

SPL IRON

Plugin Manual



Developed by Brainworx Audio in partnership with SPL electronics GmbH distributed by Plugin Alliance





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.





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 120 V 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.



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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

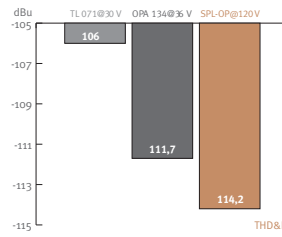
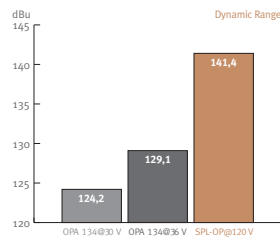
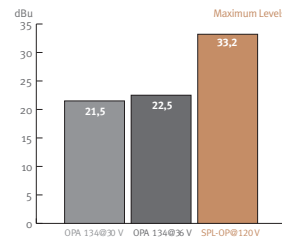
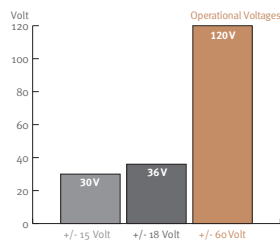
These diagrams clearly show the advantages of our 120-volt technology in comparison to other circuits with a lower operating voltage. The direct relation between operating level and maximum level is fundamental for the classification: the higher the operating level, the higher the maximum level a circuit 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.



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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 36 V — 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.

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.





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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.

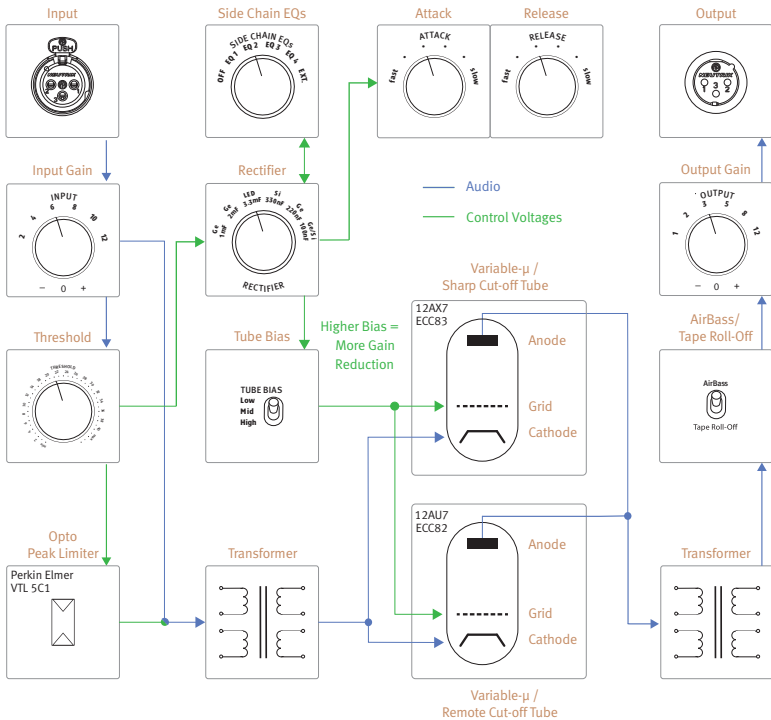
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Signal Flow

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.



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.





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1 Input

The operating value of each channel can be increased or reduced in 2 dB steps via the sixstep 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. 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.

2 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 threeway switch. In the center position, the Output switch is inactive; in other words, no level increase nor reduction takes place.

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.

3 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. Do note, however, that the intensity of the compression depends also on the Input, Tube Bias, Rectifier, Attack, Release, and Side Chain EQs parameters.

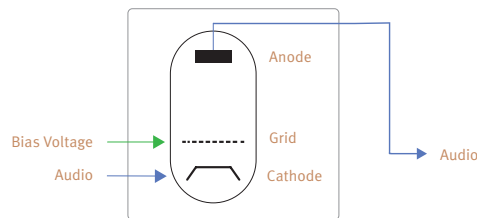
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1 Tube Bias

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.

2 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.



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1 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 15 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.

2 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 15.



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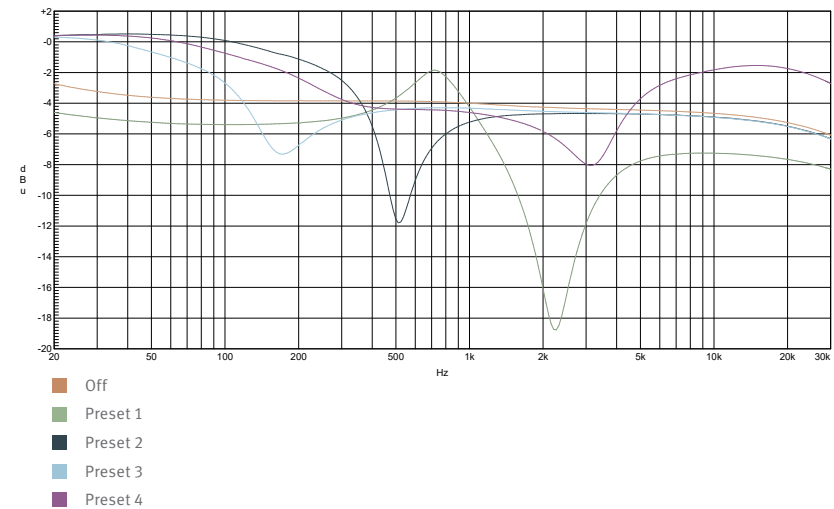


1 Side Chain EQs

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 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.



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1 Auto Bypass / Host Sync / Interval

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. Set to Host Sync for synchronising the Auto Bypass to your DAW.

When Host Sync is on, Interval times are in BARS.

When Auto Bypass is on, interval times are in seconds.

3 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:

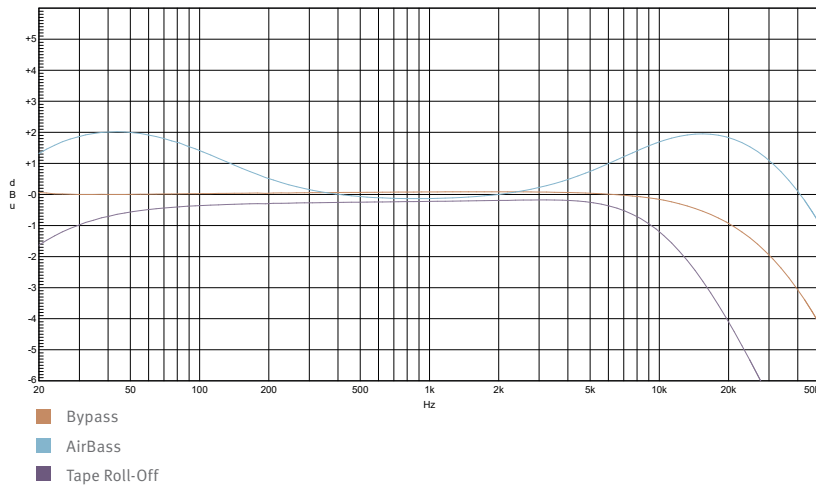
This filter is based on the frequency response of tape machines. It can prove very useful to provide a nice rounding-off in the high end when the material being processed is too shrill.

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.



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1 SC Link - Sidechain 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.



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1 VU Switch

Use this three-way switch to toggle the display between Gain Reduction and Output level (0dB and +10 dB). 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.

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

The internal reference level corresponding to 0 VU can be set in the “About” dialog, which is brought up by clicking on the SPL Logo.

The default internal reference level:

-18dbFS - 0 VU

-8dbFS - +10 VU

1 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.



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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

A + R Position	Attack (msec)	Release (msec)	Rectifier
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



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TMT

The SPL IRON Mastering Compressor offers 20 different compressor channels, made possible by TMT. TMT is Brainworx's patent-pending Tolerance Modeling Technology, originally found in the `bx_console` line of plugins. It takes the real-world tolerances of audio components found in audio circuits into account, and offers various channels of analog audio which have realistic variances in frequency response, time constants in dynamic sections, etc. The result is digital audio that sounds as analog as possible, whereas even the L/R channels of a stereo instance will react slightly different. For more information please check www.brainworx.audio

1 Stereo Mode

Toggles between using the same TMT channel for both units (Digital) and using two adjacent TMT channels (Analog).

2 Channels

TMT, switches between 20 different channel strips. In a Stereo instance, two adjacent Channel numbers will be displayed. Each channel has its own, different character!

3 Random Channel

Whenever you instantiate a SPL IRON plugin on a channel, it will start with the Default setup, which is Channel 1 in a flat setting. You can now randomize a channel by clicking the Random Channel button.

Only the plugin instance you click on will switch to any unused channel number in that session randomly. The plugin will remember which channel numbers are already used in a session and activate an unused channel number, unless you engage more than 20 channels. At that point the plugin obviously would have to use a channel number that has already been used.

4 Parameter Link

This enables or disables linking of parameters in a stereo instance. When both parameters have different values and link is engaged, both parameter values remain unless one of them is touched.

5 M/S

Engages Mid/Side processing. When this is set to On, the Left Channel processes the Mid (Sum) of both channels and the Right Channel processes the Side (difference) of both channels.



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1 Headroom

Adjusts the internal operating level so that the Plugin produces more or less gain reduction. Rotating the control clockwise will allow signals at the input to be pushed higher before they compress, this will result in less compression overall. By rotating counter-clockwise headroom is decreased resulting in a greater amount of gain reduction and more colour and compression being added to the signal. This parameter is perfect for fine tuning the effects produced and also for accurate level matching.

2 HP-SC-Filter

High-Pass Filter for the Compressor Sidechain.

3 Mono Maker

This tool is a critical component to several Brainworx processors, and it is an invaluable tool when mastering or tightening up a mix. Sweepable from 20 Hz to 20 kHz, this parameter folds the processed sound to mono at and below the frequency set. The most common setting is between 100-200 Hz, below which bass frequencies reside, where common practice deems that most sound should be mono. Other uses include folding an entire mix in order to check mono compatibility and avoid phase incoherency.

4 Stereo Width

Make your mix wider than it originally was by increasing the Stereo Width without losing the center of your recordings! You will not lose bass drum power or vocals by making your mix wider this way... and it will not sound different played back in mono at all. If you notice your Correlation Meter (e.g. bx_meter) showing less than 90°, dial up the Mono Maker a bit to tighten up the low-end until acceptable levels are shown.

5 Pararell Mix

Controls the amount of unprocessed signal being blended with the processed (compressed) signal, effectively providing the option of parallel compression.

100% = you'll only hear compressed signal.

0% = you'll only hear un-compressed signal.



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Top Toolbar

1 Undo / Redo

You can undo and redo changes you made to the controls of the SPL IRON plugin at any time. The Undo / Redo will work for as many as 32 steps. This makes experimenting and tweaking knobs easy. If you don't like what you did... just undo it.

2 Settings (A/B/C/D)

The Plugin offers four internal settings (A/B/C/D) which will be stored with every preset. So, one preset can contain up to four settings. You may use similar settings with more or less compression in one setup / preset. Now, the SETTINGS can be automated in your DAW! This way it's possible to use different sounds for your lead vocals or drums in various sections of the song. Automate the A/B/C/D settings, and you can still tweak knobs of the individual settings without overriding multiple parameters in your DAW, which would be time-consuming.

3 Copy / Paste

To set up variations of similar sounds you don't have to dial in the settings several times. Let's say you like your setting A and want to use the same sound, just with less compression, as setting B.

- Simply press Copy while you are in setting A.
- Switch to setting B by pressing 'B' in the settings section.
- Press PASTE, now setting B is identical to setting A.
- Reduce the compression on the B setting.

Now you can switch between A & B and decide which one sounds best or automate different settings for various sections of your session.

4 M/S Monitoring (for Stereo Channels only)

Solo M: Solos the Mid (Sum) signal being processed by the plugin.

Solo S: Solos the Side (Difference) signal processed by the plugin.

6 UI

Switches between three different User Interfaces:

RED, BLACK and ALL BLACK.

- The icon closes and opens the bottom panel containing the Brainworx's plugin only features.



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Artist Presets

The Plugin includes presets from prominent SPL IRON users:

Brendan Duffey

Producer, Mix & Mastering Engineer (50 Cent, Megadeth/Angra, Mike Mangini, Billy Sheehan) marked with the initials BD in the preset name.

David Reitzas

Live and Studio Engineer (multi-GRAMMY and Emmy Award winner, Whitney Houston, Madonna, Seal, Stevie Wonder, Guns N' Roses) marked with the initials DR in the preset name.

Gentry Studer

Epicenter Mastering, Mastering Engineer (Metallica, Andrew W.K., Ryan Adams, Incubus, Deftones, Miley Cyrus) marked with the initials GS in the preset name.

Michael Romanowski

Coast Mastering, Mastering Engineer (Soundgarden, Pink, Evanescence, Seal, Yes, Lady Gaga, Alanis Morissette) marked with the initials MR in the preset name.



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