

# IRON

## Mastering Compressor



Manual



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## Version 1.2 – 11 / 2015

**Developer: Wolfgang Neumann**

This manual includes a description of the product but no guarantee as for specific characteristics or successful results.

Unless stated otherwise, everything herein corresponds to the technical status at the time of delivery of the product and user manual by SPL electronics GmbH.

The design and circuitry are under continuous development and improvement.  
Technical specifications are subject to change.

## Package Contents

### IRON Mastering Kompressor

Power cord

Manual

The IRON mastering compressor is available in different colors.

Black: Model 1520

Red: Model 1524

Do consider keeping the original packaging. It can come in very useful whenever you need to transport your gear. If there is ever the need to send it in for repair, the original packaging guarantees a safe shipment.

The SPL IRON mastering compressor was designed, developed and manufactured in Germany.

## Operating Principles of a Compressor

The basic operating principles of a compressor/limiter can be easily explained. The level of an audio signal is reduced according to the specified Attack time and Ratio whenever it exceeds a given threshold. This reduction ceases when the Release time elapses, while the compressed signal is amplified with the Make-Up Gain.

Compressors basically differ from each other in the technology used. This technology - tubes, opto, FET, or VCA - is what gives a compressor its particular character. Some units sound soft and silky, some sound pounding, while some others make sound fatter, and there are those that make sound clearer, harder or more percussive. The trick resides in how the unit is technically designed, in the signature of the maker. Different compressors with the exact same settings might work and sound completely different. They provide different sounds for different applications and music styles.

Nowadays, the compressor has become a key element when it comes to provide dynamics and punch to any production. The number of compressors available is huge and it's easy to succumb to the promises made by software emulations and analog recreations of vintage gear as the perfect solution. Unfortunately, many of these emulations and recreations differ quite a bit from their original counterparts. You must simply accept that the components used today, like the transformers, tubes and all other passive elements, are different to the ones originally used and that they can't be digitally emulated. No software (DSP-emulated compressors) or hardware replica will ever be able to sound like the original. An authentic sound can only be achieved with the original unit.

## IRON Mastering Compressor

The IRON mastering compressor is not a copy of a classic unit, but rather an original concept in itself. Our goal was to conceive a compressor that provided a pleasant, melodic-sounding, transparent compression, inspired on the vintage compressors of the radio era. And we wanted it to be versatile enough to adapt perfectly to the needs of modern mastering studios. Thus, the Iron combines not only the sonic virtues of legendary vintage tube compressors with the advantages of the High Dynamic 120V operating voltage in a single unit. It also sets a new benchmark in terms of tube compressor technology, with the innovative implementation of a parallel dual-tube circuit. Thanks to the especially conceived Mu-Metal iron transformers, the signal of each channel is split across two different twin-triode tubes. The combination of the different response curves of both tubes results in a transparent and musically pleasant compression. Additionally, peak signals of the control voltage are limited by a feed-forward resistive opto-isolator. Thus, the output signal remains lively even with a high gain reduction. The compression is only noticeable with extreme settings.

But mastering is not the only domain where the IRON sets new standards. It can also be used to process individual instruments, like vocals, bass, guitar, strings, etc. The IRON is also an excellent option for subgroups.

# Technical Aspects

## 120 Volt Technology

SPL's goal was to push analog signal processing to the limits. That's why we combined the best possible components with a high-grade optimized circuit design.

We have been using the in-house developed 120-volt technology - the highest-ever operating voltage used for audio applications - in all our products from the Mastering series for years. Some of the most highly respected Mastering studios today revolve around SPL consoles and signal processors from our Mastering series (Bob Ludwigs Gateway Mastering & DVD in the USA, Simon Heyworth's Super Audio Mastering in the UK, Galaxy Studios in Belgium, and the legendary Wisseloord in the Netherlands, for instance).

The 120-volt technology is based on op-amps developed internally by SPL's co-founder and Chief Developer Wolfgang Neumann. The IRON features the most advanced generation of these op-amps. They boast better tech specs thanks to the thermal behavior optimization they underwent under the hands of Bastian Neu.

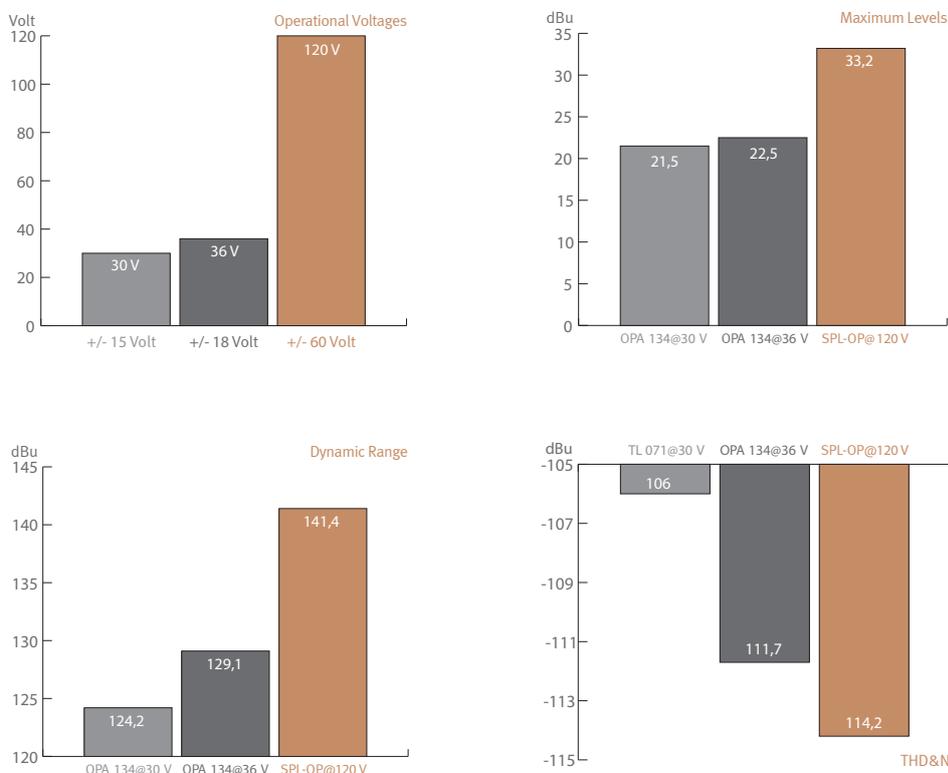
Ultimately, the supply voltage is key for the overall dynamic response of a processor. Voltage is to an electrical circuit what cylinder capacity is to an internal combustion engine.

You can't replace cylinder capacity with anything else, except more cylinder capacity.

## 120 Volt Technology - Diagram

These diagrams clearly show the advantages of our 120-volt technology in comparison to other circuits with a lower operating voltage. The direct relation between operating level and maximum level is fundamental for the classification: the higher the operating level, the higher the maximum level a circuit can handle. And since virtually all essential acoustic and musical parameters depend on this relation, a higher operating voltage also has a positive impact on the dynamic range, distortion limit and signal-to-noise ratio. The result is a clearly more laid-back and natural sound with less unpleasant coloring.

Do bear in mind that dB scales do not represent linear but rather exponential increases. A 3 dB increase corresponds to doubling the acoustic power, +6 dB correspond to twice the sound pressure level, and +10 dB correspond to twice the perceived loudness.



When it comes to volume, the 120-volt technology exhibits a performance that is twice that of common components and circuits, in regard to maximum level and dynamic range, with values that are approximately 10 dB higher. THD measurements of the SPL op-amps show a difference of more than 3 dB compared to the OPA134 at 36V — in terms of sound pressure level, that corresponds to an improvement of more than 50%.

The operating level most commonly used for audio equipment is 30 volts.

# Technical Aspects

## Innovating Compression

The IRON mastering compressor is a variable-bias limiter/compressor. The implementation of new technologies results in many improvements.

Its basic operating principle as a variable-bias tube compressor was loosely inspired by the sonic and technical operation of Fairchild, Collins and Gates compressors, which used remote cut-off of tube biasing to achieve a well-balanced, well-compensated and musical compression. However, the IRON compressor features a second sharp-cutoff tube, a medium-variable Mu Triode, in its circuit design. This tube is connected in parallel to the remote cutoff tube and it has a considerably steeper characteristic curve. The tube used to process the signal depends on the amplitude of the latter. This results in a more well-balanced sound and more controllable settings of the parameters. The pair of parallel connected tubes has been specially matched for the IRON. In order to guarantee that tube selection and pairing is perfect, we use the Weigl Roe Test for PC. The optimal selection of the tubes guarantees that all IRONs have the same sonic characteristics. Moreover, we use Lundahl custom-made balanced high-level dual-coil Mu-Metal iron transformers in the signal flow of the variable-bias tubes, which add to the overall sound.

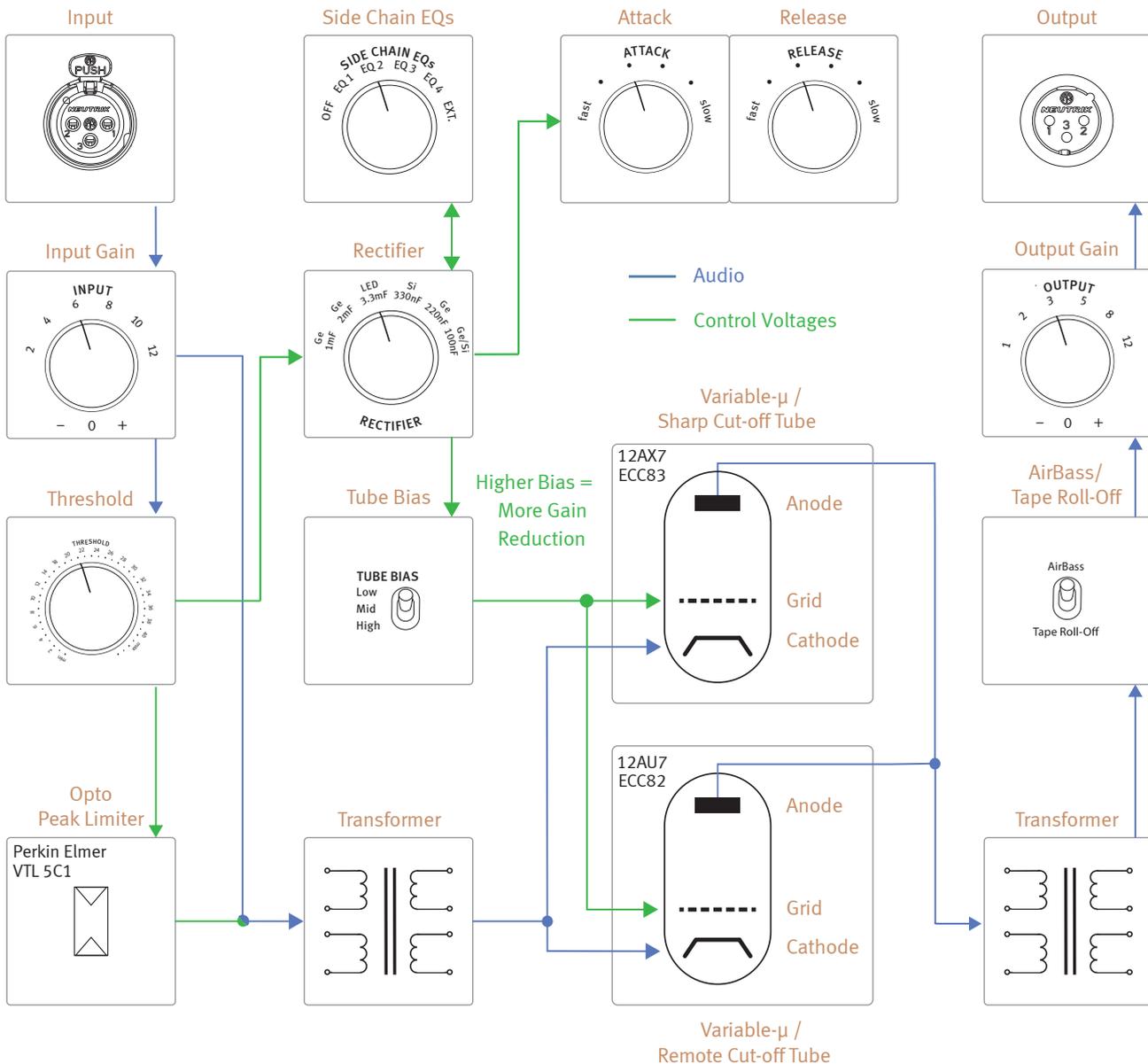
The second new technology implemented is the independent feed-forward resistive opto-isolator in the control path of the variable-bias tube circuit. Its function is to limit signal peaks and, thus, get a smaller THD (Total Harmonic Distortion) within the variable-bias tube section. The result is a silkier, more homogeneous sound in the higher frequencies of the music signal. The optical control element does not work in the sense of an audio limiter, like in a conventional opto-compressor. It is built-in in the control path of the parallel connected variable-bias tube, not in the audio path itself. The IRON compressor works as a feedback compressor in the variable-bias tube circuit and as a feed-forward compressor in the opto-control circuit.

Thirdly, the complex rectifier circuit is also worth mentioning, since it is the basis for tube control. You can use the six-position switch to choose either of the six different control characteristic curves of the diodes within the rectifier. Given the specific characteristic curve of its elements, the combination of germanium, silicon and LED diodes produces different behaviors and characteristics for the Attack and Release times. Hence, compared to most compressors, the application scope of the IRON is clearly enlarged, resulting in new possibilities regarding the processing of music material.

The fourth exceptional feature is the comprehensive logical relay circuit that perfectly links both channels together, making the right channel the Master regarding Release, Attack, Threshold, Rectifier, Tube-Bias and Side-Chain EQ settings.

## Signal Flow

The following diagram depicts the signal flow within the IRON compressor. It is meant to clarify how it works and to show the relation between its different parameters. The audio signal flow is in blue and the control voltage signal flow is in green.



# Installation

## First Steps

Before turning on the IRON you must first connect the included 3-pin power cord to the 3-pin IEC socket. The transformer, power cord and IEC socket all comply to the VDE, UL and CSA regulations.

The IRON should not be installed in close proximity to equipment that emits magnetic fields or emanates heat. Avoid exposure to heat, moisture, dust, and vibrations. Do not install the IRON close to any power amps or digital processors. Instead, install it in a fully „analog rack” where any interferences can be avoided (Word Clock, SMPTE, MIDI etc.).

The unit should be powered off before connecting or disconnecting any cables or equipment to it.

Use the On/Off switch on the rear panel to turn the unit on or off. The illuminated VU-meter on the front panel indicates the unit’s operating status. The On/Off switch was placed on the rear panel to avoid any emissions due to voltage-carrying conductors running across the unit and affecting sound. When powering on or off, there’s no need to observe a specific sequence regarding the connected devices. However, like with any audio signal chain, power amplifiers should always be powered on last and powered off first. The IRON can be powered on and off with the use of a circuit breaker, as long as the total load does not exceed the rating of the latter.

## Voltage Selection

Before connecting the IRON to the mains, make sure that the voltage selection corresponds to the values of your local power grid (230 or 115 volts) Inside the power connector, to the right, next to the on/off switch, there is an opening that displays the voltage selected. If the voltage indicated does not correspond to the one required, change it by following this procedure:

Open the power connector lid with a small screwdriver (use the tiny slots on the right hand side). Use the screwdriver to lever the red fuse holder from above until you can grab it. Take the fuse holder out and replace the fuse with one corresponding to the local power grid specifications. You can find the adequate values on the rear of the unit or on page 18 of this user’s manual. Turn the fuse holder around 180 degrees and place it back again. When you close the lid again, you should see the correct voltage displayed in the opening.

## Ground Lift switch to avoid ground loops

On the rear panel of the IRON mastering compressor is also a „GND LIFT“ (Ground Lift) switch to avoid any ground loops. Ground loops take place when gear connected in the same network have different potentials.

The GND LIFT switch disconnects the equipment ground from the service ground to avoid such problems. The Ground Lift function is activated (= equipment ground disconnected) when the switch is depressed.

## Tube Warm-Up

The IRON compressor includes several tubes in the signal path. We recommend you to warm up the tubes of the IRON about 30 minutes before processing any audio material with it. The sound and compression characteristics of the IRON compressor might change especially within the first 15 minutes after powering on.

## Suggestions for setting the compressor

The operation of the IRON compressor strongly depends on the input signal. Normally the following start values are a good starting point:

**Attack/Release:** Position 2 or 3 (clockwise from „fast“)

**Rectifier:** LED

**Side Chain EQs:** Off

**Tube Bias:** Low

If you switch through the different rectifiers, you have to adjust the other parameters. The remaining rectifier circuits tend to provide faster/slower time values. When the program material stays the same, slower/longer time values should be chosen and/or the threshold should be raised.

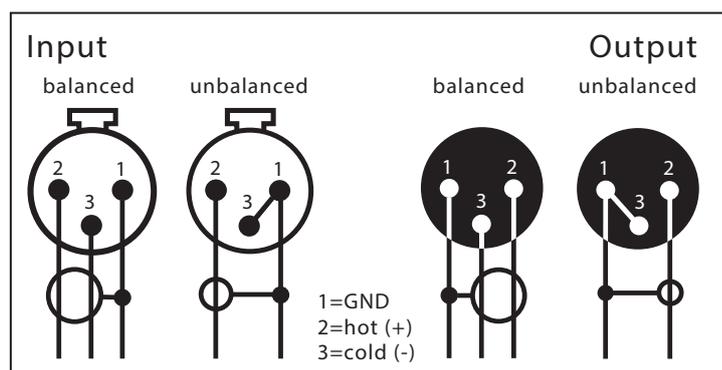
Especially when it comes to group applications, the high bias setting can be interesting.

# Cabling: Rear Side

## XLR inputs and outputs

We used exclusively Switchcraft/Neutrik XLR input and output plugs to guarantee perfect connectivity in the studio. They provide an optimal connection thanks to their electromechanical design and large contact surface.

The image shows the XLR connectors pinout. They are balanced and have three conductors or wires. Conductor 2 (Pin 2) corresponds to the (+) or hot Signal. In case an unbalanced connection is necessary, the correct polarity of the conductors needs to be observed.



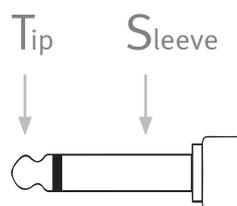
## Sidechain Input

The Sidechain input serves to connect an external control signal to the compressor. To that end, each channel features a TS jack. Please use only TS (mono) not TRS (stereo) plugs.

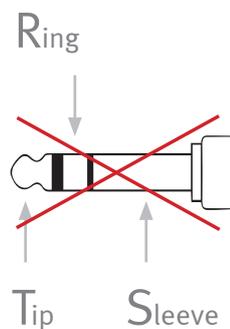
The image shows the pinout of the TS connectors.

Tip: Signal

Sleeve: Ground



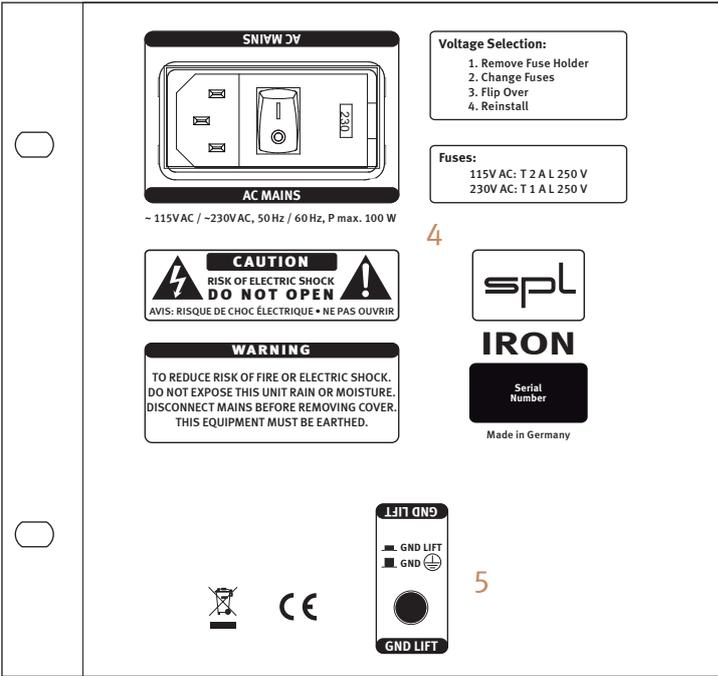
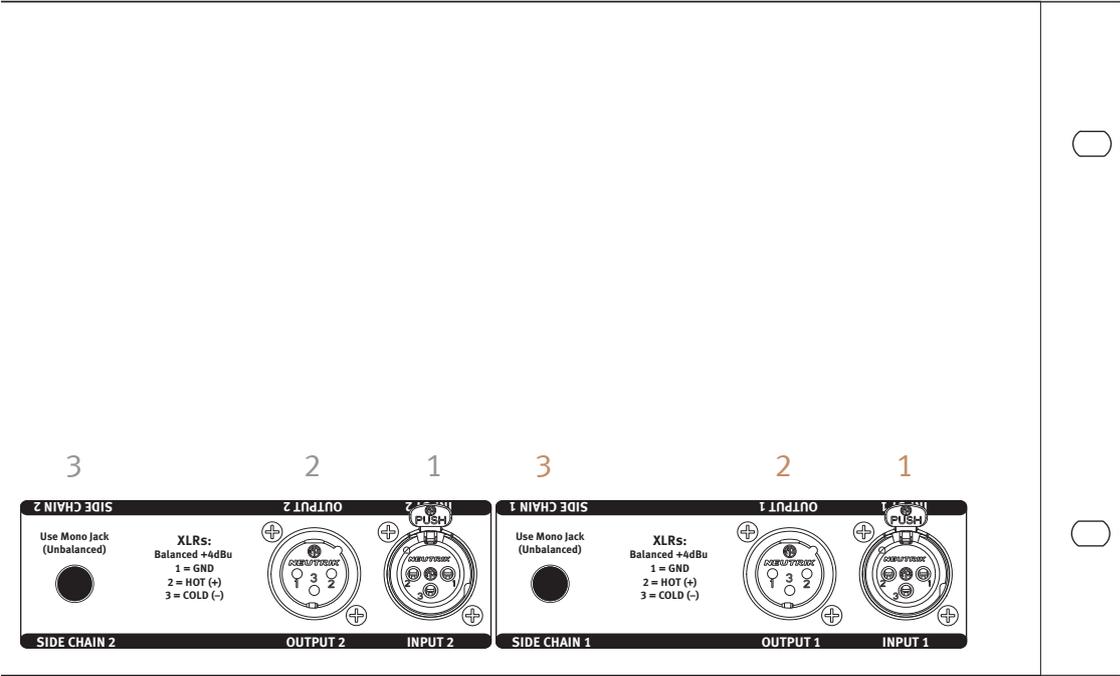
TS



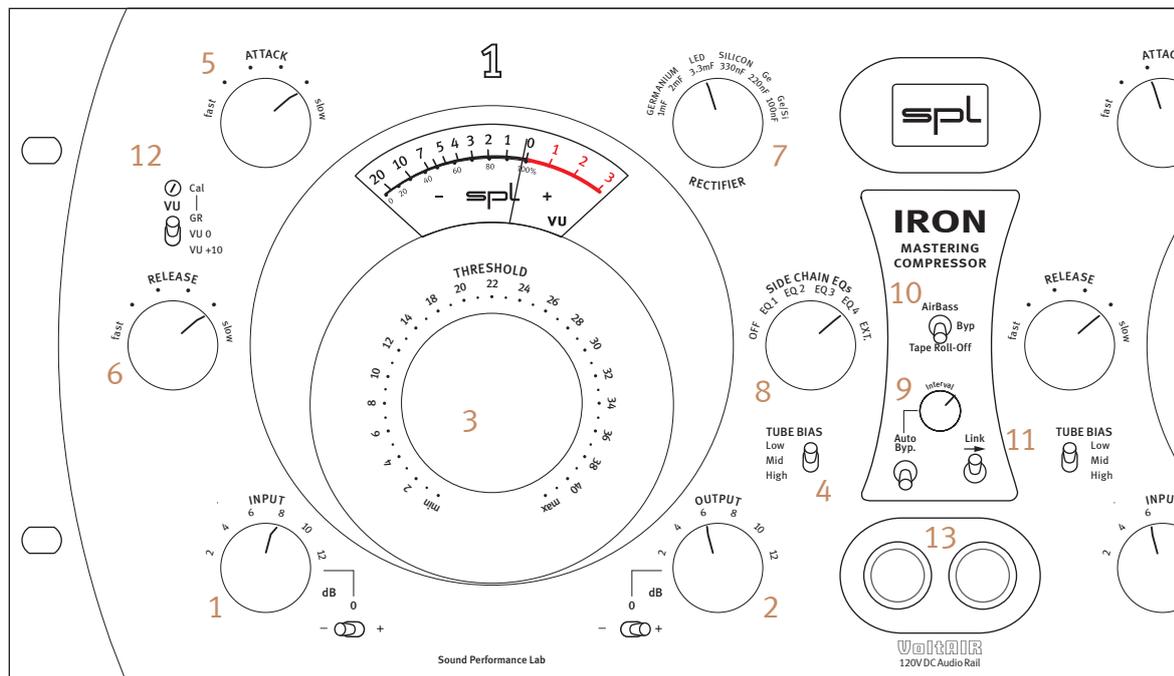
TRS

# Cabling: Rear Side

- 1 Input
- 2 Output
- 3 External Sidechain
- 4 Voltage (see details on page 8)
- 5 Ground Lift (see details on page 9)



# Control Elements



- 1 Input
- 2 Output
- 3 Threshold
- 4 Tube Bias
- 5 Attack
- 6 Release
- 7 Rectifier
- 8 Side Chain EQs
- 9 Auto Bypass
- 10 AirBass / Bypass / Tape Roll-Off
- 11 Link
- 12 VU Switch
- 13 Channel Switch

## Input

The operating value of each channel can be increased or reduced in 2 dB steps via the six-step rotary knob. A three-way switch allows you to select whether the value is increased or decreased. In the center position, the Input switch is inactive; in other words, no level increase nor reduction takes place. This position is the default setting. If the switch is in the „-“ position (left), the input level is reduced according to the chosen setting. If the switch is in the „+“ position (right), the input level is increased according to the chosen setting.

The increase or reduction of the input level affects the overall response of the compressor and it has a direct impact on the level reduction.

## Output

Since the compressor reduces the dynamics of the incoming signal, the output level is, generally speaking, lower than the input level. This audible level loss can be compensated with the Output control, in order to make the best use of the recording medium used. Just like with the input section, the increase or reduction is achieved via a three-way switch. In the center position, the Output switch is inactive; in other words, no level increase nor reduction takes place. This position is the default setting. If the switch is in the „-“ position (left), the Output level is reduced according to the chosen setting. If the switch is in the „+“ position (right), the Output level is increased according to the chosen setting.

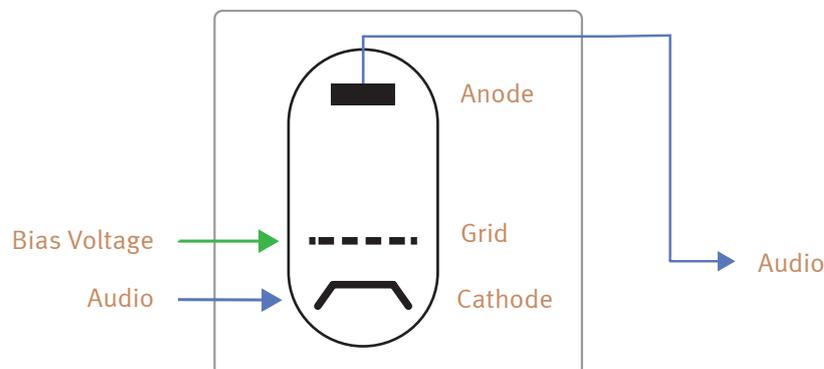
## Threshold

Threshold determines the level beyond which the compressor starts to compress. The compressor begins to process the signal once the threshold value has been exceeded. Only signals that exceed the threshold level are compressed. Signals whose level is beneath the threshold value are not processed. The Threshold parameter of the IRON can be adjusted in 41 steps with the detent potentiometer. Do note, however, that the intensity of the compression depends also on the Input, Tube Bias, Rectifier, Attack, Release, and Side Chain EQs parameters.

# Control Elements

## Tube Bias

The Tube Bias switch allows you to determine the bias of the tubes according to three settings (Low, Mid, High). The bias of a tube is the voltage present on the tube's grid. The higher the voltage, less signal makes it from the cathode to the anode of the tube, which means the compression is stronger.



The modulation of the bias is the sum of the Threshold, Rectifier, Side Chain EQ, Attack, and Release parameters.

## Attack

Attack determines the response time of the compressor. Put simply, it is the time that the compressor needs to respond once a signal is above the threshold. It indicates how long it takes the compressor to perform 63% of its work. The Attack time can be adjusted in six steps, from Fast to Slow.

The IRON does not offer the possibility to set an exact Attack time, since it is not a constant value and it depends on the rest of the parameters.

### Moderate Attack times

To get an inconspicuous compression, set a middle-of-the-road Attack time and then reduce it carefully until you can hear some distortion. Right at that moment you should go back a bit and you will have reached an ideal compromise.

### Longer Attack times

If you want to use the compressor to shape sound and to highlight the transient phase of an instrument, you should use longer attack times.

### Long Attack times and short Release times

The use of extremely long Attack times and shorter Release times is called Leveling, because the compressor can hardly react to any level changes and always keeps the signal at the same level. That way, short dynamic changes in the music are not affected, only long-term volume variations are processed.

## Release

The counterpart of the Attack is Release. The Release parameter determines how fast the compressor eases processing the signal. To be precise, it determines the time in which 63% of the reduced gain is restored. Similarly to the Attack time, the Release time can also be set in six steps from Fast to Slow. Likewise, exact Release time settings are not possible. Once again, there are no constant values, since the Release time depends on the rest of the parameters, too.

Although the Attack and Release times can be considered fixed intervals, the control-time behavior and operating mode of the tubes is very different depending on the music. That is why these values should not be considered absolute values.

On page 19 you will find an overview for orientation, which shows the time values depending on the chosen rectifiers.

### TIP

#### Compression during vocal recordings

The attack time should not be too fast, otherwise plosives could be distorted, resulting in the vocals sounding unnatural. Many sound engineers compensate these level variations by automating the fader. The actual peaks of vocals are not at the beginning of a syllable, but rather later, when long vocals come along, which ought to be limited as well. That is why the Attack time should be relatively slow and the Release time relatively fast.

## Rectifier

To produce the bias voltage to control the parallel connected tubes we use a rectifier. This circuit has six different operating characteristics (different rectifiers), which can be selected with the corresponding switch. They have a direct impact on the Attack and Release times.

In comparison to the other rectifiers, the rectifier circuit LED delivers the longest/slowest time values. You can find more information at the time values overview on page 19.

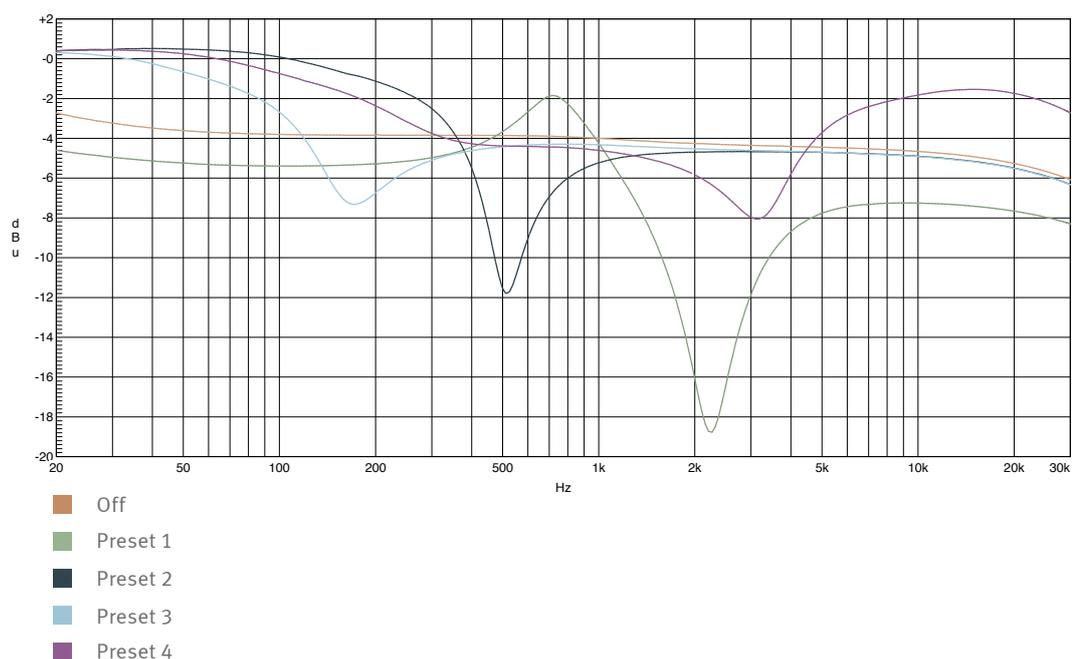
# Control Elements

## Side Chain EQs

The Sidechain filters can make the response of the compression be influenced by a given frequency range. Some call this frequency-selective compression. For instance, if the low frequencies are reduced, the compressor will not react as promptly to kick drums and bass lines. This can prove very useful when these elements are very present in the material used. The same applies the other way around. If you increase certain frequencies, the compressor will respond more resolutely to them. The Sidechain filters are only in the control signal path.

The IRON mastering compressor's Side Chain EQ features a six-step switch that allows you to choose between Off, four sidechain-filter presets or an external sidechain signal. In the Off position the only filtering that applies is due to a condenser that filters out frequencies below 20 Hz. Position 3-5 provide empirically determined, preset filter curves. In the last position, an external signal, fed through the corresponding jack on the rear of the IRON, is used to trigger the compressor. Please use only TS (mono) plugs to connect outboard gear to the rear jacks of the IRON.

In the following diagram you can see the frequency response curves of the different filter presets. The frequency response curve of the filter presets are shown in different colors to make them easily distinguishable.



## Ratio

This type of compressor does not have a fixed ratio.

The lower the Threshold and the higher the input signal, the stronger the compression. This is actually one of the main factors that make the IRON's compression so musical.

## Auto Bypass

To be able to make an objective judgment of the processed material, it is best not to have to be toggling between the original and processed signals by yourself, but rather have it done automatically. Plus, the fact that you do not have to move from the sweet spot and can concentrate better on the music to optimally assess the processing is a huge advantage. The Interval control determines the time that needs to elapse before the compressor toggles between the processed and unprocessed signals. Hard left is the shortest setting. To increase the interval, turn the knob clockwise.

## AirBass / Bypass / Tape Roll-Off

Many times, you might want to give that distinctive touch to a music production at the very end of the production process, without the need to modify or redo the entire signal chain. It was with this in mind that we developed two specially matched passive filters and integrated them into a 120-volt SUPRA op-amp.

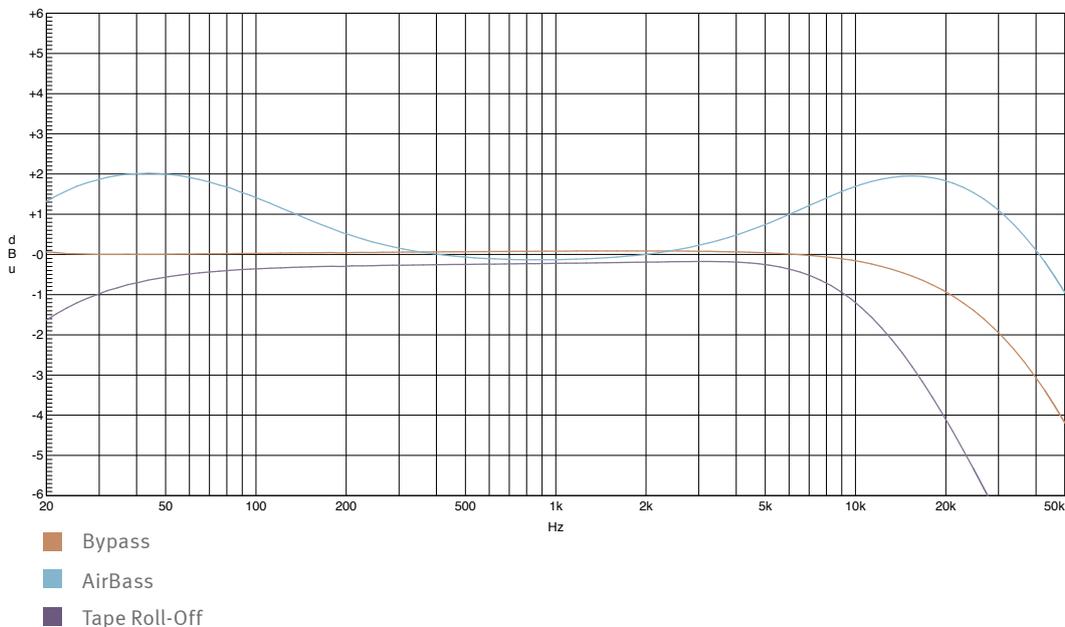
### AirBass:

This filter makes music rounder and more well-balanced with powerful lows and bright, silky highs.

### Tape Roll-Off:

This filter is based on the frequency response of tape machines. It can prove very useful to provide a nice rounding-off in the high end when the material being processed is too shrill.

In the following diagram you can see the frequency response curves for the AirBass and Tape Roll-Off presets, as well as that of the Bypass switch.



# Control Elements

## Link

The IRON mastering compressor has been designed as a completely independent two-channel, dual-mono compressor and can be used to process two different mono signals at the same time. Nevertheless, you can also easily process a stereo signal, since all settings are made with switches or a detent potentiometer (Threshold). This allows you to effortlessly make the same settings on the left and right channels. The components of both channels have been especially selected so that the difference between them is as little as possible, considering a very small tolerance range.

However, if you activate the Link function, all settings of the link channel are applied to the right channel thanks to an intelligent logical relay circuit. This is true for the Threshold, but also for the Attack, Release, Bias, Side Chain EQ, and Rectifier settings.

The combination of both control voltages makes it easier to process a stereo signal more precisely. It allows you to concentrate on the music without having to worry about correcting a parameter on the other channel.

And it can also be put to use creatively. For instance, with the Link function not activated, a sound that only exceeds the Threshold on the left channel would trigger the compression on the left channel only. However, if the Link function is activated, the right channel is compressed, too. When processing stereo signals in dual-mono mode, the stereo image is still acoustically perceived.

## VU Switch

Use this three-way switch to toggle the display between Gain Reduction and Output level (0dB and +10dB). This can be done for each of the two VU-meters separately. The meters work independently for each channel, even when the Link function is activated.

The CAL trimmer allows you to calibrate the display of the Gain Reduction on the VU-meter. The IRON's Gain Reduction VU-meter ought to show 0 dB after the warm-up phase.

0 dB on the VU-meter correspond to an output level of 0 dBu.

## Channel Switch

The two, centrally located, orange-lit switches activate or deactivate the corresponding left and right channels.

## Time values depending on the rectifiers

Although the Attack and Release times can be considered fixed intervals, the control-time behavior and operating mode of the tubes is very different depending on the music. That is why these values should not be considered absolute values. The following chart should give an overview of the dependence of the control times of the input signal and the chosen rectifier, with the same use of the Side Chain EQ Preset (EQ1). Attack and Release were measured and switched in sequence from Fast (A + R Position 1) to Slow (A + R Position 6). The time values were measured with an input signal with the frequency of 10kHz.

A + R Position	Attack (msec)	Release (msec)	Rectifier
1	0,1	100	GE 1mF
2	6	150	GE 1mF
3	10	180	GE 1mF
4	18	200	GE 1mF
5	30	220	GE 1mF
6	50	250	GE 1mF
1	1	300	GE 2mF
2	15	450	GE 2mF
3	30	500	GE 2mF
4	40	600	GE 2mF
5	50	700	GE 2mF
6	70	900	GE 2mF
1	3	600	LED 3.3 mF
2	35	1000	LED 3.3 mF
3	70	1700	LED 3.3 mF
4	100	2500	LED 3.3 mF
5	150	3200	LED 3.3 mF
6	220	5000	LED 3.3 mF
1	0,5	80	Si. 330 nF
2	3	120	Si. 330 nF
3	5	160	Si. 330 nF
4	8	180	Si. 330 nF
5	9	220	Si. 330 nF
6	12	300	Si. 330 nF
1	0,3	30	Ge 220 nF
2	1,5	50	Ge 220 nF
3	3	70	Ge 220 nF
4	5	80	Ge 220 nF
5	7	120	Ge 220 nF
6	9	130	Ge 220 nF
1	0,2	20	Ge/Si 100nF
2	0,7	40	Ge/Si 100nF
3	1,5	60	Ge/Si 100nF
4	2,5	80	Ge/Si 100nF
5	4	100	Ge/Si 100nF
6	6	170	Ge/Si 100nF

# Specifications

## Measurements

Frequency Range (40 kHz = -3 dB) ..... 10 Hz-40 kHz  
CMRR (bei 0 dBu) ..... 1 kHz: > 80 dB / 10 kHz: > 65 dB  
THD & N (0 dBu) ..... > 82 dB  
Noise (A-weighted) ..... -98 dBu

Total Harmonic Distortion  
10 dBu: 0,3 % at 100 Hz, 0,06 % at 1 kHz, 0,02 % at 15 kHz  
0 dBu: 0,01 %  
+10 dBu: 0,002 %

Inputs  
Input Impedance ..... 20 kOhm  
Max. Input Level ..... +32,5 dBu

Outputs  
Output Impedance ..... < 50 Ohm  
Max. Output Level ..... +32,5 dBu

Power Consumption: ..... 0,24 Amp, 230V/50Hz, 44 Watt, 55 VA  
0,46 Amp, 115V/60Hz, 42 Watt, 52 VA

Fuses ..... 230 V/50 Hz: 1 Amp  
115 V/60 Hz: 2 Amp

Dimensions  
Standard EIA 19 Inch Housing/4U ..... 482 x 177 x 311,5 mm / ca. 19" x 7" x 12,25"  
Weight ..... 11 kg / 24,25 lb

## Connections

Only use the connections as described. Other connections can lead to health risks and damage the equipment.

## Water and humidity

Do not use this device anywhere near water (for example in a bath room, a damp cellar, near swimming pools, or similar environments). Otherwise you are dealing with an extremely high risk of fatal electrical shocks!!

## Insertion of objects or fluids

Be careful to not insert any object into any of the chassis openings. You can otherwise easily come into contact with dangerous voltage or cause a damaging short circuit. Never allow any fluids to be spilled or sprayed on the device. Such actions can lead to dangerous electrical shocks or fire!

## Ventilation

The vent openings on the unit are meant to avoid the IRON from overheating. You should never cover nor block these openings.

## Power Supply

Power the unit exclusively with the voltage rating specified on the unit. In case of doubt, contact your local dealer or electric provider. Disconnect the unit from the electric power grid if you are not going to use it for a long period of time. Unplug the power chord from the mains to cut power supply to the unit. Always make sure that the mains plug is easily accessible.

## Opening the unit

Simply put: DON'T, if you are not a certified SPL technician or engineer. Really: Do not open the device housing, as there is great risk you will damage the device, or – even after being disconnected – you may receive a dangerous electrical shock!.

## Cord protection

Make sure that your power and audio signal cords are arranged to avoid being stepped on or any kind of crimping and damage related to such event. Do not allow any equipment or furniture to crimp the cords. Power connection overloads: Avoid any kind of overload in connections to wall sockets, extension or splitter power cords, or signal inputs. Always keep manufacturer warnings and instructions in mind. Overloads create fire hazards and risk of dangerous shocks!

## Lightning

Before thunderstorms or other severe weather, disconnect the device from wall power; do not do this during a storm in order to avoid life threatening lightning strikes. Similarly, before any severe weather, disconnect all the power connections of other devices and antenna and phone/network cables which may be interconnected so that no lightning damage or overload results from such secondary connections.

# Security Advices

## Controls and switches

Operate the controls and switches only as described in the manual. Incorrect adjustments outside safe parameters can lead to damage and unnecessary repair costs. Never use the switches or level controls to effect excessive or extreme changes.

## Repairs

Unplug the unit from all power and signal connections and immediately contact a qualified technician when you think repairs are needed – or when moisture or foreign objects may accidentally have reached inside the housing, or in cases when the device may have fallen and shows any sign of having been damaged. This also applies to any situation in which the unit has not been subjected to any of these unusual circumstances but still is not functioning normally or its performance is substantially altered. In cases of damage to the power supply and cord, first consider turning off the main circuit breaker before unplugging the power cord.

## Replacement/substitute parts

Be sure that any service technician uses original replacement parts or those with identical specifications as the originals. Incorrectly substituted parts can lead to fire, electrical shock or other dangers, including further equipment damage. Safety inspection: Be sure always to ask a service technician to conduct a thorough safety check and ensure that the state of the repaired device is in all respects up to factory standards.

## Cleaning

Do not use any solvents, as these can damage the chassis finish. Use a clean, dry cloth (if necessary, with an acid-free cleaning oil). Disconnect the device from your power source before cleaning

## Notes on Environmental Protection

At the end of its operating life, this product must not be disposed of with regular household waste but must be returned to a collection point for the recycling of electrical and electronic equipment. The wheelie bin symbol on the product, user's manual and packaging indicates that. The materials can be reused in accordance with their markings. Through reuse, recycling of raw materials, or other forms of recycling of old products, you are making an important contribution to the protection of our environment. Your local administrative office can advise you of the responsible waste disposal point.

WEEE Registration: 973 349 88.

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## Declaration of CE Conformity

The construction of this unit is in compliance with the standards and regulations of the European Community.

Artist:

Engineer:

Album:

Track(s)/Groups:

Title:

Date:

