TSL SERIES · DYNAMICS

LAP TSL-K35

COMPRESSOR-EXPANDER · V2.4.8 · USER MANUAL

What it is. TSL-K35 is a compressor-expander built as an automatic level controller: a FET gain cell steered by a control voltage, with the amplifiers and the relay around it, modelled part by part and solved as a circuit in real time. It has two independent sections. The **compressor** (GAIN, RATIO, RELEASE, AUTO) evens out the level of the programme around a fixed reference point. The **expander** (THRESHOLD, EXP) pushes down whatever falls below its threshold - noise, spill and room sound in the pauses. THRESHOLD belongs to the expander only; the compressor has no threshold.

What the compressor does. Instead of a threshold it has a rotation point, a fixed reference level of **0 dB = −12 dBFS**, through which every curve passes: a signal at −12 dBFS leaves at −12 dBFS whatever RATIO and GAIN are set to. Above the rotation point the signal is compressed by RATIO (2:1 … 20:1). Below it, quiet material is lifted towards the rotation point by the same ratio - but never by more than GAIN. GAIN is therefore not a make-up control but the most the unit may add to quiet passages: at 0 dB the unit only compresses, and only above −12 dBFS; at +18 dB with RATIO 20:1 it holds everything from about −32 dBFS up to full scale close to −12 dBFS. The detector follows the peaks of the input, the attack is fixed and fast (under 1 ms), RELEASE sets the recovery (0.5 – 3 s) and AUTO makes it programme-dependent. Turning GAIN or RATIO takes effect at once.

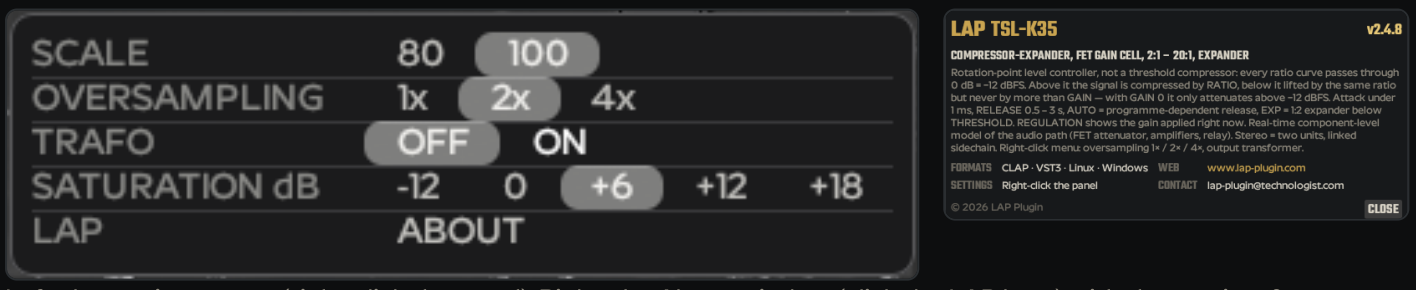
What the expander does. With GAIN turned up the compressor lifts the noise in the pauses as well. Below THRESHOLD (−55 … −15 dB relative to the rotation point, i.e. −67 … −27 dBFS) the expander lowers the gain 1:2, so a signal 10 dB under the threshold leaves 20 dB under it. With EXP off THRESHOLD does nothing. The REGULATION meter shows the gain the unit is applying right now: LIFT to the left, 0 at the rotation point, CUT to the right. Read the chapter on the rotation point before deciding that it does not work.

A mastering plugin. TSL-K35 - like every plugin of the TSL series - solves the audio board as a circuit in real time, and one stereo instance takes a sizeable part of a CPU core (about 35 % of real time at 48 kHz with the default 2× oversampling on the development machine, about 20 % at 1×). It is made for the master bus, for stems and for a few key tracks, not as a channel compressor on every track of a session: a handful of instances is fine, a dozen will run the CPU out. Use it where it counts.



1 Working the panel

Action	Result
drag a knob	vertical drag changes the value; hold `Shift` for fine control; the mouse wheel works too
hover a knob	the exact value is printed below the knob scale while the pointer is over the knob
double-click a knob	resets to default (`Ctrl` -click does the same)
click AUTO	programme-dependent release on / off (red LED lit = on), see Attack, release and AUTO
click EXP	expander on / off (yellow LED under the button lit = on), see Expander
click COMP	the compressor in or out of the path (green LED and the red bar lit = in). Out = the relay routes the input straight to the output; the model keeps running, so switching back in is seamless and COMP does not lower the processor load.
slider POWER	the unit on / off, see Stereo, COMP and POWER
click the LAP logo	opens a small About window with the plugin version, formats and links
right-click the panel	the settings menu, see below
preset bar	above the panel, see Presets

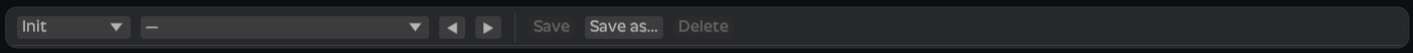


Left: the settings menu (right-click the panel). Right: the About window (click the LAP logo) with the version, formats and contact.

Menu row	Choices	What it does
SCALE	80 · 100	window size in percent: 892 × 176, **1115 × 220** (default), plus the 30 px preset bar
OVERSAMPLING	1x · **2x** · 4x	how fast the audio board is solved, counted from 44.1 / 48 kHz, see Oversampling, transformer and CPU
TRAFO	**OFF** · ON	a model of a real audio output transformer after the unit
SATURATION dB	−12 · 0 · **+6** · +12 · +18	how hard the transformer is driven, at the same level
LAP	ABOUT	the About window

The panel shares its frame with the other plugins of the TSL series and is a little narrower, as the unit is simpler. On the left the **compressor**: GAIN (black cap), RATIO and RELEASE with the AUTO button under the COMPRESSOR bracket. In the centre the LAP logo, the name and the POWER slider. Then the **expander**, deliberately set apart from the compressor line: the EXPANDER bracket with the EXP button on top, THRESHOLD (yellow cap) below it and the yellow EXP LED under the button. On the right the REGULATION meter and the COMP button with its green LED. The whole panel is a 3D model rendered with ray-traced light, at three times the resolution of the default window so it stays sharp when enlarged or on high-DPI screens.

2 Presets



Element	What it does
category ▾	choosing a category loads its first preset at once. **Init** is the default state (GAIN +6 dB, RATIO 4:1, RELEASE 1 s, THRESHOLD −35 dB, AUTO off, EXP off, COMP in, POWER on, 2× oversampling, transformer off); **User** holds presets saved without a category; every other category is a folder of your own.
preset ▾	the presets of the chosen category; user presets are marked with a dot. "-" means the current settings do not come from a preset (a knob was moved).
◀ ▶	step through all presets - quick A/B between saved settings
Save	overwrites the selected user preset with the current settings
Save as...	name and category (type a new one or pick from ▾); OK saves, Cancel returns
Delete	deletes the selected user preset - click twice ("Really delete?")

A preset stores the four knobs, AUTO, EXP and the menu settings (oversampling, transformer, saturation). It does **not** change COMP and POWER - those belong to the session. Loading a preset

moves the controls like a hand on the knobs: the audio keeps running, and the host records the change as automation if you are writing it.

Presets are plain files: Windows `%APPDATA%\LAP\TSL-K35\presets\`, Linux `~/.local/share/LAP/TSL-K35/presets/` - one JSON file per preset, one sub-folder per category. They can be copied between machines and systems.

3 Controls





Control	Range	Notes
GAIN	0 … +18 dB	the most the unit may lift quiet material. 0 dB = the unit only attenuates above the rotation point; +18 dB = full level control. In silence the unit sits at +GAIN. Takes effect at once. Default +6 dB.
RATIO	2:1 … 20:1	slope of the curve on both sides of the rotation point - compression above it, lift below it. At 20:1 the output holds 0 dB (±0.3 dB) for inputs from −20 to +15 dB re the rotation point. Takes effect at once. Default 4:1.
RELEASE	0.5 … 3 s	recovery time constant after the signal falls. The attack is fixed, under 1 ms. Default 1 s.
AUTO	button + LED	programme-dependent release: the recovery is extended by how long the input stayed above the rotation point, up to about 10 s, see Attack, release and AUTO. Default off.
THRESHOLD	−55 … −15 dB	expander threshold, relative to the rotation point (−67 … −27 dBFS). Below it the expander reduces the gain 1:2, see Expander. **Works only with EXP on** - it is not a compressor threshold. Default −35 dB.
EXP	button + LED	expander on / off. Default off.
COMP	button + LED	the compressor in (lit) or out of the path; out = relay bypass, the meter rests at 0. Default in.
POWER	ON / OFF	the unit on or off; off = dry signal, delay-matched. Default ON.
REGULATION	+18 … 0 … −20 dB	the gain the unit is applying right now, see REGULATION meter

4 The rotation point

A threshold compressor leaves everything below the threshold alone and compresses what is above. This unit has no threshold; it has a **rotation point**, a fixed reference level of **0 dB = −12 dBFS**, through which every curve passes whatever RATIO and GAIN are set to. Above the rotation point the signal is compressed by RATIO (+10 dB in, +5 dB out at 2:1, +0.5 dB at 20:1). Below it the signal is lifted towards the rotation point by the same ratio (−10 dB in, −5 dB out at 2:1, −0.5 dB at 20:1) - but never by more than GAIN: where the lift would exceed GAIN the curve continues 1:1, shifted up by GAIN. The unit is a feedback level controller - in silence it sits at +GAIN and pulls the gain down as the signal comes up. The detector follows the peaks of the input, not the average, so material with a high crest factor (drums) is compressed more than a dense mix at the same loudness.

input	2:1, GAIN 0	2:1, GAIN +18	20:1, GAIN 0	20:1, GAIN +18	EXP −45, 4:1 +6	COMP out
−60	−60.0	−42.0	−60.0	−42.0	−69.0	−60
−50	−50.0	−32.0	−50.0	−32.0	−49.0	−50
−40	−40.0	−22.0	−40.0	−22.0	−34.1	−40
−30	−30.0	−15.1	−30.0	−12.0	−24.0	−30
−20	−20.0	−10.0	−20.0	−2.0	−14.0	−20
−10	−10.0	−5.0	−10.0	−0.5	−4.0	−10
0	0.0	0.0	0.0	0.0	0.0	0
+10	+5.0	+5.0	+0.5	+0.5	+2.6	+10
+15	+7.5	+7.4	+0.8	+0.7	+3.8	+15

Output level for a 1 kHz sine, steady state, input and output in dB relative to the rotation point (0 dB = −12 dBFS). Reading the "2:1, GAIN +18" column: from −60 to −40 the signal goes 1:1 with the +18 dB lift (the cap), from −30 it bends onto the 2:1 line through the rotation point, above 0 it is compressed 2:1. "20:1, GAIN +18": from −10 to +15 dB in, the output stays within −0.5 … +0.7 dB - a level controller. At the rotation point the output is 0 dB at every GAIN and RATIO setting.

What you see	What is happening
THRESHOLD turns, nothing happens	THRESHOLD belongs to the expander; with EXP off it does nothing. The compressor has no threshold - its reference is the fixed rotation point.
GAIN 0, signal below −12 dBFS: nothing	below the rotation point the unit may only lift, and the lift is capped at GAIN = 0; compression starts above −12 dBFS. Turn GAIN up or feed it more level.
GAIN 0, 20:1, signal at −2 dBFS: out about −11.5 dBFS	10 dB over the rotation point, compressed 20:1 - it works, the "threshold" is simply fixed at −12 dBFS and the meter reads about −10
GAIN +18, 20:1: everything comes out at about −12 dBFS	automatic level control: quiet passages lifted by up to 18 dB, loud ones pulled down. No dynamics left is correct.
GAIN +18: noise rises in the pauses	in a pause there is nothing to regulate, so the unit sits at full gain. That is what the expander is for, see Expander.
meter rests at +6 in silence	correct: REGULATION shows the gain being applied - the full GAIN in silence, 0 at the rotation point, negative when compressing
a short peak gets through	feedback attack of about 0.35 ms: the first half-cycle passes, then the loop takes hold within a millisecond - the peak is compressed, not clipped
slow to come back after a loud passage	RELEASE 0.5 … 3 s, and with AUTO up to 10 s after a long passage above the rotation point - by design

Getting a result. With programme peaks around −12 dBFS and above the compressor works like any other; a typical mix peaking near −1 dBFS loses a few dB at the default settings, drums more. For a classic "only tame the peaks" job keep GAIN at 0 and choose the RATIO. For levelling (speech and programme material) use GAIN +18 and a high ratio, and switch EXP on so that the pauses are not lifted together with the programme. If your track sits well below −12 dBFS and GAIN is at 0, nothing happens - turn GAIN up or raise the input level.

5 Attack, release and AUTO

The attack is fixed and fast - a feedback detector with a time constant of about 0.35 ms, so the gain is in place within a millisecond. RELEASE sets the recovery after the signal falls, 0.5 … 3 s, a single time constant. With **AUTO** the release becomes programme-dependent: the recovery is extended by the time the input spent above the rotation point, up to about 10 s, so a short peak recovers at the set RELEASE and a long loud passage comes back slowly - without pumping and without the level breathing on every pause. RELEASE and AUTO govern only the reaction to the signal: when you turn GAIN or RATIO the new curve applies at once, there is no slow drift after a knob move.

6 Expander

With GAIN up, a level controller lifts whatever is there - including the noise and spill in the pauses. The expander prevents that: below THRESHOLD (−55 … −15 dB relative to the rotation point, i.e. −67 … −27 dBFS) the gain falls 1:2, so a signal 10 dB under the threshold comes out 20 dB under it. It uses the same level detector as the compressor with its own timing: it closes in about 20 ms and opens in about 0.25 s. For noise in the pauses set THRESHOLD just above the noise floor of the source; towards −15 dB it starts to work on the music itself and tightens the room between drum hits (drums peaking near −1 dBFS: no change at −35 dB, −0.4 dB at −25 dB, about −7 dB RMS at −15 dB). With EXP off nothing happens below the threshold.

7 REGULATION meter

The needle shows the gain the unit is applying right now, relative to 0 dB: to the left (**LIFT**, up to +18) quiet material is being brought up, at 0 the signal is at the rotation point, to the right (**CUT**, down to −20) the signal is being compressed. In silence the needle rests at +GAIN; with COMP out or POWER off it reads 0. The movement has the inertia of the unit's meter (about 0.3 s), so it reads the level control, not single peaks.

8 Stereo, COMP and POWER



The unit is mono. A stereo track gets two units with a **common sidechain**, as two units are coupled in a rack: the detector follows the louder of the two channels and both units apply the same gain, so the stereo image stays in place. There is one set of controls.

COMP takes the compressor out of the path - the relay of the unit routes the input straight to the output while the model keeps running, so switching it back in is seamless. **POWER** switches the unit off: the dry signal passes delay-matched (including the transformer latency). The model keeps running in the background so that switching POWER on again starts from a settled state; POWER does not save CPU.

9 Oversampling, transformer and CPU

The audio board is solved at a multiple of 44.1 / 48 kHz, whatever the session rate: 1× runs it at 44.1 / 48 kHz, **2×** (the default) at 88.2 / 96 kHz and 4× at 176.4 / 192 kHz. In a 96 or 192 kHz session the signal is resampled down to the board and back, so the load does not grow with the session rate. The curves and the rotation point are the same at every setting; 4× makes the attenuator a little smoother when it works hard, 1× saves CPU.

Output transformer (TRAFO, default OFF). The unit itself has an electronic output; as in the other plugins of the TSL series, the signal can pass through a model of a real audio output transformer after it - also with COMP out, as the relay is inside the unit. The core with its magnetisation and hysteresis is solved sample by sample (at 176.4 / 192 kHz whatever the session rate). It adds weight in the low end and low-order harmonics that grow with the bass content and the level, while mid and high frequencies stay clean; the level drops by about 1.5 dB, the same as in the other TSL plugins. **SATURATION** raises the signal in front of the transformer and lowers it by the same amount after it, so the level stays and only the core works harder or softer; at +18 dB the deep bass of loud passages goes into saturation.

Session	1×	2×	4×	+ transformer
44.1 / 48 kHz	0	30	36	+36
88.2 / 96 kHz	61	0	30	+30
176.4 / 192 kHz	147	61	0	+0

Latency in samples of the session, reported to the host; it changes when OVERSAMPLING or TRAFO is switched. Switching either while playing is safe: a new pair of units is built in the background and cross-faded in. The latency is the same with COMP out and with POWER off - the dry signal is delay-matched.

Load. Stereo instance at 48 kHz on the development machine, programme material (pink noise): about 20 % of real time at 1×, about 35 % at 2× (the default) and about 65 % at 4×; the transformer adds about 10 %. Hard settings on full-band white noise (20:1, GAIN +18) cost up to about 75 % at 2×; music stays near the programme figures. The same figures apply in 96 and 192 kHz sessions.

10 Signal flow

Stage	What happens
input	−12 dBFS = 0 dB (the rotation point), input stage of the board
attenuator	FET attenuator driven by the control voltage; GAIN sets its maximum gain
output	output stage, COMP relay (in / out)
transformer	optional output transformer (TRAFO, SATURATION) after the unit
sidechain	peak detector on the input · rotation point · RATIO · RELEASE / AUTO · expander below THRESHOLD · control voltage to the attenuator; in stereo the detector follows the louder channel
meter	REGULATION = gain of the attenuator relative to 0 dB, 0.3 s inertia