

## Emperical Labs EL8X DISTRESSOR Manual

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## FEATURES

- \***Classic knee sound** - With modern noise specs and improved performance. Really grabs.
- \***Programmable analog distortion/warmth** - helpful in the pristine but unforgiving digital world. Three audio modes providing user programmable, warm harmonic distortion. Emphasized tube-like, 2nd harmonic in clean and Distort 2 mode. In Distort 3 mode, the distortion becomes dominated by 3rd harmonic, more similar to tape.
- \***Distortion indicator lights** - A 1% LED and a "Redline" (3%) LED. No hard clipping until a few dB past "Redline".
- \***Advanced built-in sidechain EQ** - High mid band emphasis prevents harsh, edgy guitars or vocals from hurting innocent ears. Low cut keeps the low "sum & difference" frequencies from pumping the upper frequencies of source material.
- \***Fool proof operation** - Even though there are 384 possible settings (not counting knob settings), it's almost impossible to get a bad sound. Keep all knobs on 5 or 6 (around middle) with ratio at 6:1 and you won't go wrong.
- \***Eight unique curves** - From the 1:1 mode that simply warms up signal with low order harmonics without intentional compression, to the "Nuke" setting - a brick wall limiting curve that shines on live drum room mics. Each curve has its own personality, and release shape. Most exceptional is the 10:1 "Opto" ratio which uses separate circuitry to emulate the oldest (and valued) "light controlled" devices, such as the LA2A etc. See manual to emulate other compressors of old.
- \***Discrete and integrated combination** - the best of speed/linearity with repeatability. Hand tested & selected components.
- \***Huge knobs with high resolution numbering** - For easy readability and repeatable settings. They also go to 10 1/2 .
- \***Locked, calibrated, output level** - Allows speed in setting tape and live mix levels.
- \***Stereo Strappable**
- \***Switchable 110/220 volt operation** - Extra fuse provided inside unit.
- \***Over design power supplies** - Runs cool, allowing cabinet to be sealed - without heat vents. Long life components.
- \***Single height and light weight** - Classic sound in a small, extremely reliable package.
- \***True bypass** - Know what it's really doing. All contacts doubled up for maximum reliability. No

internal audio connectors.

**\*XLR and 1/4" phone ins and outs** - XLR fully balanced, transformerless design, pin 2 hot.

Changeable by user to pin 3 hot!

**\*All metal film and Roederstein resistors** in the audio path - top quality components. Many mil spec. parts.

**\*Interface and features found nowhere else.**

**\*Hand wired, calibrated in USA.** Shipping weight 11.25Lbs.

## **SPECS**

**\*Freq. response is 2 Hz to 160 kHz** in clean audio mode (+0, -3 dB). Response is shaped in distortion modes (Dist 2, Dist 3).

**\*Dynamic range 110 dB** from max. output to min. output in 1:1 mode. Greater than 100 dB signal to noise in distort 3 mode.

**\*Distortion ranges between .02% and 20% depending on distortion mode and release times set on front panel.**

**\*DC coupled output** - High quality input caps.

**\*Time constants** - Attack range 50uS - 30mS. Release range .05 sec to 3.5 seconds, normal mode and up to 20 seconds in 10:1 opto mode.

Empirical Labs - *Something old, Something new*

## **USING THE DISTRESSOR FOR THE FIRST TIME**

Hookup is straightforward. Either the XLR's or phone plugs can be used. In relation to the phone jack tips, pin 2 is wired "hot" on the XLR's. But if you're using the XLR's in and out, it doesn't matter which pin is hot, as long as you're cabling is in phase. [If you use a single ended XLR output, leave unused pin floating!](#) The ground pin (pin 1 on XLR) should, of course, always be connected. [Connecting all input pins is preferred, but the unit will operate fine if unused pins aren't tied to ground.](#) Hookup directions are also located on the rear panel of unit, near the connectors. See wiring section on p7 for greater details.

### **Where to start - 5 5 5 5**

Start with 6:1 ratio and set all four knobs to 5, the midway position. This is a great starting place for anything. Push the ratio button until the LED's cycle to the 6:1 ratio (Yellow LED). Adjust input to drive into more compression. The harder you drive, the more knee you'll hit, and the greater the ratio will be. Only 1 LED should be lit - the 6:1 LED (not counting any bargraph LED's). If you need more obvious compression, push ratio button to progress to higher ratios. If you would like lower ratios, the very long knees of 2:1, 3:1, 4:1 are silky smooth. The 2:1 ratio has a +15 dB knee, where the ratio gradually increases! Unit will scroll around "Nuke" back to these lower ratios, but if you must cycle through 1:1 while unit is in use, do it quickly since compression will be turned "off" and the signal will swell to its peak input levels, possibly becoming dangerously loud. Waiting for a pause in the input before changing ratio is a safe thing to do. For a quick +4 tape levels, try setting output knob to 8. For more, see p5.

### **Distortion Settings**

If all the LED's are off in the "Audio" area, your Distressor is operating in its cleanest mode.

Distortion settings should be used when subtle analog distortion is desired. Dist 2 mode produces "Class A" type warmth, producing mostly 2nd harmonic when compressing (tube distortion is known for its 2nd harmonic) and Dist 3 adds 3rd along with 2nd harmonic. Dist 3 can look and sound very similar to tape distortion - it gradually flattens out the top and bottom of the waveform. If you want a digital signal to sound like an analog tape signal, try 2:1 mode with Dist 3 engaged, and compress 1 - 3 dB (as displayed on bargraph). Tape goes in and out of saturation quickly, so fast attacks and decays are appropriate. If you want to make it sound like over-saturated tape, you could try one of the higher ratios and drive the input to produce 1 - 5 dB of compression. With the quick release, 2nd harmonic will still be strong in Dist 3 mode. More than 3 to 5 dB of reduction will sound less like tape,

more like compression.

### **Advanced Detector functions**

The new user may want to stick with a basic setup until he feels comfortable, but with the push of a button he can enable some advanced sidechain functions. While tracking vocals for instance, sometimes "p's" and "b's" can hit the mic with an air blast that shows up as a high amplitude, low frequency signal, causing the compressor to "kick in". The result may be a brief, unnatural drop in the apparent vocal level. By pushing the detector button once, you engage a high-pass (abbreviated with HP) filter in the detector (the part of the circuit that figures out how much to turn down the signal). This high-pass, or low cut, will not allow low, low frequencies to trigger compression, and in this case, prevent the unnatural drop in vocal level from a "p" or "b" blasting the mic with wind. It may also help to HP (high-pass) the audio in this case.

Another detector sidechain filter can be engaged with a second push of the button. This is the "band emphasis function" that inserts an Eq into the detector circuitry that makes the circuit much more sensitive to harsh, mid band frequencies. This is useful on vocals (for those singers with a nasty edge to their voice when they go up high), guitars, synths, and many other solo instruments that may become harsh and too loud in the mix. See "Detector Modes" for more info.

### **EXAMPLE SETTINGS**

Generally, it is difficult to make the unit sound unnatural due to its vintage topology. The ratio and release times are the most critical settings. Again, around 5 on the release knob is a good starting spot. The attack is variable from 50uS to 30mS. The release is variable from 50mS to 3 seconds. For percussive material, if you need to add attack, add attack. That is, slow the attack by turning the knob clockwise towards 10. Conversely, if you need to get rid of some pick noise, or over transient sounds, the fast attack and release is the way to go. With these tools, an engineer can mold the envelope of sounds in a very controlled manner, adding or softening attack, sustaining, smoothing and evening until the sounds fit into the mix as desired.

#### **Vocals**

Turn off all distort modes if you're going to tape, however the High-pass (HP) in both the detector and audio paths may be useful. Set ratio to 6:1 or less, attack 5, release 4. Adjust input to produce anywhere from 3 to 17 dB of compression. Sometimes the band emphasis setting is effective for those dynamic, "piercing" vocal passages. On mixdowns Dist 2 can add a warm edge to vocals. The "Opto" mode in 10:1 is guaranteed to give you a classic compression curve. Try 10:1, with attack on 10, release on 0. Separate detector circuitry will be enabled.

#### **Bass**

4:1, 6:1 turn attack on 5, release 4. The distortion audio modes sound great on bass, but caution should be observed if you are going to tape. You cannot un-distort. If you have a very "clacky" bass player, sometimes the band emphasis in the detector just flattens that stuff out. Use fast attack and release times to keep "clacks" from pumping. Also, try "Opto" mode.

#### **Elec. guitar**

A wide range of settings can be used. To get rid of edgy attacks, use quick attack, medium release. To smooth out solos, try the band emphasis in the detector to pull up the lower, softer notes and push back and sustain the higher, and often, thinner notes. Try "Opto".

#### **Acoustic guitar**

We've been told by a couple of engineers that the Distressor is one of the best sounding units for acoustic they've ever heard. Use 6:1, [ 7, 2, 5, 7] settings (i.e. Input 7, Attack 2, Release 5, Output 7). High-pass (HP) is often useful in both detector and audio modes. The fast attack will get you a "glassy" full sound since the pick noise will be attenuated and the sustain lengthened.

#### **Piano/Keys**

Start with quick attack (0-4) and medium release (4-6). Acoustic pianos often need less attack to fit into a mix, but there are millions of exceptions. Bruce Hornsbyish pianos are often real or samples of real pianos with medium attack and medium release, getting that "bite" followed by sustained body. Try attack 5, rel 5. Opto mode is very nice here, too. Sometimes brittle high notes can be extra compressed by using the "band emphasis" detector mode.

#### **Drums**

Start by keeping the attack over 3 to keep transients. Play with decay to get more or less "in your face" sounds. Because of the wide range of attack, the Distressor puts the drum "percusiveness" much more into the engineer's control than the older, classic units.

**Snares/Kicks/Toms - Try** [3:1 6,5,5,6].

Shorten decay if you need to bring up "after ring". If a tom has too much attack, turn attack down between 0 - 4. If crackling from L.F., modulation occurs, play with longer attack or release times, or Det HP. Since you can load compression on without sounding funny, watch "mic leakage" which can become a problem. Kick drums sound great using Opto mode (10:1, attack on 10, release 0) and Det HP on.

### **Room mics**

For radical treatment, try 20:1 or "Nuke", [10, 6, 2.5, 6]. The "Nuke" ratio was originally developed for room mics, but we have since found it useful in many areas. "Nuke" and 20:1 are pretty much brick wall limiting, keeping any normal signal within 1 dB or so. Just patch in a room mic that is 10 - 25 feet from drums (or other instruments) and slam the meters. Try attack on 5 and release on 3. Fifteen to twenty dB of compression is starting to sound about right for the John Bonham thing, but don't be afraid to run the gain reduction meters right off scale. You will find the output a little lower than the other ratios in "Nuke". Better have quiet mic preamps too - as 20 dB of compression can bring the noise floor up by 20 dB. The release should be quick (< 3) for the largest sound, but slower releases can often be effective when mixed in with the rest of the kit. Room ambience can be made to "swell up" on the tom and snare rings later, filling in behind the close mics. If you want to add "grunge", experiment with Dist 2 and Dist 3.

### **THE RATIOS AND THEIR CURVES**

Each "ratio mode" of the Distressor sets both the threshold and the ratio, in the standard sense of the word. This was done to provide an easy to set, yet versatile group of curves. The 1:1 mode provides no compression, but allows the audio to pass through the "warming" circuits of the unit (we'll get to the distortion modes in a moment). Ratio's 2 through 6 are general purpose curves great for tracking. The 2:1 and 3:1 ratios are "parabolic" knees - very gentle curves that won't typically go into hard limiting and therefore, also won't provide absolute overload protection. Ratios 4:1 and 6:1 have steeper knees and are good general purpose curves that gradually move towards hard limiting, "nailing" the signal in its place. The ratio of 6:1 is very useful for vocals, bass, and acoustic instruments. It has an easy slope at first until after the knee, where an increasing ratio "musically" limits the peaks of the signal before damage is done. The 6:1 and 10:1 Opto ratios employ shorter knee limiting, reminiscent of some old classics from the 60's and 70's (see Classic Emulation). "Nuke" is a different story. The "Nuke" ratio was developed for room mics, but we have since found it useful in many areas. "Nuke" has a medium threshold but when the signal hits it, a nuclear blast won't budge the output level. It is brick wall limiting, keeping any normal signal within 1 dB or so. Just patch in a room mic while recording drums (or other instruments) and slam the meters. Try attack on 4 and release on 2. The release curve of "Nuke" is logarithmic, meaning it lets off quickly at first and then slows. This release curve is a big part of the Distressor's sound. Experiment with the release times - this guy can release really fast without too much crackling, even on bass. 20:1 can be used similarly to "Nuke". Each of these curves again has their own feel to them, with the release slopes slightly altered, and the knees falling in slightly different places. Most exceptional are the 2:1, 10:1 and Nuke ratios, which employ special detector circuitry.

Just what is a soft knee?

A "soft knee" is a compression curve where the first few dB of gain reduction occur at very low ratios, gradually increasing as the signal increases (gets louder). This makes the onset of compression very hard to detect. The knee usually extends for a few dB and gradually flattens out toward a final ratio. All curves with the exception of 20:1 and "Nuke" have dominant knees. The 2:1 ratio has a knee that can be as long as 30 dB, depending on attack and decay settings.

## **CLASSIC EMULATION**

Since the unit is based on the oldest compressor topology, the unit can be made to sound very similar to older classics. The nonlinear nature of the older gain control elements of opto-couplers, FET's, pentode (or triode) tube bias or "mu" modulation, etc., can be closely emulated if proper settings are used. A special "Opto" mode has been provided in the 10:1 ratio.

### **Some Examples:**

\*To simulate the opto-VCA tube models of old (the LA2, LA3, LA4, DeMaria, Meek units), try 10:1 "Opto" ratio, with attack on 10, release on 0, Det HP on. Adjust input and outputs to your taste. Remember our LED metering deflects much faster than the old VU's so don't be afraid to hit the unit quite hard (10-20 dB of compression on peaks). Try Dist 2 & 3 mode, but let your ears be your guide. Try faster attacks (4-9) for more aggressive sounding compression.

\*DBX160 2:1 (for over easy) on up will do, att 9, release 2, clean mode.

\*LN1176 6:1, Att 0 - 3.5, rel 1 - 10.5. Use ratios 3:1, 4:1, 6:1, 20:1 to emulate 4 LN1176 ratios. Clean mode is appropriate (Dist 2 or 3 off). Remember that the LN1176 attacks extremely fast and you must keep attack under 4 max. A familiar sound is 6:1, att2, rel 4.

\*Old Fairchild IGFET - 6:1 att 3-5, rel 2 - 7 (start with att 4 and rel 4)

Due to the transformerless design, you will maintain a low transient intermodulation distortion, but will get the warming grunge of 2nd and 3rd harmonic distortion, if distortion modes are enabled. Also, unlike the older units, the Distressor is uniform and predictable from one unit to the next. Precise factory calibration assures that if you go from one Distressor to the next, these settings will all sound the same.

## **THE AUDIO MODES**

To switch between the "Audio" modes, press the button labeled Audio. The LED's above the switch will cycle through 6 states. In order of occurrence:

- 1) Norm - (No LED's lit) Low distortion and full frequency range.
- 2) HP - High-pass (Green LED) Smoothly cuts low "mud" audio frequencies.
- 3) Dist 2 - (Yellow LED) Emphasized 2nd harmonic distortion.
- 4) Dist 2 & HP - Combination of 2 and 3 above.
- 5) Dist 3 - (Red LED) 3rd harmonic emphasized.
- 6) Dist 3 & HP - Combination of 2 and 5 above.

### **The High-pass mode (HP)**

The first mode cycled to after normal is HP (or High-pass). With the HP LED on, the unit rolls off low "sub" frequencies below 80 Hz in the audio. It is a very smooth Bessel filter, about 3 dB down at 60Hz and -12 @ 30Hz. Its final slope is 18 dB per octave but is below all but the very exceptionally low vocal tones. Rolling "subs" off of a singers mic is an excellent use for this filter. This can also be selected along with either Dist 2 or Dist 3 modes as explained below.

### ***Its not only a compressor but a ... "Distortion Generator"***

The Distressor is a modern digitally controlled analog device that attempts to offer some of the "musical non-linearities" exhibited by the older tube, class A discrete, and magnetic tape mediums. The old, sought after vintage gear is not anywhere near as accurate (or linear) as devices made today, but certain "faults" or non-linearities are exactly the reason some sell today at 10 times their original value. They color the sound with distortion and frequency response shaping. Getting the frequency response flat to 20kHz and having distortion below .5% used to be an achievement. Today, in 1996, a 35 cent op amp is flat to 3 MHz and produces distortion below .002%. Getting things accurate in the digital age is relatively cheap and easy. But getting the expert user to think a piece of gear is "musical" and fun to use is something else.

## **THE DISTORTION MODES**

By using a design that allows pinpoint control of nonlinear analog devices, the Distressor is trimmed to produce three controllable distortion modes:

1. Normal (Clean) No induced distortion. THD hovering between .025 and .3%
2. Dist 2 THD hovering between .05 and 3% Emphasized 2nd Harmonic
3. Dist 3 THD hovering between .1% and 20% 3rd Harmonic increased.

#### **Dist 2 Mode**

It is well known that the triode distortion in tube circuits produces lots of 2nd and 3rd harmonics, in somewhat varying ratios. These lower order harmonics form "the octave" and "the octave and a fifth" to the fundamental musical tones. They are actually "musical" distortion. Harmonics above the 2nd and 3rd are usually considered harsh and unmusical, and therefore should be lower in amplitude (<-60 dB) to keep with our line of thinking. Second harmonic is considered to be the warmest and most "consonant" harmonic distortion. The Dist 2 mode on the Distressor emphasizes the 2nd harmonic (octave), especially while compressing.

#### **Dist 3 mode & the Distortion indicators**

This mode emphasizes the third harmonic. This is basically caused by nonlinear gain that results with the top and the bottom of waveforms being flattened out. Analog tape saturates in this manner. The 3rd harmonic is induced in the Distressor by increasing VCA output level. We have provided distortion indicator lights that come on most frequently in Dist 3 mode. A yellow LED light indicates .25% THD and the red "redline" LED indicates 3% THD or more. Though not always an exact indication of the distortion, these LED's are an excellent guide to where the user is in the "Grunge Department" and can help to avoid turning the music into an "overwell" mess. You will find that the harmonic distortion is generally more obvious on overall mixes and complex programs. On individual instruments, sometimes 3% distortion sounds "fat" and "analog" and isn't heard as distortion at all. 5

### **THE DETECTOR MODES**

There are three additional modes that affect the detector part of this unit. The detector is the part of the compressor circuit (or software) that figures out how much and how fast to turn down a signal. The actual audio you finally hear is not passed through this circuitry, only adjusted by it. In fact, you can put entirely different audio into the Stereo Link input that will affect the main audio coming out, but not be heard itself. See block diagram below and stereo hookup in this manual.

**Detector Modes** To switch between the "Detector" modes, press the button labeled Detector. The LED's above the switch will cycle through eight states. In order of occurrence:

- 1) Norm - No detector LED's lit. Standard compressor operation.
- 2) HP High-pass - (Green LED) cuts low frequencies in detector to stop L.F. modulation.
- 3) Band Emphasis - (Yellow LED) emphasized 6kHz band makes unit overreact to harsh mids.
- 4) HP and Band Emphasis - Combination of 2 and 3 above.
- 5) Stereo Link - (Red LED) - Puts unit in Stereo operation mode to respond with 2nd unit.
- 6) Stereo Link and HP - Combination.
- 7) Stereo Link and Band Emphasis - Combination
- 8) Stereo Link with HP and Band Emphasis - Combination

## **Block Diagram**

### **BASIC WIRING**

Wiring is straightforward. Connect AC line cord to 3 prong jack, plug in XLR or phone plug ins and outs, and you're wired. Both input jacks are differential but at the output, only the XLR is differential (balanced). The output phone jack tip is wired to pin 2 of the XLR out, and therefore is in phase with that pin. The only possible problem is if you attach one of the XLR output pins 2 or 3 to ground. A separate amplifier drives each of these pins, so grounding one of them will short the associated amplifier out. Therefore if you only use only pin 2 on your output cable, leave pin 3 floating (unconnected) and vice-versa. The phone jack ins and outs will be out of phase with pin 3 since the unit is wired pin 2 hot from the factory (see note below). Pin 1 should almost always be grounded on the XLR cables.

Note: It is possible to change the wiring of the connectors inside since they are hand wired. A user

can therefore make XLR pin two or three hot in relation to the phone jacks. Always unplug unit before making any changes. Our company cannot be responsible for damage to unit or electric shock to anyone trying such a modification.

### ***STEREO OPERATION***

Stereo operation requires only two things, - 1) that two (preferably) short 1/4" phone (guitar) cables are plugged from Stereo Link input of one unit to Link output of second unit and vice versa, and that 2) the unit has the Link function selected on the front (the RED "Link" LED in the detector mode should be on). It is usually best to match all front panel settings on the two "left and right" units to maintain imaging. However, unlike most units, the user has the option to treat the left and right channels differently.

An example of this may be when one channel has a heavy low frequency source (such as a tom drum) that is causing both sides to pump. You could put the side without the L.F. source into DET HP mode to prevent that side from excessively modulating, allowing you to set the release a little faster on the side with the boomy tom.

Sometimes for room mics, keeping the units unlinked actually makes them sound more stereo. This is due to unique left and right ambient envelopes widening the stereo image.

### ***DISTRESSOR "PET" TRICKS***

- 1) You can elevate distortion levels by going to "link" with stereo links unplugged (on rear). Obviously, the unit will not work in stereo now. "Link" sums 2 inputs, and with one missing, the distortion generator will receive a hotter signal since the detector is seeing half of what it would normally see in true stereo operation. Try this on bass guitar in Dist 3 mode for extra grunge.
- 2) It is also possible to sidechain process. Take the "Link Out" of a unit, go to an EQ (and/or preamp), then return it to the "Link In" of the same unit. Then put the unit into link to further affect the compression in a more frequency dependent unit. The sidechain must not have appreciable delay nor be out of phase since the "link" signal gets mixed back in with the normal detector signal and the delay would cause "combing" of the frequency response, resulting in irrational compression behavior.
- 3) To set quick +4 tape levels, try setting output at 8 and "drive" input knob until compression occurs. For -10 equipment, try 6.5 on the output. For ADAT's try 6 to 7 output level.