the SYNC input, and the converter is automatically synchronized to the external sample rate.

The internal oscillators are automatically disabled when an external clock signal is present to prevent interference. If the sync signal is no longer present (e.g. in the case of a dropout), the converter automatically reverts to the sample rate selected via the buttons.



Control elements

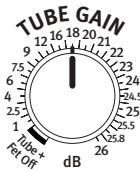


CLEAN GAIN

This potentiometer controls the amount of preamplification provided by the class A solid-state stage. A range of up to +63 dB is provided. For more information, please see „Setting levels on the GainStation 1“ on page 19.



IMPORTANT NOTE: If a Lundahl input transformer is installed, add 7 dB to the printed values.



TUBE GAIN

This potentiometer controls the amount of preamplification provided by the tube stage. This stage follows the clean (solid-state) stage, so that the gain values of the two stages are additive. Setting Clean Gain at 20 dB and Tube Gain at 15 dB results in 35 dB of total preamplification.

Turning the Tube Gain control fully counter-clockwise causes the tube stage to be deactivated and bypassed via a relay.



TIP: For optimal signal-noise ratios at high preamplification values, the majority of preamplification should be achieved via the solid-state stage, adding just enough of the tube stage for the desired sound. Due to the nature of tubes and tube circuitry, the tube stage is somewhat noisier than the solid-state stage.



OUTPUT LEVEL

This potentiometer adapts the output level to devices following in the chain or to the converter. At 0 dB the output level is equal to the internal level indicated by the LED display. The OUTPUT LEVEL control allows an additional 6 dB of amplification or 26 dB of reduction. The output level control is post-limiter to allow maximum levels to the internal or external converter.



IMPORTANT NOTE: If the internal level is noticeably above +18 dB (the orange +18 dB LED is brightly illuminated) and the output level is set to +6 dB, the output level at the analog outputs can be up to +34 dBu. Please ensure that all other equipment can handle these levels to prevent possible damage.



SOURCE

This switch allows you to select between the MIC and HI-Z/LINE inputs. Both inputs can remain connected at all times, regardless of which input is selected.

When first thrown after powering up the unit, this switch can cause a noticeable pop due to the discharge of residual current. This is normal and no cause for concern.



HI PASS

This switch activates the integrated high-pass filter, which operates at a 50-Hz center frequency and 12 dB/octave (often called a „rumble filter“). The filter is entirely passive, avoiding additional active circuitry that could potentially degrade the signal, and cuts 6 dB pre- and 6 dB post-solid-state preamplification to prevent the amplification of unwanted low-frequency signal portions.



PHASE

The phase reverse function reverses the polarity of the microphone signal, „turning“ the phase by 180° to correct phase-inverted signals caused by multiple signal sources.

A voice-over artist, for example, hears himself during recording through the headphones and simultaneously through the bones in his head. Phase inversion will cause an unnatural sound and even minimal variations in distance to the microphone will cause drastic variations in the sound. Phase inversion is also commonly encountered when using multiple microphones on a single sound source.

The GainStation 1's phase reverse switching is achieved passively via a relay, pre-preamplification, to avoid additional active circuitry.



Control elements

IMPED. Ω



IMPED. Ω

This 3-way switch allows you to select between three input impedances for the MIC input. The effect varies depending on the microphone used. With dynamic microphones, a lower impedance setting will also reduce the input level—this effect is less pronounced with good condenser microphones. We recommend the 10 k (Ω) setting for most applications, although some microphones may benefit from a different setting.

PHANTOM



PHANTOM

The GainStation 1 provides 48-Volt phantom power for microphones requiring external current (generally condenser microphones). Such microphones are dependent upon a clean, consistent and noise-free power supply for optimal operation and audio quality. The GainStation 1 continuously delivers precisely 48 V and a maximum of 14 mA, which will power all microphones.



IMPORTANT NOTE: All microphones with balanced, ground-free outputs, including tube microphones, can be used with the phantom power activated. First connect the microphone to the GainStation 1, then activate the phantom power. When finished, first deactivate the phantom power and wait at least 30 seconds before disconnecting the microphone to allow residual current to discharge.

Phantom power should only be activated when using microphones that require it. Please be sure to deactivate phantom power with all other microphones. Unbalanced microphones may only be used with phantom power deactivated.

48V



The 48V LED illuminates to indicate activated phantom power. When deactivating phantom power, it can take several seconds for the LED to go out, since the 48-V current dissipates rather slowly. When changing microphones, you should wait until the LED is completely dark before re-patching.

LIMITER



The GainStation₁ offers two types of output level limiting: PEAK and FET. The limiter is pre-output level control, so that the limited signal can be optimally adapted to the internal or external converter.

The peak limiter operates with special diodes that convert signal peaks into a type of saturation. Depending on the signal, this allows levels to be effectively and subtly limited. This type of limiting works very quickly, reliably limiting even microsecond-long transients, and is very effective for drums and percussion. The peak limiter also enables maximum loudness. Operation is displayed via the Limit LED.



The FET limiter is additionally available when the tube stage is activated. The FET circuit operates with a Field Effect Transistor (FET), which is connected to the tube and enables—always in conjunction with the peak limiter—a reduction of signal amplitude. Thus this limiter works in a similar fashion to a compressor, which makes it very effective for signals that undergo unforeseeable level changes (i.e. vocals, speech, guitar, bass, piano etc.) and where minimum loss in signal quality is desired. The peak limiter is always active post-FET limiter to ensure reliable protection. The Limit LED also displays the operation of the FET limiter (always somewhat more calmly than with peak limiting).

IMPORTANT NOTE: If the tube stage is deactivated while FET limiting is active, the LED will continue to display in FET limiting mode.

For more information on using the limiters please see page 20, "Limiter".

Control elements

Power



POWER-LED

This LED indicates that the GainStation1 is connected to the proper AC current and switched on. If the tube stage is active when the unit is switched on, it can take several seconds before a signal can be heard—this time is necessary for the tube to reach operating temperature.

-30 0dB 9 18 Clip



LED Level Display

The level display shows the peak level before output level control. A special circuit allows the LED's to vary in brightness to display in-between values. The -30 LED illuminates weakly at -30dB and reaches full brightness at 0dB. The 0dB LED illuminates weakly at 0dB and reaches full brightness at +9 dB and so on.

The CLIP LED operates post-CLEAN GAIN stage and displays clipping at this point in the signal path. It will not react to tube saturation in the tube stage, since this can be a desired effect.

AD OVL



AD OVL

This LED displays clipping in the internal AD converter and illuminates at approximately 0.5 dB before 0 dBfs. This LED should never illuminate when using the internal or an external converter—if it does, the output level must be reduced accordingly.

If the converter is not being used or not installed, the AD IN 1 MUTE switch should be activated, so that the output signal is no longer routed to the converter and the AD OVL circuit. Signals connected to AD IN 2 are also displayed by the AD OVL LED and cannot be switched off (they can only be disconnected).

In spite of its quality and flexibility, the GainStation 1's transparent user interface allows quick, intuitive operation. The unit is suited for a wide variety of applications. The following sections will provide an overview of the most important operational concepts and several application examples.

Setting levels on the GainStation 1

Start with the limiter switched off. With a representative signal present at either the MIC or HI-Z input, set the desired combination of Clean and Tube Gain so that the 9dB LED illuminates brightly. When this LED illuminates weakly, you have 9dB of gain. When brightly lit, you have 15-17dB, which still leaves you with a good 9dB of headroom (in the range displayed by the orange 18dB LED) before clipping. The orange LED illuminates dimly at 18dB and brightly at around 26dB. The red Clip LED should never illuminate—this indicates clipping in the clean stage, which generally should be avoided, as it will lead to distortion of the solid-state circuitry. (You may find this desirable in some rare cases—we had lots of fun creating heavily distorted guitar sounds...)

The Clip LED does not display high amplification levels in the tube stage that could lead to distortion. The GainStation 1 intentionally allows tube saturation, since tube distortion—contrary to transistor distortion—is often a desirable effect.

Once you have adjusted the gain levels as described above, use the Output Level control to set the optimal output level for subsequent devices in the chain.

IMPORTANT NOTE: The Output Level control should not be set above 0dB when working with high internal levels of more than 18dBu. Otherwise, extremely high output voltages of up to 34dBu (approximately 38Veff) can occur, which can damage other equipment. Please refer to the documentation of your other equipment regarding maximum input levels.



Combining different amounts of clean and tube gain will create various effects. The GainStation 1 operates virtually distortion-free with the tube stage bypassed. The sound is clean and transparent with extreme detail and very low noise. The clean stage is ideal for most acoustic instruments, as well as jazz or classical recordings. If you activate the tube stage and increase the gain setting slowly, you will notice that once you reach a certain level, harmonic distortion enters the signal. The sound becomes punchier and „fatter“, and attains more loudness. At this setting the tube stage is still relatively noise-free, and ideal for adding a bit of presence and liveliness to signals that may otherwise sound dull or lifeless. This setting works very well with stringed instruments like acoustic guitars, electric and acoustic basses and violins, since it highlights the harmonics of the strings.

Naturally, these effects become more pronounced as the amount of Tube Gain is increased. The tube can be driven to full saturation to produce pronounced distortion, which can be very effective with synthesizers, samplers and drum machines that lack punch. Signals recorded in this fashion will generally cut through a mix with no trouble at all.

Limiters

To achieve the desired results with the integrated limiter, it is important to understand its operation. The threshold value is fixed at 20 dBu. The clean and/or tube gain settings determine the amount of limiting, so that these settings more or less work like a threshold control. When the limiter is activated, it levels everything above 20 dBu. The orange 18 dB LED, which displays this level range, varies in brightness depending on limiting. The actual amount of limiting is displayed by the Limit LED, which becomes brighter as more level reduction is applied.

The peak limiter sounds different with the tube stage activated, since leveling occurs somewhat asymmetrically with the tube in the signal path, so that the negative half-wave is leveled with a much flatter curve.

To determine the ideal limiter setting for the internal converter, activate the peak limiting mode and adjust the Clean and/or Tube Gain to a setting well above your working level, so that the Limit LED illuminates brightly. Then reduce the Output Level until the AD OVL LED goes out. Now your gain levels can be returned to their normal settings and the limiter can be switched into FET mode if desired. The same method should be used with an external converter, except that in this case the external unit's clip LED is used for calibration. If you are only using the FET limiter and your program material contains few fast transients, the output level can be set somewhat higher.

Application examples

Next to the obvious recording or sound reinforcement applications, the GainStation 1 is also extremely interesting as an instrument preamp for musicians. Bassists can go through it directly into a power amp, resulting in a sound that is hard to achieve with standard bass preamps, with unparalleled punch, detail and dynamic. (An electric bass was used extensively during development as a „test generator“.) Using the FET limiter results in an extremely compact bass sound, which can usually get by without additional compression. On stage, the GainStation signal can be fed directly to the FOH console. Be sure that the console has a pad activated to prevent clipping.

The GainStation 1 is a much better choice for acoustic guitar than standard DI boxes, which rarely have high enough impedance to effectively amplify low-level pickup signals. With the GainStation 1, guitars sound much more transparent and dynamic—subtle string transients and harmonics are reproduced with amazing detail to create a harmonious, colorful sound.

Keyboardists also benefit from the GainStation 1's excellent sonic characteristics. On stage, the keyboard signal often runs through a DI and then through endless lengths of cable. By using the GS1 as a preamp and connecting its output directly to the stage box, the FOH console receives a much healthier signal, so it—and the engineer—can do their work effectively. Due to its compact format, the GainStation 1 can almost always be placed in an ergonomic position without being in the way.

The following section, while not attempting to represent a complete guide or answer all questions, provides several operational tips for various instruments.

Vocals/speech

The tube stage is well suited for adding presence to vocals. Exercise caution when setting levels, particularly with the clean stage, since vocals can be extremely dynamic. The FET limiter can be very helpful here to level peaks in a subtle, musical fashion and ensure safe levels for AD conversion. Once the limiter is properly set (see "Limiter", page 20), tube gain can be added as required.

Acoustic instruments/orchestra

The tube stage should be used very sparingly, if at all, when miking/recording orchestras or acoustic instruments, to ensure the highest possible S/N ratio. Levels should be set with the utmost care, since distortion and clipping are easily heard and absolutely undesirable in classical and most acoustic recordings. In general, the limiter should only be used if absolutely necessary.

Acoustic guitar with pickup

A combination of clean and tube stages will deliver good results here. Lower tube gain settings between 1 and 9 dB will result in a very acceptable S/N ratio. Moderate use of the peak limiter will provide the best protection against clipping.

Guitar amps

As with acoustic guitars, combining the clean and tube stages is especially effective when miking guitar amps. Higher Tube Gain settings result in more punch and loudness. The more distorted the guitar sound, the less limiting is required, since the distortion process levels dynamics.

Application examples

Electric Bass

If an electric bass is directly connected to the HI-Z input, a combination of clean and tube stages is usually best. In the case of extreme dynamics, the FET limiter will deliver excellent results and a tight, punchy bass sound that usually needs no additional compression.

Keyboards/samplers/drum machines

Electronic sound sources allow you to fully utilize the GainStation 1's potential. The clean stage is excellent for clear, glassy sounds and pads, and a combination of clean and tube stages for most other sounds. The more dynamic the material, the more effectively you can utilize the limiter.

Tube distortions with GainStation 1

The GainStation can be a great creative tool for creating distortion effects for suitable instruments and loops. Try using very high tube gain settings, so that the 18 dB LED is constantly illuminated. Increasing the clean gain will feed more level to the tube stage, intensifying the tube saturation effect.

Activating the peak limiter will add a different type of distortion with more overtones. The FET limiter will not add distortion, but will create „hard limited“ sounds with an extreme loudness effect.

Drums/snare drum

Exercise caution when setting levels to avoid clipping. Drums are notorious for fast, powerful transients that can easily add 10 dB to the average level. In addition, few drummers (or any musicians, for that matter) are so disciplined that they don't play louder during a take or concert than they do during sound check. Experiment to see whether or not you like the sound of the tube stage and in what proportion. It's definitely a good idea to use peak limiting to protect converters and/or other equipment and prevent unwanted distortion (see "Limiter", page 20). In FET mode, the limiter may be more audible than you'd like it to be when used on drums.

Bass drum

Here pretty much the same applies as for snare drum. The peak limiter may tend to accentuate the attack or „click“ of the bass drum, which can lead to undesirable sound variations with less disciplined drummers.

Toms

Level setting is not quite as critical with toms. Moderate use of the FET limiter will provide pleasant yet effective leveling.

Overheads

Using the tube stage on overheads can give the entire drum set extra punch and presence—don't worry if the 18 dB LED illuminates brightly in this case. Higher tube gain levels will increase the punch and loudness effect. The FET limiter is an additional creative tool on overheads.

Inside the GainStation 1

The most time-consuming part of the development of the GainStation 1 was searching for, selecting and matching components, PCB's and IC's. One decisive factor in achieving impeccable audio quality is the refusal to accept any weak spots in the chain—the insistence upon each link being as good as the next. It makes no sense to use a world-class op-amp with an improperly engineered power supply or lower-quality passive components such as resistors and condensers.

The GainStation 1 is based on fully discrete op-amps that operate in class A mode. Class A operation dictates that both end transistors are constantly conducting current to prevent distortion. In conventional class B amplifiers, each transistor carries a half-wave, and distortion occurs every time current moves from one transistor to the next. Class A operation requires much higher closed-circuit current—approximately 6 mA with this op-amps or roughly three times the total current consumption of a conventional amplifier—which in turn leads to increased heat generation.

Several months went into the development of the GainStation 1 op-amp. First, we tested several different circuit configurations, using test equipment as well as listening tests with a wide variety of program material. It became more and more apparent that less complicated circuits provided better audio results.

The GainStation 1's input differential amplifier utilizes an extremely low-tolerance, thermal-coupled matched transistor pair in a single casing. This prevents deviances between the transistors to ensure minimal THD (total harmonic distortion) even at various temperatures. The resistors in the initial differential amplifier are connected to a secondary differential amplifier—also based on a matched transistor pair—that handles current conversion.

An output stage, which also operates in class A mode with over 6 mA of closed-circuit current, functions as a current amplifier.

The transistors and resistors utilized also had an enormous effect on the audio quality. To facilitate selection, we assembled several models and subjected them to extensive listening tests. All this trouble more than paid off: the final GainStation 1 op-amp has a slew rate of over 100V/ μ s—several times faster than industrial op-amps. This is an absolute prerequisite for clean, transparent and dynamic audio. Transients are depicted with unparalleled accuracy, resulting in an open, airy and realistic sound.

The clean stage is based on a fully discrete, balanced instrument amplifier and also operates in class A mode. The special circuit configuration ensures consistent frequency response at virtually every gain setting. With its slew rate of over 200 V/ μ s, it is able to amplify fast transients and extremely high frequencies with almost no distortion. An op-amp subsequently converts the instrument amplifier's output signal into an unbalanced signal, which is fed to the tube.

The tube type—a Sovtek® 12 AX7 LPS—was also selected after extensive measurements and listening tests. This tube type delivers an open, transparent sound, excellent noise values and is especially reliable. A generously proportioned 2.2 μ F WIMA-MKP decoupling capacitor is utilized to ensure clean, punchy low frequency response. An impedance converter adapts the tube's high-impedance signal to the output stage, which also utilizes fully discrete op-amps and can easily drive extreme cable lengths. Coupling condensers were used as sparingly as possible to avoid their inherent disadvantages such as diffuse sound, slurring and loss of dynamics. Instead, servo circuits were utilized to eliminate DC artifacts.

The Hi-Z input is a fully discrete impedance converter that also operates in class A mode. It is based on a low-noise field effect transistor that is especially well suited to this task due to its extremely high input impedance. The signal then passes to the clean gain stage.

In order to ensure the shortest possible signal paths, all switching functions are handled by optimally positioned, encapsulated relays with gold-plated contacts—the switches themselves only trigger the relays. Since resistors also greatly affect audio quality, the entire audio signal path utilizes painstakingly selected resistors with 0.1% tolerance.

The op-amp circuits use premium FKP foil condensers, which sound much more open than ceramic types and provide more natural dynamic response.

All circuit boards have oversized grounding surfaces for optimal shielding.

In the case of the power supply, no expense was spared. After all, the power supply is one of the primary factors in the audio quality and overall sound of any device. Just like the best coffee beans in the world will not produce a good cup of coffee with poor water, the best circuits can't produce a great sound with unreliable, inconsistent current. The transformer delivers seven different voltages, each of which is separately screened and regulated: 250-V anode current for the tube, 12.6V for tube heating and relays, 48V for phantom power, 2 x 15V for the LED's and 2 x 30V for the audio signal path.

The 2 x 30-V current alone is first pre-regulated to 33 V and then reduced to 30 V in order to filter out the last remnants of hum. This task is handled by select 1000- μ F electrolytic capacitors. In addition, critical currents are stabilized via a 100-nF MKP foil condenser, to ensure sufficient current for even the shortest impulses. The transformer is encompassed by double shielding to keep magnetic stray fields to an absolute minimum.

In our humble opinion, the time and energy invested in the development of the GainStation 1 was well worth it. The result is an extremely compact, unusually flexible preamplifier that delivers audio quality usually found only in units costing much more. We believe we just may have set a new record in the sound per cubic centimeter category.

Technical specifications

| | |
|---|-------------------------|
| Frequency response (Clean Gain 30dB, Tube Gain off, output level 0dB, +/- 0.5 dB): | <1 Hz-125 kHz |
| Frequency response (Clean Gain 30dB, Tube Gain off, output level 0dB, +/- 3 dB): | <1 Hz-310 kHz |
| Frequency response (Clean Gain 30dB, Tube Gain 1dB, output level 0dB, +/- 0.5 dB): | <1Hz-125 kHz |
| THD+N (Clean Gain 24dB, Tube Gain off, output level +6dB, 20-22 kHz, +25 dBu out): | 0.0005 % |
| THD+N (Clean Gain 23dB, Tube Gain 1dB, output level +6dB, 20-22 kHz, +25 dBu out): | 0.032 % |
| Noise (Clean Gain 10dB, Tube Gain off, output level 0dB, 20-22 kHz, A-weighted) | -95.4 dBu |
| Noise (Clean Gain 30dB, Tube Gain off, output level 0dB, 20-22 kHz, A-weighted) | -91.8 dBu |
| Noise (Clean Gain 60dB, Tube Gain off, output level 0dB, 20-22 kHz, A-weighted): | -67.2 dBu |
| Noise (Clean Gain 20dB, Tube Gain 10dB, output level 0dB, 20-22kHz, A-weighted): | -86.4 dBu |
| EIN (Clean Gain 60dB, Tube Gain off, output level 0dB, 20-22kHz, A-weighted, 40Ω): | 127.2 dB |
| Dynamic response (20-22kHz, A-weighted): | >130 dB |
| Common Mode Rejection (Clean Gain 30dB, Tube Gain off, 1kHz, Input -30dBu, output level 0, w/o transformer): | >80 dB |
| Maximum Output Level: | +34 dBu |
| Max. Input Level (Mic Input, Hi-Z Input): | +17 dBu |
| Input Impedance (Instrument input): | >1 MΩ |
| Output impedance: | >75 Ω |
| Slew Rate (Clean Gain 30dB, Tube Gain off, Output Level +6dB): | >40 V/μs |
| Phantom power: | 48 V +/-2 V |
| Power consumption (w/o AD-Converter): | 25 W |

Dimensions (W x H x D): 106 x 122 x 271 mm

Weight (w/o Lundahl transformer and AD converter): 2.65 kg

Options

The following accessory is optionally available:

- Lundahl input transformer (upgrades after sale by authorized service personnel or SPL only)
- 24-Bit/96 kHz AD converter (Upgrading after sale can also be done by clients)
- SPL GainBag (Transportation bag for GainStation 1, average-sized microphone and cable)
- 19"/3U mounting frame for up to four GainStation 1

Information on Lundahl input transformers

Transformers have the characteristics usually associated with other analog components like tubes or coils—they sound „warmer“, fatter, punchier, more direct, improved presence without boosting the top end.

One main reason for this is that transformers cancel out a large amount of odd harmonics (those portions of an audio signal that sound harsh to human ears).

The GainStation 1's input transformer delivers 7 dB of additional passive gain, which must be added to the printed values.

Technical specifications are subject to change without notice.

Warranty

SPL products are manufactured using carefully selected components and materials and state-of-the-art production technology. Every SPL product is thorough inspected and tested before leaving the factory, including acoustic and electronic testing.

SPL warrants the SPL 24/96 AD Converter Model 2376 to be free of defects in materials or workmanship for a period of 24 months after the date of purchase. Should any trouble caused by defects in materials or workmanship develop during this period, SPL will repair or, at our option, replace the product at no charge. Should SPL choose to replace the product, we reserve the right to replace it with a newer model.

In order to validate your warranty, you must either return the enclosed warranty registration card, completely filled out, to SPL, or register your product online within 14 days of purchase. You may register your product online at www.soundperformancelab.com or, in the USA or Canada at www.spl-usa.com.

The warranty period begins on the date of purchase. The warranty is non-transferable. Repairs or replacements do not extend the warranty period.

This warranty does not apply if:

- the product was not purchased from an authorized SPL dealer
- repairs are required due to normal wear and tear
- the product has been abused, misused or improperly maintained, or if repairs or alterations have been made or attempted by any other than authorized SPL service personnel
- the serial number has been removed or defaced

In no event shall SPL be liable for any indirect, incidental or consequential damages from the sale or use of this product, either during or after the warranty period.

SPL disclaims liability for any implied warranties, including implied warranties of merchantability and/or fitness for a specific purpose, after the warranty period.

This warranty gives you specific legal rights. You may have other rights, which vary from country to country and state to state. Some of the above limitations may not apply to you.

SPL electronics GmbH

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User's Guide GainStation 1, Models 2272 & 2273

All you need is imagination, good ears and three letters:

