# AROUSOR™
## EMPIRICAL LABS



# CLASSIC KNEE COMPRESSOR PLUG-IN

# INDEX

MANUAL IN PROGRESS

**DIGITAL.**

**Empirical Labs**
INC.
Technology for the Artist.
www.EmpiricalLabs.com

# Features

- **Classic** Empirical Labs SoftKnee Compression **like you never heard in a software Plug in.** Heavily influenced by our own Distressor.
- **10 Ratios including our famous brick wall ratio, called RIVET in the AROUSOR.**
- **New 1.5:1 and 2:1 ratios - Gentle and great for buss compression and glue**
- **Our Huge White Knobs** with high resolution numbering - For easy readability and repeatable settings.
- **Custom Direct Entry Knobs** - Double Click in the middle of the knob and Enter an exact value. Allows ease, accuracy, and speed when adjusting. You'll love it. **Real world Parameter readout** within the knobs
- **Unique Attack Shape.** Even without using our new AtMod feature, you will notice a carefully crafted sound on the AROUSOR's attack. Very analog sounding without the choking often found in Plugins.
- **Wide arrange of Attack and Release, with easy adjustability**
- **Unique "Soft Clipping" Section** - Soft saturate the peaks of waveforms to warm things up, and have even greater control on the front edge of transient signals.
- **Crafted Odd and Even harmonics** that enhances low and high level signals.
- **Saturation Meter** - You will find this is one of the most useful displays, and helps keep the user aware of how much crunch and smush is being applied to the peaks.
- **A "BAD!" Hard Clip Indicator** – A "Bad" Clip LED that lets user know he is within .5dB of hard clipping on the output. Usually if this comes on, turning down the output knob will fix it.
- **Giant Bargraph**, high resolution, providing a very analog look and feel.
- **Idealized controls** - Many of the same controls as the Distressor but Compressor Curves, pots curves and many other things have been made closer to what we consider ideal. Users will benefit from this with speedy adjustments. However, the exact same settings on the Distressor will usally not result in the same sound.
- **Stereo and Multi Mono versions** - The unit can be a linked Stereo version, or a Muliti-Mono (Dual Mono) version when inserted on Stereo Tracks.
- **Infiniite headroom internally** - Almost impossible to clip, but we do monitor the output in case your DAW is not floating point.
- **Zero Latency** - One sample in, One sample out
- **Evolutional Technology** - First Empirical Labs software product offering "Evolutional Technology". More unique and amazing features will be coming your way over the years.

# Specs

- ♦ **Freq. Response** is sample rate dependant
- ♦ **Distortion Ranges between .001% and 30%** depending on mode and settings.
- ♦ **Attack Ranges** - 50uS – 40mS attack.
- ♦ **Release range** is .50mS – 3000mS (3 Sec).

Empirical Labs - *Something Old, Something New*

# What is the AROUSOR?

The AROUSOR  is  a software plug-in audio Compressor, that was designed to finally offer the sound and features from our own award winning compressors, most notably, the Distressor.  For over 20 years, producers and engineers have been yearning for a Distressor-In-The-Box.  At least 5 other companies have tried to capitalize on this huge market, but with the AROUSOR, Empirical Labs will finally satisfy the need for an In-the-Box compressor, and gives you one that starts where the Distressor left off.    In fact, we modeled the Distressors detector circuits on a component basis, to get the magic tens of thousands have enjoyed for decades.  But we did NOT limit ourselves to the features of our award winning product.

As this plugin does all kinds of non-linear stuff, we had to employ a variety of techniques to minimize common digital artifacts found in almost all digital compressors/limiters etc.  Unfortunately, these techniques are costly as far as processing, and one has to streamline certain DSP processes for less CPU load without sacrificing any audio quality.  Ironically, sometimes stuff that is hard in Analog is easy in Digital, and sometimes stuff that is hard (or impossible) in Digital is easy in Analog.
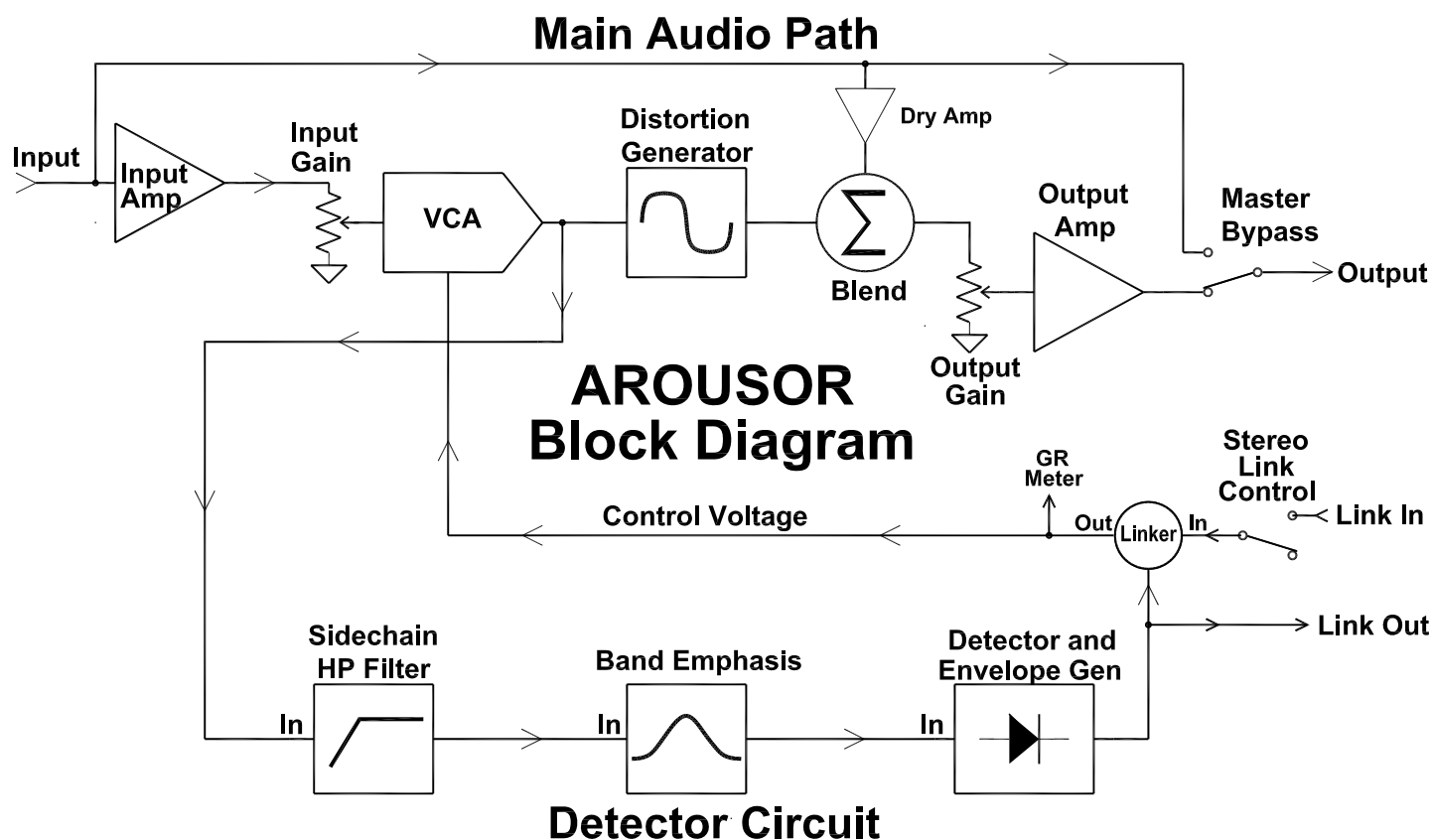
The first implementation of this plugin imitates the look and feel of real world stuff. In this case, it is the look and feel of our own Empirical Labs hardware.  But in Digital, a whole universe opens up with interfaces.  Suddenly things you could never do in the hardware world become simple.  It's a wonderland.

The best part of getting this plugin now is an immediate improvement of your mixes, increased speed in your workflow. But it is just the beginning.  More great features are coming, including new processing and interface upgrades, with more awesome presets to lock n' load.

### What is an Audio Compressor or Limiter?

A compressor is a device or software that does musical, automatic volume control.  For those unfamiliar with what an audio compressor is, imagine a little guy that turns the volume up when a signal gets too soft, and turns it down when it gets too loud.  And he does it very fast and automatically.  In engineering terms, it is called an Automatic Gain Control (AGC).  But when these devices are used for enhancing music, they are called audio Compressors OR Limiters, and the way they turn things up and down becomes absolutely critical.  Audio Compressors can be done with hardware, that is with resistors, caps, and transistors, etc, or they can be done mathematically in software.  When a software compressor is done in a standard format for open use, it is called a Compressor "Plugin", and this, is our AROUSOR Plugin.

# AROUSOR BLOCK DIAGRAM

## Main Audio Path

**AROUSOR Block Diagram**

*(Block diagram labels: Input, Input Amp, Input Gain, VCA, Distortion Generator, Dry Amp, Blend, Output Amp, Output Gain, Master Bypass, Output, Control Voltage, GR Meter, Stereo Link Control, Out, Linker, In, Link In, Link Out, Sidechain HP Filter, Band Emphasis, Detector and Envelope Gen, In)*

## Detector Circuit

# SECTION DETAILS

Below, we go into a little more detail about each Major Section of the AROUSOR.  We  have broken this subject into 6 Main Sections:  1) The Compressor,  2) AtMod 3)  Saturation, 4) Blend, 5) Det HP, 6) Det Band EQ

**The Compressor** - This is the main section of the AROUSOR and is comprised of the five Big White Knobs and the Ratio Select.  We separate this here from the other sections, as they can be thought of as enhancements to the basic Compressor.  The compressor in the AROUSOR is the most critical in Sound, and the process which separates Empirical Labs from the crowd.

Modeled after our most famous compressor on the component level, it's five main controls are the INPUT, ATTACK, RELEASE, OUTPUT Knobs, and the RATIO select.  The User who masters these five controls will have classic compression at their beck and call, in the box, and have a tool capable of producing top notch recordings.  For new comers to compression, the AROUSOR is going to be a revelation, making Compression easy and fun to learn.  The design of these five main compressor controls have such a range, and such an effect, that within a couple hours of playing around, most any novice will have a good understanding of basic compression.
If you are unfamiliar with what compression is, see What is a Compressor?

**The Five Main Compressor Controls**

**IN** - Input - This Big White Knob controls how much compression is used.  If you want more compression, turn this up (CW) and drive into the compressor, and vice versa to lower compression.  This arrangement supplants the "Threshold" control found on many compressors. Because of the knees in almost all of our ratios, above about 6dB of peak compression, the output will start to flatten out, so often, when you turn up the INPUT to increase compression, the output will hardly change.  We think this is an advantage over adjusting the "Threshold" control of other compressors, which can cause the output level to change

unpredictably, until you really know the unit.  Usually once you set the output level with our compression applied, you can make minor adjustments of the input without adjusting the output, except on the lowest ratios.  This method also has less interaction with other controls like AtMod and Soft Clipping.  We hate unnecessary control interaction.

**ATT** -  Attack control. This controls how fast it turns down and compresses a signal.  The slower it is, the more transients and dynamics a signal will have.  When it is faster, more transients are grabbed and the less dynamics, and less overshoot you will have.  When you want to add attack to something, add Attack by turning it clockwise (up), making it slower.  On percussives, this creates overshoot, and can really add power and whack to the source.  Extremely fast attacks (below 1mS)can cause problems, like modulation distortion on bass stuff, and produce a squashed, clamped sound.  But it can also be beautiful on plucked instruments and percussives, if adjusted judiciously.  <span style="color:red">Attack Range is 50uS to 40mS.</span>

**REL** - Release Control. This tells the compressor how quickly to recover and turn the signal back up after it has been lowered by compression.  With a fast release, a signal will have more body and ambience, as it brings up the lower level stuff quickly.  With a slower release, the more overshoot, less ambience you will add.  The AROUSOR gives you great control over the Attack and Release, and their "shape" is probably one of the main components that give our compressors their classic sound, and ease of use.  <span style="color:red">Release Range is 50mS to 3Sec.</span>

**OUT** - This adjusts the final output level.  Often this will be the control used to match the uncompressed level for convenient comparing in Bypass, or tweak an overall track level.  The Output control is after the "BLEND" mixer, so it does not affect the "Dry" to "Comp" (Compressed) signal ratio.  If the BAD! Led comes on, lowering this OUT control will usually stop it.  However, on floating point DAWs, there is not actual clipping happening even when BAD! lights up.

**RATIO** - This is the control that selects how severe or how steep the compression is.  The lower the ratio, the less the AROUSOR will change the dynamic range.  The higher the ratio, the more the dynamic range will be squeezed smaller, or limited.  We have added new ratios here, ones not found on our Distressor.  Most notable are the new low ratios 1.5:1 and 2:1.  Among other things, these are excellent for master buss compression to help fit and glue things together, but they can invisibly compress almost anything.  Note:  If you wish to match a favorite Distressor Ratio, select the next higher ratio on the AROUSOR.  IE 6:1 Distressor equals the 8:1 on the AROUSOR.

**Attack Modification** - AtMod - This section works in conjunction with the standard Attack control, and slows up the initial slope of the attack, especially on transient material.  Many older analog compressors exhibit a non-linear initial attack when used heavily on transient material, and the original AtMod intent was to make this interesting effect available AND controllable on the AROUSOR.  For this type of treatment, small amounts of AtMod are best.  Just turning on the first Green LED of the AtMod indicator will do.  As often happens, users have found all kinds of uses for AtMod beyond subtlety, and some examples can be found in factory presets.

When AtMod is used to extreme, the user will eventually start limiting the total gain reduction amount.  The amount the Gain Reduction is limited to depends on the Ratio mostly, but also the time constants.

**Soft Clipper** - This is a musical saturation "circuit" and is the second biggest factor in the Arousers sound.  It can gently reduce and round the peaks of waveforms, similar to tubes or analog Tape.  We have tweaked the math of this Soft Clipper to contain both Even and Odd harmonics, so at low levels, the 2nd harmonic becomes dominant, while at higher levels, the Odd harmonics dominate, flattening both the top and bottom of the waveforms.  There is actually a Class A circuit inside.  This has caused a fair amount of problems in modern

DAWs because it has a bias point that requires stabilization time at first instancing.  Because we experimented with topologies to minimize digital artifacts, allow easy control, yet maintain Zero Latency, you will find you can add tremendous amounts of saturation to signals and not hear it as actual distortion.  This allows you to soften transients, bring up the RMS level, add LF Harmonics, and generally make the AROUSOR sound very analog.

Because of these smooth analog harmonics, early on we realized we needed a visual guide for Soft Clipping to keep users out of trouble.  Because of the topology, Empirical Labs was able to introduce a unique distortion readout.  There is a four LED bargraph in the Soft Clipping section, and it quite accurately shows you the percentage of THD (Total Harmonic Distortion) being added to a signal.  With this display, you will see that you can add 8% or even 14% on transients and hardly be able to hear any difference, but on metering following the AROUSOR, you will see some substantial decreases in levels, as the peaks are flattened out instantly. Try the following to get a better grasp on the AROUSOR's Soft Clipping:

Put the AROUSOR on a stereo track (mono is fine too) like a Drum Buss or Master Buss or something that is always going. Set it to some decent compressed sound, but initially keep Saturation at 0 (OFF).  On a DAW meter following the AROUSOR, set some nice meter levels at some kind of hi-res point on them.

Now, while listening, watch the meters, and slowly start turning up the Saturator. Initially, the meters will drop a dB but both channels will still peak differently. Now increase the Saturation and watch the meters drop more, and notice it is STILL difficult to hear the Soft Clipping as actual saturation. On transient peaks, you can hit 8% THD and have a lot of trouble hearing it.

As you increase the Saturation, at some point the two channels will peak at the same place, and you will be dropping peak levels by 3 - 4dB from the original unsaturated level. At this point, you may hear the Saturation as Distortion, especially when it starts affecting more than just the transients.  The Display may well be showing you are hitting 14% THD!  You will find this Saturation display to be a re-assuring reference as you become an expert at using our Soft Clipper.  Distort responsibly.

**Blend** - This is your usual Wet/Dry control, sweeping from the input to the AROUSOR (Dry), to the Compressor-Saturator Output (Comp).  See Block Diagram.  You may often have a level difference between the Dry and Compressed levels, as this is a feedback compressor, and does not use a Threshold control.  Sweep between the two extremes on the BLEND control and get an idea of their relative levels.  The actual mixer between the Wet (compressed) and Dry is just before the OUTPUT knob, so as you adjust your output, the blend stays perfectly the same. There are some nice provisions coming for the Blend knob.

**Det HP** - The Detector High-pass keeps low frequencies from affecting the compressor and can prevent bass drums and other low frequency sources from pumping and modulating the signal.  Detector high-pass filters have become quite standard since the Distressor offered one of the first controllable Det HP back in 1995.  This is a gentle 6dB per octave filter, and when turned up high on some sources like vocals, can help bring out lower register notes.  On full BW material, it can keep LF material like Kick Drums from "pumping" everything.  The Audio itself is NOT directly affected or filtered with these Detector sidechain filters, but only the signal going to the detector, which determines how things get turned down and compressed.

**Det Parametric EQ** - Like the Det HP, this is filtering that affects what frequencies the Detector "sees", and therefore what the Compressor is most sensitive too, or what it ignores.  This has many uses, and is wildly variable.  Sometimes it's effects can be counter-intuitive, so be careful with this control, especially at first.  With a +-30dB range, it can allow even frequencies with low levels to affect the compressor.  For instance, if you are dealing with musical passages that get harsh in the 3Khz-5Khz range, boosting a wide band there by 10dB or more will help ride those problem areas lower.  You can even build an effective De-Esser out of the AROUSOR

using the sidechain EQ sections. We include at least one De-Esser setting in our Factory Presets, along with many other examples of Detector Parametric EQ use.

# EXAMPLE SETTINGS

**Treating the Front Edge of Sources**
One of the things that is the hallmark of Analog Vs Digital sound is how a spikey front edge of a signal gets handled.

The AROUSOR gives the users a few options. If you are treating percussives and want more attack, more front edge, you can slow the attack OR use the AtMod to let the first millisecond or two to come through a little harder. This is the "Smacking Attack" that may separate the AROUSOR from other software compressors. I honestly cannot imagine someone saying they cannot get enough "Attack and Punch" on a source with the AROUSOR, when so desired.

Going in the other direction, one can soften the front edge using a fast attack OR, by using the AROUSOR's Saturator. Digitally recorded snares and cymbals are often very peaky on the front edge, and need treatment. By listening to the pointy source, slowly turn up the saturator and listen to the "point" slowly get transformed, softened and crunched down. Too much and you end up with too "soft" a snare or cymbal, without definition and punch. You will be over 14% THD at this point, which would sound awful on a sustained pitch instrument. But a Snare goes by pretty quick.

One of my favorite uses for the Saturator is on guitars. Especially spiky guitars like a semi-clean strat, or a single coil guitar solo in the higher range. Depending on the sustain needed, apply between 3dB and 10dB of compression. The front edge can really "Clack out" and become even more annoying. But with electric guitars, already being heavily distorted, one can apply both a faster attack, AND a LOT more saturation before it is heard disparagingly, especially compared to other sources. You will probably want to keep the AtMod off to minimize any overshoot on the front edge.

We have a preset called **Clean Fat Strat** with which you can start, in this experiment.

On a kind of screechy solo guitar track, try a really fast attack (around 1mS or less), and turn the saturator up til you are pretty consistently hitting 8% THD on the Saturation meter. Match the bypassed and compressed signal, then go back and forth to test the edge-softening effect of the Saturator, as the soft clipping is increased. Between the compressor attack time, and the Saturator, you can often take a pointy piercing guitar solo, etc, and turn it into a creamy, connected sound with judicious use of the AROUSORS processing.

BTW, this same thinking can be applied to keyboards. Anything from bright grand pianos, to spiky electric pianos, to radical synthesizer sounds. Getting rid of the "points" is often key (pun intended) to getting these sources sit well in a mix.

Finally, the user has a parametric EQ in the sidechain at his fingertips. By emphasizing the harsh frequencies here, 1K - 8K, you can have the compressor push back passages with excessive energy in this range. I have successfully had guitar solos (and even vocals) ride themselves by boosting a wide band around 2K (2oct?), and rolling off up to 250Hz on the DET HP so the lower warm passages are a little louder.