limit.one (version 2)

analog dynamik limiter

rockruepel

MasteringWorks GmbH

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WARNING: High Voltage – Risk of electric shock

Do not open chassis. Check if the right voltage (115V/230V) is selected before connecting the *limit.one* to the main power supply. If the device is damaged or does not work as expected, refer to qualified service staff only. Never use damaged power chords. Replace fuse with the same type and value only: 50mA (115V); 50mA (230V) Insure yourself that the *limit.one* is connected via grounded junction. Hold the device off splash water, moisture and other liquids. Do not use the *limit.one* in the near of water or in wet surroundings.

CAUTION: Temperature – Chassis may become hot during operation

Do not install any heat sources (for instance radiators or stoves) close to the device. Avoid direct solar irradiation. Do not block the circulation vents. Warm air has to draw off. Let enough free rack-space around the unit to avoid overheating. Do not install power amps near the device.

WARNING: Incorrect installation – Connection may cause damage

Do not connect power amp-outputs to the *limit.one.* Install the device on solid components only or mount it proper into a adequate rack.

WARNING: Condensed water (liquid) may cause damage

Condensed water inside the device may occur, when you move the device from a cold place to a warm room. To avoid damaging the *limit.one* always wait until the device has reached room temperature before switching it on.

WARNING: High sound volume may harm the sense of hearing

Set the output controls on zero position before monitoring the sound via headphones or loudspeakers. Increase the volume carefully. Pay attention to maximum input levels of connected devices.

Welcome Aboard

Your LIMIT.ONE is one of the most forward-thinking and unique analog limiters available today. This manual will help you learn about the LIMIT.ONE, yet as with all high quality analog equipment, the more you use the LIMIT.ONE the more applications you will discover. We encourage you to be curious, daring and experimental as you use the LIMIT.ONE over the years, and we invite you to share your discoveries with us. Welcome to rockruepel.

A Limiter for the 21st Century

The LIMIT.ONE grew out of a need to address the demands of preparing audio for today's evolving digital distribution channels. The way that people obtain music—from free streaming services to high-resolution downloads to YouTube and all the rest—has transformed the way we must prepare audio, yet so many of our tools were developed in the analog era, which had vastly different requirements and expectations.

Specifically, today's engineers are expected to bring volume levels up to within *just a few samples* of digital clipping (0dBFS) while still providing clean, professional results. Precision analog devices developed specifically for this purpose are rare, and in their absence a number of questionable practices have emerged: clipping converters, intentionally distorting and clipping the digital waveform, using excessive compression and/or limiting, and—most commonly— relying on digital processing to generate an audio file that approximates the original while peaking dangerously close to clipping. We often call these various methods "brickwall limiting."

The LIMIT.ONE is among a very few all-analog limiters designed specifically to accomplish brickwall limiting while offering ultra-clean, audiophile sound quality *before you hit your A-D converter*. Achieving your maximum volume before converting to digital is one of the most overlooked and misunderstood aspects of creating truly professional digital masters. By avoiding digital overs in the converter *and* using the full bit-depth available—rather than "making up" empty bits in the digital realm—your final digital audio file will be both *clean* and truly *full volume*. These are the marks of a processional master.

Unlike most digital brickwall limiters, the LIMIT.ONE's unique circuit maintains the shape of the original waveform as much as possible. The processed wave form is not identical, of course, but rather than being flattened at the peaks, the waveform processed by the LIMIT.ONE can maintain the original (typically rounded) shape. We might say that the LIMIT.ONE can be more *faithful* to the original signal while still providing brickwall limiting.

These unique abilities of the LIMIT.ONE are accomplished by employing a *current controlled attenuator* between two Pikatron transformers. We've taken this core design from the renown broadcast limiters developed in the 1960s by TAB Funkenwerk, specifically the later models

which were solid state designs utilizing dual transformers. However, we have added significant updates and features that make the LIMIT.ONE as powerful and effective in the digital era as the U73s were at the height of the analog era.

Of course, clean brickwall limiting is not the only use of the LIMIT.ONE's unique circuits, and we encourage creative uses for it that go beyond the original intentions. You'll soon find that there a many unique ways to use the LIMIT.ONE whether you're mastering, mixing, tracking or even working in a live concert setting. Some of those other uses will be explored after we take a closer look at the unit's unique controls and features.

Controls, Features & Some Suggestions for Use

FRONT PANEL
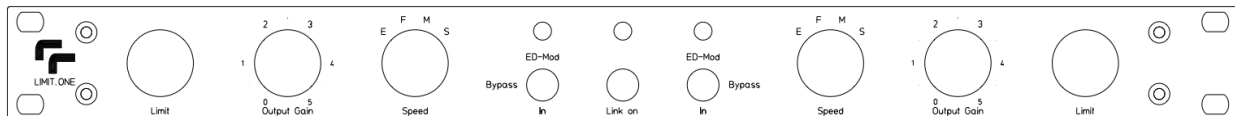
LIMIT

This unique multi-knob is used to set the threshold of the limiter. The multi-knob subdivides itself upon rotation so that you can achieve, and easily recall, exact settings. Because the goal of the LIMIT.ONE is often ultra-precise limiting, we felt it was necessary to develop this unique control.

The LIMIT.ONE can handle very loud input signals (as high as +26dBu), but has a wide range on the threshold to accommodate much quieter signals as well. Note that the 0 setting on the multi-knob (fully counter-clockwise) turns the limiting function off, but this position is not a true bypass (use BYPASS switch for that).

Here are the dBu threshold values of the multi-knob.

0-10	+ unend.	-	+22	dBu
10-20	+ 22	-	+15	dBu
20-30	+ 15	-	+11	dBu
30-40	+ 11	-	+9	dBu
40-50	+ 9	-	+7	dBu
50-60	+ 7	-	+6	dBu
60-70	+ 6	-	+4,5	dBu
70-80	+ 4,5	-	+3,5	dBu
80-90	+ 3,5	-	+2,5	dBu
90-100	+ 2,5	-	+2	dBu

OUTPUT

All the way counter-clockwise, there is no make-up gain. Each click gives exactly +.5db of gain and the total make-up gain available is +5dB. These stepped attenuators are from Elma. They provide perfectly matched gain settings between channels, as well as effortless recall.

The OUTPUT gain circuit comes after the detector circuit, such that changing the OUTPUT level *will not* affect the behavior of the limiter.

Basic Signal Path of the LIMIT.ONE
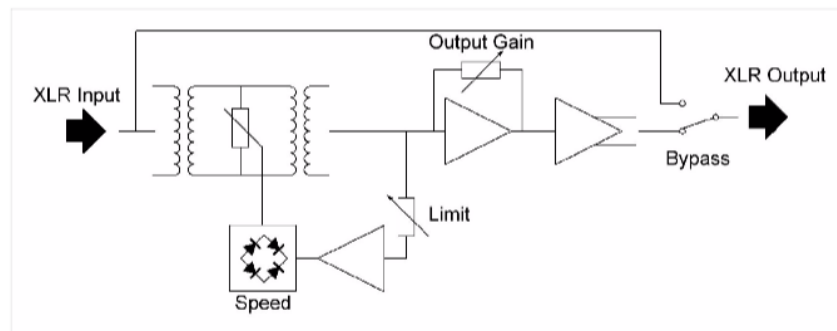
For those using the LIMIT.ONE as the final unit in their chain—especially if you're setting exact levels to be sent to your converter—you will want to leave the OUTPUT fully counter-clockwise. In other applications where the LIMIT.ONE comes before other processing units, the added gain available through the OUTPUT knob will allow you to drive or "hit" other units more aggressively as desired.

SPEED

These four settings adjust the release time of the limiter. The four different SPEED knob settings provide a wide variety of tone qualities and dynamic behaviors. As you get to know the LIMIT.ONE, you will find different uses for each of these release times.

- **S** — SLOW — More bass will pass on this setting, making it more neutral tonally, but limiting artifacts become audible when pushing beyond threshold more aggressively. This setting is the most faithful to the original Telefunken U73 broadcast settings (which were fixed).

- **M** — MEDIUM — This is what we consider the "normal" release time for the LIMIT.ONE, and is our recommended starting point for using the unit in most cases. We feel it offers the best balance between maintaining transients while maximizing transparent limiting.

- **F** — FAST — Very useful for controlling lowend with fewer limiting artifacts. As you push past the threshold, you'll notice the low-end tightening up.
- **E** — EXTREME — The fastest setting that will attenuate bass but will have less audible limiting artifacts. There may be some distortion on this setting when pushing beyond the threshold more aggressively. This distortion is intentional and very useful for parallel compression configurations (see below for more). Used more subtly, this setting can be very effective at tightening up the low-end.

BYPASS

Individual hard bypass switches for each channel.

LINK

The LIMIT.ONE's channels can operate independently, or they can be linked. When you link the channels, the unit will attenuate both channels identically *based on whichever channel is limiting the most at any given moment*. For this reason, it is typically a good idea to set the two channels identically when operating with the channels linked. However, there may be instances when allowing one channel to dominate the other is desired (such as when using the limiting artifacts as a rhythmic effect).

ED-Mod

The ED-Mod featured in Version 2 of the LIMIT.ONE is inspired through the use of bass heavy material found in Electronic Music (also EDM) . The Mod enables a high pass filter at around 225Hz with a 6dB slope in the side chain to allow for more consistency and transparency in the bass frequencies. The limit threshold will now effect only higher frequencies for tone and dynamic control. Specially in bass heavy mixes you will enjoy this feature ! For brick wall limiting you need to select the limit mode !

HAMMER LIGHTS

These are highly accurate indicators of when the limiting circuit is being activated. When setting the threshold using the LIMIT knob, these lights are your window into the behavior of the circuit. When you're aiming to transparently control "overs" before your A/D converter, for example, you will want to set the LIMIT multi-knobs such that the HAMMER LIGHTS only come on briefly at the very loudest transient moments in the program material.

USE OF EXTERNAL METERS

For mastering, we encourage the use of very accurate external RMS/Peak meters with the LIMIT.ONE. These may be free-standing units or they may be incorporated into your converter or console. Alternative balanced XLR outputs are provided on each channel for easy connection to external meters.

REAR PANEL
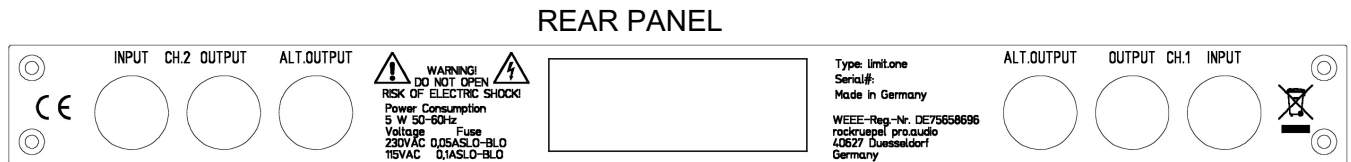
INPUT XLR
Individual inputs for each channel.

OUTPUT XLR
Individual outputs for each channel.

ALT OUTPUT

An exact mirror of the output, this is provided primarily to allow the use of external Peak/RMS meters, but can also be used for various other purposes, such as feeding a headphone system during mixing, more elaborate parallel processing configurations, and so on.

IEC PLUG AND FUSES
A standard IEC power cord is used. Fuses are on a spring loaded panel next to the IEC socket.

Some Examples of Workflows and Techniques Using the LIMIT.ONE

As we've seen above, the LIMIT.ONE is a versatile processor that can achieve a wide variety of limiting styles, from transparent precision limiting to intentional tone-shaping with limiting artifacts and more. How you choose to use the LIMIT.ONE on any given project is up to you. We offer the suggestions below in order to help you find your own workflows and techniques, yet we strongly encourage curiosity and experimentation on your own.

Final Stage in Analog Mastering Chain — This is the original intention of the LIMIT.ONE that drove its design. With its unique and highly accurate threshold knobs and ultra-fast limiting circuit, you can preserve the basic shape of the original waveform while achieving higher overall volume. The LIMIT.ONE is ideal as the final processor in a mastering chain, going straight to the A/D converter for capture with no "in the box" processing.

We recommend the following procedure in order to achieve transparent yet effective limiting.

- Set the OUTPUT to 0 (fully counter-clockwise)
- Set the SPEED to M (our optimized setting for precise and transparent limiting)
- LINK the channels.
- Turn the LIMIT knobs to 0 (fully counter clockwise)
- Turn the LIMIT multi-knobs clockwise simultaneously until you see the HAMMER LIGHTS blink, then back off on the LIMIT knobs until the hammer lights go out.
- You are now at the brink of limiting, and can precisely dial in the amount of limiting you desire and need.
- Keep in mind that the level you're sending into the LIMIT.ONE will impact where you set the threshold via the LIMIT multi-knob. The LIMIT.ONE can handle very loud input levels up to +26dBU.

Final Stage in Analog Mastering Chain with Plugin Processing After — By deriving precise levels just under the upper limits of digital clipping (0dBFS) using the method above, one can convert to digital and then process with plugins without having to adjust levels significantly within the computer. Ideal levels are already achieved going into the plugins, bit-depth maximized, and the computer processing can operate optimally.

Earlier Stage in Analog Mastering Chain — Some engineers have found that setting exact levels with the LIMIT.ONE prior to analog compressors, EQs and other processors allows them a whole new level of precision control over how they "hit" their downstream analog gear. Further, by rounding out peaks and bringing up the overall average level of the program material, the LIMIT.ONE can help you bring out new, and often better, sounds from your other analog devices. In particular, many analog compressors and EQs can impart their unique sonic character more consistently when driven by such a healthy and well-controlled signal.

Follow the steps above for setting the LIMIT.ONE for precise and transparent limiting.

Parallel Compression Configurations While Mixing — Many mixing engineers have become fans of how the LIMIT.ONE can be used aggressively to achieve sustain and grit that can be mixed with the original signal in a so-called parallel compression configuration. Use the Extreme setting on the SPEED knob while lowering the threshold via the LIMIT multi-knob. Parallel compression in the analog domain is typically phase coherent (plugins often are not). Phase coherence offers powerful and clear sound, even under extreme processing.

"Cascaded Parallel" Configurations While Mixing — Because the **Alt Outputs** offer up an instant "mult" of your processed signal, you can use the LIMIT.ONE in myriad "cascaded parallel" configurations. For example, use the LIMIT.ONE on a subgroup to set precise and healthy levels, then send the **Alt Outputs** to another processing chain in parallel with the **Main Outs**. In this "cascaded parallel" configuration, you can use the LIMIT.ONE to set optimal levels into your downstream processors and converters. Push the LIMIT.ONE to more aggressive settings within this configuration as desired.

Controlling the Final Print for Analog Mixing — Many mix engineers today use analog compressors and limiters on a 2-BUS insert during final mix down. Those working on an full-sized analog console or summing mixer will find that using the LIMIT.ONE as the final device in the 2-BUS chain allows for exact levels going into the final capture device (DAW, freestanding digital recorder, or even analog tape deck). Hitting the LIMIT.ONE's circuit more aggressively can add desirable tonal and dynamic changes to your mix, as well, while still providing exact levels to your mixing destination.

Controlling the Final Print for Digital (In The Box) Mixing — Those working within the DAW may use analog processors on a 2-BUS insert to pick up "analog flavor" at the final stages of their mix. The LIMIT.ONE can be used neutrally to control the levels going back into the DAW or other final print destination, or one can choose to hit its circuits more aggressively and derive desirable analog tone and dynamic changes that plugins can't provide. The transformers in the LIMIT.ONE are particularly good at tightening up low-end and giving a unique analog flavor to a mix.

Tracking Overly Dynamic Signals — There are few things more maddening than getting "digital overs" while tracking. This is especially problematic with dynamic singers. By setting the LIMIT.ONE carefully at the end of a vocal tracking input chain, you can effectively have a guarantee that you wont get overs while also increasing your recording levels. This method can work with other instruments as well.

Cascading both Channels while Tracking Vocals — Similar to the suggestion above, by plugging channel one into channel two, you can use a "cascade" scheme to achieve even more transparent level control. Experiment to find optimal settings, but we suggest the following method to start:

- Bypass the first channel in the chain.
- Engage the second channel.
- With SPEED at M and OUTPUT at 0, set the *second* channel to limit the signal under moderately loud conditions. Make sure you do not clip your converter.
- Copy those settings to the first channel.
- Engage the first channel.
- Raise the threshold on the first channel (by turning the LIMIT multi-knob counterclockwise) until the first channel is engaging the HAMMER LIGHT only under exceptionally loud passages.

This configuration will cause the second channel in the circuit to operate as your normal limiter, while the first channel will only come on during very loud passages, thus allowing the second channel to work less during these passages. Once set properly, the result should be exceptionally transparent automatic level control with minimal, if any, artifacts. Your mixing engineer will thank you for providing such healthy recording levels without any overs. This method can work with other instruments as well.

Printing Artifacts to Tape and Digital During Tracking — Using the LIMIT.ONE more aggressively to derive artifacts, you can print these directly to your recording device, thus deriving your processed sound in the analog domain while minimizing processing during mixing. You'll also have committed to a sound while recording—far too rare these days.

Keep Experimenting

The above are just a few ideas to help you get started using the LIMIT.ONE. We know that working for years and years with a high quality analog unit like the LIMIT.ONE will reveal new and unexpected uses, sounds and ideas. We hope that you will share those discoveries with us in the years to come.

Enjoy!

Most importantly, enjoy your relationship with the LIMIT.ONE!

Tech Specs :

Frequency Response

40Hz – 15 kHz	± 0,35 dB
20Hz – 20 kHz	± 0,73 dB

Amplification   0 to +5 dB

Max Output level (40Hz k_3 -50dB)   +24dBu

Voltage   115/230V AC

Power usage   5W

Dimensions B/H/T	483 mm (19") 44,2 mm (1HE)	27,5mm	
Weight		3,95 kg	

Input   symmetric, isolated ground

Input resistance   ≧ 30kOhm

Input damping at 15KHz   ≧ -60dB

Output   symmetric

Output resistance   ≧ 80Ohm

Output damping at 15KHz   ≧ -42dB

Harmonics k_3:
at +4dBu

40Hz	1kHz	6,3 kHz
-57dB	-77B	-67dB

Noise floor:

(at + 4dBu Output at 5)

p_{Ger} ≧ -75 dBqs (CCIR 486)

p_{Fr} ≧ -85 dBq   (Bandwidth 10Hz – 30 kHz)

About rockruepel and Mastering Works:

Rockruepel launched with the successful tube compressor series consisting of comp.one and its successor, the comp.two. This boutique compressors are insiders secret tool for recording, mixing and mastering and are now among engineers such as Russell Elevado, Luca Pretolesi, Max Dingel, Paul Stacey, Fab Dupont. The amazing sound and build quality that the users of comp.one and comp.two already know and love, is now in a completely new audio tool available, the limit.one. The user can balance between loudness and dynamics in a new previously unknown way.

Mastering Works GmbH is the European distributor of selected high-end audio solutions. CEO Stefan Heger introduced in 2004 the Dangerous 2 Bus to different studios and engineers and founded Mastering Works GmbH, a company with an exquisite product portfolio and the exceptionally close contacts with end users. Besides the brands Dangerous Music, Sterling Modular, rockruepel and Guzauski Swist it also includes training and individual studio solutions.

Warranty:

2 years with registration : www.masteringworks.com

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